HORNSBY SHIRE COUNCIL

ROCK MECHANICS STUDY

HORNSBY QUARRY
OLD MAN'S VALLEY

REPORT No S8463/4-AD MAY, 1990

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your reference
our reference S8463/4-AD PLV:KMR
date 21st May, 1990

The Shire Clerk
Hornsby Shire Council
296 Pacific Highway
HORNSBY NSW 2077

ATTENTION: MR. KEVIN SMITH

Dear Sir,

RE: ROCK MECHANICS STUDY - HORNSBY QUARRY, OLD MAN'S VALLEY

Please find enclosed 6 copies, as requested by Mr. W. Latham of our report on a rock mechanics study carried out at Hornsby Quarry, Old Man's Valley. This study was undertaken in conjunction with an extended geotechnical investigation of the Old Man's Valley proposed playing field development, the results of which will be reported separately.

Should you have any queries regarding this report please do not hesitate to contact Mr. Peter Volk or the undersigned.

For and on behalf of
COFFEY & PARTNERS PTY LTD

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EXECUTIVE SUMMARY

Investigations in the vicinity of the proposed playing field development at Old Man's Valley by Coffey & Partners in 1989, concluded that additional investigations including a rock mechanics study be undertaken to further assess the stability of the eastern quarry area of the Hornsby breccia quarry.

As the toe of the proposed playing field development at Old Man's Valley will come to within 50m of the top of the present position of the eastern face of the quarry and would be within about 25m of the proposed final development profile, the stability of the quarry face is of major importance to the feasibility of the playing field development.

The aim of the rock mechanics study was to obtain additional structural data on the rock mass, both on the existing quarry face and on the rock mass behind the present face. Structural data on the quarry face was obtained by detailed line discontinuity mapping carried out along three benches. This data has been presented in the form of histograms and stereographic projections. The orientation and nature of major rock mass discontinuities beyond the eastern quarry face was investigated by three 90m, long fully cored oriented inclined boreholes.

The two boreholes located above the eastern face of the quarry confirmed that the attitude and inclination of basinal layering evident in the quarry face extends for a distance of at least 60m into the hillside. The orientation and the generally massive nature of the breccia in this area indicates that slope failure by planar sliding along bedding is unlikely. The prominent joint sets identified on the three line traverses on the quarry face were either not present or poorly developed in the rock mass behind the quarry face.

The borehole located near the south-eastern corner of the quarry indicated the presence of a broad 'transition' zone some 70m wide of material between breccia in the quarry and the Hawkesbury Sandstone. The orientation of defects and the nature of materials in this zone, is not considered to have an adverse impact on the proposed development.

In summary, the general combination of rock strength, structure and groundwater conditions in the vicinity of the Hornsby breccia quarry, is unlikely to result in an overall failure of the quarry slope, and therefore does not appear to be of general concern for the proposed development.

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a rock mechanics study undertaken at the request of Hornsby Shire Council in the eastern area of the Hornsby breccia quarry. The purpose of the study was to supplement earlier preliminary investigations carried out in the area, the results of which were esented in Report No. S8463/2-AC, July 1989.

The work was undertaken in general accordance with our proposal for additional rock mechanics studies, as outlined in Appendix E of the above report. The work was commissioned by Hornsby Shire Council in a letter dated 4th October 1989.

As mentioned in previous reports, the toe of the proposed playing field development at Old Man's Valley will come to within 50m of the top of the present position of the eastern face of the quarry and would be within about 25m of the proposed final development profile for the eastern face. To further assess the stability of the eastern quarry area, the aim of the present rock mechanics study was to obtain additional structural data on the rock mass, both on the existing quarry face and on the rock mass behind the face.

2.0 Previous Investigations

In 1982, Golder & Associates (Golders) undertook a slope stability investigation of the eastern face of the Hornsby Breccia Quarry (Report No. 8267037A) for the Readymix Group. This investigation comprised the drilling of two vertical diamond drill holes, Bores G1 and G2, to 49.9m and 48.4m depth respectively. Bore G1 was located at RL41.5m near the then existing base of the quarry, and Bore G2 was located some 40m east of the top of the eastern face. The principal purpose of the drilling as outlined in Golders Preliminary Report No. 82627037 was to investigate the potential for slope failure on either a breccia/sandstone interface or alternatively along bedding or foliation planes. The report stated:

> "The drilling has confirmed that synclinal bedding/foliation exists; the bedding slope being generally 5 to 10° in Bore G1 and about 50° in Bore G2. Only very few actual bedding/foliation discontinuities were observed and no fracturing along these planes was encountered. Bedding/foliation planes are therefore not considered to form a potential failure plane.
>
> Complete joint orientation was not possible as core orienting equipment was not used during drilling of the vertical holes. Joint dip angles measured were variable however, the dominant angle of about 80° noted in Bore G1 agreed with the principal joint dip established from the joint survey of the eastern face above. The joints logged in Bore G2 indicate principal joint dips of 15 to 30° and 45 to 60°.
>
> Most joint faces were calcite filled and no clay infilling was apparent thus indicating appreciable joint strength.

The generally moderately to widely spaced presence of jointing together with the indicated appreciable joint strength is considered to preclude failure of the slope through either a single or a series of intersecting joint planes".

Subsequent to the above investigations, Coffey & Partners Pty. Ltd. (CAP) undertook in 1989 a preliminary investigation of the quarry area which included some field mapping along creek lines and surface exposures in the area above the quarry, as well as limited geological mapping of joints and bedding exposed on the eastern quarry face. This information was presented in Report No. S8463/2-AC, July 1989 which concluded that; "On the basis of information available, Golder & Associates conclusions appears reasonable. In view of the possible ramifications if the quarry were to be extended, consideration should be given to implementing a rock mechanics study in conjunction with other work".

The present rock mechanics study was undertaken concurrently with additional geotechnical investigations being carried out in the vicinity of the Old Man's Valley playing fields, the results of which will be reported separately.

In addition to survey information previously supplied by Council for the preparation of Report No. S8463/2-AC, which was used in the preparation of this report, the following information was recently provided by Council:

- A 1:500 plan of Old Man's Valley Hornsby Site Details as at May 1989, (Drawn January 1990).

- A 1:1000 plan of Hornsby Quarry prepared by QASCO (NSW) Pty. Ltd., from aerial photography flown in February 1989, (Reference 14279).

The survey data included the location of boreholes and test pits. Other factual data supplied, including factual data in Golders report, has not been checked and this report relies on that data.

3.0 RECENT INVESTIGATIONS

3.1 Investigation Drilling

To further access the orientation and nature of major rock mass discontinuities in the quarry area, but more particularly beyond the eastern face of the quarry, recent investigations have included the drilling of three approximately 90m long, fully cored oriented inclined boreholes, namely 101, 102 and 103 (for location see Drawing No. S8463/4-1).

Boreholes 101 and 102, are located approximately 25 metres east of a point located midway along the top of the eastern quarry face. Both holes where inclined at 65° from the horizontal. Borehole 101 was oriented at 260°(magnetic) towards the quarry, whereas borehole 102 was oriented away from the quarry at approximately 80° (magnetic). The presence of a deeply

incised creek near the quarry's eastern boundary and the adjacent constantly used quarry haul road, reduced the scope for borehole site selection. As a result of these limitation, boreholes 101 and 102 were located adjacent to the quarry-playing fields access road on Council land and borehole 103 was located on a bench near the top of south-eastern corner of the quarry.

Borehole 103 was inclined at 65° from the horizontal and oriented at 142° (magnetic). This orientation was selected so as to maximise the intersection of known joint sets.

During the drilling of the boreholes core orientation was attempted at the completion of each drilling run. In areas of highly fractured rock, particularly in near surface layers in boreholes 101 and 103, core orientation was largely unsuccessful, however, in less fractured rock the technique was successful. Appendix E contains a listing of all recorded defect orientations including bedding planes, joints and veins for each of the boreholes.

3.2 Line Discontinuity Mapping

Detailed line discontinuity mapping has been carried out along three benches on the eastern quarry face. These traverses have been designated 1989/1, 1982/2 and 1989/3 and are located as shown on Drawing No. S8463/4-1. This line mapping is additional to earlier mapping, the results of which were presented in Report No. S8463/2-AC. The three traverses are located on benches at approximately RL90 (traverse 1989/1), approximately RL70 (traverse 1989/2) and approximately RL40 (traverse 1989/3).

Information gathered from the line discontinuity mapping includes the following data on defects:

- spacing,
- length,
- continuity,
- surface roughness,
- surface hardness,
- water condition and
- structural orientation.

This information has been summarised and is presented in Appendix C in histogram form for each of the three traverses. Stereographic projections are presented for each of the traverses in Appendix D. For each of the three traverses, separate histogram plots have been prepared for, the total of all defects, joints only and, bedding defects only.

The mean structural orientation of major defect sets and defect types are summarised in Table 1.

4.0 DESCRIPTION OF ROCK MASS

4.1 General

Hornsby Quarry, situated immediately west of the proposed filling at Old Man's Valley is sited within volcanic breccia, with the surrounding plateau area comprised of Hawkesbury Sandstone. The Sydney 1:100,000 Geological Series Sheet indicates that the quarry is located in the so called Hornsby Diatreme, which is dumbell shaped and elongate in a north-east/south-west direction for about 1.5km and generally less than 400m wide.

It is unknown whether the Hornsby Diatreme represents a single intrusion or a number of intrusions. As the dumbell shape alludes to the possibility of more than one intrusion, the number of intrusions, their relationships and effects on one another are unknown.

A diatreme can be defined as a pipe-like volcanic conduit filled with pyroclastic debris (tuff or lapilli tuff) and blocks of wall rock. Diatremes in the Sydney Basin are generally considered to have resulted from violent intrusions of molten magma into surrounding country rocks.

Drawing No. S8463/4-1 shows the interpolated boundary between the volcanic breccia of the diatreme and the Hawkesbury Sandstone. The location of this boundary has been assessed based on previous field mapping by CAP and on borehole information from past and present studies by CAP and Golders. The steepness of the boundary is uncertain. Crawford et al (Reference 2) has indicated that the boundary in other diatremes of the Sydney Basin is commonly characterised by steep sandstone walls.

The two inclined boreholes, 101 and 102 fully penetrated volcanic breccia, as did the boreholes G1 and G2 drilled by Golders. Borehole 103 however, unexpectedly intersected alternating bands of sandstone/siltstone and breccia from near the surface to a depth of about 75m, where undisturbed sedimentary rock is believed to have been intersected. The inferred orientation of the bedding, both within the breccia and the sandstone/siltstone blocks (?) appears to rapidly vary, both with rock type and depth. This geologically complex area, has been interpreted as representing a 'transition zone' between the relatively massive breccia exposed in the quarry and the undisturbed sandstone at the boundary of the diatreme. As shown on Drawing No. S8463/4-2, the 'transition zone' in the vicinity of borehole 103 may be up to 70m wide.

4.2 Lithology

The volcanic breccia at Hornsby is generally comprised of a heterogeneous mix of grey to grey-green angular to subrounded fragments of volcanic rock cemented within a fine grained dark grey tuffaceous matrix. As shown on the borehole logs, the breccia consists of bands of finer grained breccia interlayered with medium to coarse grained breccia. Within the coarser layers in particular, there is often a scattering of irregular to subrounded fragments of coal, siltstone and sandstone up to 180mm thick. In addition to the fragments of sedimentary rock within the breccia, clasts of dolerite were also noted, particularly in boreholes 101 and 102.

The presence of irregular to subrounded fragments of sedimentary rock and dolerite within the breccia, helps to confirm the violent intrusive nature of diatreme formation. In addition, within borehole 101 imbrication of breccia fragments indicates flow of molten magma.

Fragments of volcanic rock within the breccia mainly range from 1 to 10mm in size, although fragments up to 400mm were noted in outcrops. The fragment to matrix ratio generally ranges from about 70:30 to 40:60. Fragments of sedimentary rock within the breccia are more frequent in borehole 101 than in nearby borehole 102, further indicating the heterogeneous nature of the breccia.

Borehole 103 located within the 'transition-zone' near the margins of the diatreme, shows a high proportion of sedimentary rock fragments within the breccia bands with fragments of sandstone up to 180mm across.

Throughout the breccia there is irregular calite veining, as well as calate infillings along joints and bedding partings. The majority of the joints are coated with at least a veneer of calcite.

The breccia is generally of high to very high strength when fresh, with the finer grained breccia of slightly higher strength than the medium to coarse grained breccia.

4.3 Weathering

Boreholes 101 and 102 intersected what may be regarded as essentially fresh breccia below depths of about 12 to 13m. In borehole 101, a number of iron-stained joints were intersected to a depth of 65.8m, whereas in borehole 102 which was drilled away from the quarry, the number of iron-stained joints were considerably fewer with the deepest iron-stained joint intersected at a depth of about 32m.

In borehole 101 a number of iron-stained joints had associated narrow bands of slightly weathered breccia and these have been designated as slightly weathered bands on the borehole logs. However, as mentioned above, the rock mass below about 13m may generally be regarded as fresh, with iron-stained joints.

Borehole 103 located above the south-eastern corner of the quarry intersected essentially fresh sandstone from about 12m. The base of extremely to moderately weathered sandstone and breccia occurs at about 9m.

On the eastern quarry face, the approximate boundary between the variably weathered breccia and the underlying essentially fresh breccia occurs along or near the bench located at RL90m.

4.4 Permeability

Although no water pressure testing or other permeability testing as such was carried out during the investigation, the losses of drill water during drilling give some indication as to the permeability characteristics of the rock mass. During the drilling of borehole 101, a number of highly fractured zones were intersected in which complete drill water loss was experienced. These conditions were unexpected and were not apparent from previously available subsurface data. Complete drill water losses were recorded on fourteen occasions during the drilling of borehole 101, with the majority of the losses recorded in the upper half of the hole. For precise locations see the borehole logs in Appendix A. When complete drill water losses were experienced, the hole was cemented. Partial drill water losses were also recorded at twelve locations most of which are in the upper half of the hole.

In comparison with borehole 101, borehole 102 recorded complete drill water losses on only three occasions, at depths 10.3m, 17.0m and 65.5m with only one partial drill water loss at 58.9m. Borehole 103 did not experience any noticable losses of drill water over its full length.

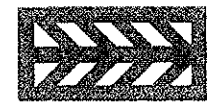
In summary, it appears that the rock mass in the vicinity of borehole 101, which is located nearest to the quarry face, has a number of highly permeable fractured zones. The permeability of these zones may have increased as a result of the opening up of fractures either from the relief of stresses associated with excavation or from blasting.

Observation of the upper three benches of the eastern quarry face (down to approximately RL40m) did not reveal any significant zones of seepage which indicate that water levels in the adjacent breccia may have been effectively drawn down to near quarry floor level. Observation of piezometric levels in boreholes in the vicinity of Councils playing fields support this view, with water levels in some boreholes at depths greater than 50m.

4.5 Structure

4.5.1 Bedding

Within Hornsby Quarry the volcanic breccia of the Hornsby Diatreme shows a particularly well defined basinal layering. This is particularly evident on the eastern face of the quarry where the strata dips steeply to the south-east on the northern half of the face, flattening out to almost horizontal in the central area before steepening on the southern face where the dip is to the north-east.



The results of the mapping of bedding planes, particularly along Line Mapping Traverses 1989/1, 1989/2 and 1989/3 is shown on Drawing No. S8463/4-1. The mapping indicates that the dip of the bedding planes in the quarry ranges from less than 10o up to 75°. As shown on the stereographic plots for bedding presented in Appendix D, the bedding orientations generally plot along an arc, reflecting the basinal layering in the breccia. Beds in the northern half of the quarry face mostly dip towards the east-south-east at about 8° to 32° whereas beds on the southern half of the quarry face mostly dip towards the north-east at about 15 to 25°. Towards the centre of the eastern quarry face, the number of bedding plane intersections were fewer on each of the traverses, but more particularly on Traverse 1989/3. This was in part due to the massive nature of the breccia in these locations.

The data histograms for the three line mapping traverses presented in Appendix C, indicates that the majority of bedding partings were 6 to 20m in length discrete to semi-continuous, with ridges and stained. The increase in spacing between bedding measurements for traverses 1989/1 and 2 and 1989/3 is however, largely the result of coarser screening applied to traverse 1989/3.

Towards the south-east corner of the quarry, particularly in the area below borehole 103, the breccia appears to be more massive than elsewhere in the quarry. The relatively few bedding planes in this area may either indicate the presence of a thick breccia layer conformable with the strata in the remainder of the quarry, or alternatively, it may represent the northern extremity of the 'transition zone' shown on Drawing No. S8463/4-2.

Bedding or foliation was generally indistinct in much of the breccia intersected in inclined cored boreholes 101 and 102. Appendix E presents a tabulation of bedding plane orientations obtained by core orientation. As shown, relatively few measurements were obtained and the results show a surprisingly wide scatter of orientations. Bedding planes measured in borehole 101 below depths of 58m, generally indicated dip directions to the south, south-west and west at angles ranging from 5° to 29°. These orientations appear to conflict with the relatively consistent trends shown on the line mapping traverses which are located a distance of 40m to the west, and with the bedding angles recorded in borehole G1.

TABLE 1

SUMMARY OF MAJOR DEFECT SET ORIENTATIONS

DATA SOURCE	DEFECT TYPE	DEFECT SET	MEAN ORIENTATION DIP (deg)	DIP DIRECTION (deg)
Line Mapping Traverse 1989/1	J	A	80	265
	J	B	85	167
	J	C	75	234
	B	D	8	108
	B	D'	25	032
Line Mapping Traverse 1989/2	J	A	82	274
	J	B	80	203
	J	C	80	245
	B	D	32	160
	B	D'	15	043
Line Mapping Traverse 1989/3	J	A	82	268
	J	B	83	168
	J		84	254
	B	D	11	094
Borehole 101	J	B(?)	65	145
	J	E	84	060
	J		80	015
	B		9	205
	V	E	73	055
Borehole 102	J	F	35	340
	J		34	026
	J	A(?)	54	267
	B		23	012
	V	F	44	320
Borehole 103	J	F	55	348
	B		10	108

J - Joint
B - Bedding
V - Vein

Bedding plane orientations obtained in borehole 102 show relatively consistent trends, with dips to the north-east and south-east (i.e. into the hillside) at angles ranging from 8° to 28°. These orientations appear consistent with measurements obtained for the three line mapping traverses and they indicate that for at least the upper 25m of borehole 102, the orientation of the bedding is away from the quarry.

Previous investigations by Golders indicated that in borehole G2 below depths of about 30m, bedding plane dips of 48° and 50° were noted. No evidence of such high angle bedding was noted in boreholes 101 or 102. In addition, these boreholes were generally indistinctly bedded with very few bedding plane partings.

4.5.2 Jointing

Line mapping along three benches on the eastern quarry face, namely Traveres 1989/1, 2 and 3 has confirmed the existence of two major joint sets identified during previous studies. As shown on the stereographic plots presented in Appendix D and as summarised in Table 1, the principal joint set (designated defect set A) dips at 82° with a dip direction of 270°. The minor joint set (designated defect set B) is also steeply dipping at about 83°, with a dip direction of about 180°. In addition to these orthogonal joint sets, a subordinate joint set (defect set C) steeply dipping at 80°, with a dip direction of 245° was identified on Traverse 1989/2. This subordinate joint set was also present on Traverses 1989/1 and 3 but was not as pronounced.

Observations of the lower benches below Traverse 1989/3 on the eastern quarry face indicated similar joint orientations to those outlined above. Observations of defect set A indicated a spacing between joints typically ranging from 0.6m to 2m. Defect set B has a similar spacing between joints to set A and are distinctive in outcrop. Towards the lower central part of the quarry, a number of the more continuous joints belonging to defect set B were points of minor seepages.

Throughout the quarry and in the three boreholes the majority of the joints were planar and rough and either clean or coated/infilled with calcite. Borehole 101 had a number of limonite stained joints to a depth of 65.8m, but in general the majority of the joints were planar, rough and calcite coated.

Joint sets identified in each of the three boreholes did not show any consistent pattern, compared with the joint sets identified in the line mapping. The steeply dipping orthogonal sets identified on the eastern quarry face were not present in the boreholes.

In borehole 101 the major joint set may reflect defect set B identified on the quarry face and in borehole 102 the third largest joint set may reflect joint set A, however, these correlations may be just coincidental. Contrasting with the above, borehole 102 identified two major relatively shallow dipping joint sets with dip angles of 34° and 35° and dip

directions of 340° and 026°, respectively. These low angle joints did not appear to be well developed in the quarry face, which indicates that either they were masked by other rock mass defects or alternatively the orientation of defects in the vicinity of borehole 102 is different to that of the defects on the quarry face.

As very few joint measurements were made in borehole 103, it is difficult to obtain a reliable picture of the jointing in the area, however, from the few measurements it appears that joints in the sandstone dip to the north-north-west at an angle of about 55°.

The orientation of the calcite veins as measured in boreholes 101 and 102 have as expected a general tendency to parallel the major joint directions.

5.0 SLOPE STABILITY

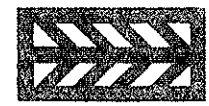
The bedding planes within the breccia, which reflect basinal layering, are potential planes of weakness within the rock mass. In the past, a number of planar slope failures have taken place along these bedding planes, as evidenced by the extensive 65° face on the southern side of the quarry. A smaller number of minor planar slope failures, also along bedding planes have occurred on the northern quarry face. Therefore, the orientation of bedding in the eastern quarry area near the toe of the proposed playing field development is critical in the overall assessment of slope stability.

As mentioned in Section 4.5.1 the bedding plane orientations measured in the upper parts of borehole 102 are consistent with the measurements obtained from the line mapping, that is, they dip away from the quarry. The bedding in this area is therefore considered to be favourably oriented with respect to possible bedding plane failures. In addition, the generally massive nature of the breccia in the area behind the present quarry face further indicates that slope failure by planar sliding along bedding is unlikely.

The wide variation in bedding orientations recorded below depths of 58m in borehole 101 may represent a discrete contorted zone which was not apparent in nearby Line Mapping Traverse 1989/3 or in borehole G1. As this possible zone occurs well below the proposed development, and set back some distance from the quarry face, it is not considered to have an adverse impact on the overall stability of the slope.

Line mapping confirmed the presence of orthogonal joint sets in the quarry, with the major set striking north-south, dipping 80° west and the minor set striking east-west and dipping 83° south.

As shown on Drawing Nos. S8463/4-1 and 2, the breccia/sandstone contact is believed to pass along or near to the southern boundary of the present quarry. Borehole 103 is located in a highly variable 'transition zone' between the relatively massive breccia in the quarry and the undisturbed sandstone at the boundary of the diatreme. The strength of the siltstones, silty sandstones and sandstone within the breccia in this 'transition zone' vary from very low to high, whereas the breccia itself is generally of high



strength. No reliable bedding or joint orientations were obtained in borehole 103 above the breccia/sandstone contact at 75m. Below 75m, the joints appear to be dipping at angles of about 70° with dip directions between 331° and 009°. Should the joints in the "transition zone" be of a similar orientation to those in the intact sandstone, then the jointing within the 'transition zone' is considered to be oriented favourably with respect to possible failure of the slope below the proposed development.

As most joint faces within the breccia are planar, rough and calcite coated, with little or no clay infillings, the rock mass could be expected to have appreciable joint strengths. In addition, as the spacing between joints and bedding plane defects is generally moderately to widely spaced, failure of the slope through either a discrete defect plane or a series of intersecting defects is highly unlikely.

The eastern quarry face appears to be well drained in that no significant areas of groundwater seepage were observed on the quarry face down to about RL40. Below this depth a number of joints, belonging to defect set B show signs of minor seepage. This conclusion is supported in that boreholes located in the playing field area above the quarry have piezometric levels up to 50m below the surface.

The proposed filling is unlikely to significantly load the quarry face as it now stands, nor is it likely to adversely affect groundwater conditions behind the face. The installation of drainage measures in and around the proposed playing field development will limit the amount of water entering the slope.

6.0 SUMMARY AND CONCLUSIONS

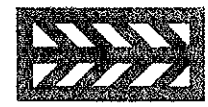
The recent investigations into the stability of the eastern quarry area in the vicinity of the proposed playing field development has identified the following major features:

- A broad 'transition zone' some 70m wide located along the southern side of the quarry believed to be comprised of a chaotic mix of sedimentary blocks and volcanic breccia. Jointing in this area is believed to be steeply dipping to the north.

- A general continuation of the bedding/basinal layering orientation as observed on the central area of the eastern quarry face for at least 60m eastwards into the hillside and for at least the upper 50m of the present quarry.

- Major joint sets identified on the eastern quarry face were either not present or poorly defined in the area beyond the existing quarry face.

- The eastern quarry face and adjacent rock mass appears to be well drained.



As the proposed playing field development is unlikely to significantly load the quarry face as it now stands, and with the general combination of rock strength, structure and groundwater conditions, the overall failure of the quarry slope does not appear to be of general concern for the proposed development.

Provided any future blasting adjacent to the final quarry outline is designed to produce sound slopes with minimal blast induced fractures then the above information indicates that the eastern quarry face should remain stable to the depths and at the slopes proposed.

For and on behalf of
COFFEY & PARTNERS PTY LTD

REFERENCES

1. Coffey & Partners Pty. Ltd., Hornsby Shire Council. Report on Proposed Filling Old Man's Valley, Hornsby. Report No. S8463/2-AC, July 1989.

2. Crawford et al "Diatremes of the Sydney Basin in A Guide to the Sydney Basin", Geological Survey of NSW, Bulletin No. 26, 1980.

3. Golder Associates Pty. Ltd, 'Supplementary Report to the Readymix Group on Slope Stability Study, Eastern Face, Hornsby Quarry. Report No. 8267037A, August 1982.

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

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A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT *

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by The Institution of Engineers Australia, National Headquarters, Canberra, 1987.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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0788/3M

APPENDIX A

APPENDIX A

BOREHOLE LOGS

Coffey & Partners Pty Ltd.
Incorporated in Queensland

descriptive terms soil and rock

COFFEY

Explanation Sheet 1

SOIL DESCRIPTIONS

Classification of Material based on Unified Classification System (refer SAA Site Investigation Code AS1726–1975 Add. No. 1 Table D1).

Moisture Condition based on appearance of soil

dry	Looks and feels dry; cohesive soils usually hard, powdery or friable, granular soils run freely through hands.
moist	Soil feels cool, darkened in colour; cohesive soils usually weakened by moisture, granular soils tend to cohere, but one gets no free water on hands on remoulding.
wet	Soil feels cool, darkened in colour; cohesive soils weakened, granular soils tend to cohere, free water collects on hands when remoulding.

Consistency based on unconfined compressive strength (Qu) (generally estimated or measured by hand penetrometer)

term	very soft	soft	firm	stiff	very stiff	hard
Qu kPa	25	50	100	200	400	

If soil crumbles on test without meaningful result, it is described as **friable.**

Density Index (generally estimated or based on penetrometer results).

term	very loose	loose	medium dense	dense	very dense
density index I_D %	15	35	65	85	

ROCK DESCRIPTIONS

Weathering based on visual assessment

term	**criterion**
Fresh:	Rock substance unaffected by weathering.
Slightly Weathered:	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Moderately Weathered:	Rock substance affected by weathering to the extent that staining extends throughout whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Highly Weathered:	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and signs of chemical or physical decomposition of individual minerals are usually evident. Porosity and strength may be increased or decreased when compared to the fresh rock substance, usually as a result of the leaching or deposition of iron. The colour and strength of the original fresh rock substance is no longer recognisable.
Extremely Weathered:	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.

Strength based on point load strength index, corrected to 50 mm diameter - Is(50) (refer I.S.R.M., Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1). (Generally estimated: x indicates test result).

classification	extremely low	very low	low	medium	high	very high	extremely high
Is (50) MPa	0.03	0.1	0.3	1	3	10	

The unconfined compressive strength is typically about 20 x I_{S50} but the multiplier may range, for different rock types, from as low as 4 to as high as 30.

Defect Spacing

classification	extremely close	very close	close	medium	wide	very wide	extremely wide
spacing m	0.03	0.1	0.3	1	3	10	

Defect description uses terms contained on AS1726 table D2 to describe nature of defect (fault, joint, crushed zone, clay seam (etc.) and character (roughness, extent, coating etc.).

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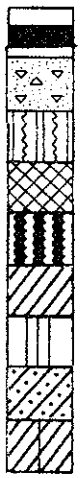
Incorporated in NSW

graphic symbols soil and rock

COFFEY

Explanation Sheet 2

SOIL

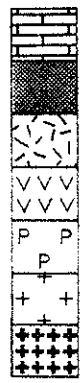


Asphaltic Concrete or Hotmix
Concrete
Topsoil
Fill
Peat, Organic Clays and Silts (Pt, OL, OH)
Clay (CL, CH)
Silt (ML, MH)
Sandy Clay (CL, CH)
Silty Clay (CL, CH)

Gravelly Clay (CL, CH)
Sandy Silt (ML)
Clayey Sand (SC)
Silty Sand (SM)
Sand (SP, SW)
Clayey Gravel (GC)
Silty Gravel (GM)
Gravel (GP, GW)

ROCK

Claystone (massive)
Siltstone (massive)
Shale (laminated)
Sandstone (undifferentiated)
Sandstone, fine grained
Sandstone, coarse grained
Conglomerate



Limestone
Coal
Dolerite, Basalt
Tuff
Porphyry
Granite
Pegmatite

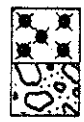
Schist
Gneiss
Quartzite
Talus
Alluvium

SEAMS

Seam >0.1 m thick
(on a scale 1:50)
Seam 0.01 m to 0.1 m thick
(on a scale 1:50)

INCLUSIONS (Special purposes only)

Rock Fragments
Swamp



Ironstone Gravel, Laterite
Shale Breccia in Sandstone

Water Level

Surfaces ——— Known Boundary — — — Probable Boundary ——?——? Possible Boundary

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Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 1 of 13

engineering log - borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40	slope: -65 DEG	R.L.Surface: 102.9 m
hole diameter:	76mm	bearing: 260.	datum: AHD

method	penetration 1 2 3	support	water	notes samples, test,etc	R.L.	depth metres	graphic log	classification symbol	material: soil type:plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R		C			102	1		CL	FILL: CLAY: medium plasticity, red brown sand & gravel,fine to coarse grained	M			FILL, contains breccia boulders
					101	2							
					100	3							
					99	4		CL	GRAVELLY CLAY: medium plasticity, yellow brown gravel & sand,fine to coarse grained				RESIDUAL(?)
					98	5							
					97	6		GC	CLAYEY GRAVEL: fine to coarse grained, grey brown, sand fine to coarse grained, & clay				EW BRECCIA(?)
					96	7							
						8							

METHOD
- AS auger screwing*
- AD auger drilling*
- R roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT dialube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- C casing
- M mud

PENETRATION 1 2 3 — no resistance ranging to refusal

WATER
- * not measured
- water level
- water outflow
- water inflow

NOTES samples and tests
- U50 undisturbed sample 50 mm diameter
- D disturbed sample
- N standard penetration test:
- N* SPT + sample recovered
- Nc SPT with solid cone
- V vane shear
- P pressuremeter
- Bs bulk sample
- R refusal

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

187-230


COFFEY
S 84 63/4
BH 101
FROM 11.3 M
TO 18.0 M

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 2 of 13

engineering log - borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40	slope:	-65 DEG
hole diameter:	76mm	bearing:	260.
R.L.Surface:	102.9 m		
datum:	AHD		

method	penetration 1 2 3	support	water	notes samples, test,etc	R.L.	depth metres	graphic log	classification symbol	material: soil type:plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R		C			95	9		GC	CLAYEY GRAVEL: fine to coarse grained, grey brown, sand fine to coarse grained, & clay moderately to highly weathered breccia	M			EW BRECCIA(?)
					94	10							
					93	11							
					92	12			COMMENCED CORING AT 11.3m				
					91	13							
					90	14							
					89	15							
						16							

METHOD

AS	auger screwing*
AD	auger drilling*
R	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
*bit shown by suffix	
B	blank bit
V	V bit
T	TC bit
e.g.	ADT

SUPPORT

C	casing
M	mud

PENETRATION 1 2 3 — no resistance ranging to refusal

WATER

*	not measured
	water level
	water outflow
	water inflow

NOTES samples and tests

U50	undisturbed sample 50 mm diameter
D	disturbed sample
N	standard penetration test:
N*	SPT + sample recovered
Nc	SPT with solid cone
V	vane shear
P	pressuremeter
Bs	bulk sample
R	refusal

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION

based on unified classification system

MOISTURE

D	dry
M	moist
W	wet
Wp	plastic limit

CONSISTENCY/DENSITY INDEX

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey & Partners Pty. Ltd
Incorporated in Queensland

engineering log – cored borehole

borehole no: 101
sheet 3 of 13

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope: -65 DEG	R.L.Surface: 102.9 m
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260. datum: AHD

drilling information					rock substance				rock mass defects	
method	core-lift	water	R.L.	depth metres	graphic log core loss	substance description: rock type; grain characteristics, colour, structure, minor components	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
			95	9							
			94	10							
			93	11		Continued from non-core borehole					
NQ						NO CORE: 0.3m					
			92	12		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding,	SW				JT PL Fe stained, smooth JT PL Fe stained JT PL Fe stained crushed layer 30mm thick IR fracturing associated with JT PL
							FR				JT PL clean crushed SM 10mm thick 3 intersecting JT PL clean fractured zone 200mm thick
			91	13		cement put in hole to seal water loss					Broken zone 200mm thick
			90	14							2 intersecting JT PL some calcite series of 6 parallel PL RO JT 20mm spacing calcite vein 14.2 - 14.3 JT PL smooth calcite
						BRECCIA: fine to medium grained, light grey, indistinct bedding,			D A T.30 2.80		fracturing around IR JT 60mm JT PL RO Fe stained 3 closed JT PL RO, parallel, 30mm spacing JT IR CU
			89	15		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding, large clasts of sandstone					some calcite
				16							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular


COFFEY
S 8463/4
BH 101
18.0
25.0

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 4 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.86 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260.

R.L.Surface: 102.9 m
datum: AHD

drilling information | rock substance | rock mass defects

method	case-liff	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
NQ			88			BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding, large clasts of sandstone	SW				JT PL clean crushed zone 120mm thick fractured zone and broken zone 200mm thick
				17			FR				JT PL smooth JT PL smooth fractured layer 30mm thick IR fracturing associated with JT fracturing layer 20mm thick
			87			BRECCIA: fine to medium grained, light grey, thinly bedded, calcite nodules on bedding plane					JT (2) intersecting PL RO IR fracturing associated with JT broken zone 200mm
				18		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.					JT PL RO some calcite 2 parallel PL JT JT PL RO with broken zone fissured zone IR from 17.8 - 17.9m with calcite filling JT PL crushed broken zones with JT IR RO from 18.2-18.6m
			86								IR fracturing 70mm zone zone of JT IR RO crushed seam 30mm thick crushed & fragmented zone 120mm thick Broken zone with JT IR RO
				19			SW				JT PL smooth broken zone 80mm thick JT PL smooth broken layer 40mm thick
							FR				fragmented zone 100mm thick containing calcite and Fe stains 2 parallel JT PL
			85				SW				fractured zone 50mm thick broken zone 100mm thick JT PL smooth
				20			FR				JT PL RO 20.25 - 20.4m contains calcite filling fragmented zone 40mm thick JT PL RO calcite JT closed PL RO
			84			BRECCIA: medium to coarse grained, light grey, - grey, thinly bedded, graded bedding					JT PL smooth JT PL smooth JT PL smooth
				21							JT PL RO calcite and Fe stain JT PL RO Fe stained
						BRECCIA: medium to coarse grained, light grey, indistinct bedding, large clasts of siltstone and sandstone					fragmented zone 15mm thick JT PL RO Fe stained fractured layer 80mm thick with Fe staining
			83				SW				
				22			FR				JT PL smooth, calcite Fe stain
											Broken layer Fe stained JT PL smooth JT PL RO Fe stained
											calcite vein 2mm thick PL JT PL smooth Fe stained
			82	23		BRECCIA: fine to medium grained, light grey, indistinct bedding.					calcite vein 4mm thick PL JT PL smooth Fe stained
						BRECCIA: medium to coarse grained, grey, light grey, indistinct bedding, large clasts of siltstone, sandstone and coal			D A 1.70 1.00		
				24			SW				broken layer fractured and fragmented zone 150mm thick

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

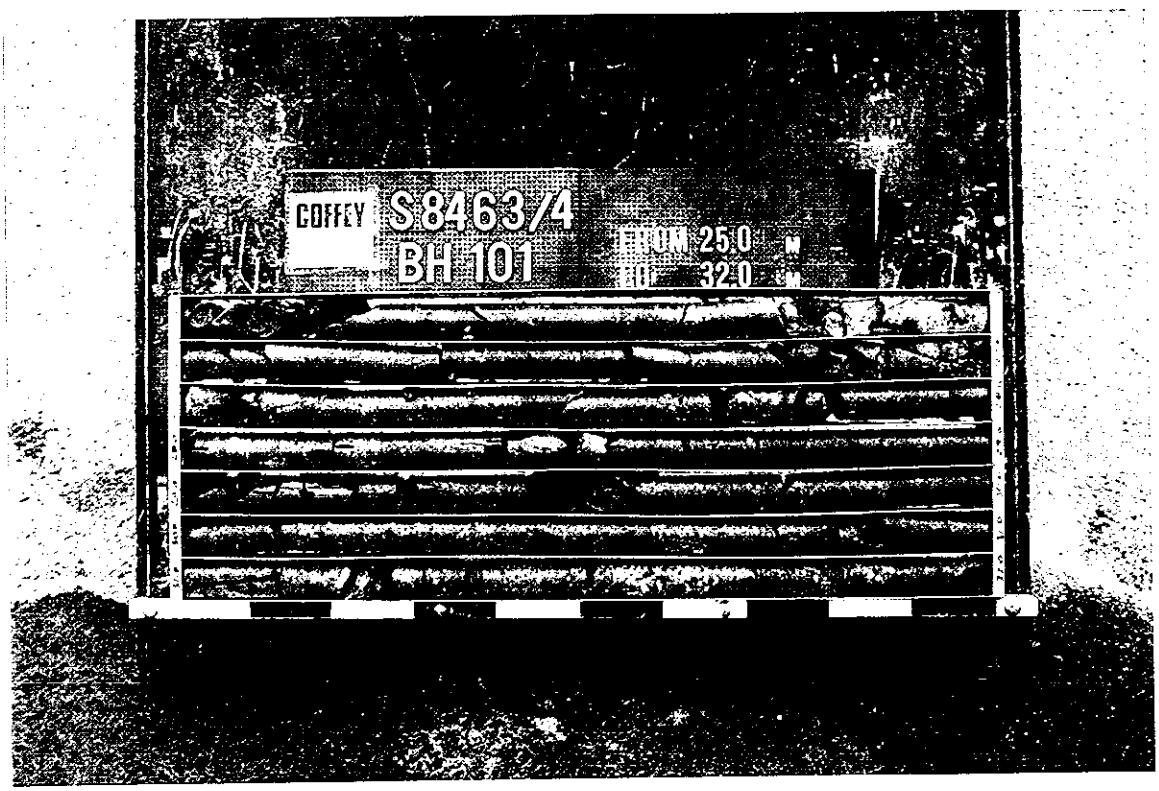
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular


COFFEY
S8463/4
BH 101
FROM 25.0 M
TO 32.0 M

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 6 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK			slope:	-65 DEG	R.L.Surface:	102.9 m
barrel type and length:	NQ 3.0m	fluid:	WATER	bearing:	260.	datum:	AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			81			BRECCIA: medium to coarse grained, grey, light grey, indistinct bedding, large clasts of siltstone, sandstone and coal					crushed seam 20mm thick Fe broken zone 24.25 - 24.4m Fe stained
							MW				crushed zone 5mm thick Fe stained JT PL smooth Fe stained
				25			SW				JT PL smooth Fe intersecting joint above and below
			80			BRECCIA: fine to medium grained, light grey, grey, indistinct bedding,	FR				JT PL Fe RO Broken layer Fe and calcite surfaces JT PL smooth Fe JT PL smooth
						BRECCIA: medium to coarse grained, grey, light grey, indistinct bedding, large clasts of coal, siltstone and sandstone	SW				JT PL smooth fragmented zone 200mm thick
				26							2 parallel JT PL Fe
			79			Cement poured in to seal water loss	FR				JT CU clean intersecting JT above broken zone Fe stained 100mm thick JT PL RO Fe stained JT PL Fe stained
							SW				fragmented zone associated with JT
				27			MW				fractured zone 50mm thick JT PL RO closed
						BRECCIA: fine to coarse grained, light grey, grey, indistinct bedding, some grading probably due to bedding, coarse grained band 250mm thick	FR				JT PL closed calcite fill 1mm thick JT IR RO closed
			78				SW		D A 2.00 1.70		JT IR RO Fe stained JT PL RO Fe stained JT PL RO Fe stained JT IR RO 12deg DD.224deg
				28		BRECCIA: fine to medium grained, light grey, grey, thinly beaded.	FR				JT IR RO 35deg DD.201deg JT PL RO 81deg DD.340deg fractured zone 100mm thick JT PL RO calcite 50deg DD.167deg JT PL RO 35deg DD.102deg
			77			BRECCIA: medium to coarse grained, grey, indistinct bedding, large clasts of siltstone / sandstone					JT PL Fe stained 70deg DD.107deg JT PL Fe stained 70deg DD 107deg continuous to 29.3m broken zone along north side of JT
				29			SW				fractured zone 100mm calcite vein 1mm thick
			76				FR				
				30							
			75								JT PL Fe stained, associated crushed zone 5mm thick JT PL smooth Fe JT IR RO calcite
				31			SW				broken zone 100mm thick some calcite
							FR				calcite vein, 1mm thick iR
			74	32							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
not measured Drilling Water
partial loss
complete loss

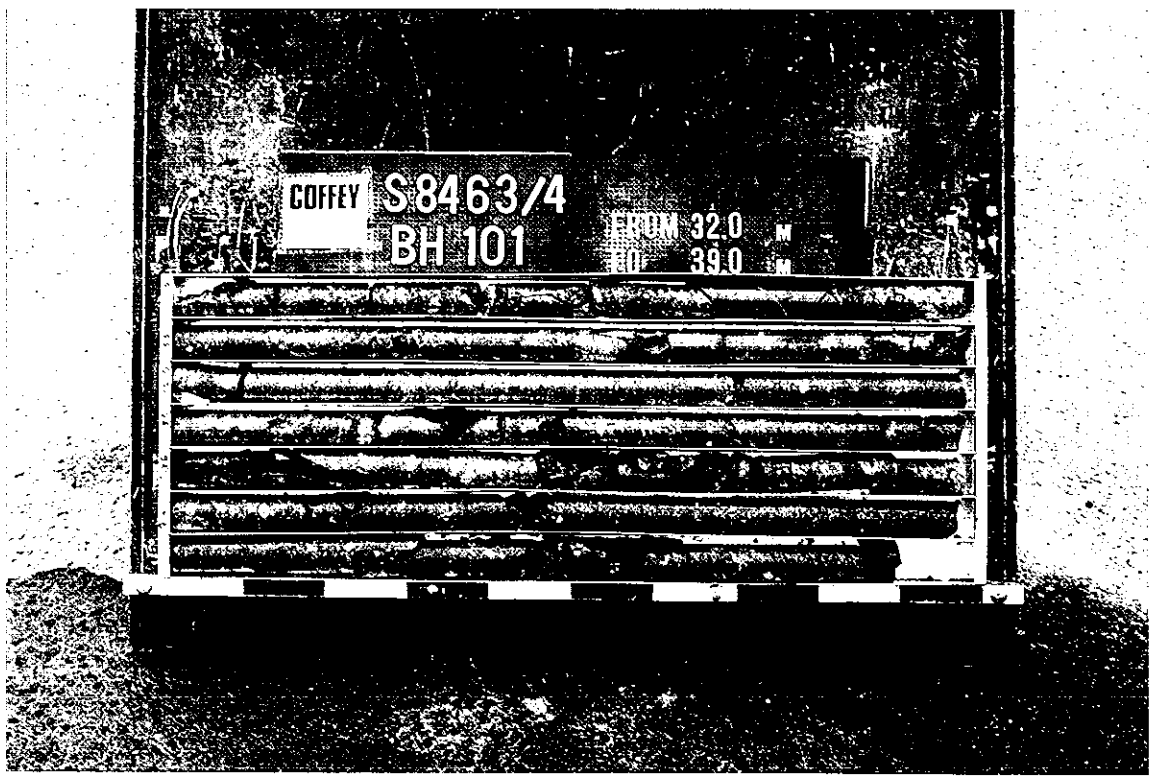
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH101-4

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

engineering log - cored borehole

COFFEY

borehole no: 101

sheet 4 of 13

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260.
R.L.Surface:	102.9 m		
datum:	AHD		

drilling information					rock substance					rock mass defects	
method	core lift	water	R.L.	depth metres	graphic log core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			73	33		BRECCIA: medium to coarse grained, grey, indistinct bedding, large clasts of siltstone / sandstone	FR				JT (3) parallel 20mm spacing PL JT IR calcite broken zone 30mm thick JT PL smooth calcite vein 1mm thick PL JT PL calcite smooth
						BRECCIA: fine grained, grey, indistinct bedding,					
						BRECCIA: medium to coarse grained, light grey, indistinct bedding, large clasts of siltstone/sandstone some fine grained zones (boulders) to 33.7m					JT PL RO Fe JT PL smooth JT PL smooth JT PL Fe stained RO JT IR RO Fe JT PL smooth
			72	34		BRECCIA: medium to coarse grained, light grey, grey, thinly bedded, bedding distinguished by variations in grain size					JT IR calcite JT IR calcite
			71	35			SW				JT PL RO Fe Broken zone 100mm thick
							FR				
			70	36			SW		D A 0.70 2.10		JT PL RO Fe broken zone associated with Jts JT PL RO Fe JT IR RO Fe closed at bottom JT PL smooth fractured zone 150mm Fe JT PL Fe broken layer 50mm thick
							FR				JT PL JT IR closed
			69	37			SW				broken zone 50mm thick fractured zone 50mm thick
							FR				
			68	38		BRECCIA: medium to coarse grained, grey, dark grey, indistinct bedding, large clasts of siltstone /sandstone	SW				JT PL smooth calcite fractured/broken zone 200mm thick Hole cemented due to water loss calcite vein <1mm thick
							FR				JT PL smooth JT PL smooth calcite
			67	39							
				40		Hole cemented due to water loss.	SW FR				

General Defect Description:
JT PL RO

METHOD			
AS	auger screwing		water level
AD	auger drilling		water inflow
R	roller/tricone	*	not measured
W	washbore	Drilling Water	
NMLC	core drilling		partial loss
NQ,HQ	core drilling		complete loss
	casing used		
	barrel withdrawn		

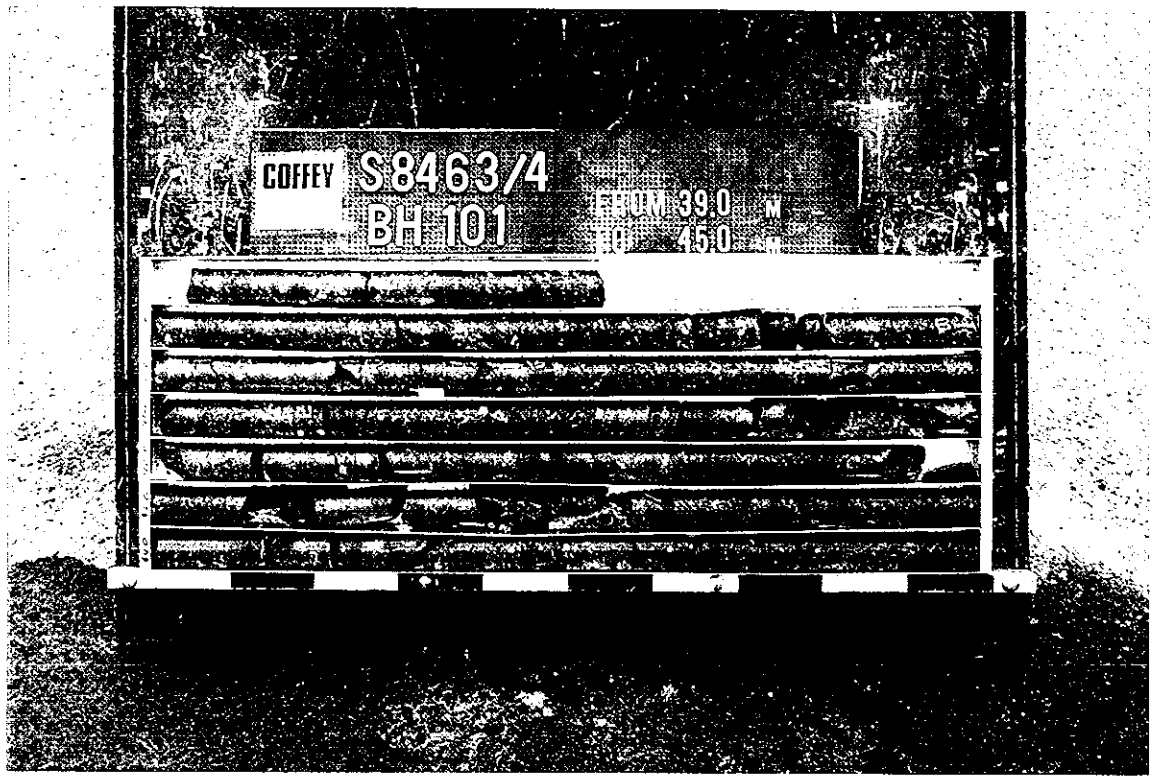
POINT LOAD TEST	
D	-diametral
A	-axial

GRAPHIC LOG/CORE LOSS	
	core recovered (hatching indicates material)
	no core recovered

WEATHERING	
FR	-fresh
SW	-slightly
MW	-moderately
HW	-highly
EW	-extremely

STRENGTH	
EL	-extremely low
VL	-very low
L	-low
M	-medium
H	-high
VH	-very high
EH	-extremely high

DEFECTS	
JT	-joint
PT	-parting
SM	-seam
CL	-clay
RO	-rough
DC	-decomposed
PL	-planar
IR	-irregular


COFFEY
S8463/4
BH 101
FROM 39.0 M
0 150

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

engineering log – cored borehole

borehole no: 101
sheet 7 of 13

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope: -65 DEG	R.L.Surface: 102.9 m
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 266 datum: AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			66	41		BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding, large clasts of siltstone/sandstone	FR		D A 0.30 0.40		calcite veins <1mm thick
											JT PL RO Fe
			65				MW				broken zone Fe 200mm thick
				42							JT IR RO Fe
											JT IR RO Fe
							SW				JT IR RO Fe 70deg DD.67deg
						BRECCIA: medium to coarse grained, grey, thinly bedded, bedding indicated by imbrication					calcite vien <1mm thick 32deg DD.357deg
							FR				JT IR RO calcite 30deg DD.342deg
			64	43							JT PL RO calcite 69deg DD.79deg
							SW				fractured zone 50mm calcite Fe
											JT PL RO Fe 76deg DD.79deg
											JT PL RO Fe 74deg DD.99deg
							FR				fractured zone 50mm
											JT PL RO calcite 80deg DD.295deg
											calcite vein <1mm thick 82deg DD.302deg
											IR calcite fissures <1mm thick
											Hole cemented to seal drill water loss at 44.4m
			63	44		BRECCIA: fine to medium grained, light grey, indistinct bedding.					JT PL RO calcite 73deg DD.167deg
											some pyrite on JT surface
											JT PL smooth calcite 38deg DD.22deg
						BRECCIA: medium to coarse grained, grey, thinly bedded, some clasts of coal, siltstone and sandstone with some fine grained bands, boulders up to 100mm thick					calcite veins IR RO <1mm thick
											JT PL RO calcite
				45							JT PL RO some calcite & pyrite
											calcite veins <1mm thick
											calcite pods 5mm dia.
			62								
											JT PL RO calcite fill 1mm thick
				46		BRECCIA: medium grained, grey, dark grey, indistinct bedding.					
			61								SM crushed CL 25mm thick
						BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding, clasts of coal, siltstone and sandstone					
				47							calcite vein <1mm thick
			60								calcite vein IR <1mm thick
						some fine grained bands (boulders) to 100mm thick			D A 0.50 2.50		
				48							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

BH 101-6

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 8 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK		slope:	-65 DEG	R.L.Surface:	102.9	m
barrel type and length:	NQ 3.0m	fluid: WATER	bearing:	260.	datum:	AHD	

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			59	49		BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding, clasts of coal, siltstone and sandstone	FR	EL VL L M H VH EH		30 100 300 1000 3000	JT PL smooth calcite calcite fissures <1mm thick JT PL calcite JT PL RO calcite JT PL calcite
			58								calcite fissure <1mm thick
						BRECCIA: medium grained, light grey, indistinct bedding.	SW				JT PL calcite smooth JT PL RO calcite JT PL RO calcite broken zone 200mm thick
				50		BRECCIA: medium to coarse grained, dark grey, grey, indistinct bedding, large clasts of siltstone/sandstone	FR				JT PL RO Fe
						BRECCIA: fine to medium grained, light grey, indistinct bedding.	SW				broken JT 10mm thick JT PL RO calcite Fe 80deg DD.15deg JT PL RO Fe 79deg DD.10deg JT PL RO 46deg DD.127deg JT PL RO Fe 72deg DD.132deg JT PL RO Fe 54deg DD.337deg JT PL RO Fe 88deg DD.59deg JT PL RO 31deg DD.206deg JT PL RO 50deg DD.17deg
			57				FR				
				51		BRECCIA: medium to coarse grained, light grey, dark grey, thinly bedded, graded bedding and flows imbrication bedding dipping at 23deg DD.154deg	SW				JT IR RO Fe
							FR				bedding plane 23deg DD.154deg bedding plane 22deg DD.156deg JT PL RO 55deg DD.59deg JT PL RO 87deg DD.59deg JT PL RO 82deg DD.62deg bedding plane 36deg DD.127deg JT PL RO calcite 74deg DD.231deg JT IR RO Fe
			56								
				52		BRECCIA: medium to coarse grained, grey, dark grey, indistinct bedding.	SW				JT IR RO Fe 52.1 - 52.25m 76deg DD.224deg
							FR				calcite vein <1mm thick crushed zone 15mm thick JT PL CL 48deg DD.199deg
			55								JT PL RO closed 44deg DD.243deg
				53							JT PL RO 35deg DD.239deg
											JT PL RO 69deg DD.224deg
			54			BRECCIA: fine to coarse grained, light grey, grey, indistinct bedding.					JT PL RO calcite
				54		some fine grained boulders up to 100mm diameter.					JT PL smooth calcite
						BRECCIA: medium to coarse grained, grey, dark grey, indistinct bedding, some larger clasts possibly dolerite					JT PL smooth
			53	55		BRECCIA: fine to medium grained, grey, indistinct bedding.					JT PL calcite
						BRECCIA: medium to coarse grained, grey, dark grey, indistinct bedding, some larger clasts of dolerite			D A 0.6 0.6		JT PL RO calcite
				56							

General Defect Description:
JT PL

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

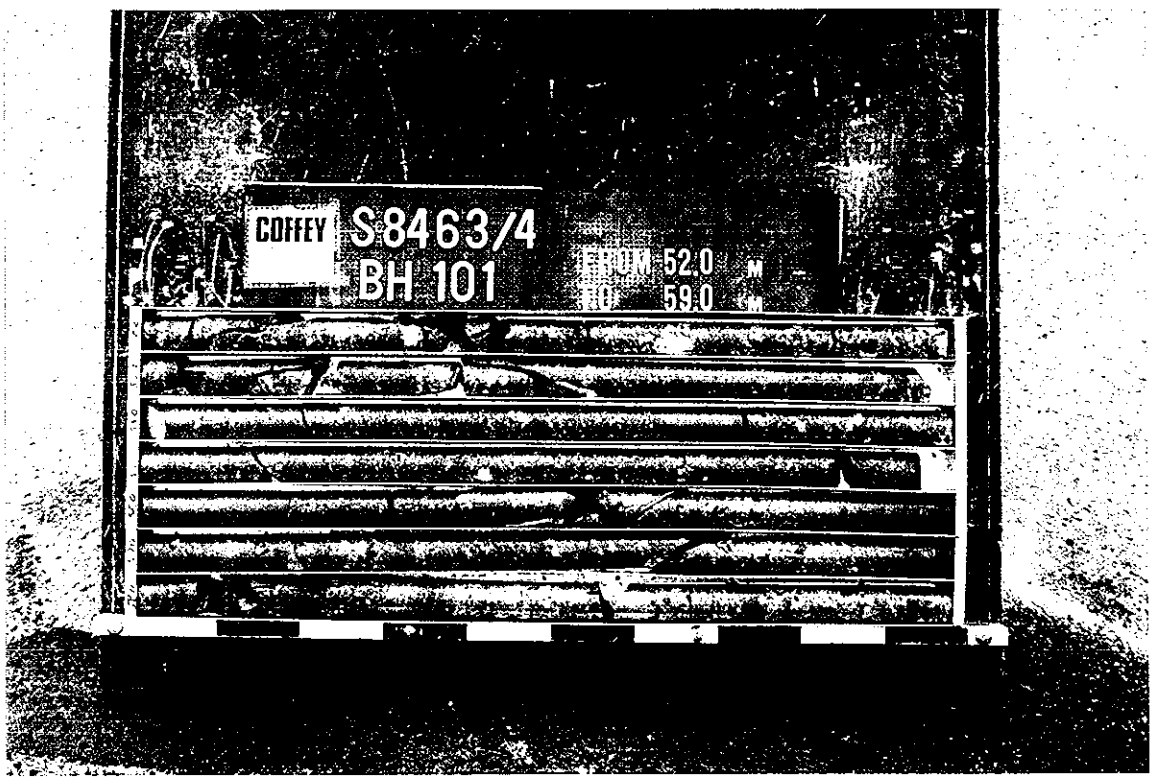
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229


COFFEY
S8463/4
BH 101
FROM 52.0 M
TO 59.0 M

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 101

sheet 9 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-05 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260.

R.L.Surface: 102.9 m
datum: AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (1m 600 200 60mm 2000)	defect description: type, inclination, planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			52			BRECCIA: fine to medium grained, grey, indistinct bedding.	FR				
						BRECCIA: medium to coarse grained, dark grey, grey, indistinct bedding, large clasts of siltstone/sandstone					JT PL calcite JT CU calcite 56.4 - 56.6m fractured layer associated with JT JT PL calcite 2mm thick
				57		BRECCIA: fine to medium grained, dark grey, grey, thinly bedded.					calcite vein IR 1mm thick zone of IR calcite fissures < 1mm thick 57.2 - 57.7m
			51			BRECCIA: medium to coarse grained, light grey, grey, thinly bedded, some imbrication					JT PL calcite JT IR RO CU
				58		BRECCIA: fine to coarse grained, grey, dark grey, thinly bedded, with graded bedding dipping at 9deg DD 234deg					JT PL RO calcite 40deg DD.211deg JT PL calcite 76deg DD.10deg JT PL calcite 51deg DD.49deg JT PL calcite 78deg DD.94deg bedding 9deg DD.234deg
			50			BRECCIA: medium to coarse grained, dark grey, light grey, indistinct bedding, clasts include coal, siltstone and sandstone					JT CU calcite 72deg DD.144deg JT PL 78deg DD.156deg bedding 15deg DD.260deg
				59		BRECCIA: fine to coarse grained, dark grey, grey, thinly bedded, dipping at 15deg DD 260deg					PT 21deg DD.201deg bedding 17deg DD.196deg
			49			BRECCIA: medium to coarse grained, grey, dark grey, indistinct bedding.					calcite veins <1mm thick 34deg DD.191deg calcite veins <1mm thick 31deg DD.120deg calcite veins <1mm thick 33deg DD.204deg calcite veins <1mm thick 37deg DD.184deg
				60		BRECCIA: medium to coarse grained, light grey, dark grey, thinly bedded, bedding dipping at 12deg DD.189deg					JT PL RO 61deg DD.119deg
			48			BRECCIA: fine to coarse grained, grey, thinly bedded, bedding dipping at 20 deg DD. 199deg					JT PL RO calcite 89deg DD.39deg calcite veins <1mm thick 30deg DD.221deg calcite veins <1mm thick 88deg DD.29deg
				61							calcite veins IR <1mm thick
			47						D 0.10		calcite veins <1mm thick 32deg DD.34deg calcite veins <1mm thick 31deg DD.37deg calcite veins <1mm thick 87deg DD.209deg
				62		BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding.					bedding plane 19deg DD.191deg calcite veins <1mm thick IR 62.0 - 62.2m
						BRECCIA: fine to coarse grained, dark grey, grey, indistinct bedding.					JT PL calcite 62deg DD.146deg JT PL calcite 80deg DD.74deg JT PL RO 46deg DD.272deg
			46			BRECCIA: coarse grained, light grey, grey, indistinct bedding.					calcite veins <1mm thick 32deg DD.17deg
				63		BRECCIA: fine to coarse grained, grey, dark grey, indistinct bedding.					calcite veins <1mm thick 31deg DD.312deg calcite veins <1mm thick 34deg DD.309deg calcite veins <1mm thick 72deg DD.49deg calcite veins <1mm thick 33deg DD.317deg
			45			BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding, apparent bedding at 12deg DD. 186deg					
				64							

General Defect Description:
JT PL RO

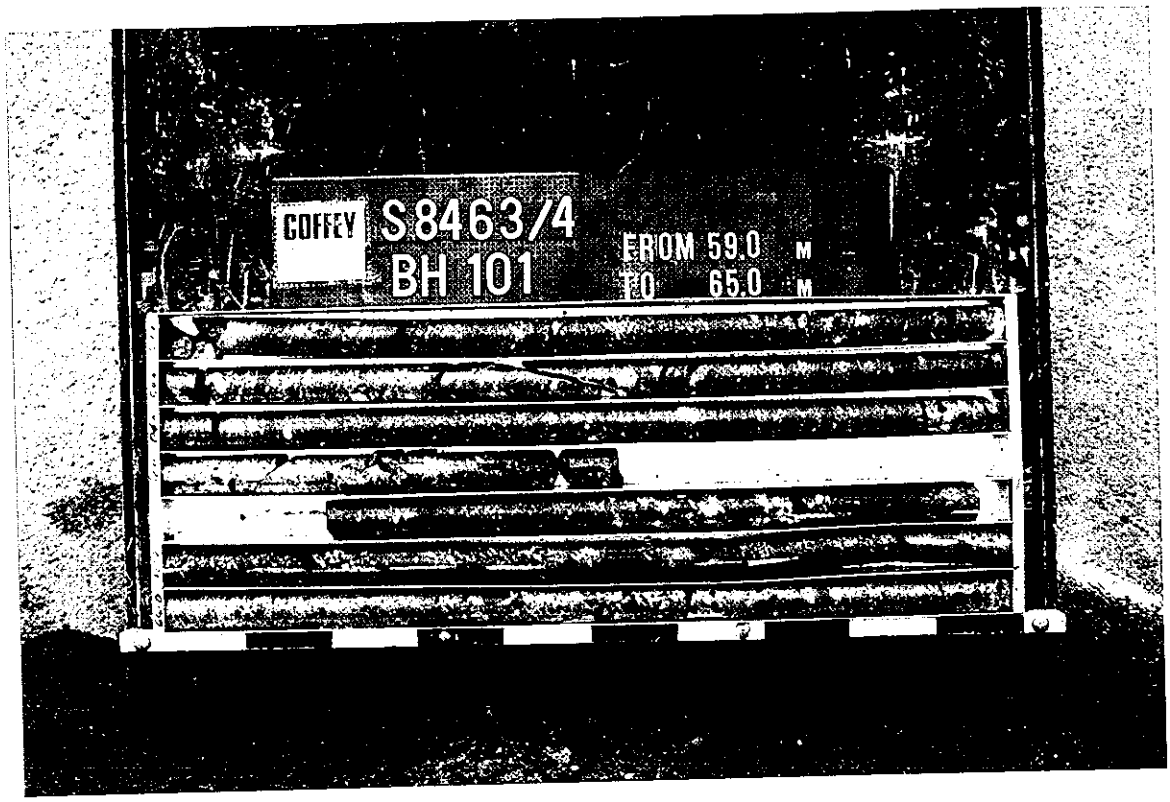
METHOD			
AS	auger screwing		water level
AD	auger drilling		water inflow
R	roller/tricone	*	not measured Drilling Water
W	washbore		partial loss
NMLC	core drilling		complete loss
NQ,HQ	core drilling		
	casing used		
	barrel withdrawn		

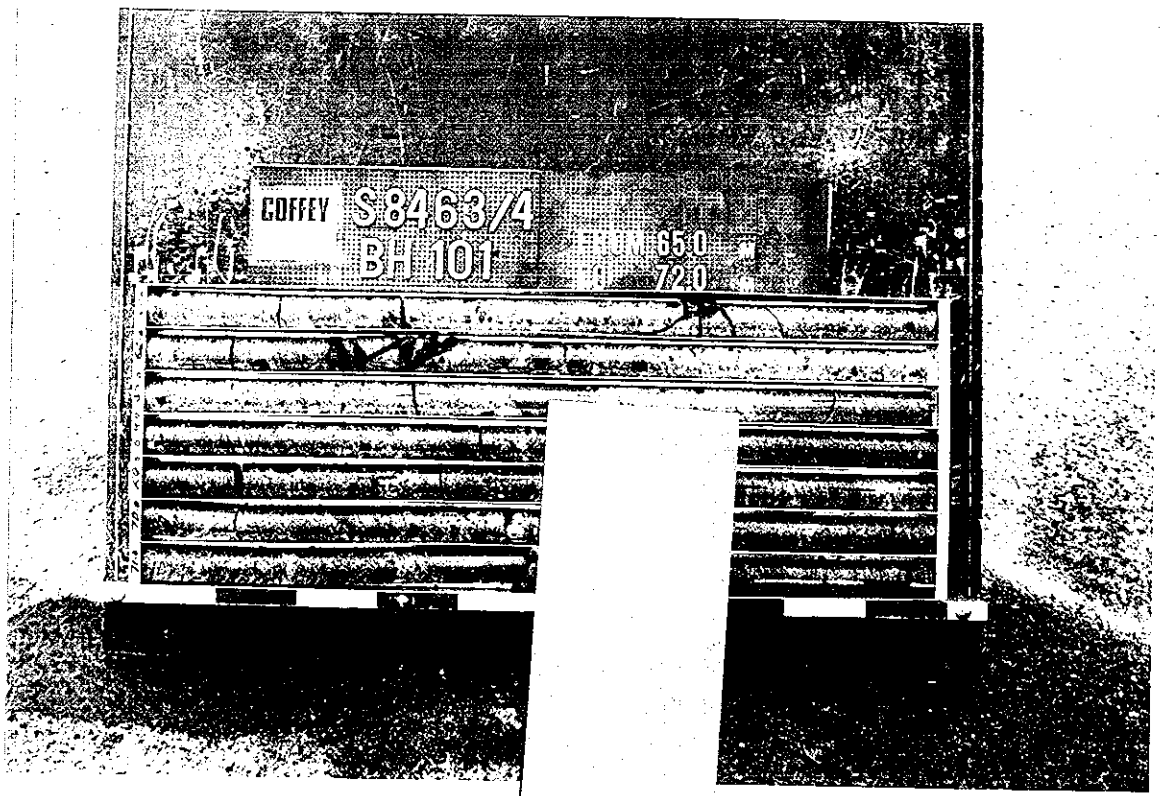
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING		STRENGTH		DEFECTS	
FR	-fresh	EL	-extremely low	JT	-joint
SW	-slightly	VL	-very low	PT	-parting
MW	-moderately	L	-low	SM	-seam
HW	-highly	M	-medium	CL	-clay
EW	-extremely	H	-high	RO	-rough
		VH	-very high	DC	-decomposed
		EH	-extremely high	PL	-planar
				IR	-irregular

187-229


COFFEY
S8463/4
BH 101
FROM 59.0 M
TO 65.0 M


COFFEY
S8463/4
BH 101
FROM 65.0 M
TO 72.0

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 10 of 15

office job no: S5463/4

engineering log – cored borehole

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260.
R.L.Surface:	102.9 m		
datum:	AHD		

drilling information / rock substance / rock mass defects

method	case-liff	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
NQ			44	65		BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding, apparent bedding at12deg DD 186deg	FR				JT PL RO 61deg DD.213deg JT PL calcite 68deg DD.119deg PT calcite 12deg DD.186deg
						darker band 50mm thick					
			43	66		darker medium grained band 100mm thick	SW FR				JT IR RO Fe 78deg DD.131deg PT PL Fe 18deg DD.136deg fractured/decomposed layer 40mm thick JT PL 62deg DD.144deg JT PL 61deg DD.151deg JT PL 63deg DD.149deg
			42	67		BRECCIA: medium to coarse grained, light grey, grey, thinly bedded, bedding dipping at 10deg DD. 2deg					bedding 10deg DD.100deg
						BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding.					calcite vein <1mm thick 82deg DDD.124deg JT PL calcite 15deg DD.297deg bedding 29deg DD.352deg calcite vein <1mm thick 87deg DD.201deg calcite vein IR <1mm thick
				68		BRECCIA: fine to coarse grained, grey, light grey, very thinly bedded, 29 to 352deg.					
			41			BRECCIA: fine to coarse grained, grey, dark grey, indistinct bedding.					calcite vein <1mm thick PL 30deg DD.234deg
				69		BRECCIA: fine to medium grained, dark grey, grey, indistinct bedding.			D A 0.70 1.90		
			40			BRECCIA: fine to coarse grained, dark grey, grey, cross bedded, thinly bedded, imbricated bedding dipping at 18deg DD 285deg					bedding planes 18deg DD.284deg calcite vein <1mm thick 82deg DD.74deg bedding planes 19deg DD.282deg
				70							fissured zone calcite filled IR 70.1-70.3m
			39			BRECCIA: fine to coarse grained, dark grey, grey, indistinct bedding.					calcite vein <1mm thick 31deg DD.290deg calcite vein <1mm thick 33deg DD.307deg
				71							calcite vein <1mm thick 32deg DD.37deg calcite vein <1mm thick 78deg DD.193deg JT PL 18deg DD.198deg
			38			some cobbles, fine grained, to 100mm diameter.					
				72							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

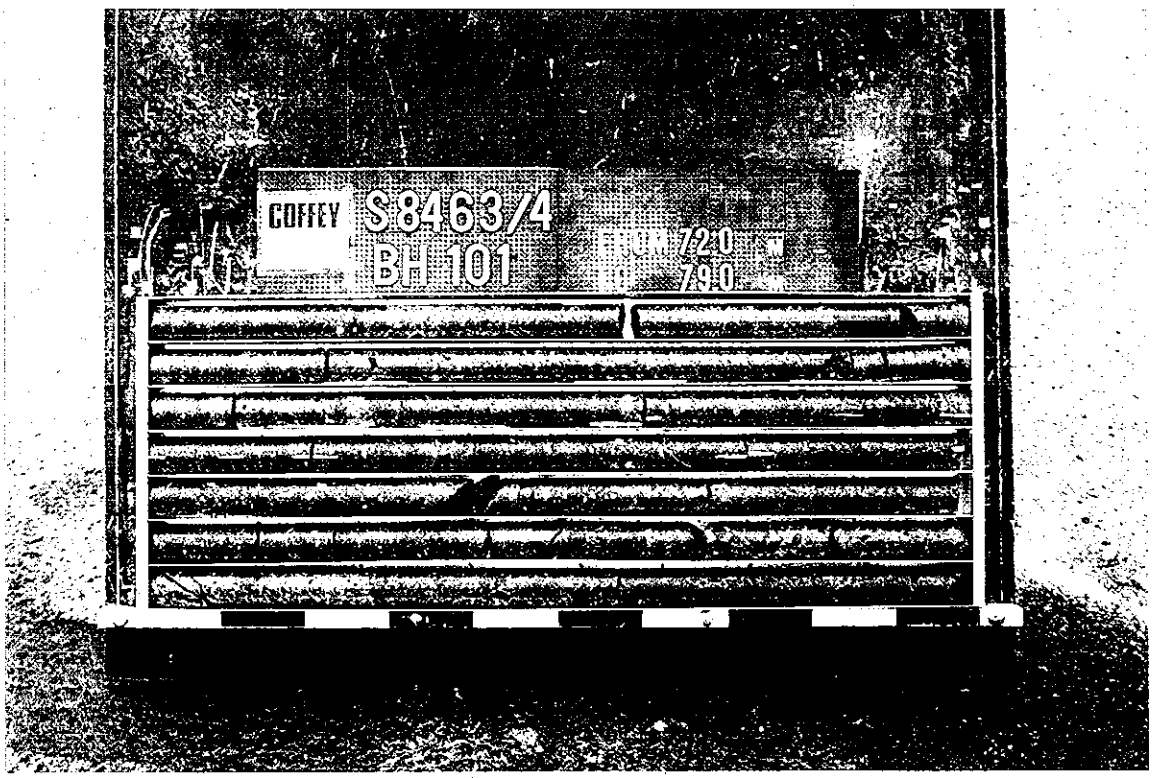
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

T87-229



BH101 .9

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 101
sheet 11 of 13

engineering log
cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope: -85 DEG	R.L.Surface: 102.9 m
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260. datum: AHD

drilling information					rock substance					rock mass defects	
method	core-lift	water	R.L.	depth metres	graphic log core loss	substance description rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below
NQ			37	73		BRECCIA: fine to coarse grained, dark grey, grey, indistinct bedding.	FR				JT PL RO 44deg DD.169deg JT PL RO 81deg DD.151deg
			36	74							JT PL RO 85deg DD.17deg calcite vein IR <1mm thick
			35	75							calcite vein 73deg DD.52deg calcite vein <1mm thick 76deg DD.59deg
			34	76		BRECCIA: medium to coarse grained, light grey, grey, bedding dipping at approx 12deg DD. 234deg					calcite vein <1mm thick 75deg DD.62deg broken zone 42mm thick 12deg DD.234deg
						BRECCIA: coarse grained, light grey, grey, indistinct bedding, at about 14deg DD 260deg			D A 2.6 0.70		some IR calcite fissures
			33	77		BRECCIA: fine to coarse grained, dark grey, grey, indistinct bedding.					calcite vein 2mm thick 73deg DD.54deg
						BRECCIA: coarse grained, grey, light grey, indistinct bedding.					
			32	78		BRECCIA: medium to coarse grained, light grey, grey, indistinct bedding.					JT PL calcite vein 1mm thick 74deg DD.57deg calcite vein <1mm thick 74deg DD.57deg
						BRECCIA: fine to coarse grained, grey, dark grey, indistinct bedding.					calcite vein IR <1mm thick calcite vein IR <1mm thick
				79		BRECCIA: medium to coarse grained, grey, indistinct bedding.					calcite fissures IR <1mm thick
			31			BRECCIA: medium to coarse grained, dark grey, grey, indistinct bedding.			D A 3.1 2.80		calcite vein IR <1mm thick
				80							

General Defect Description:
JT PL RO

METHOD				POINT LOAD TEST	WEATHERING	STRENGTH	DEFECTS
AS	auger screwing		water level	D -diametral	FR -fresh	EL -extremely low	JT -joint
AD	auger drilling		water inflow	A -axial	SW -slightly	VL -very low	PT -parting
R	roller/tricone	*	not measured	GRAPHIC LOG/CORE LOSS	MW -moderately	L -low	SM -seam
W	washbore		Drilling Water	core recovered (hatching indicates material)	HW -highly	M -medium	CL -clay
NMLC	core drilling		partial loss		EW -extremely	H -high	RO -rough
NQ,HQ	core drilling		complete loss	no core recovered		VH -very high	DC -decomposed
	casing used					EH -extremely high	PL -planar
	barrel withdrawn						IR -irregular

BH101-12

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

engineering log — cored borehole

COFFEY

borehole no: 101
sheet 12 of 15

office job no: S6463-4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.86 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 265.

R.L.Surface: 102.9 m
datum: AHD

drilling information / rock substance / rock mass defects

method	case-lin	water	R.L	depth metres	graphic log core loss	substance description (rock type; grain characteristics; colour, structure, minor components)	weathering	est Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			30			BRECCIA: fine to coarse grained, light grey, grey, very thinly bedded.	FR				calcite vein IR <1mm thick calcite vein IR <1mm thick JT PL calcite 2mm thick
				81		BRECCIA: medium to coarse grained light grey, grey, indistinct bedding.					JT IR calcite 2mm thick JT PL smooth calcite JT PL smooth calcite broken zone 100mm thick 13deg DD.211deg JT PL smooth calcite 83deg DD.64deg
			29			BRECCIA: fine to coarse grained, light grey, grey, thinly bedded.					
				82		BRECCIA: medium to coarse grained light grey, grey, indistinct bedding.					calcite vein 2mm thick 80deg DD.106deg JT PL RO calcite 74deg DD 154deg calcite vein IR
			28								calcite vein PL 81deg DD 184deg
				83		BRECCIA: fine to coarse grained, grey. DOLERITE: fine grained, grey, massive,					
			27			BRECCIA: fine to coarse grained, dark grey, grey, indistinct bedding.					
				84							calcite vein IR <1mm thick
											PL calcite vein 2mm 88deg DD.82deg
			26			Coal clast 100mm diameter					calcite filled IR fissured zone in coal clast
				85							broken zone 5mm thick 13deg DD.221deg
			25	86							
						BRECCIA: medium to coarse grained, light grey, indistinct bedding.					calcite vein <1mm thick 60deg DD.7deg JT PL RO 43deg DD.109deg
			24	87		BRECCIA: fine to coarse grained, light grey, indistinct bedding.			D A 2.00 3.70		
				88							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

Drilling Water
water level
water inflow
not measured
partial loss
complete loss

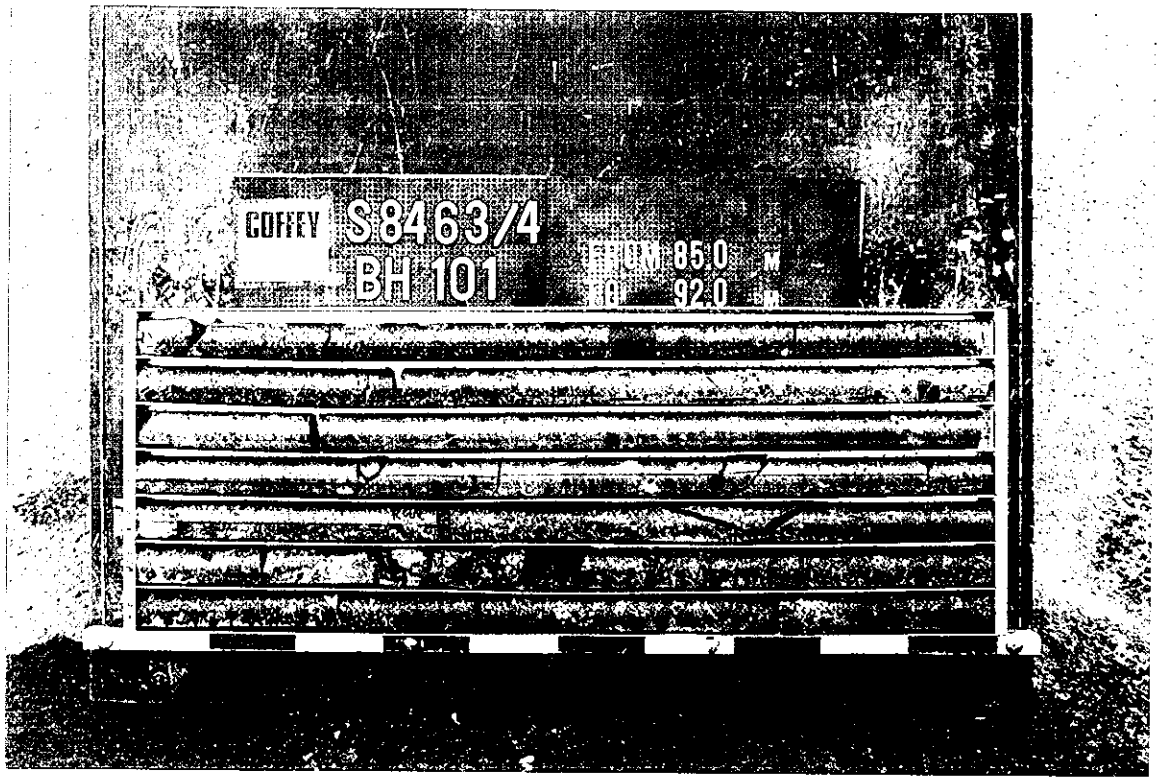
POINT LOAD TEST
D -diametral
A -axial

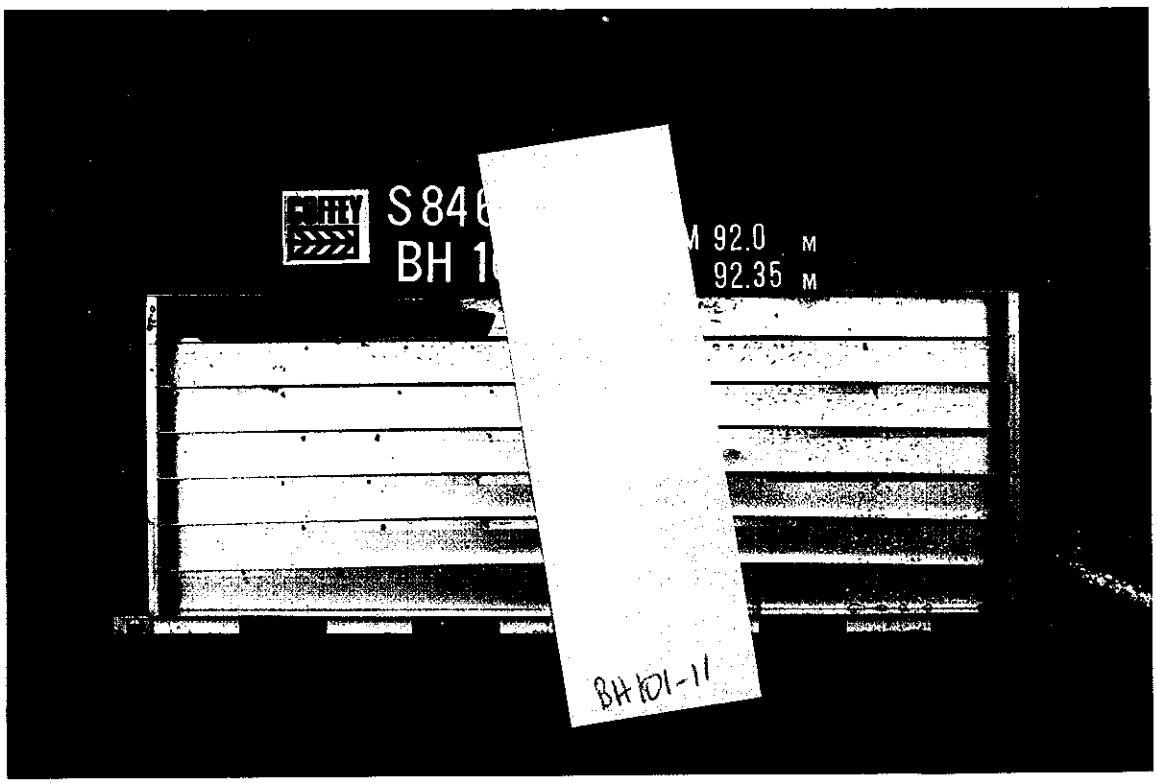
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular


COFFEY
S8463/4
BH 101
FROM 85.0 M
TO 92.0 M


COFFEY
S846
BH 1
M 92.0 M
92.35 M
BH101-11

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no. 101
sheet 13 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.11.89
principal:		hole completed:	30.11.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308513.88 N 1269889.05	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-55 DEG
barrel type and length:	NQ 3.0m	fluid: WATER	bearing: 260.
		R.L.Surface:	102.9 m
		datum:	AHD

drilling information | rock substance | rock mass defects

method	case-liff	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity roughness coating, thickness; unless otherwise noted defects follow general description below)
NQ			23			BRECCIA: fine to coarse grained, light grey, indistinct bedding.	FR				JT PL RO Fe 40deg DD.176deg PT calcite 6deg DD.213deg calcite vein 2mm 70deg DD.292deg PT PL 5deg DD.174deg JT PL calcite 2mm thick 35deg DD.135deg calcite vein IR <1mm thick calcite vein 1mm thick 87deg DD.94deg
			22	89		BRECCIA: medium to coarse grained, grey, indistinct bedding.					calcite vein 1mm thick 87deg DD.94deg calcite vein 1mm thick 83deg DD.183deg JT PL Fe 70deg DD.98deg JT PL Fe 80deg DD.97deg
				90		BRECCIA: fine to coarse grained, grey, very thinly bedded					
			21			BRECCIA: medium to coarse grained grey, indistinct bedding.	SW				fracture zone 20mm thick fragmented zone 60mm thick
						BRECCIA: medium to coarse grained, dark grey, grey, indistinct bedding.	FR				JT PL calcite vein <1mm thick PL
				91							
			20								calcite vein PL <1mm thick calcite vein CU <1mm thick
											crushed seam 5mm thick
				92							calcite vein broken JT PL
			19			Borehole 101 terminated at 92.40 m					
				93							
			18								
				94							
			17								
				95							
			16								
				96							

General Defect Description:
JT PL RO

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

Coffey & Partners Pty. Ltd
Incorporated in Queensland

COFFEY

borehole no: 102
sheet 1 of 12

engineering log – borehole

office job no: S8463/3

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
borehole location: E308518.10 N1269889.83

hole commenced: 4.12.89
hole completed: 4.12.89
logged by: SRM
checked by: PLV

drill model and mounting: PIONEER B40
hole diameter: 76mm

slope: -65 DEG
bearing: 80deg

R.L.Surface: 103.1 m
datum: AHD

method	penetration 1 2 3	support	water	notes samples, test,etc	R.L.	depth metres	graphic log	classification symbol	material: soil type:plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/ density index	hand penetro-meter kPa	structure and additional observations
R		C			103	0		CL	FILL: Clay medium plasticity, red brown Gravel and Sand fine to coarse grained	M			FILL- contains breccia boulders
								CL	GRAVELLY CLAY: medium plasticity, yellow brown Gravel and Sand fine to coarse grained				RESIDUAL?
					102	1							
					101	2							
					100	3		GC	CLAYEY GRAVEL: fine to coarse grained grey brown Sand fine to coarse grained and Clay				EW Breccia?
					99	4							
					98	5			moderately to highly weathered breccia				
					97	6							
					96	7			Commenced coring at 7.65m				

METHOD
AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
C casing
M mud

PENETRATION
1 2 3
no resistance
ranging to
refusal

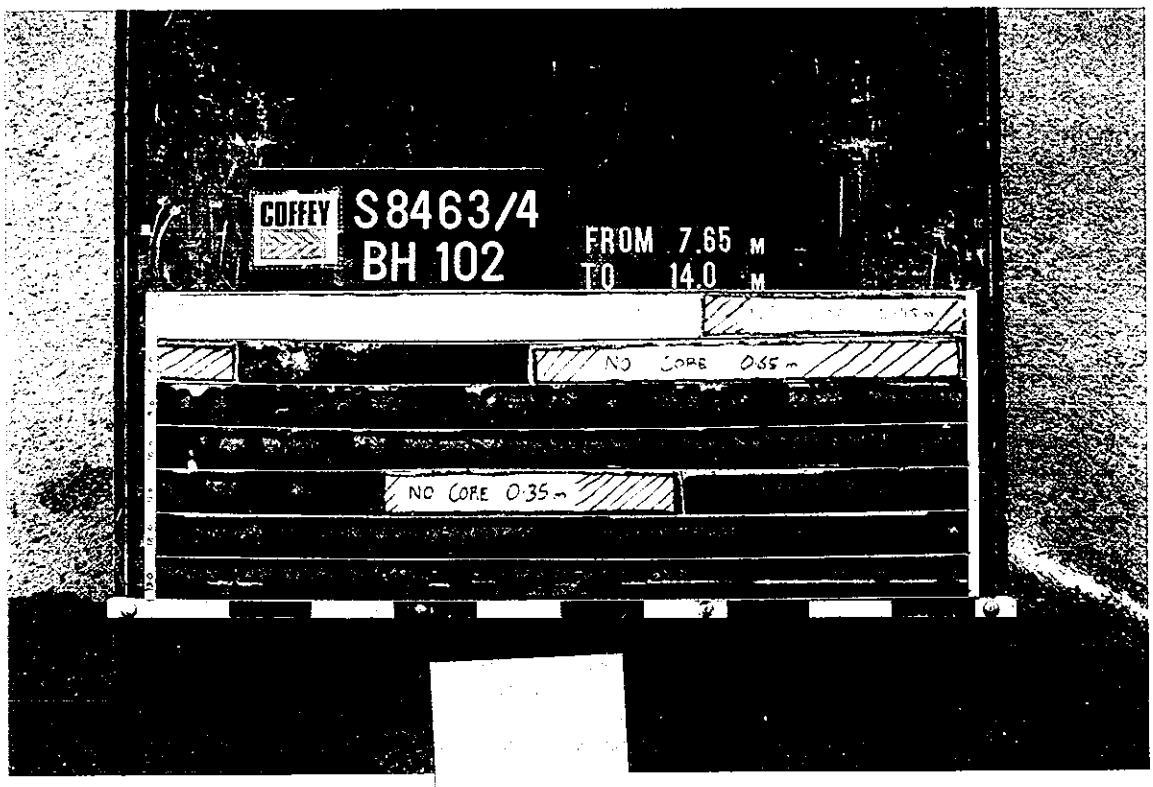
WATER
* not measured
water level
water outflow
water inflow

NOTES samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
V vane shear
P pressuremeter
Bs bulk sample
R refusal

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense



BH102-1
~~BH102-12~~

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 2 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK			slope:	-65 DEG	R.L.Surface:	103.1 m
barrel type and length:	NQ 3m	fluid:	WATER	bearing:	80deg	datum:	AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below
			103	0							
			102	1							
			101	2							
			100	3							
			99	4							
			98	5							
			97	6							
			96	7		Continued from non-core borehole					
NQ				8		NO CORE: 0.45m					

General Defect Description:

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

- water level
- water inflow
- * not measured Drilling Water
- partial loss
- complete loss

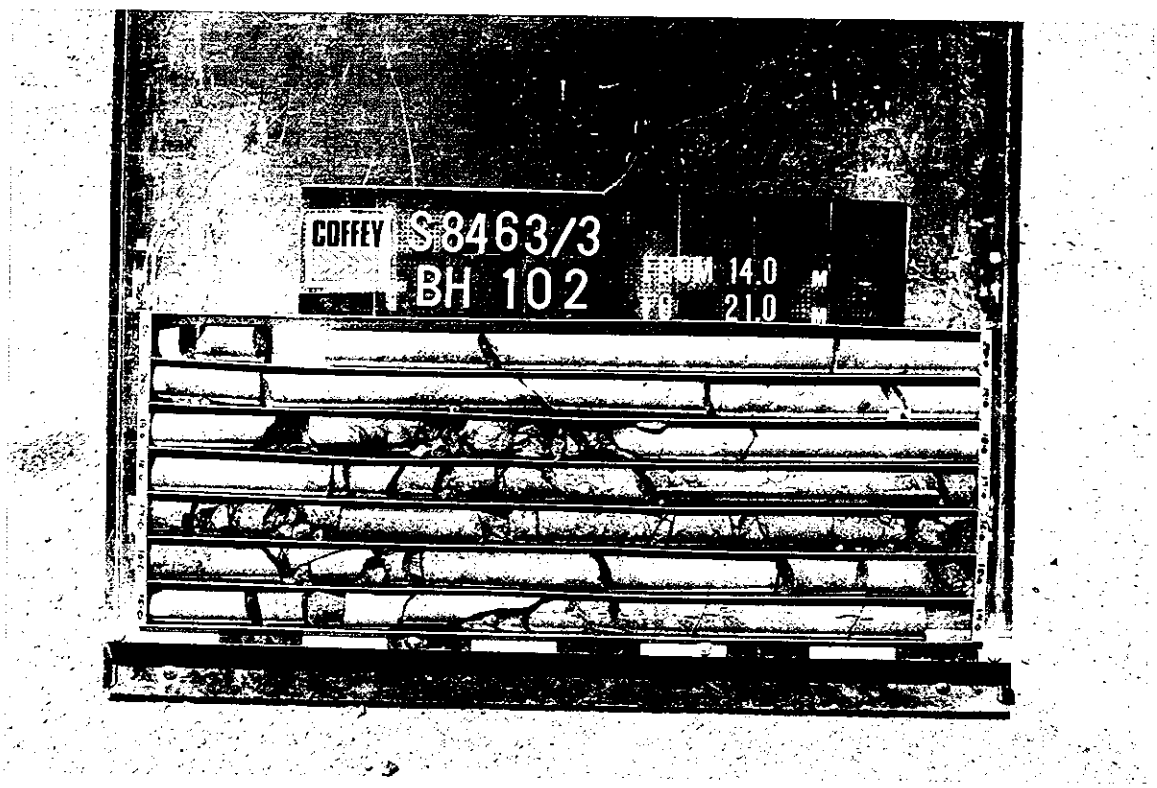
POINT LOAD TEST
- D -diametral
- A -axial

GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular



BH102-2
BH102-3

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 3 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER 840 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
NQ						NO CORE: 0.45m					
						BRECCIA: medium to coarse grained, orange, brown, decomposed & fragmented	HW				Broken/fractured/decomposed zone 400mm thick
						NO CORE: 0.65m					
			95	9							
						BRECCIA: medium to coarse grained, red, - brown, mottled indistinct bedding.	HW				broken/fractured/decomposed zone 9.25-10.3m
							MW				
			94	10							
						BRECCIA: fine to coarse grained, light grey, - grey, indistinct bedding.	SW				zone of JT PL Fe RO 50mm spacing 10.4-10.8m
						BRECCIA: medium to coarse grained, dark grey, - grey, indistinct bedding.					CR SM Fe 10mm thick JT PL Fe RO CR SM Fe 40mm thick
			93	11			MW				JT PL Fe RO decomposed zone 100mm thick
						NO CORE: 0.35m					
						BRECCIA: medium to coarse grained, grey, indistinct bedding.	SW				zone of JT PL Fe RO 11.6-11.85m decomposed zone 40mm thick fractured zone 50mm thick JT PL Fe
			92	12							JT PL RO JT PL RO broken zone 50mm thick
						BRECCIA: fine grained, grey, indistinct bedding.	FR		D 2.95		JT PL RO calcite vein <1mm thick
				13		BRECCIA: fine to coarse grained, grey, indistinct bedding, 28deg to 17mm					JT PL RO 40deg,DD.13deg PT PL RO Fe 28deg,DD.122deg JT PL RO 10deg,DD.117deg 2 parallel JT PL calcite 1mm thick 75deg,DD.253deg
			91								
				14							JT PL RO calcite 48deg,DD.316deg JT PL RO calcite 45deg,DD322deg calcite veins <1mm thick IR PT PL RO 8deg,DD.115deg PT PL RO 10deg,DD.115deg JT IR RO 85deg,DD.354deg JT PL RO 44deg,DD.319deg JT PL RO calcite 77deg,DD.214deg JT PL RO broken zone 50mm thick
			90								
				15							JT PL calcite PT PL PT PL
			89			BRECCIA: medium to coarse grained, grey, indistinct bedding, very thinly bedded.					PT PL fracturing around JT 50mm zone CR SM 10mm thick JT PL RO
				16		BRECCIA: as below					(JT PL RO broken

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229

BH102-3

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102

sheet 4 of 13

engineering log - cored borehole

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
borehole location: E 308518.10 N 1269889.83

hole commenced: 4.12.89
hole completed: 4.12.89
logged by: SRM
checked by: PLV

drill model and mounting: PIONEER B40 TRUCK
barrel type and length: NQ 3m
fluid: WATER
slope: -65 DEG
bearing: 80deg
R.L.Surface: 103.1 m
datum: AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH) / point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			88	17		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.	FR			Fissures, 50mm zone JT PL RO JT / CR SM 5mm thick PL PT Calcite PL 1mm thick PL PT Calcite PL 1mm thick. FE Broken zone 40mm thick JT PL calcite 46deg,DD.214 degrees JT PL 30deg,DD.107 degrees Fractured layer 10mm thick Fracture IR RO JT PL RO 39deg,DD.219 degrees
						BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.				
						BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.				
			87	18		BRECCIA: medium to coarse grained, light grey, - grey, varying from indistinct bedding, to very thinly bedded.				Fractured zone on PT JT 41deg,DD.217 degrees JT PL RO 28deg,DD.125 degrees JT PL RO 31deg,DD.125 degrees JT PL RO 39deg,DD.34 degrees JT PL / CR SM 38deg,DD.31 degrees JT PL 35deg,DD.29 degrees JT PL clean JT PL clean
			86	19						JT PL RO Fractured/broken zone 250mm thick
			85	20						Calcite vein IR <1mm thick JT PL RO Crushed coal clast 30mm thick Calcite vein PL 2mm thick PT RO Calcite vein PL 2mm thick JT PL RO Calcite vein <1mm thick
						BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.				Calcite vein <1mm thick JT PL clean Calcite fissured zone 100mm thick
			84	21		BRECCIA: medium to coarse grained, dark grey, - grey, indistinct bedding.				JT PL RO slightly decomposed
						BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.				JT IR RO calcite 21.7 to 21.9m JT PL Calcite
			83	22		BRECCIA: medium to coarse grained, grey, - dark grey, indistinct bedding. Dolerite clast 100mm diameter.		D A Z.454.52		Calcite vein 1mm thick IR 22.05 & 22.15m JT PL RO Clast boundaries,calcite coated,22.4 & 22.5m
			82	23						Calcite vein PL 1mm thick Calcite vein 1mm thick IR JT PL calcite 1mm thick
				24						

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229

BH102-4

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102

sheet 5 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			81	25		BRECCIA: medium to coarse grained, grey, - dark grey, indistinct bedding,	FR				JT PL calcite 42deg,DD.257 degrees Calcite fissures <1mm thick Calcite vein 1mm thick 40deg,DD.137 degrees JT PL RO 66deg,DD.239 degrees PT PL clean 27deg,DD.4 degrees JT PL IR calcite
			80	26		BRECCIA: fine to coarse grained, dark grey, - grey, varying from indistinct bedding, to very thinly bedded, dipping 24deg DD 114deg					PT PL calcite 25deg,DD.21 degrees JT PL RO calcite 60deg,DD.284 degrees
			79	27		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding,					JT PL RO calcite, pyrite 67deg,DD.349deg JT PL RO calcite 78deg,DD.239 degrees JT PL RO calcite 60deg,DD.264 degrees JT PL RO calcite
			78	28		BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding,					JT PL RO 40deg,DD.41 degrees JT PL calcite 32deg,DD.80 degrees Calcite vein IR RO 2mm thick
			77	29							JT PL calcite 47deg,DD.162 degrees JT PL calcite, pyrite 21deg,DD.36 degrees Calcite vein 2mm thick 44deg,DD.152 degrees JT PL RO 73deg DD.132 degrees JT PL calcite 15deg,DD.95 degrees Fissured zone with calcite 29.1 to 29.4m
			76	30							Broken zone 40mm wide Joints (3) 50mm spacings, calcite JT PL calcite JT PL RO calcite
			75	31							JT PL RO Calcite veins, <1mm thick IR JT PL calcite JT PL calcite JT PL RO calcite JT PL calcite, 31.3 and 31.35m
				32		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding,					JT IR RO FE 31.6 to 31.8m Coal clast 60mm thick JT PL FE CR 8mm thick JT PL calcite

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

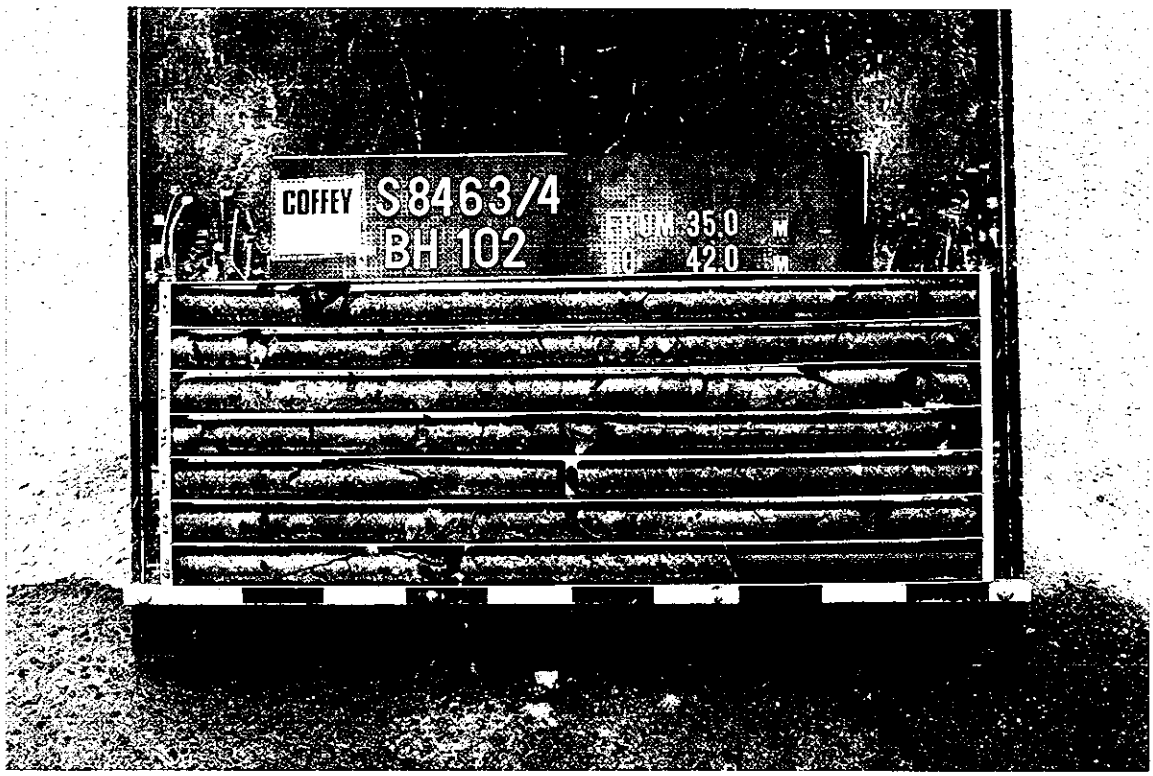
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229



BH102-13

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 6 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope: -65 DEG	R.L.Surface: 103.1 m
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg datum: AHD

drilling information

method	case-lift	water	R.L.	depth metres
NQ			74	
				33
			73	
				34
			72	
				35
			71	
				36
			70	
				37
			69	
				38
			68	
				39
			67	
				40

rock substance

graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa
	BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.	FR		
	BRECCIA: fine to coarse grained, light grey, - dark grey, very thinly bedded, indistinct bedding.			
	BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, very thinly bedded.			
				D A 0.50 0.06
	BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.			
	BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.			

rock mass defects

defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
	JT PL FE
	JT PL FE
	JT IR RO
	JT PL RO 80deg,DD.46 degrees
	JT PL RO 47deg,DD.344 degrees
	JT IR RO
	JT PL calcite
	JT PL RO
	JT PL calcite
	JT PL RO calcite
	JT PL calcite
	JT PL RO calcite
	JT PL
	JT PL
	Broken zone 50mm thick
	JT PL calcite
	JT IR RO
	JT PL calcite
	JT IR RO
	JT PL
	JT PL
	JT PL RO
	JT PL calcite
	JT PL calcite
	JT PL
	JT PL RO calcite
	JT PL RO calcite
	JT PL
	JT IR RO calcite
	JT IR RO
	Broken zone ass. with JT
	JT PL 64deg,DD.324 degrees
	JT IR calcite RO
	JT PL calcite 3mm thick
	Calcite fissures <1mm thick

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 6 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (60 200 600 2000 6000)	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			74			BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.	FR				JT PL FE JT PL FE JT IR RO JT PL RO 80deg,DD.46 degrees JT PL RO 47deg,DD.344 degrees
			73	33		BRECCIA: fine to coarse grained, light grey, - dark grey, very thinly bedded, indistinct bedding.					JT IR RO JT PL calcite JT PL RO
			72	34		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, very thinly bedded.					JT PL calcite JT PL RO calcite JT PL calcite JT PL RO calcite
			71	35					D A 0.50 0.06		JT PL JT PL Broken zone 50mm thick
			70	36							JT PL calcite JT IR RO JT PL calcite JT IR RO JT PL JT PL
			69	37		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.					JT PL RO JT PL calcite JT PL calcite JT PL JT PL RO calcite JT PL RO calcite
			68	38		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.					JT PL JT IR RO calcite JT IR RO Broken zone ass. with JT JT PL 64deg,DD.324 degrees
			67	39							JT IR calcite RO JT PL calcite 3mm thick Calcite fissures <1mm thick
				40							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

BH102 - 6

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 7 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK			slope:	-65 DEG	R.L.Surface:	103.1 m
barrel type and length:	NQ 3m	fluid:	WATER	bearing:	80deg	datum:	AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			66	41		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.	FR				JT PL calcite JT PL calcite RO JT PL RO calcite JT PL calcite JT PL JT PL RO
						BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding, clasts of dolerite, coal & sandstone					JT IR RO calcite Broken JT IR RO calcite
			65	42		DOLERITE: fine grained, light grey, massive.					JT PL calcite
						BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding.					JT PL calcite JT PL calcite
			64	43		coarse grained band 100mm thick					JT PL calcite
											JT PL RO JT PL RO calcite JT PL clean
			63	44							JT PL RO calcite JT PL calcite JT PL calcite JT PL calcite 5mm thick JT PL clean
			62	45							JT PL FE calcite JT PL RO calcite
									D A 3.2 92.6 7		JT PL clean
			61	46							JT PL RO calcite calcite fissures <1mm thick zone 70mm thick
											JT PL RO calcite
			60	47							JT IR RO calcite 47deg,DD.262 degrees
				48							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

BH102-7

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

engineering log - cored borehole

borehole no: 102
sheet 6 of 13

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK			slope:	-65 DEG	R.L.Surface:	103.1 m
barrel type and length:	NQ 3m	fluid:	WATER	bearing:	80deg	datum:	AHD

drilling information					rock substance					rock mass defects	
method	case-liff	water	R.L.	depth metres	graphic log core loss	substance description rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below
NQ			59	49		BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding.	FR				JT PL RO calcite 56deg,DD.272 degrees JT PL RO 49deg,DD.269 degrees
			58	50		BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding.					JT PL calcite JT PL RO calcite
			57	51		BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding.					JT PL RO calcite Calcite vein 1mm thick Zone of calcite fissures to 2mm thick 50.75 to 50.95m
			56	52							JT PL RO calcite Calcite vein < 1mm thick JT PL calcite JT PL RO Calcite veins up to 5mm thick
			55	53							JT PL RO
			54	54		Coarse grained band 250mm thick					JT PL RO calcite JT PL RO
			53	55							JT PL RO JT PL RO calcite
				56							JT PL RO calcite

General Defect Description:

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

- water level
- water inflow
- * not measured Drilling Water
- partial loss
- complete loss

POINT LOAD TEST
- D -diametral
- A -axial

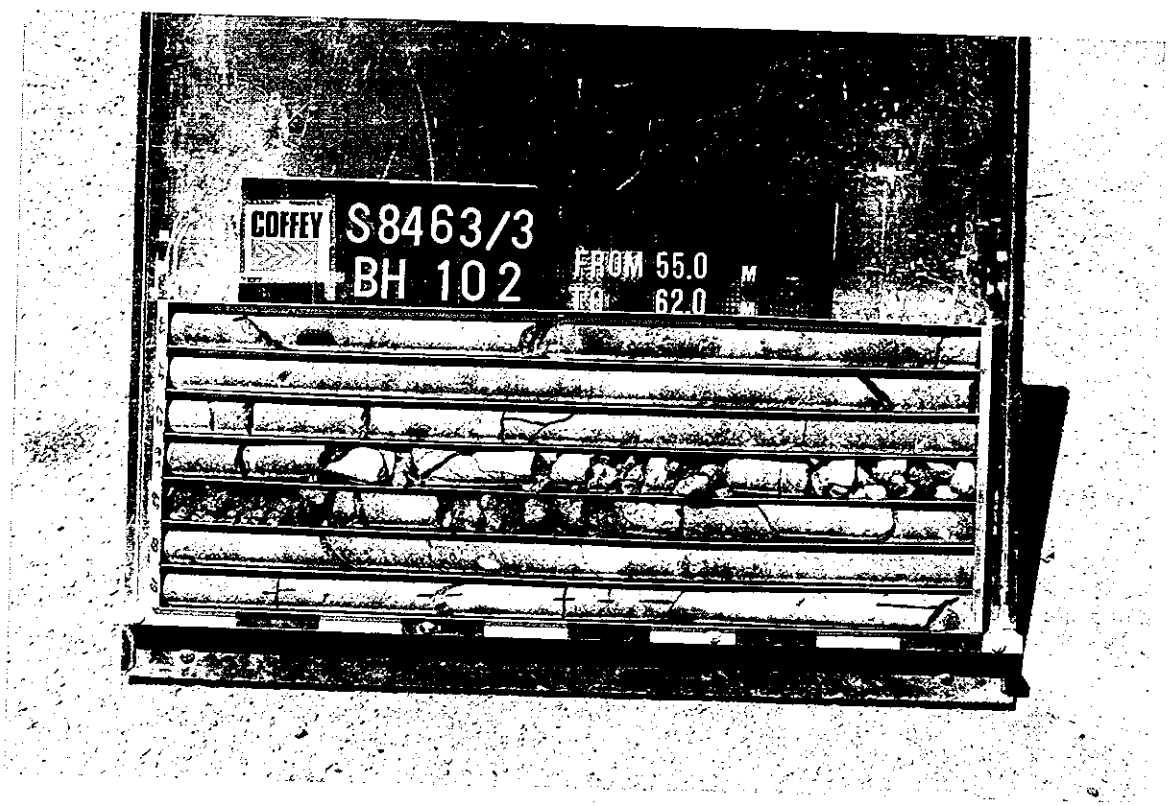
GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular

787-229



BH102 -8

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 9 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER 840 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
NQ			52	57		BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding.	FR		D A 3.17 2.64		JT PL RO calcite JT PL RO Jf curved RO calcite JT PL calcite calcite vein <1mm thick
			51	58							JT IR RO Broken zone 40mm thick Fractured zone with JT PL Fractured zone 30mm thick Fractured zone 58.55 to 58.70m
			50	59							Calcite vein 1mm thick Broken zone 58.8 to 59.0m Crushed and fractured zone 250mm thick
			49	60							Crushed and fractured zone 200mm thick JT PL calcite JT PL calcite
			48	61							Calcite vein 1mm thick
			47	62		BRECCIA: fine to coarse grained, light grey, - grey, indistinct bedding.					JT PL RO calcite 56deg,DD.80 degrees JT PL calcite 78deg,DD.394 degrees JT PL 47deg,DD.339 degrees JT PL 43deg,DD.339 degrees Calcite vein 74deg,DD.269 degrees Calcite vein 78deg,DD.274 degrees Calcite vein/ JT 65deg,DD.80 degrees JT PL RO calcite 74deg,DD.322 degrees
			46	63		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.					Calcite vein <1mm thick JT PL RO 88deg,DD.319 degrees JT PL RO 89deg,DD.326 degrees JT PL RO calcite 43deg,DD.322 degrees Calcite vein 2mm thick 46deg,DD.319 degrees Calcite vein 1mm thick 47deg,DD.324 degrees JT PL RO calcite 30deg,DD.26 degrees
				64							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229

BH102 - 9

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 10 of 13

engineering log — cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	core-lift	water	R.L.	depth metres	graphic log / core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination, planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			45			BRECCIA: fine to coarse grained, light grey, - grey, indistinct bedding.	FR				JT PL RO 42deg,DD.14 degrees JT PL RO 38deg,DD.21 degrees JT PL RO 38deg,DD.21 degrees JT PL RO 84deg,DD.262 degrees
			44	65		BRECCIA: fine to coarse grained, grey, - dark grey, very thinly bedded, dipping 18 degrees					JT PL RO calcite 41deg,DD.332 degrees Calcite vein 1mm thick 42deg,DD.319 degrees Calcite vein 3mm thick 30deg,DD.314 degrees Calcite vein <1mm thick 30deg,DD.326 degrees
			43	66							JT PL RO
				67		BRECCIA: fine to coarse grained, light grey, - dark grey, indistinct bedding.					JT PL RO JT PL calcite
			42	68							Calcite fissures <1mm thick IR JT PL calcite
			41	69		BRECCIA: fine to coarse grained, dark grey, indistinct bedding.					JT PL calcite (2 parallel) JT PL calcite JT PL calcite vein PL <1mm thick JT PL calcite JT PL RO
			40	70							
			39	71		BRECCIA: fine to coarse grained, light grey, indistinct bedding.			D A 4.6 7.4 3.6		Calcite vein PL <1mm thick JT PL Calcite vein <1mm thick PL JT PL RO JT PL RO calcite
			38	72							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

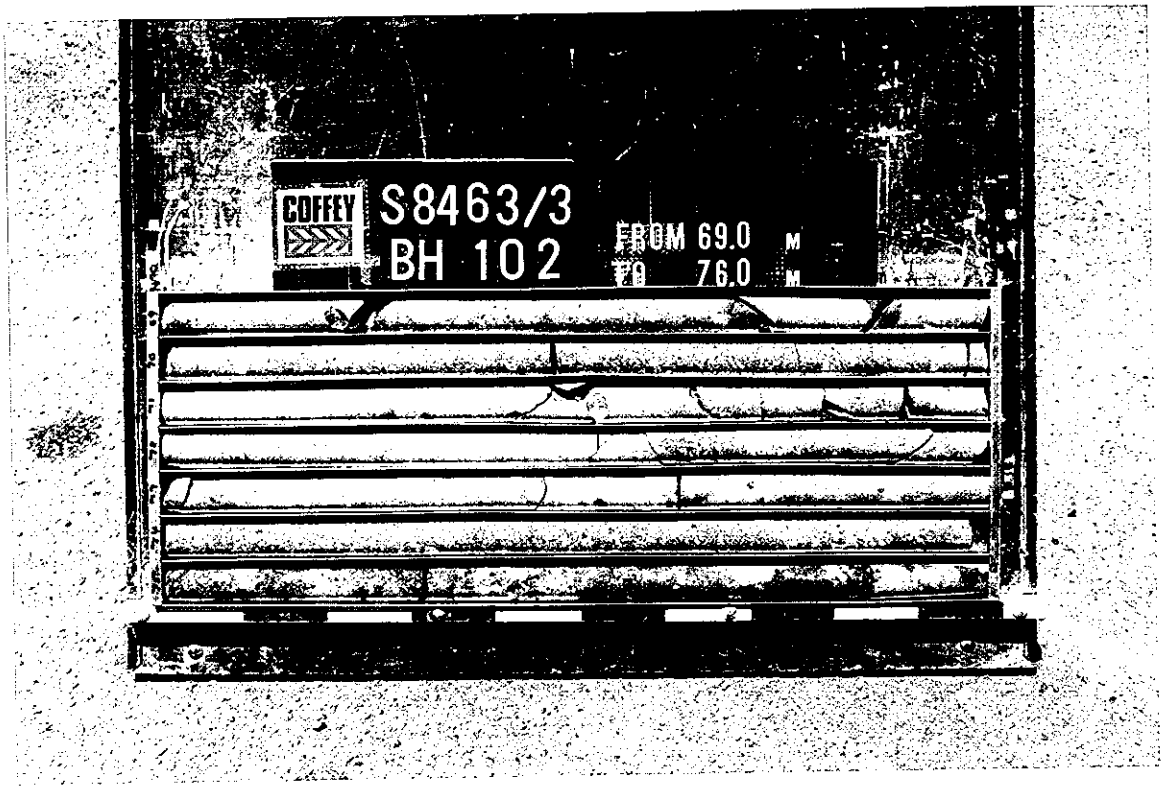
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

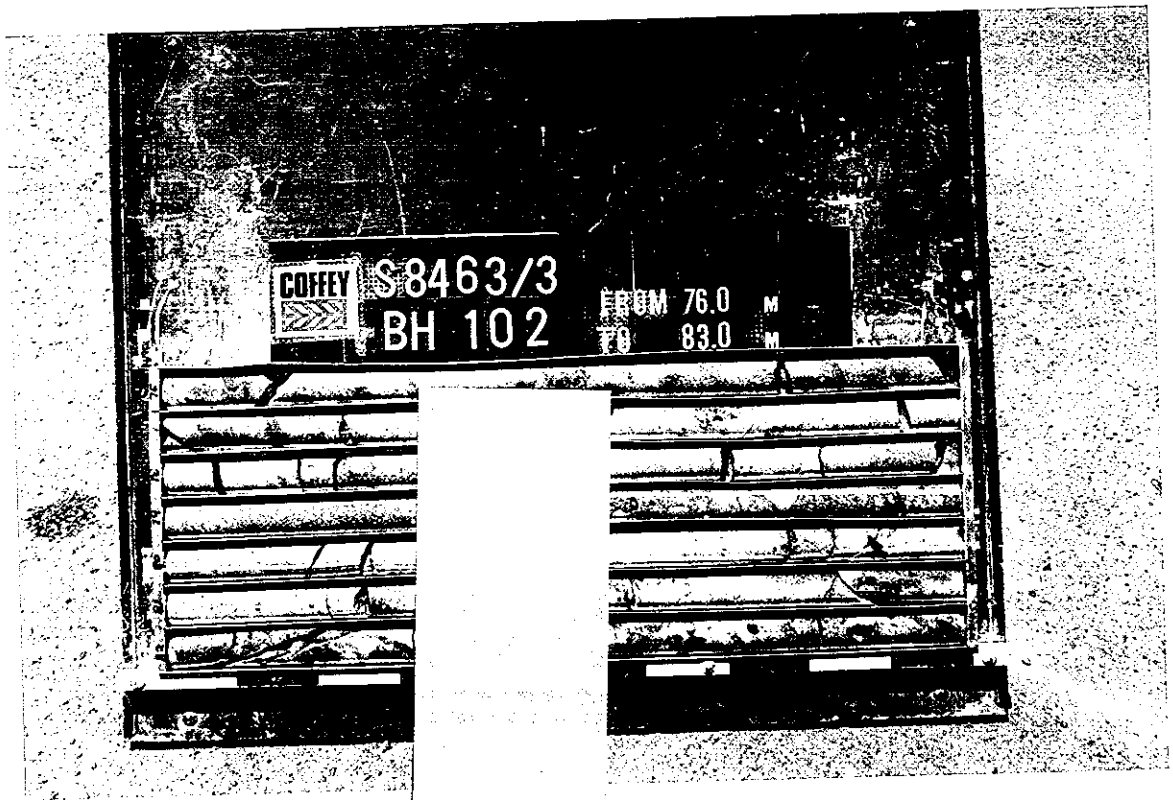
WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

T87-229


COFFEY
S8463/3
BH 102
FROM 69.0 M
TO 76.0 M


COFFEY
S8463/3
BH 102
FROM 76.0 M
TO 83.0 M

BH102-10

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 11 of 13

engineering log - cored borehole

office job no: S0463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope: -65 DEG	R.L.Surface: 103.1 m
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg datum: AHD

drilling information					rock substance				rock mass defects	
method	core-lift	water	R.L.	depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	Est. Strength; point load test Is(50) MPa	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			37	73		BRECCIA: fine to coarse grained, light grey, indistinct bedding.	FR			JT PL calcite
						BRECCIA: fine to coarse grained, dark grey, - light grey, indistinct bedding.				JT PL RO calcite JT PL RO calcite
			36	74						Calcite fissures IR <1mm thick
						BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding, thinly bedded.				
			35	75						Calcite fissures <1mm thick IR
				76						JT PL RO JT PL RO
			34							
				77						JT PL RO calcite JT PL RO calcite
			33			BRECCIA: medium to coarse grained, light grey, indistinct bedding.				Broken zone 15mm thick JT PL RO calcite
				78		BRECCIA: fine to coarse grained, grey, - dark grey, indistinct bedding, to very thinly bedded.				JT PL RO calcite
			32			BRECCIA: fine to medium grained, grey, indistinct bedding.				JT IR RO calcite 38deg,DD.349 degrees JT PL RO 31deg,DD.336 degrees
				79		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.				JT PL RO clean 30deg,DD.339 degrees
			31							JT PL clean 32deg,DD.53 degrees
				80						

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
not measured
Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

BH102-11

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102

sheet 12 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV
drill model and mounting:	PIONEER B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 80deg
R.L.Surface:	103.1 m		
datum:	AHD		

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (60 200 600 2000 6000)	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
NQ			30	81		BRECCIA: fine to coarse grained, light grey, indistinct bedding,	FR				JT PL clean 31deg,DD.3[illegible] degrees
			29	82							JT PL clean 36deg,DD.349 degrees JT PL clean 34deg,DD.349 degrees JT PL RO calcite 41deg,DD.336 degrees JT PL calcite 70deg,DD.217 degrees JT PL calcite 6deg,DD.034 degrees JT PL RO calcite 60deg,DD.276 degrees JT PL RO 76deg,DD.187 degrees JT PL RO calcite 86deg,DD.272 degrees JT PL RO calcite 86deg,DD.272 degrees
			28	83		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding,					
						BRECCIA: medium to coarse grained, light grey, - grey, indistinct bedding,					
			27	84		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, some dolerite clasts to 50mm diameter.					JT PL clean
			26	85							JT PL clean JT PL calcite RO Calcite veins IR 2mm thick Broken zone 50mm thick
			25	86							Calcite vein PL 1mm thick
			24	87							Calcite vein PL 1mm thick Fractured zone 60mm thick JT PL calcite JT PL calcite
				88							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

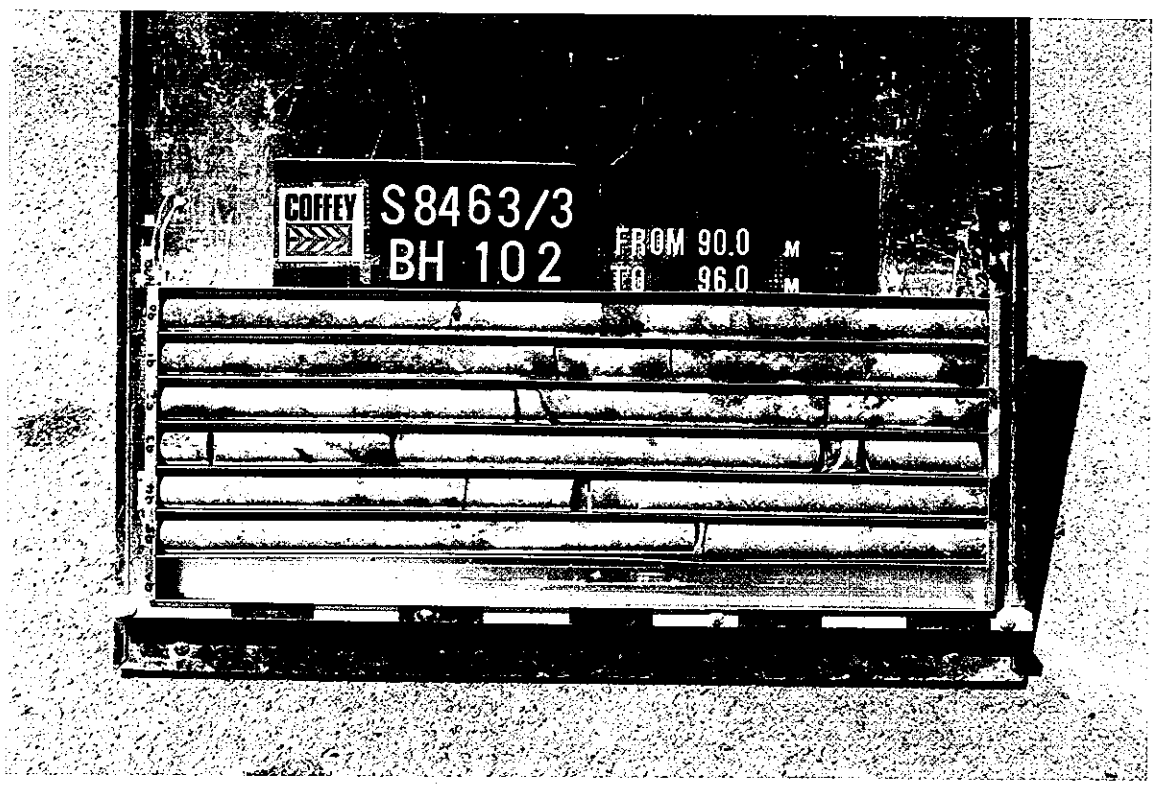
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

787-229



BH102-12

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 102
sheet 13 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	4.12.89
principal:		hole completed:	4.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308518.10 N 1269889.83	checked by:	PLV

drill model and mounting:	PIONEER B40 TRUCK			slope:	-65 DEG	R.L.Surface:	103.1 m
barrel type and length:	NQ 3m	fluid:	WATER	bearing:	80deg	datum:	AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength EL VL L M H VH EH	point load test Is(50) MPa	defect spacing mm 50 100 200 600 2000 6000	defect description type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below
NQ			23	89		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, some dolerite clasts to 50mm diameter.	FR				JT PL calcite JT PL JT PL RO calcite JT PL calcite
			22	90							Calcite veins IR 3mm thick Calcite veins IR 3mm thick Calcite veins 1mm thick IR
			21	91							
			20	92							JT PL RO clean JT PL RO clean JT PL RO calcite
			19	93							JT PL calcite JT PL clean
			18	94							JT PL calcite 1mm thick
			17	95							
				96							JT (2 parallel) PL 5mm spacings

General Defect Description:

Borehole 102 Terminated at 96.00 m

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

- water level
- water inflow
- * not measured Drilling Water
- partial loss
- complete loss

POINT LOAD TEST
- D -diametral
- A -axial

GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103

sheet 1 of 13

engineering log - borehole

office job no: S8463/3

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E308469.08 N1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
hole diameter:	76mm	bearing:	142deg
		R.L.Surface:	112.6 m
		datum:	AHD

method	penetration 1 2 3	support	water	notes samples, test,etc	R.L. depth metres	graphic log	classification symbol	material: soil type:plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R		C			112		GP	FILL: Gravel fine to coarse grained light grey Sand fine to coarse grained Clay medium plasticity,				FILL for drilling pad
					111		CL	GRAVELLY CLAY: medium plasticity, red brown Gravel, fine to coarse grained, some fine to coarse sand				RESIDUAL (?)
					110							
					109							
					108							
					107			Commenced coring at 6.2m				
					106							

METHOD
- AS auger screwing*
- AD auger drilling*
- R roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- C casing
- M mud

PENETRATION 1 2 3 — no resistance ranging to refusal

WATER
- * not measured
- water level
- water outflow
- water inflow

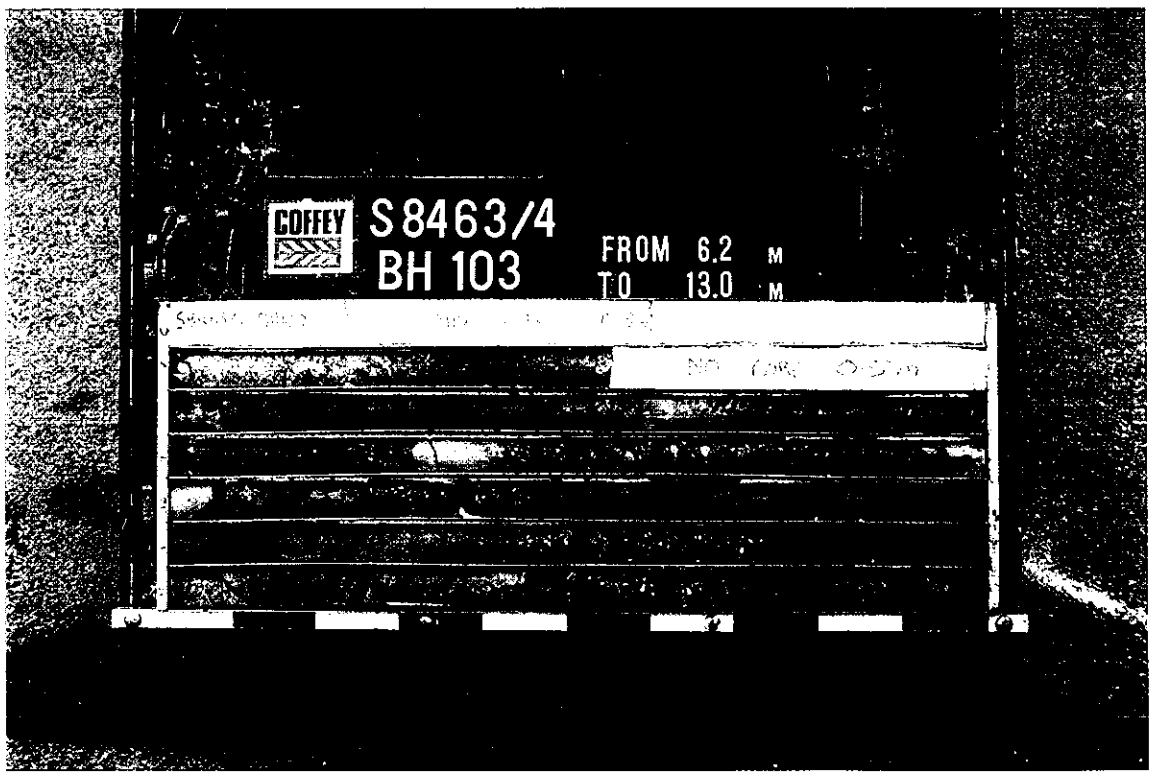
NOTES samples and tests
- U50 undisturbed sample 50 mm diameter
- D disturbed sample
- N standard penetration test:
- N* SPT + sample recovered
- Nc SPT with solid cone
- V vane shear
- P pressuremeter
- Bs bulk sample
- R refusal

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

187-230


COFFEY
S8463/4
BH 103
FROM 6.2 M
TO 13.0 M

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 2 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV

drill model and mounting:	B40 TRUCK			slope:	-65 DEG	R.L.Surface:	112.6 m
barrel type and length:	NQ 3m	fluid:	WATER	bearing:	142deg	datum:	AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description: rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (50 100 300 1000 3000)	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
			112	1							
			111	2							
			110	3							
			109	4							
			108	5							
			107	6		Continued from non-core borehole					
NQ				7		NO CORE: 0.8m					
			106			BRECCIA: fine grained, light grey, - brown, indistinct bedding.	HW				fissured zone 300mm thick; EW / decomposed zone 250mm thick
						BRECCIA: fine grained, red, brown,	EW				decomposed zone 150mm thick
				8		NO CORE: 0.45m					

General Defect Description:
Partings 0-10deg

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

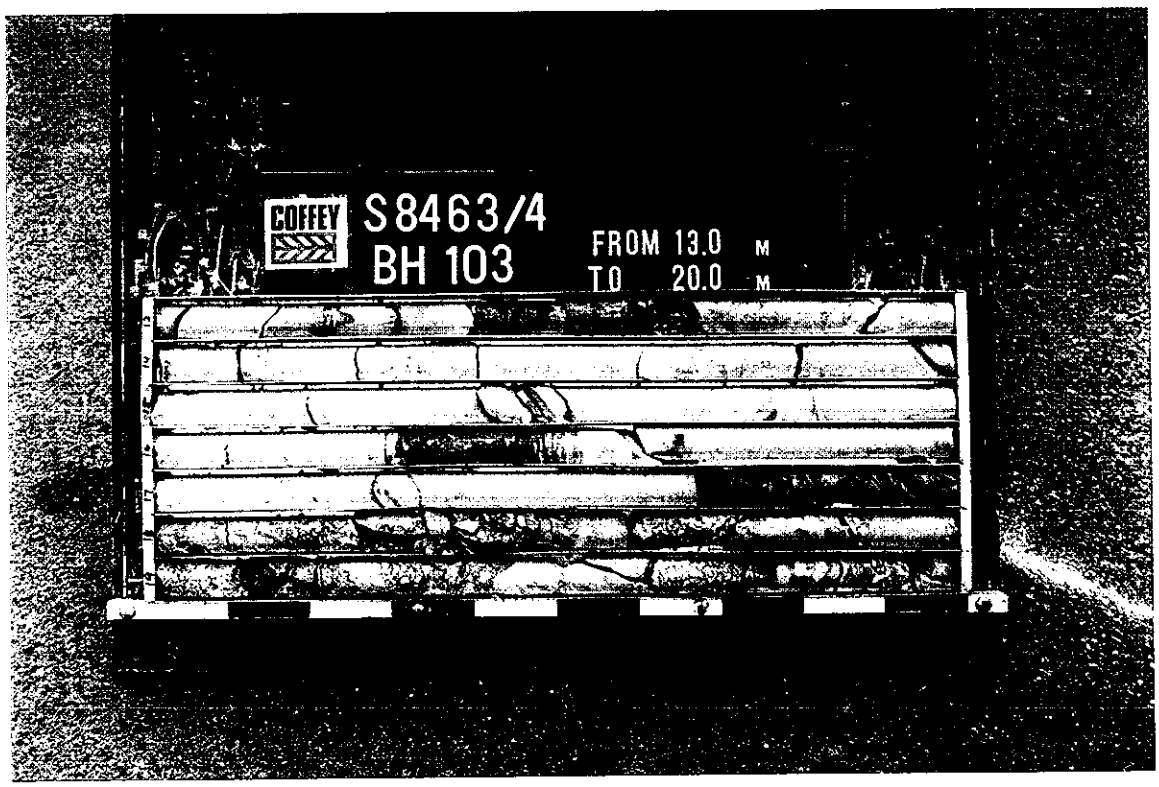
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH103-2

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 3 of 13

engineering log - cored borehole

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
borehole location: E 308469.08 N 1269764.16

hole commenced: 14.12.89
hole completed: 20.12.89
logged by: SRM
checked by: PLV

drill model and mounting: B40 TRUCK
barrel type and length: NQ 3m
fluid: WATER
slope: -65 DEG
bearing: 142deg
R.L.Surface: 112.6 m
datum: AHD

drilling information					rock substance					rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log / core loss	substance description: rock type: grain characteristics, colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			105			SILTY SANDSTONE: light grey, - light brown, laminated, approximately horizontal bedding	MW				fissured zone Fe stained 400mm thick
											CL SM 50mm thick
											decomposed zone 200mm thick
											broken zone at sandstone breccia interface
			104	9		BRECCIA: light grey, - grey, indistinct bedding, / massive. Large sandstone clasts to 100mm	SW		D A 0.09 0.13		JT PL RO JT PL RO
				10		SANDSTONE: white, - light grey, laminated.					JT curved Fe JT curved Fe RO JT curved Fe RO
						BRECCIA: light grey, - grey, indistinct bedding, / massive.					broken zone 50mm thick
			103			SILTY SANDSTONE: light grey, - dark grey, laminated, / cross laminated. Breccia up to 5mm thick along some bedding planes					JT PL clean
				11			MW				SM CL/CR 5mm thick PT high angle cross bedding IR PT
							SW				
			102			Band of breccia 170mm thick along bedding plane	MW				JT PL RO broken zone with some clay 150mm thick
				12			SW				JT IR RO JT PL RO with associated IR fracturing JT PL clean
											crushed zone 80mm thick
			101			Interlaminated breccia and silty sandstone in 250mm thick band					
				13		SANDSTONE: fine grained, light grey, indistinct bedding, with some silty bands up to 13.7m	FR				PT IR PT RO PT RO
						Cross laminated siltstone in a band 250mm thick	MW				fractured and decomposed zone 90mm thick
							FR				
			100	14							PT RO
											PT RO
			99	15					D A 1.91 2.10		JT PL RO clean
				16							

General Defect Description:
Partings 0-10deg

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

- water level
- water inflow
- * not measured Drilling Water
- partial loss
- complete loss

POINT LOAD TEST
- D -diametral
- A -axial

GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular

BH 103 -3

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 4 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
R.L.Surface:	112.6 m	datum:	AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength EL VL L M H VH EH	point load test Is(50) MPa	defect spacing mm 30 100 300 1000 3000

defect description type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below
PT broken 5mm thick
JT PL
CR/CL SM 30mm thick
cleats in coal with <5mm spacings
broken zone 40mm thick
fissured and broken zone 100mm thick
JT PL RO
JT PL CL smear
fractured zone around JT to 18.45
PT on breccia sandstone contact
JT CU
PT PL
broken zone 100mm thick
JT PL RO
decomposed zone 50mm thick
broken zone 100mm thick
JT PL
JT PL
PT (2) PL parallel 20.3 and 20.33
broken zone around IR JT 150mm thick
JT PL
JT PL
decomposed zone of partings 100mm thick
JT PL polished
fissured zone 200mm thick
JT PL polished
fractured zone with CR SM 100mm thick
fissured zone 22.4-22.65
JT PL polished
fractured zone 200mm thick
fragmented zone 150mm thick
fissured zone 23.35-23.55
JT PL polished
broken zone 23.7-23.9
JT IR CU RO

R.L.	depth metres	graphic log core loss	substance description	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description
98	17		SANDSTONE: fine grained, light grey, indistinct bedding, with some silty bands up to 13.7m	SW				
			Breccia layer 150mm thick	FR				
97								
	18		SANDSTONE: fine grained, dark grey, - grey, laminated, laminated, / cross laminated, some carbonaceous material, including coal	SW				
96			BRECCIA: fine to coarse grained, light grey, - dark grey, massive, clasts of sandstone and limestone(?) up to 100mm					
	19		Sandstone 130mm thick					
95			Sandstone 120mm thick					
			Sandstone 180mm thick					
	20		Sandstone 120mm thick					
94			SANDSTONE: fine to medium grained, grey, indistinct bedding, becoming silty sandstone at 20.9m					
	21		BRECCIA: fine to coarse grained, light grey, - grey,					
93			SANDY SILTSTONE: fine grained, grey, - light grey, laminated, / cross laminated,					
	22							
92								
	23							
91			SILTSTONE: fine grained, dark grey, laminated, carbonaceous with bands of coal					
	24							

General Defect Description:
Partings 0-5deg

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

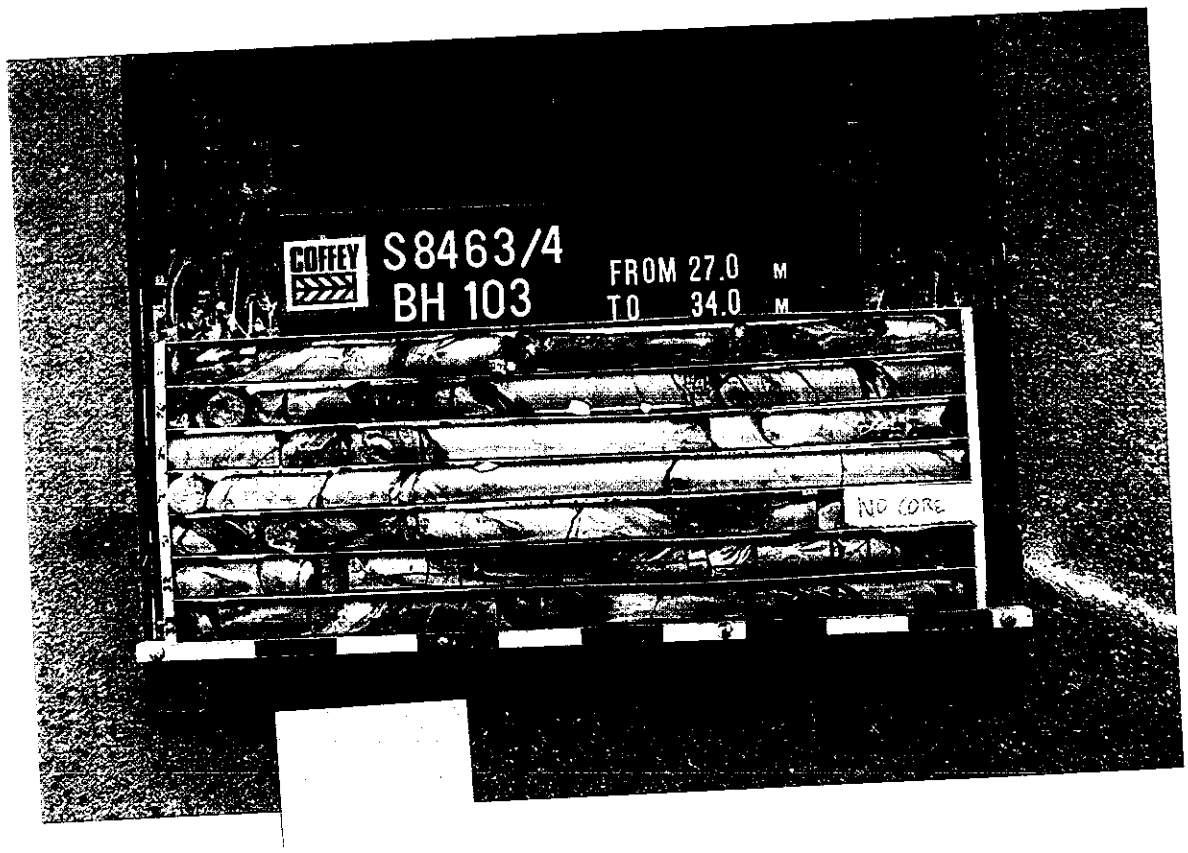
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH103-4

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 5 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
		R.L.Surface:	112.6 m
		datum:	AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			90	25		SILTSTONE: fine grained, dark grey, laminated, carbonaceous with bands of coal	SW				broken layer 10mm thick JT PL polished fractured zone including coal cleats 100mm CL SM 10mm thick
						SILTY SANDSTONE: fine to medium grained, grey, - light grey, cross laminated, with some bands of fine to medium grained volcanic flow structures					JT PL smooth broken zone 50mm thick JT PL RO
						70mm thick band of breccia					broken zone 50mm thick
			89	26		coal ply 200mm thick					fissured zone 100mm thick broken zone 100mm thick JT PL smooth JT PL RO with broken zone
									D A 1.65 1.17		JT PL RO JT PL RO JT PL RO JT PL JT PL JT PL RO JT PL RO with fracturing
			88	27							JT (2 parallel) PL RO JT PL Calcite broken zone 50mm thick
						Some bands of breccia material, fine to medium					crushed seam 5mm thick
				28							decomposed zone 100mm thick decomposed/crushed zone 100mm thick JT smooth PL
			87			Coal fragment 80mm thick					broken zone 100mm thick JT CU smooth
							FR				
				29							JT IR RO
			86								decomposed layer 50mm thick decomposed layer 50mm thick
				30							
			85								
				31			SW				JT PL polished JT PL polished JT PL RO JT PL RO
			84								fractured/broken zone 100mm thick
				32							

General Defect Description:
Partings 0-5deg

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

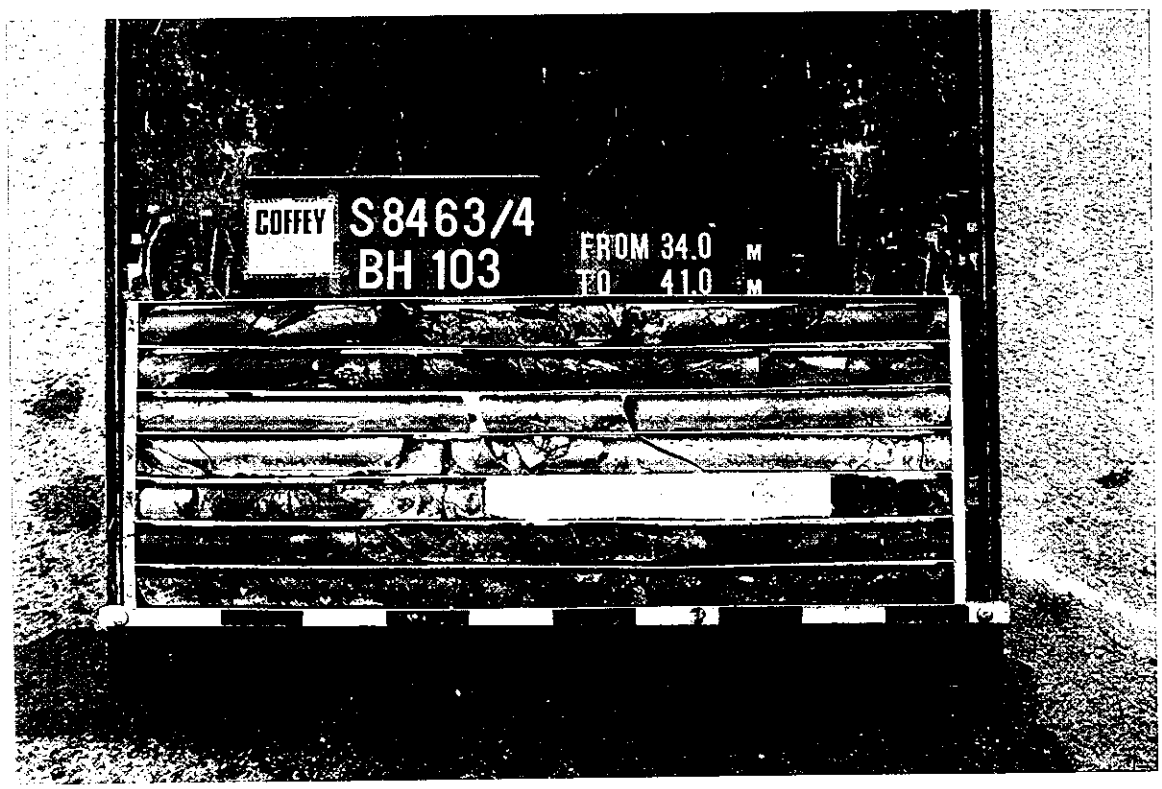
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH103-5

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 6 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope: -65 DEG	R.L.Surface: 112.6 m
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg datum: AHD

drilling information

method	case-lift	water	R.L.	depth metres
NQ			83	33
			82	34
			81	35
			80	36
			79	37
			78	38
			77	39
				40

rock substance

graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa
	SILTY SANDSTONE: fine to medium grained, grey, - light grey, cross laminated, with some bands of fine to medium grained volcanic flow structures Coal block 220mm thick, cleated, undulose laminae	SW	EL VL L M H VH EH	
	SANDY SILTSTONE: fine grained, light grey, - grey, cross laminated.	SW FR		
	SANDSTONE: fine to medium grained, light grey, indistinct bedding.			
	NO CORE: 0.5m thick.			
	SANDY SILTSTONE: fine grained, light grey, - grey, laminated, / cross laminated.			
	See below			

rock mass defects

defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness unless otherwise noted defects follow general description below)
30 100 300 1000 3000	broken zone on JT PL 70deg,DD 106deg
	JT PL 88deg,DD 251deg
	JT PL striations 57deg,DD 45deg
	JT PL polished 85deg,DD 276deg
	JT PL polished 44deg,DD 96deg
	JT curved polished
	JT PL Slickensided
	fractured layer 50mm thick
	decomposed joints 100mm thick
	2 parallel JT PL polished
	JT CU smooth
	decomposed JT
	JT PL smooth
	JT PL smooth
	JT PL polished
	JT PL polished
	CR SM 5mm thick
	PT CU
	JT PL RO
	2 parallel JT PL RO 30mm spacings
	JT PL RO fractured
	fractured zone around JT PL RO
	JT PL RO
	clayey zone 30mm thick
	PT IR
	PT IR
	decomposed JT
	decomposed fractured zone 50mm thick
	JT PL smooth
	JT IR smooth
	PT crushed
	JT PL smooth
	JT decomposed clayey
	JT PL smooth

General Defect Description:
Partings 0-5deg

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

Drilling Water
- water level
- water inflow
- * not measured
- partial loss
- complete loss

POINT LOAD TEST
- D -diametral
- A -axial

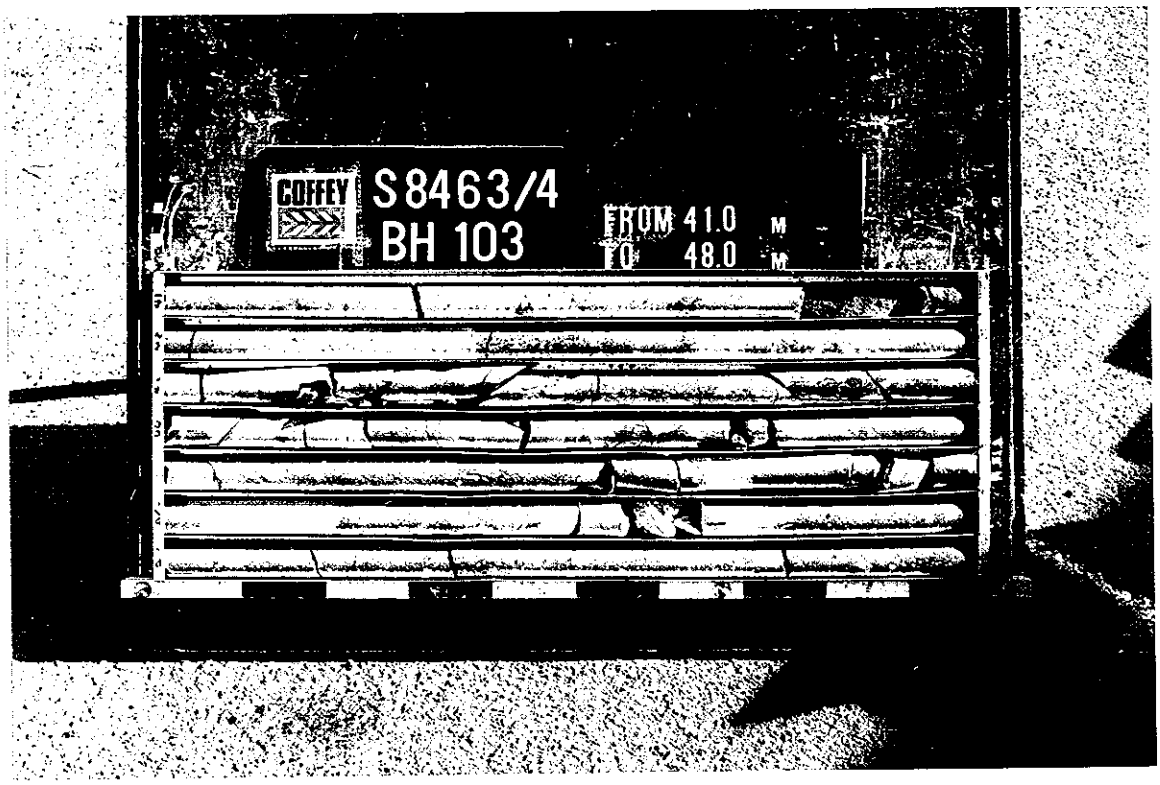
GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular

T87-229



BH 103-6

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 7 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg

R.L.Surface: 112.6 m
datum: AHD

drilling information

method	case-lift	water	R.L.	depth metres
NQ			76	41
			75	42
			74	43
			73	44
			72	45
			71	46
			70	47
				48

rock substance

graphic log / core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa (D / A)
	SANDY SILTSTONE: fine grained, light grey, - grey, laminated, cross laminated.	FR	EL VL L M H VH EH	0.65 1.60
	BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, to very thinly bedded.			
	SILTSTONE: fine grained, light grey, - grey, laminated.			
	BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding.			
	SILTY SANDSTONE: fine to medium grained, grey, - dark grey, cross laminated.			
	BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, some bleached bands up to 300mm thick			
	Bleached layer 200mm thick			
	Bleached layer 300mm thick			

rock mass defects

defect spacing mm (30 100 300 1000 3000)	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
	calcite vein PL <1mm thick
	calcite vein PL <1mm thick
	JT IR RO
	calcite vein PL <1mm thick
	JT PL smooth
	JT PL smooth
	JT (3 parallel) PL smooth
	JT PL smooth
	JT PL RO
	JT PL RO
	PT PL
	JT PL RO clean
	fissured zone 44.3-44.6
	broken zone 50mm thick
	fissured zone 44.85-45.05
	JT PL
	PT weathered
	JT PL RO
	decomposed/crushed zone dipping at 40deg DD 321deg
	calcite vein <1mm thick

General Defect Description:
Partings 0-5deg rough clean

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

Drilling Water
water level
water inflow
* not measured
partial loss
complete loss

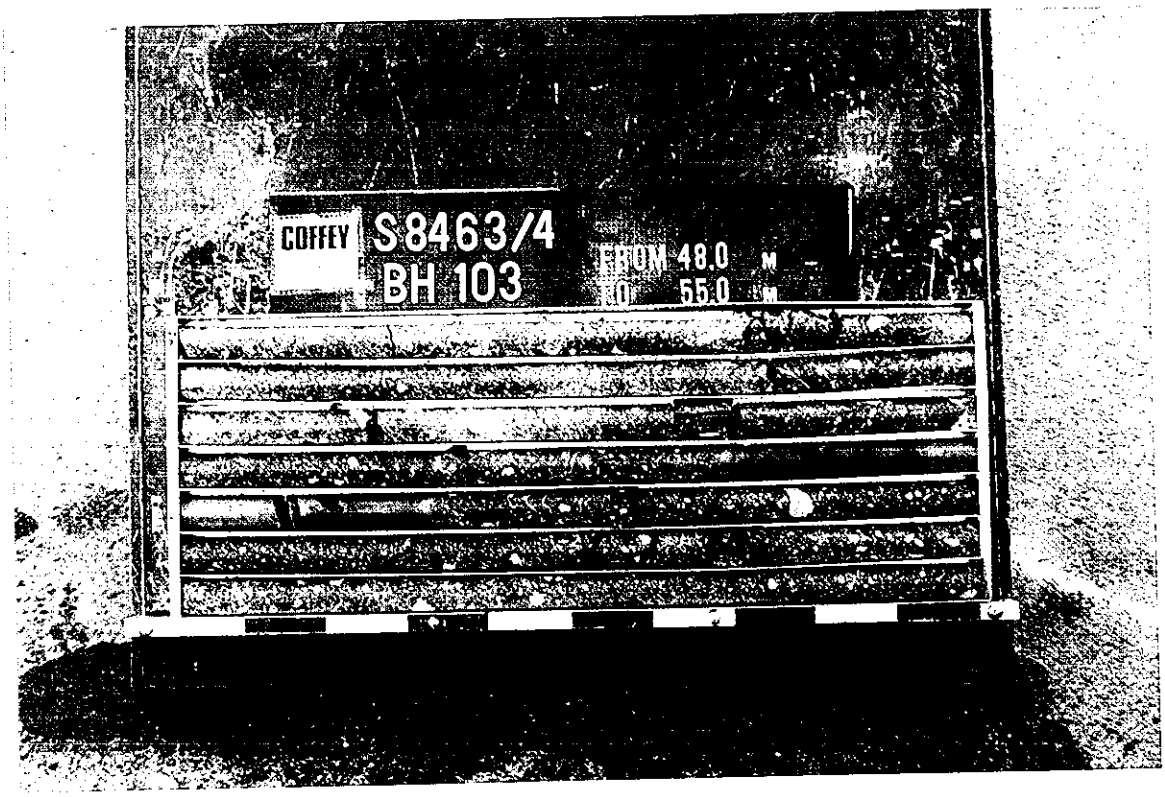
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH 103 - 7

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 5 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope: -65 DEG	R.L.Surface: 112.6 m
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg	datum: AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log / core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			69	49		BRECCIA: fine to coarse grained, dark grey, - grey, indistinct bedding, some bleached bands up to 300mm thick	FR		D 0.96 1.10		broken zone 100mm thick; calcite vein 2mm thick JT PL RO
			68								SM CR 5mm thick; calcite veins 2mm thick
			67	50							PT CR CL
			66	51							calcite vein PL <1mm thick JT PL RO
				52		SILTSTONE: fine grained, grey, cross laminated,					JT PL RO; calcite veins IR 2mm thick JT PL RO CR
			65			BRECCIA: fine to coarse grained, grey, - dark grey, very thinly bedded,					
				53		BRECCIA: fine to coarse grained, dark grey, - grey, massive, some clasts of fine sandstone up to 150mm across					CR SM 10mm thick; fractured/CR zone 80mm thick
			64	54							
			63	55							calcite veins IR <1mm thick; JT/CR SM PL 5mm thick
			62	56							

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

BH103-8

Coffey & Partners Pty. Ltd.
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 9 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
R.L.Surface:	112.6 m	datum:	AHD

drilling information | rock substance | rock mass defects

method	case-liff	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			61	57		BRECCIA: fine to coarse grained, dark grey, - grey, massive, some clasts of fine sandstone up to 150mm across	FR	EL VL L M H VH EH		30 100 300 1000 3000	calcite filled fissures <1mm thick
			60	58							calcite vein PL <1mm thick
			59	59							calcite vein 1mm thick
			58	60							calcite vein 1mm thick IR
			57	61							calcite veins 2mm thick IR
			56	62							calcite veins 2mm thick IR
			55	63							calcite vein 4mm thick
				64							CR SM curved 3mm thick
											JT IR RO

General Defect Description:

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

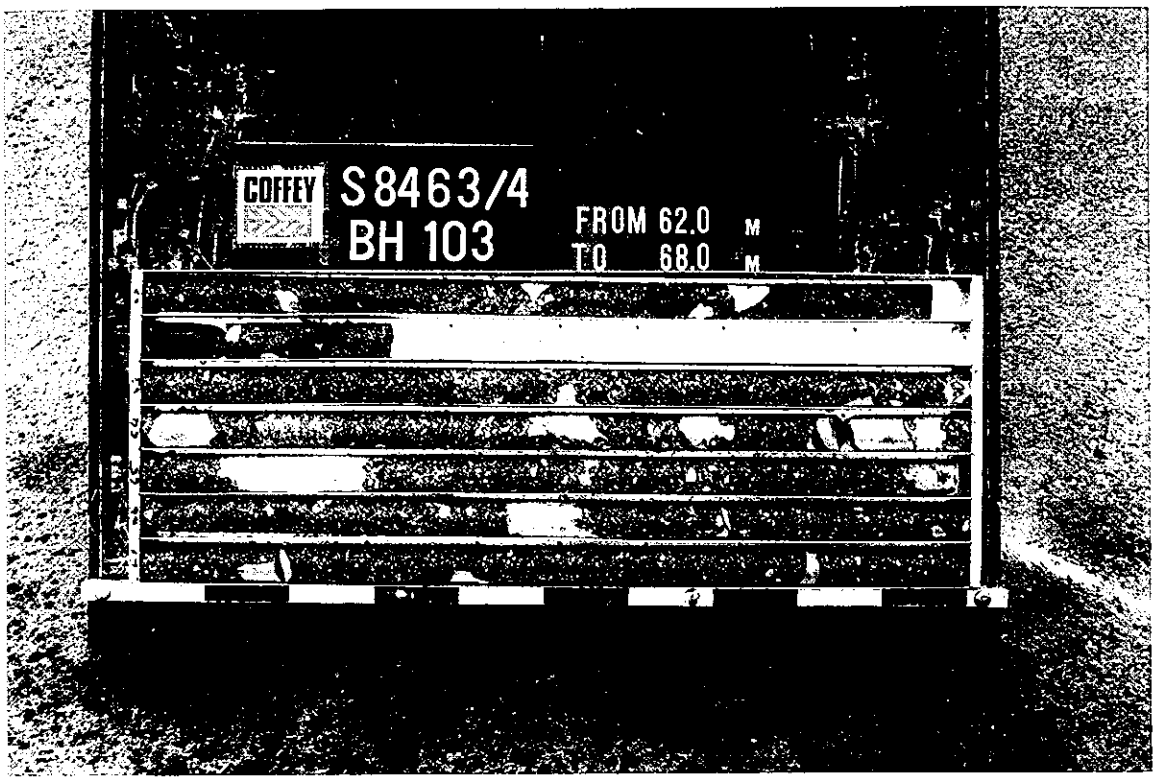
POINT LOAD TEST
D -diametral
A -axial

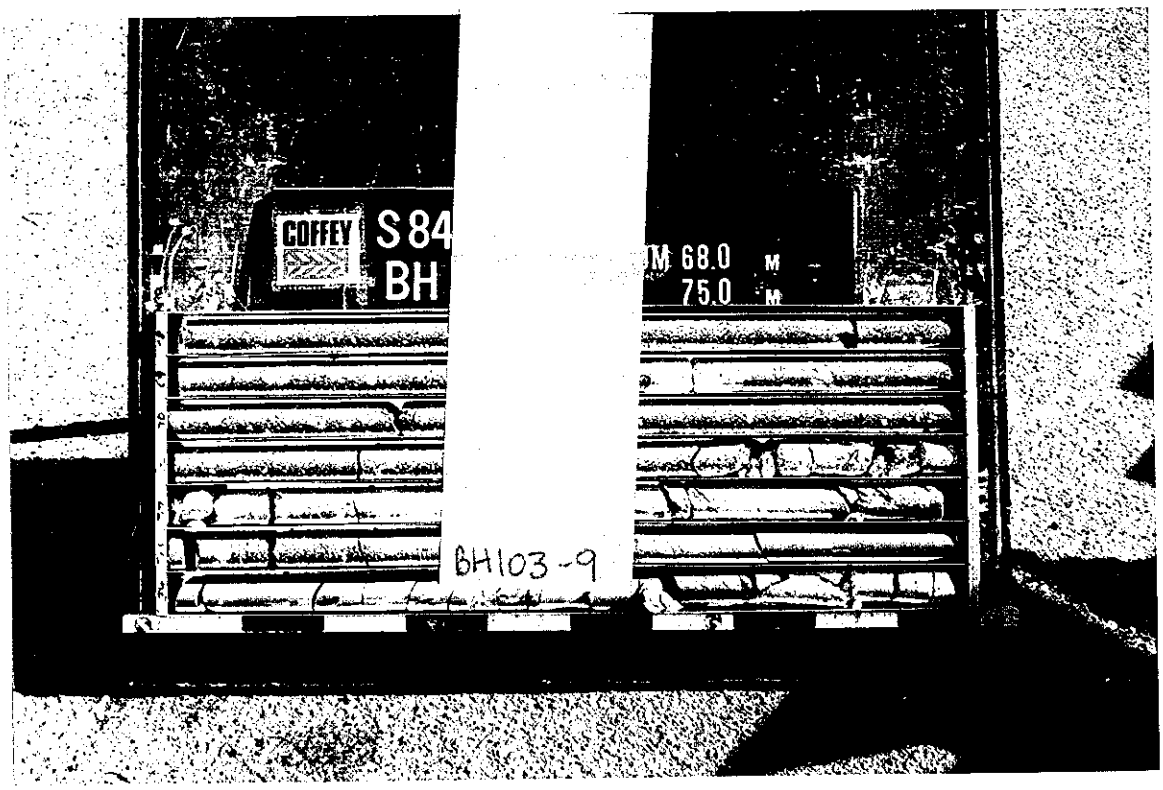
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular


COFFEY
S8463/4
BH 103
FROM 62.0 M
TO 68.0 M


COFFEY
S84
BH
M 68.0 M
75.0 M
BH103-9

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103

sheet 10 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
R.L.Surface:	112.6 m		
datum:	AHD		

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description: rock type: grain characteristics colour, structure, minor components	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			54	65		BRECCIA: fine to coarse grained, dark grey, - grey, massive, some clasts of fine sandstone up to 150mm across	FR				calcite vein PL 2mm thick
			53	66					D A 0.73 0.33		calcite vein <1mm thick
			52	67							
			51	68							
			50	69							
			49	70							decomposed layer in siltstone clast 20mm thick
			48	71							
				72		BRECCIA: fine to coarse grained, white, - light grey, massive,					fractured/decomposed zone 200mm thick; broken zone 200mm thick

General Defect Description:

METHOD
- AS auger screwing
- AD auger drilling
- R roller/tricone
- W washbore
- NMLC core drilling
- NQ,HQ core drilling
- casing used
- barrel withdrawn

Drilling Water
- water level
- water inflow
- * not measured
- partial loss
- complete loss

POINT LOAD TEST
- D -diametral
- A -axial

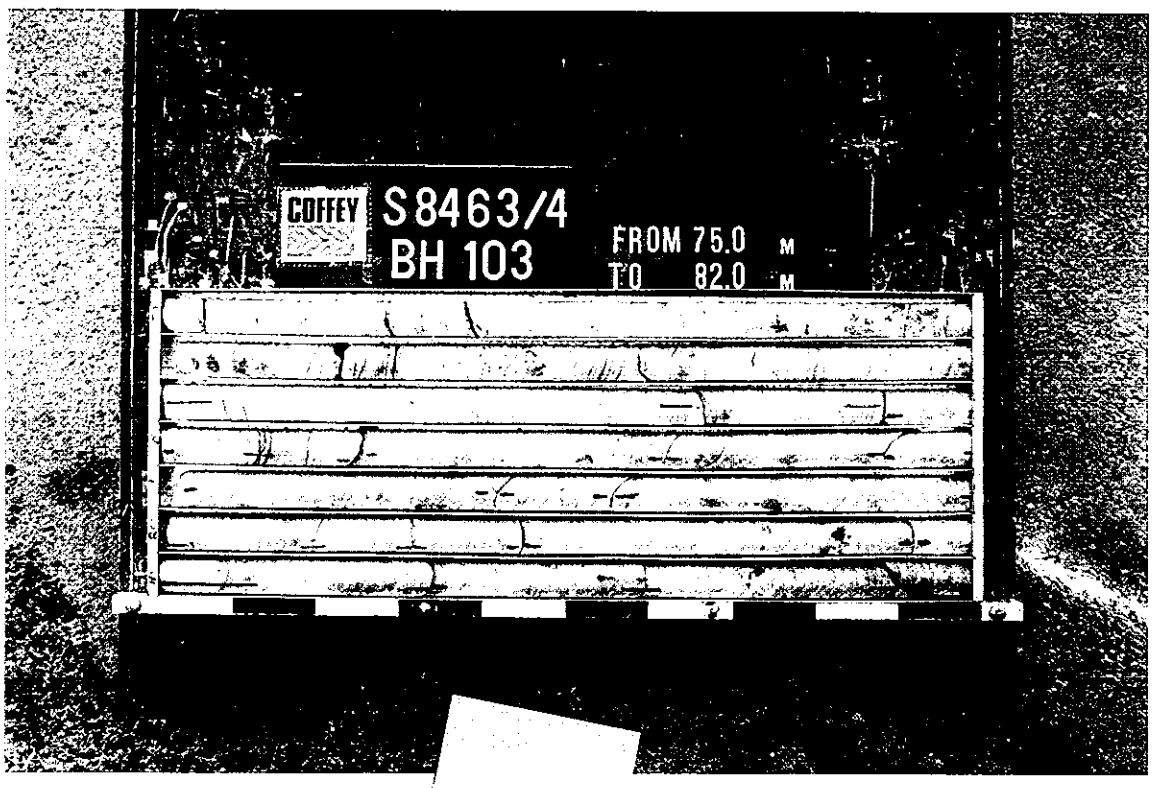
GRAPHIC LOG/CORE LOSS
- core recovered (hatching indicates material)
- no core recovered

WEATHERING
- FR -fresh
- SW -slightly
- MW -moderately
- HW -highly
- EW -extremely

STRENGTH
- EL -extremely low
- VL -very low
- L -low
- M -medium
- H -high
- VH -very high
- EH -extremely high

DEFECTS
- JT -joint
- PT -parting
- SM -seam
- CL -clay
- RO -rough
- DC -decomposed
- PL -planar
- IR -irregular

T87-229



BH103 - 10

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 11 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
R.L.Surface:	112.6 m	datum:	AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log / core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength (EL VL L M H VH EH)	point load test Is(50) MPa	defect spacing mm (30 100 300 1000 3000)	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			47			BRECCIA: fine to coarse grained, white, - light grey, massive,	FR				fissured zone 100mm thick
											decomposed zone 200mm thick
				73		BRECCIA: fine to coarse grained, grey, massive,					
			46			SILTSTONE: fine to medium grained, light grey, - dark grey, laminated, some massive breccia bands to 100mm thick at 73.5 and 74.4m					fissured zone 100mm thick
											fissured zone around JT IR
				74							
			45								fissured zone 100mm thick
						BRECCIA: fine to coarse grained, white, massive,					clay seam 5mm thick
				75		SANDSTONE: fine to medium grained, white, - light grey, indistinct bedding,					JT PL RO
											PT RO
											PT RO
			44								
				76		SANDSTONE: fine to medium grained, white, - grey, very thinly bedded, bedding marked by dark silty laminae dipping 10deg					CL SM 4mm thick
											JT curved clean
			43								
				77							
											PT PL on cross bed dipping 20deg,DD 194deg
									D A 0.87 0.27		
			42	78							PT PL dipping 10deg,DD 108deg
											PT dipping 11deg,DD 96deg
											JT PL clean dipping 70deg,DD 348deg
											JT PL clean dipping 70deg,DD 331deg
			41	79							
											JT PL clean dipping 68deg,DD 90deg
											JT PL clean dipping 67deg,DD 6deg
				80							

General Defect Description:
Partings 0-5deg, rough, clean

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

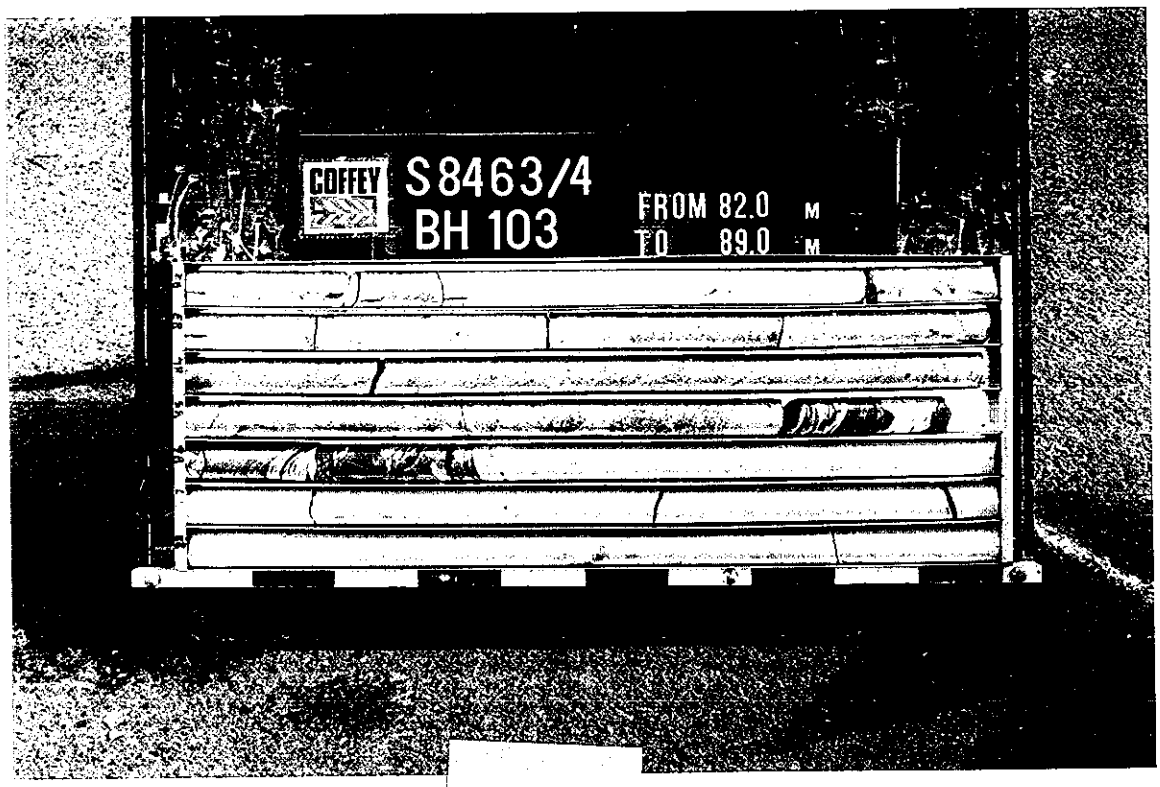
GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229


COFFEY
S8463/4
BH 103
FROM 82.0 M
TO 89.0 M

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 12 of 13

engineering log – cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope:	-65 DEG
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg
R.L.Surface:	112.6 m	datum:	AHD

drilling information					rock substance				rock mass defects	
method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description: rock type; grain characteristics, colour, structure, minor components	weathering	Est. Strength; point load test Is(50) MPa	defect spacing mm	defect description: type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below
NQ			40	81		SANDSTONE: fine to medium grained, white, - grey, very thinly bedded, bedding marked by dark silty laminae dipping 10deg,	FR			JT PL clean dipping 45deg,DD 341deg PT PL clean dipping 10deg,DD 100deg PT PL clean dipping 11deg,DD 96deg
			39							PT PL clean dipping 9deg,DD 106deg
				82		Coarse grained band 300mm thick				JT PL RO dipping 53deg,DD 252deg
			38							
				83						CR SM 10mm thick
			37			SANDSTONE: medium to coarse grained, white, - light grey, very thinly bedded, 10 degrees				
				84						JT PL RO
			36							
				85						JT PL RO
			35			SILTSTONE: fine to medium grained, dark grey, - white, laminated, / cross laminated, with interbedded sandstone				
				86						
						SANDSTONE: fine to medium grained, light grey, very thinly bedded, some carbonaceous fragments				
			34	87						
										JT PL clean
			33	88						

General Defect Description:
Parting 0-5deg, planar, rough, clean

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured
Drilling Water
partial loss
complete loss

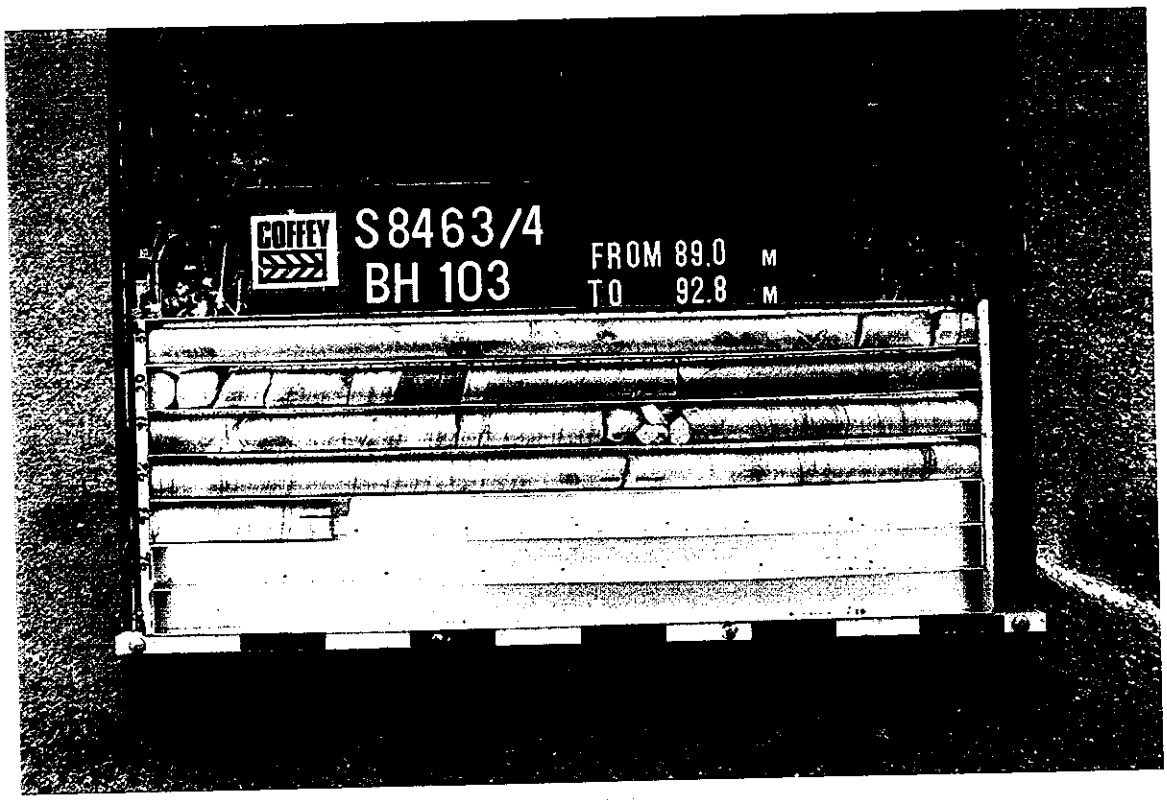
POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular



BH103-12.

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

COFFEY

borehole no: 103
sheet 13 of 13

engineering log - cored borehole

office job no: S8463/4

client:	HORNSBY SHIRE COUNCIL	hole commenced:	14.12.89
principal:		hole completed:	20.12.89
project:	OLD MANS VALLEY	logged by:	SRM
borehole location:	E 308469.08 N 1269764.16	checked by:	PLV
drill model and mounting:	B40 TRUCK	slope: -65 DEG	R.L.Surface: 112.6 m
barrel type and length:	NQ 3m	fluid: WATER	bearing: 142deg	datum: AHD

drilling information | rock substance | rock mass defects

method	case-lift	water	R.L.	depth metres	graphic log core loss	substance description (rock type: grain characteristics, colour, structure, minor components)	weathering	Est. Strength	point load test Is(50) MPa	defect spacing mm	defect description (type, inclination planarity, roughness, coating, thickness; unless otherwise noted defects follow general description below)
NQ			32	89		SANDSTONE: fine to medium grained, light grey, very thinly bedded, some carbonaceous fragments	FR				zone of PT every 50mm from 89.9 to 90.15m
			31	90							
			30	91							JT PL with associated IR fracturing
											JT PT CR
			29	92							broken zone 50mm thick
			28	93		Borehole 103 Terminated at 92.80 m					
			27	94							
			26	95							
				96							

General Defect Description:
Partings 0-5deg, planar, rough, clean

METHOD
AS auger screwing
AD auger drilling
R roller/tricone
W washbore
NMLC core drilling
NQ,HQ core drilling
casing used
barrel withdrawn

water level
water inflow
* not measured Drilling Water
partial loss
complete loss

POINT LOAD TEST
D -diametral
A -axial

GRAPHIC LOG/CORE LOSS
core recovered (hatching indicates material)
no core recovered

WEATHERING
FR -fresh
SW -slightly
MW -moderately
HW -highly
EW -extremely

STRENGTH
EL -extremely low
VL -very low
L -low
M -medium
H -high
VH -very high
EH -extremely high

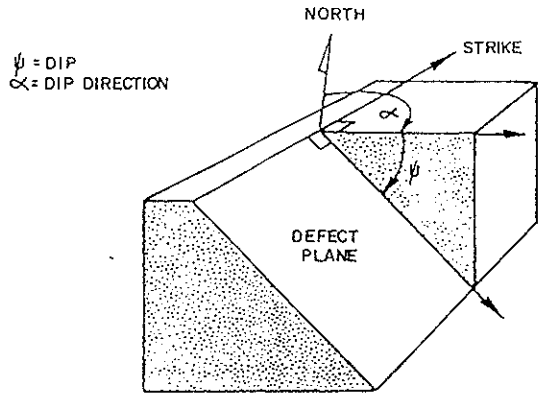
DEFECTS
JT -joint
PT -parting
SM -seam
CL -clay
RO -rough
DC -decomposed
PL -planar
IR -irregular

187-229

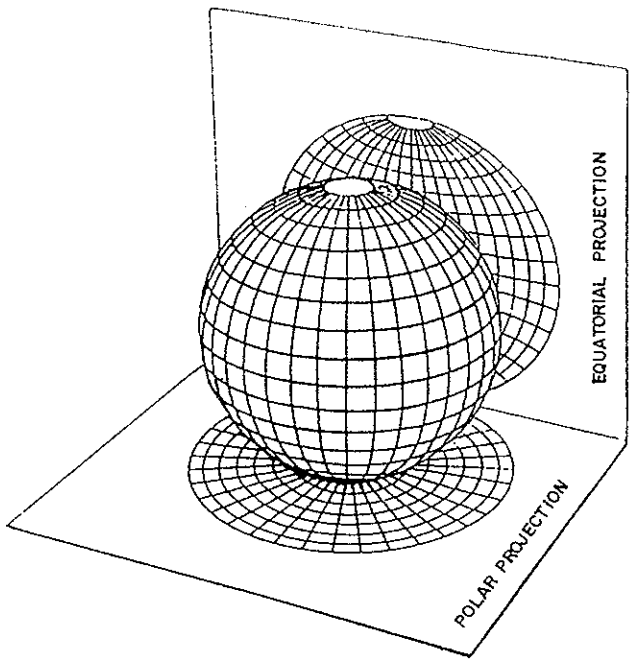
APPENDIX B

APPENDIX B

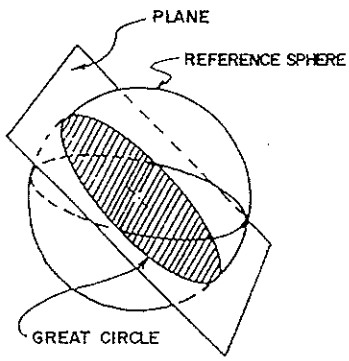
STEREOGRAPHIC PROJECTIONS FOR ORIENTATED CORED BOREHOLES

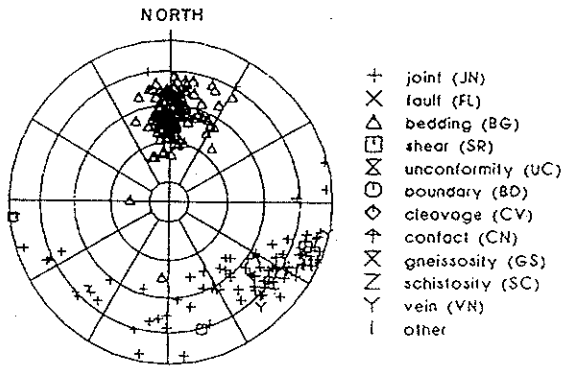


DEFINITION OF GEOMETRICAL TERMS

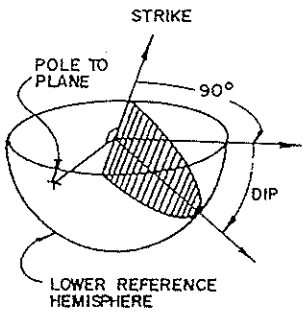


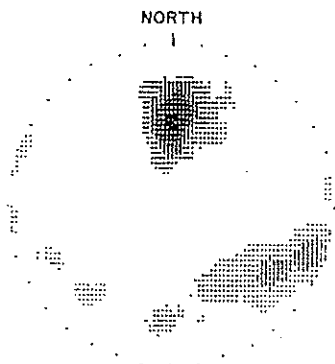
POLAR & EQUATORIAL PROJECTIONS



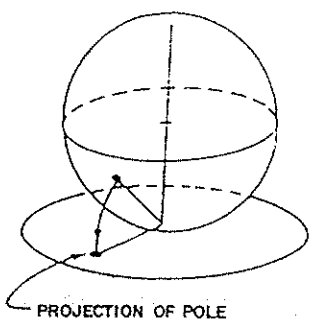


POLAR EQUAL-AREA STEREOGRAPHIC PROJECTION
DISPLAYING DEFECT TYPES





EQUATORIAL EQUAL-AREA STEREOGRAPHIC PROJECTION
OF ABOVE CONTOURED



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drawn	PLV / LT
approved	
date	
scale	NOT TO SCALE

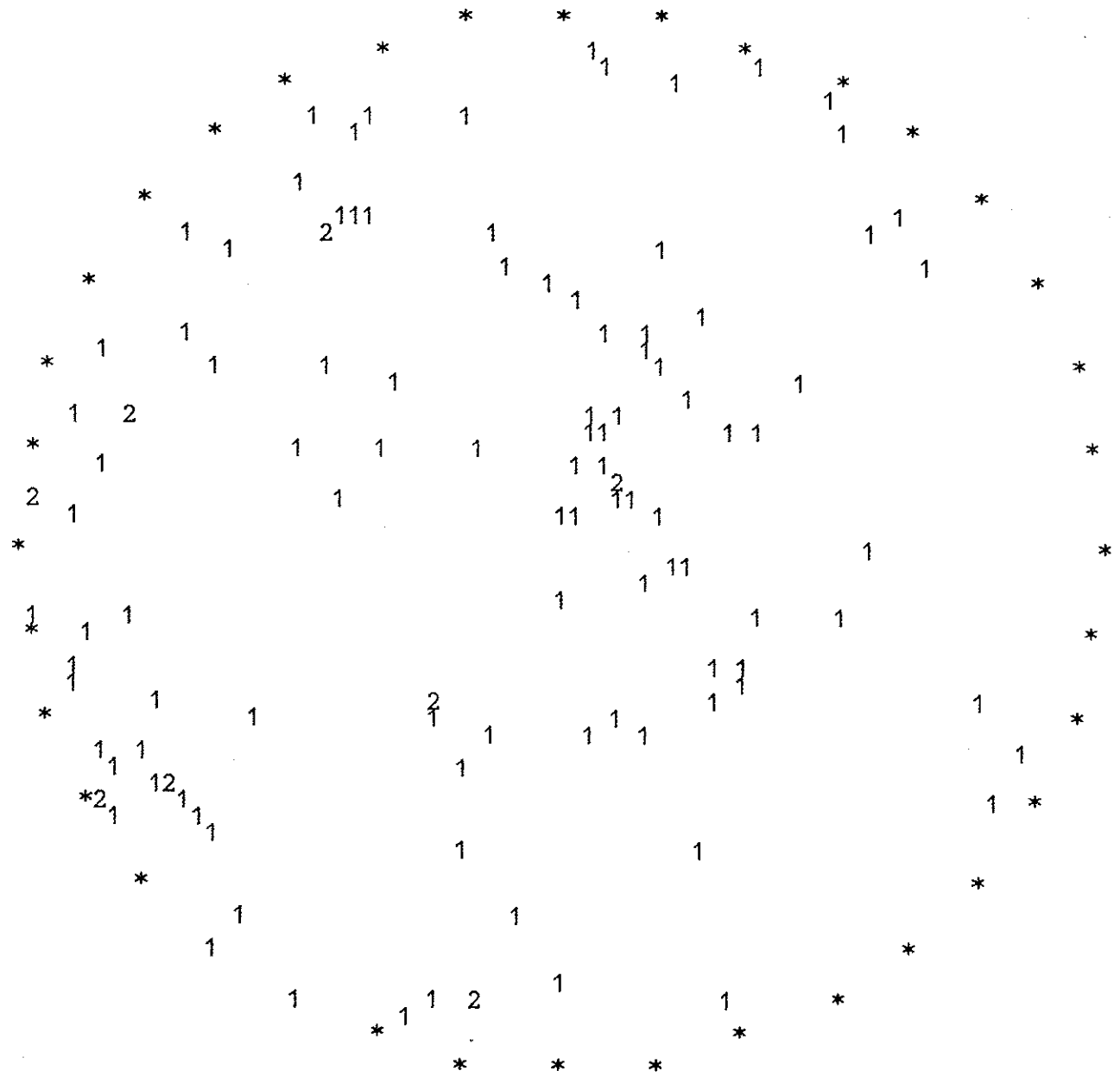
HORNSBY SHIRE COUNCIL
OLD MANS VALLEY

DEFINITION & PRESENTATION
OF STRUCTURAL DEFECTS

COFFEY

FIGURE B1

job no S8463 / 4



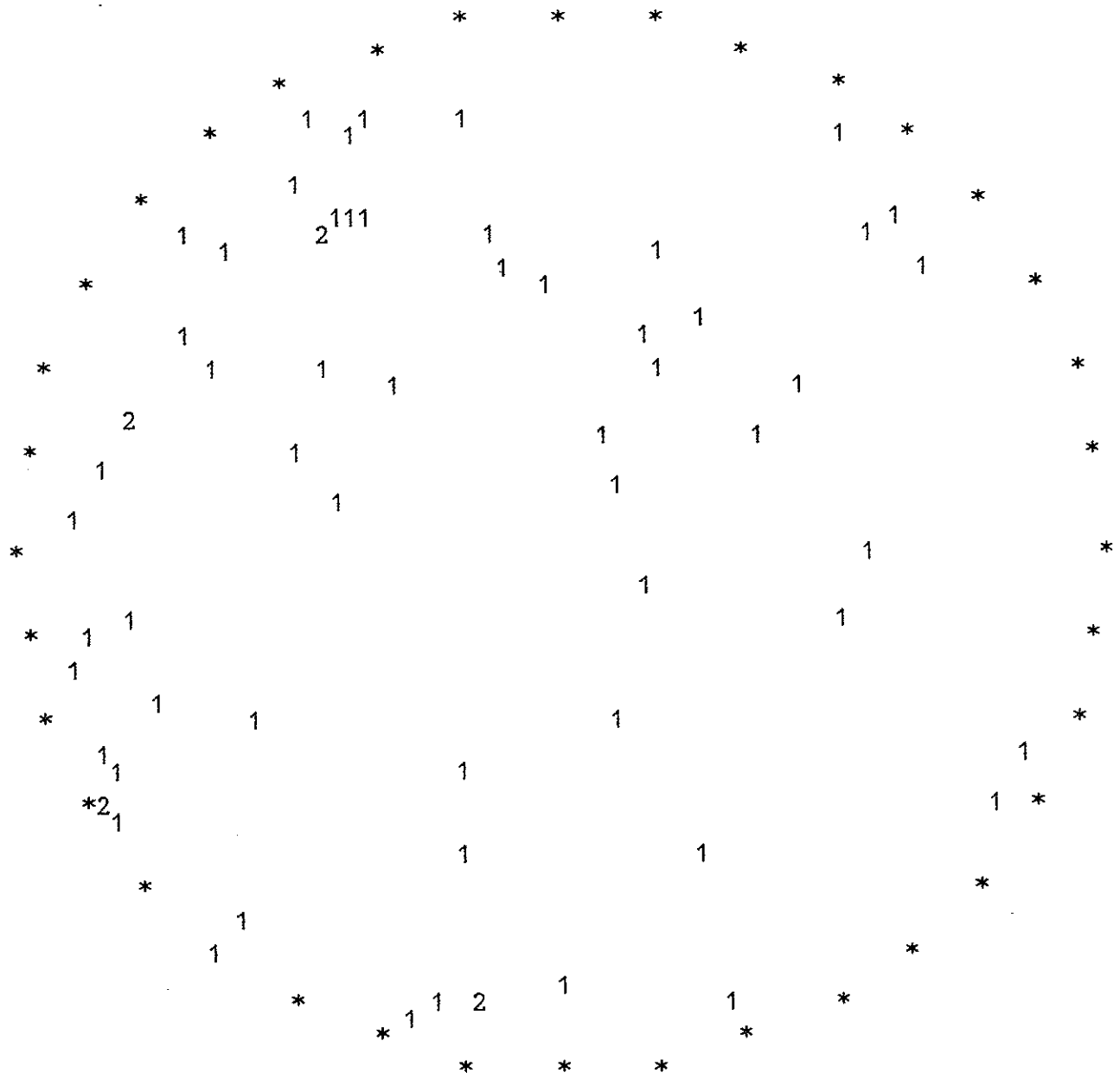
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 117
ROTATION ANGLES: 0 0 0

S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 117
ROTATION ANGLES: 0 0 0

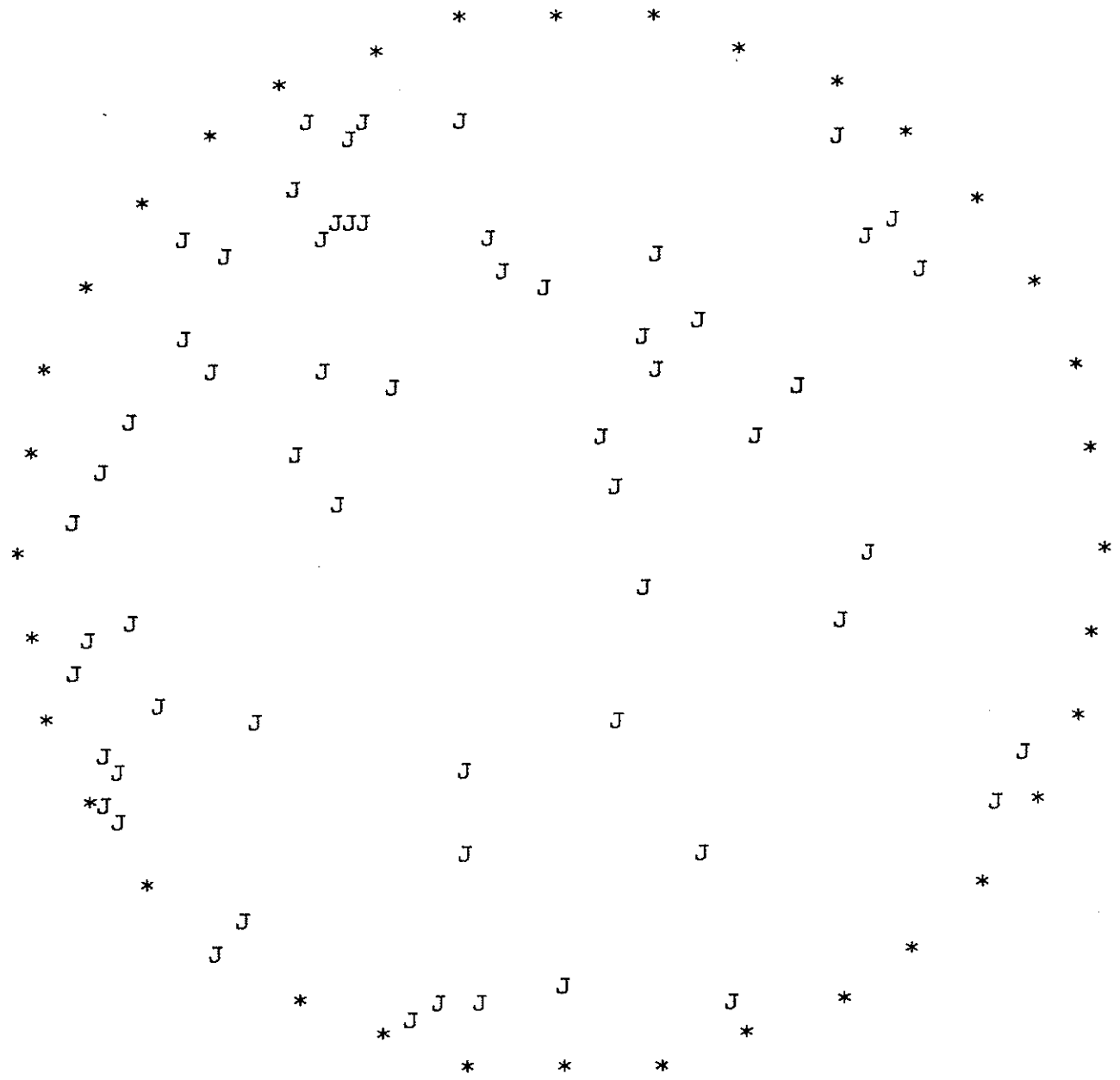
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 117
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

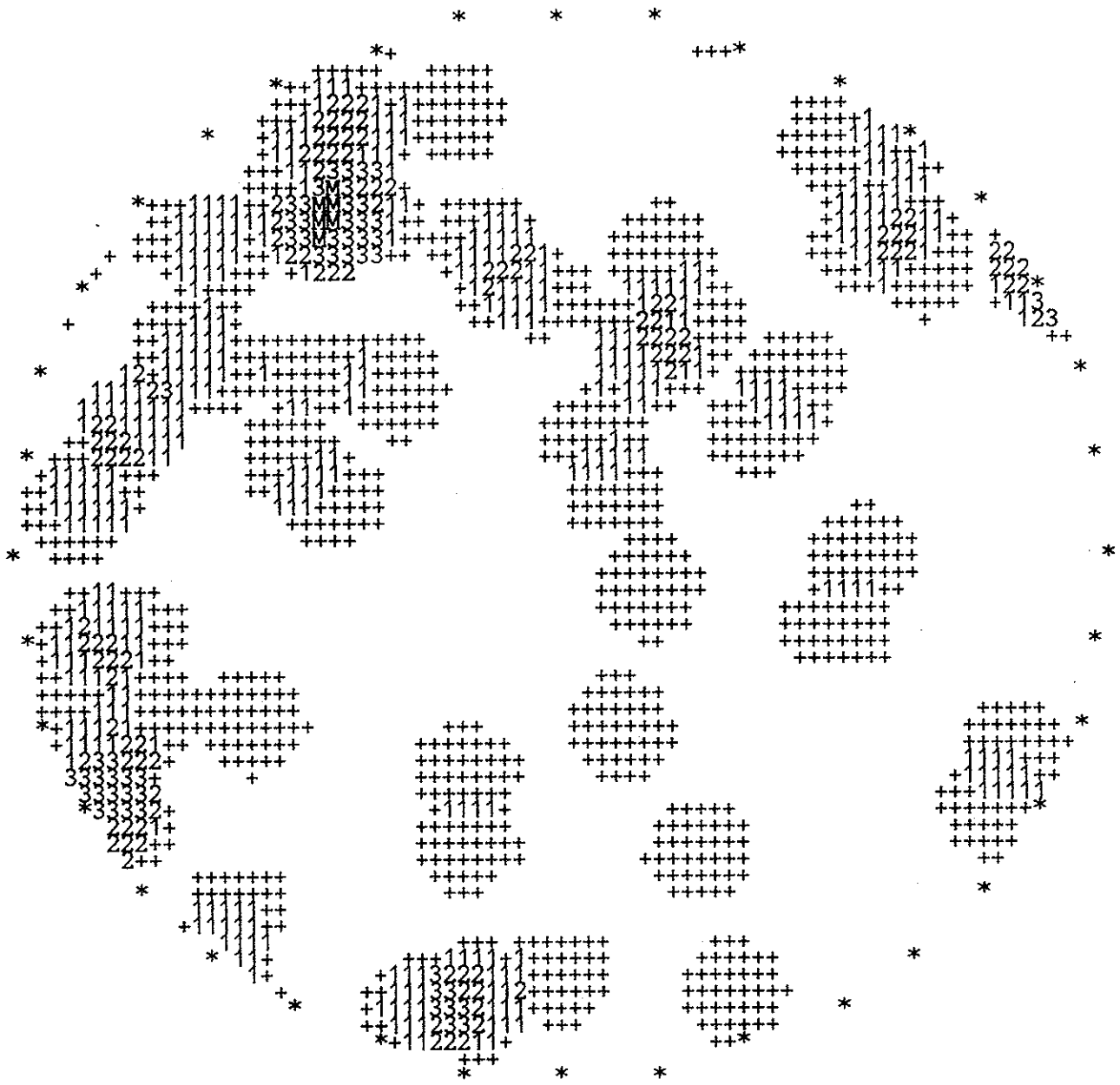
' '	<LT>	1%
'+'	<LT>	2%
'1'	<LT>	4%
'2'	<LT>	6%
'3'	<LT>	8%
'M'	MAX =	8.5



S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 64
ROTATION ANGLES: 0 0 0



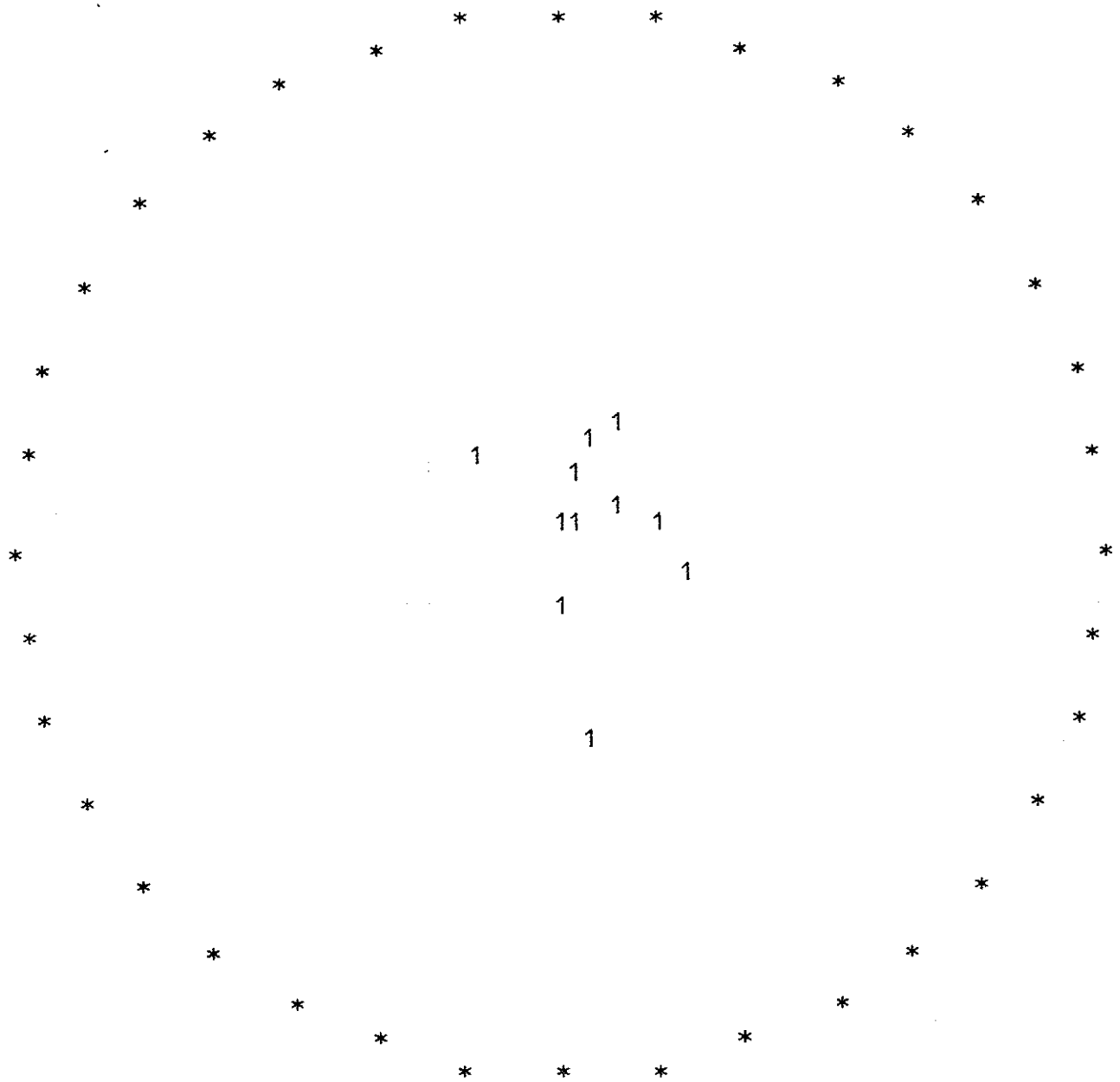
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 64
ROTATION ANGLES: 0 0 0



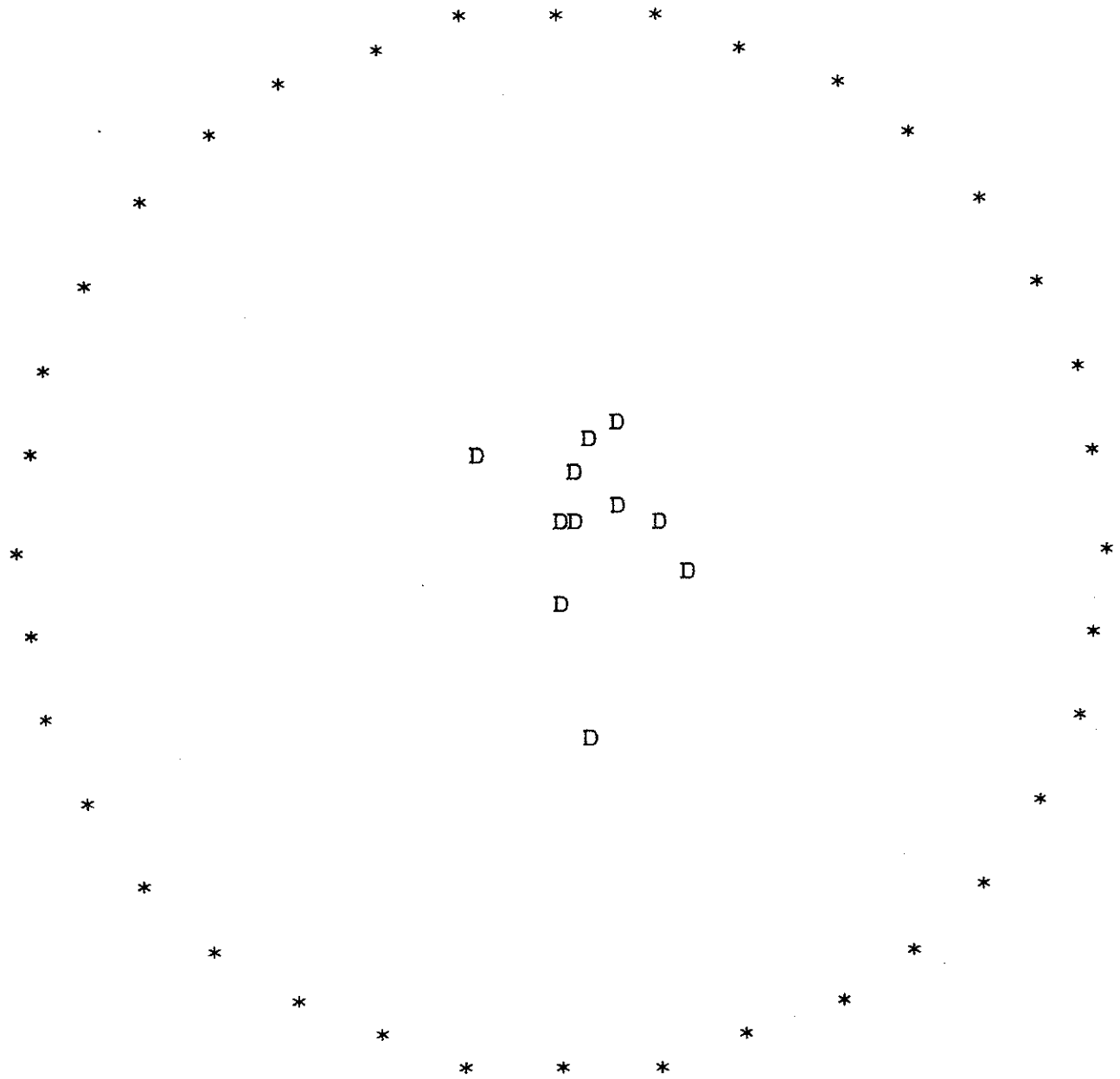
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 JOINTS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 64
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

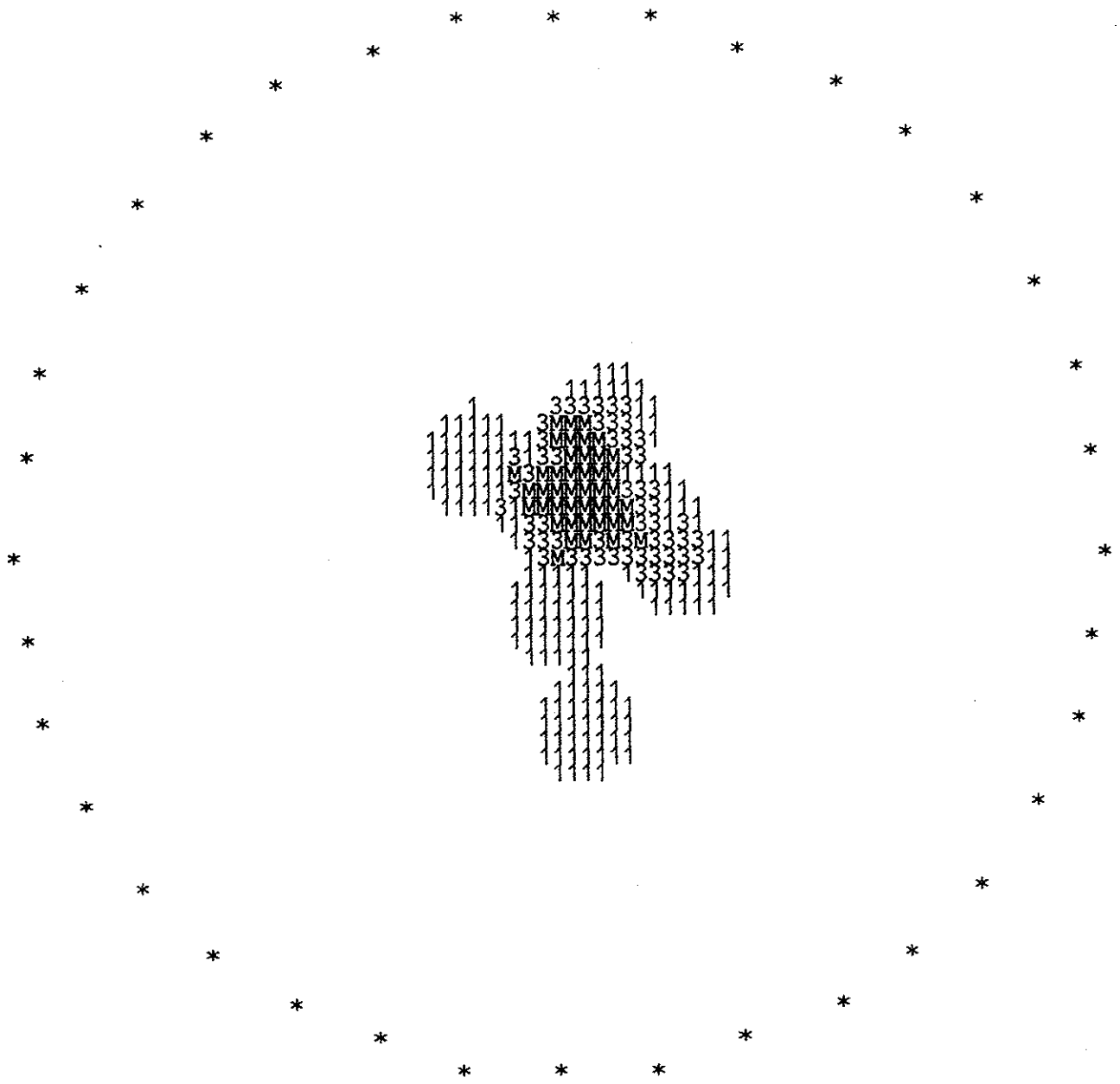
' '	<LT>	1%
'+'	<LT>	2%
'1'	<LT>	4%
'2'	<LT>	6%
'3'	<LT>	8%
'M'	MAX =	9.4



S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 11
ROTATION ANGLES: 0 0 0



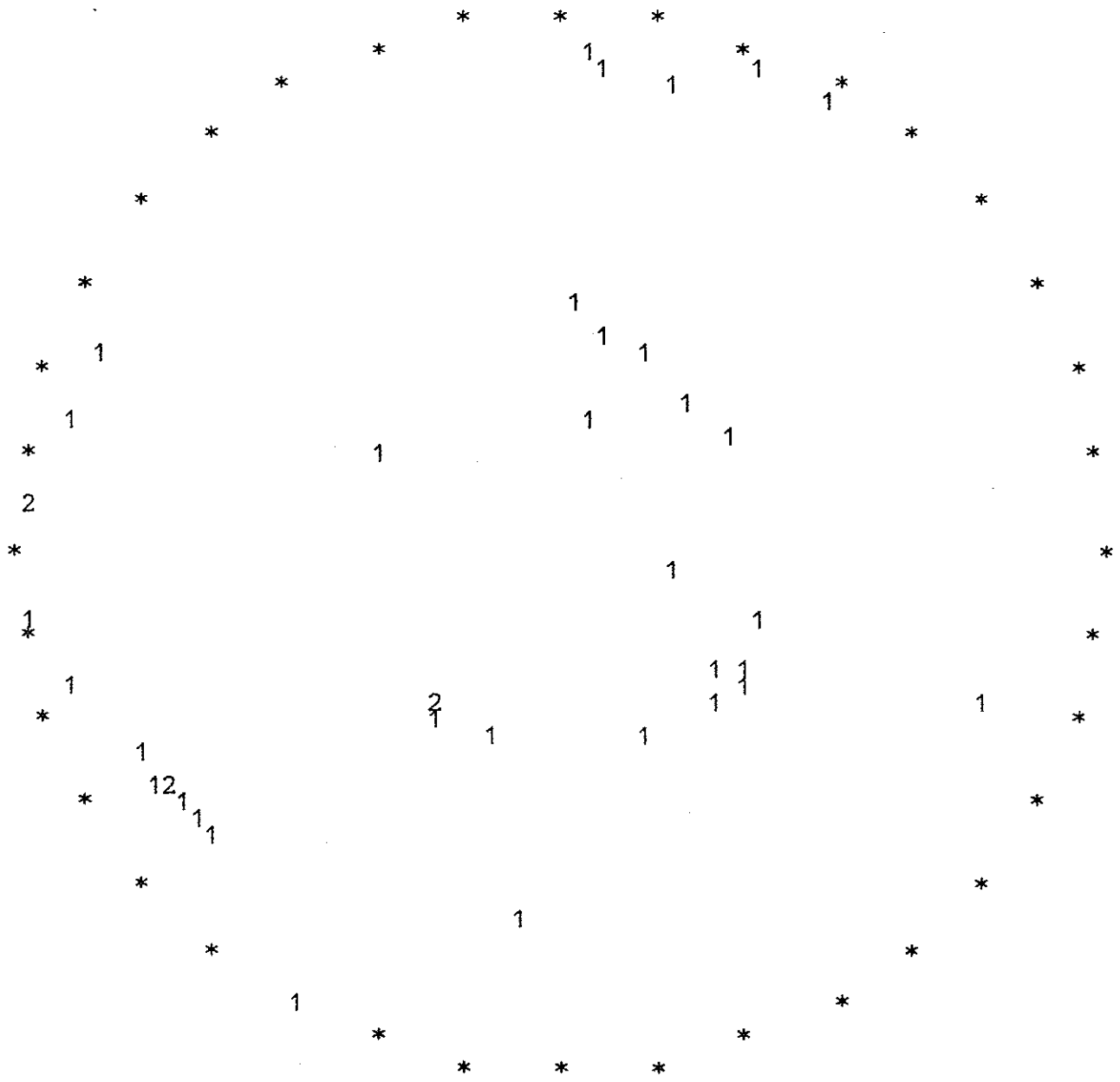
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 11
ROTATION ANGLES: 0 0 0



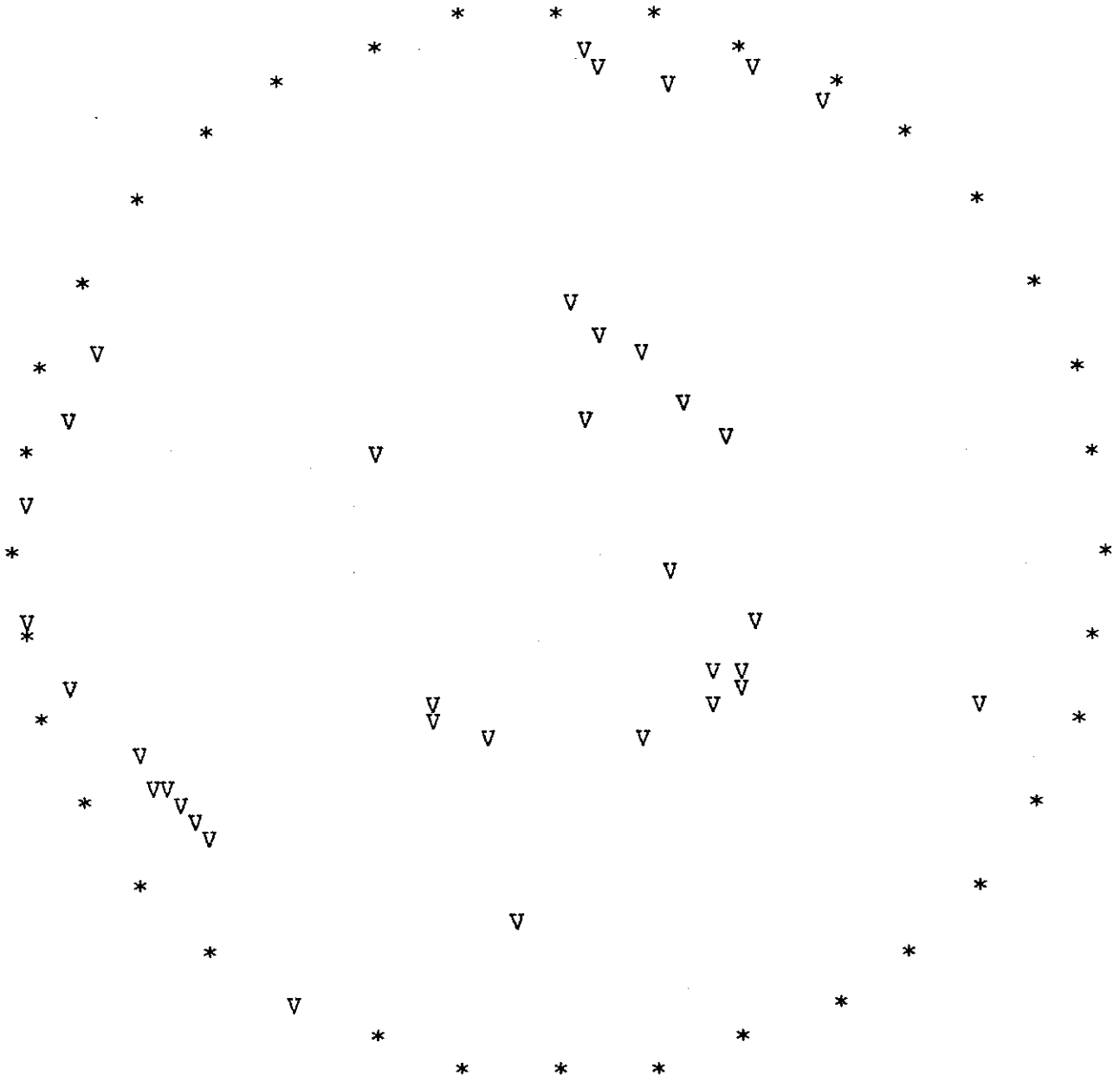
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 BEDDINGS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 11
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

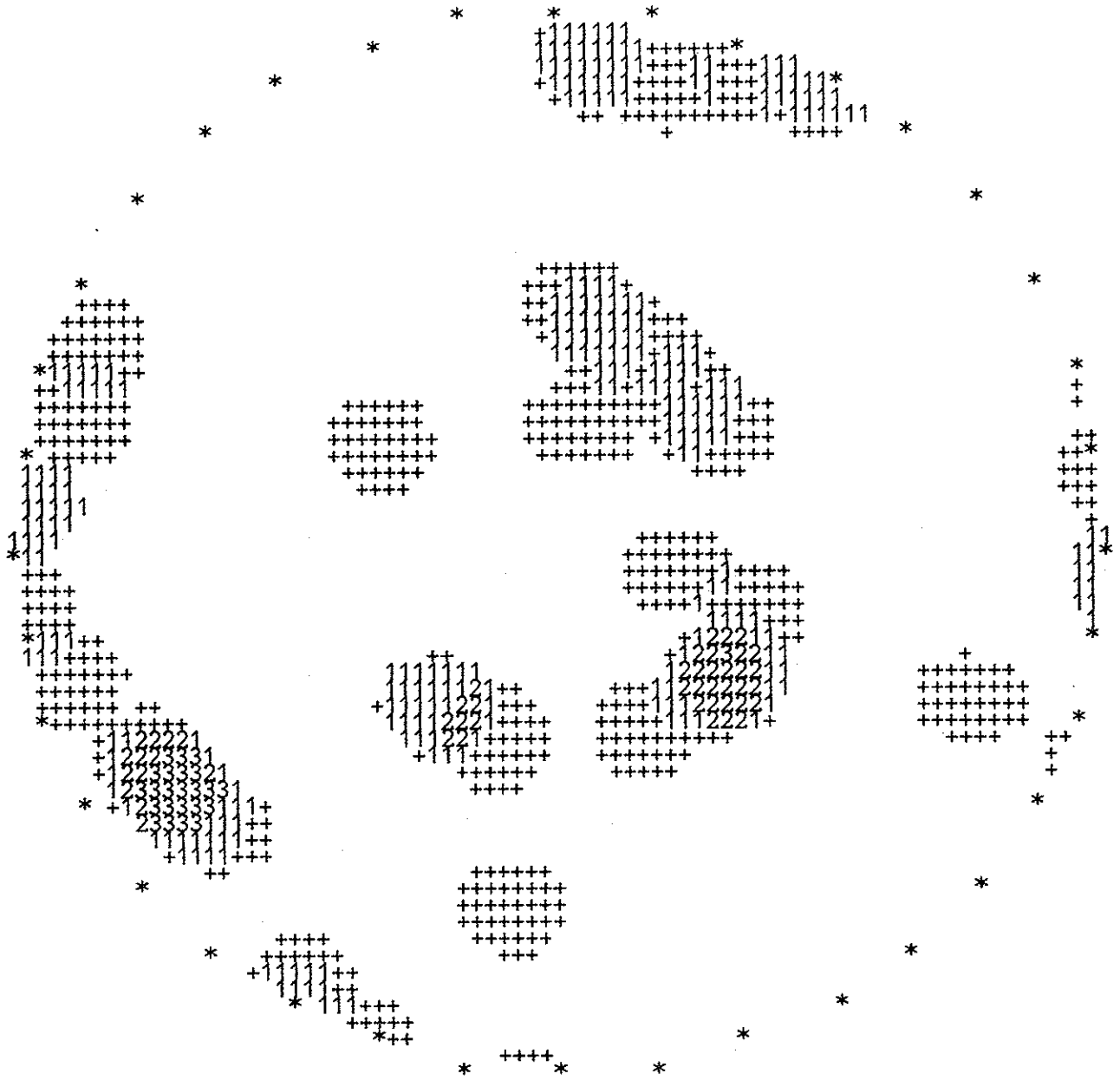
' '	<LT> 1%
'+'	<LT> 5%
'1'	<LT> 10%
'2'	<LT> 15%
'3'	<LT> 20%
'M'	MAX = 45.5



S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 VEINS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 39
ROTATION ANGLES: 0 0 0



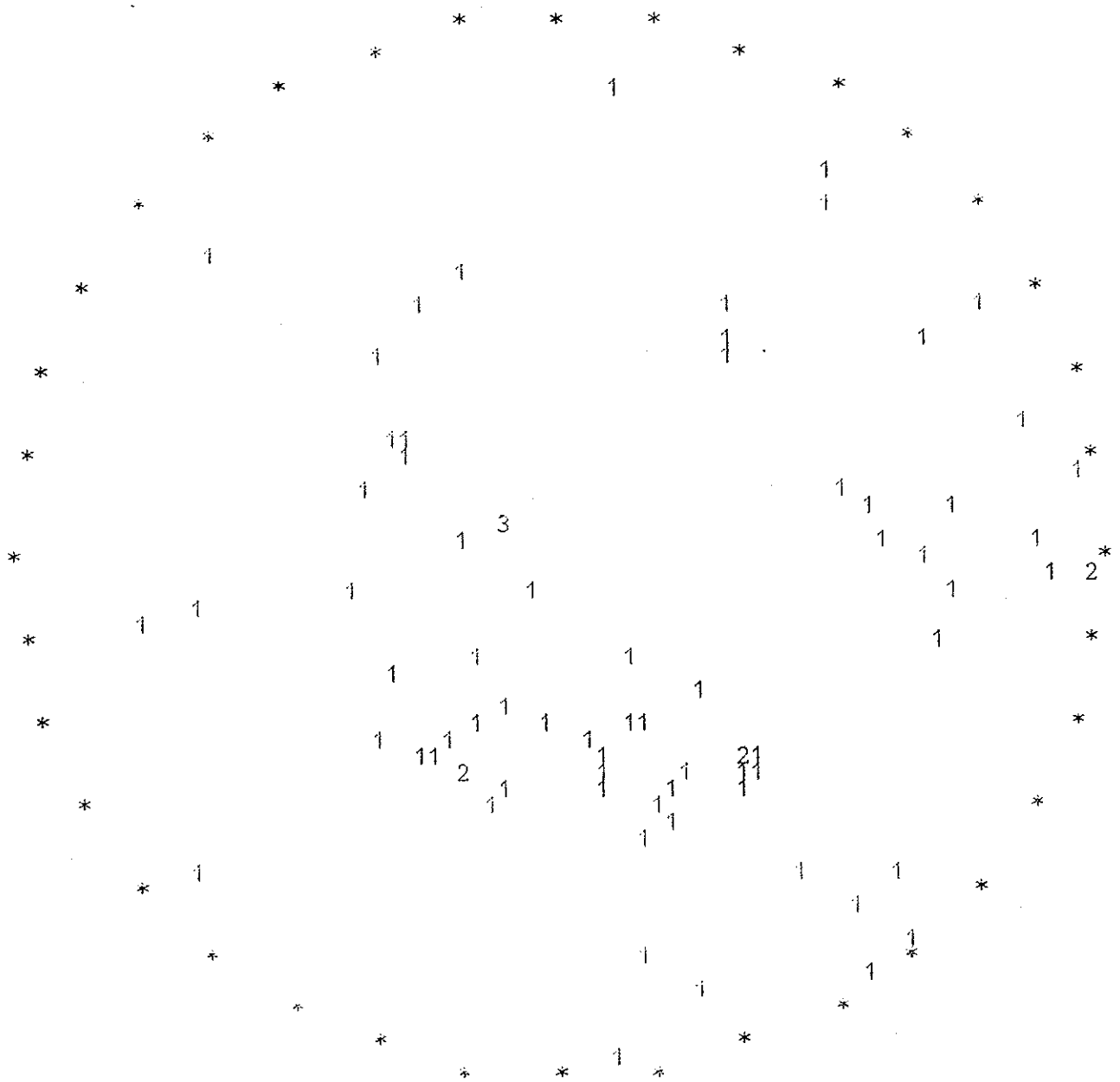
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 VEINS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 39
ROTATION ANGLES: 0 0 0



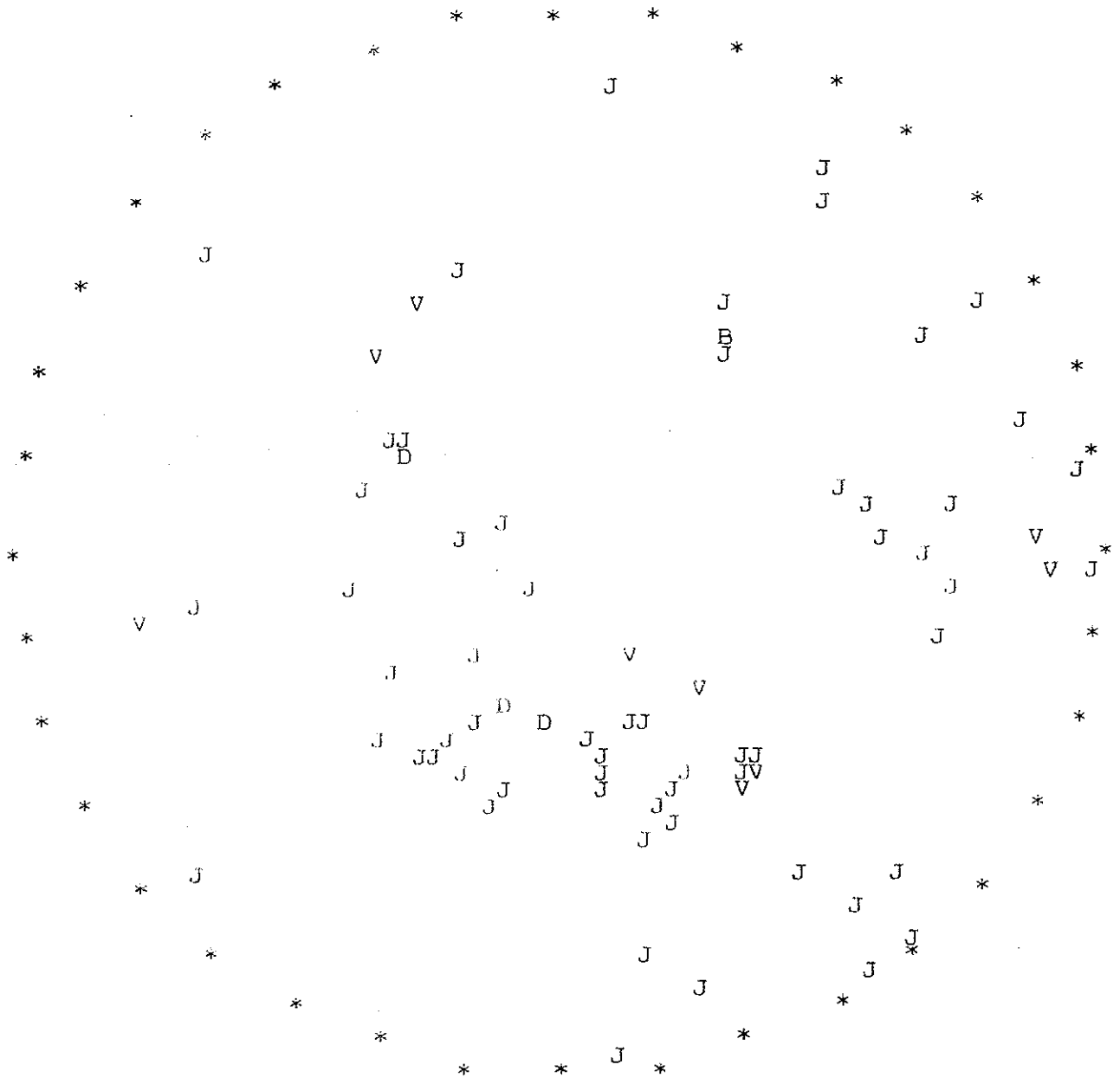
S8463/4 HORNSBY SHIRE COUNCIL - BOREHOLE 101 VEINS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 39
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

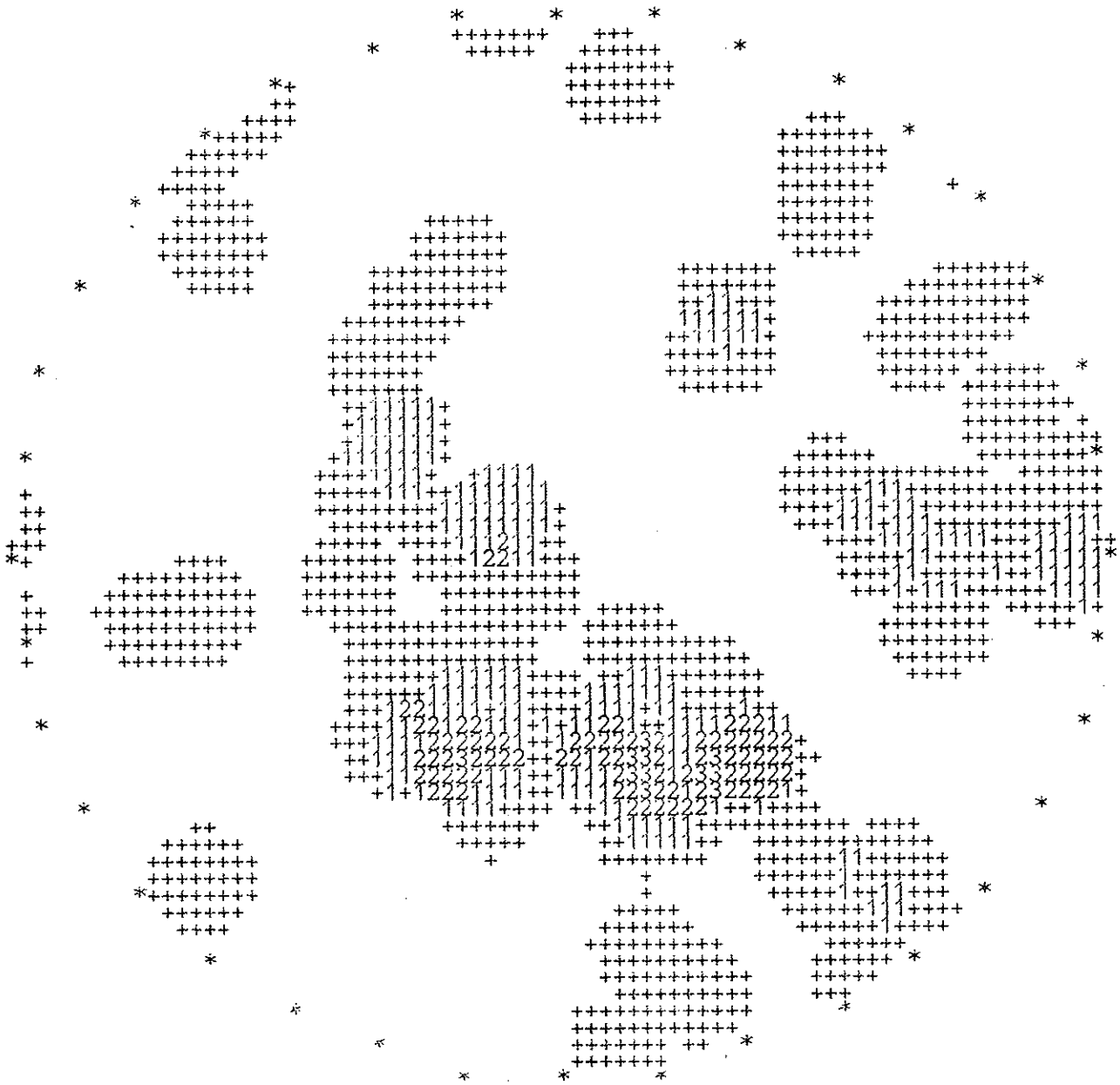
' '	<LT> 1%
'+'	<LT> 4%
'1'	<LT> 8%
'2'	<LT> 12%
'3'	<LT> 16%
'M'	MAX = 15.4



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 78
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 78
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102

SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES

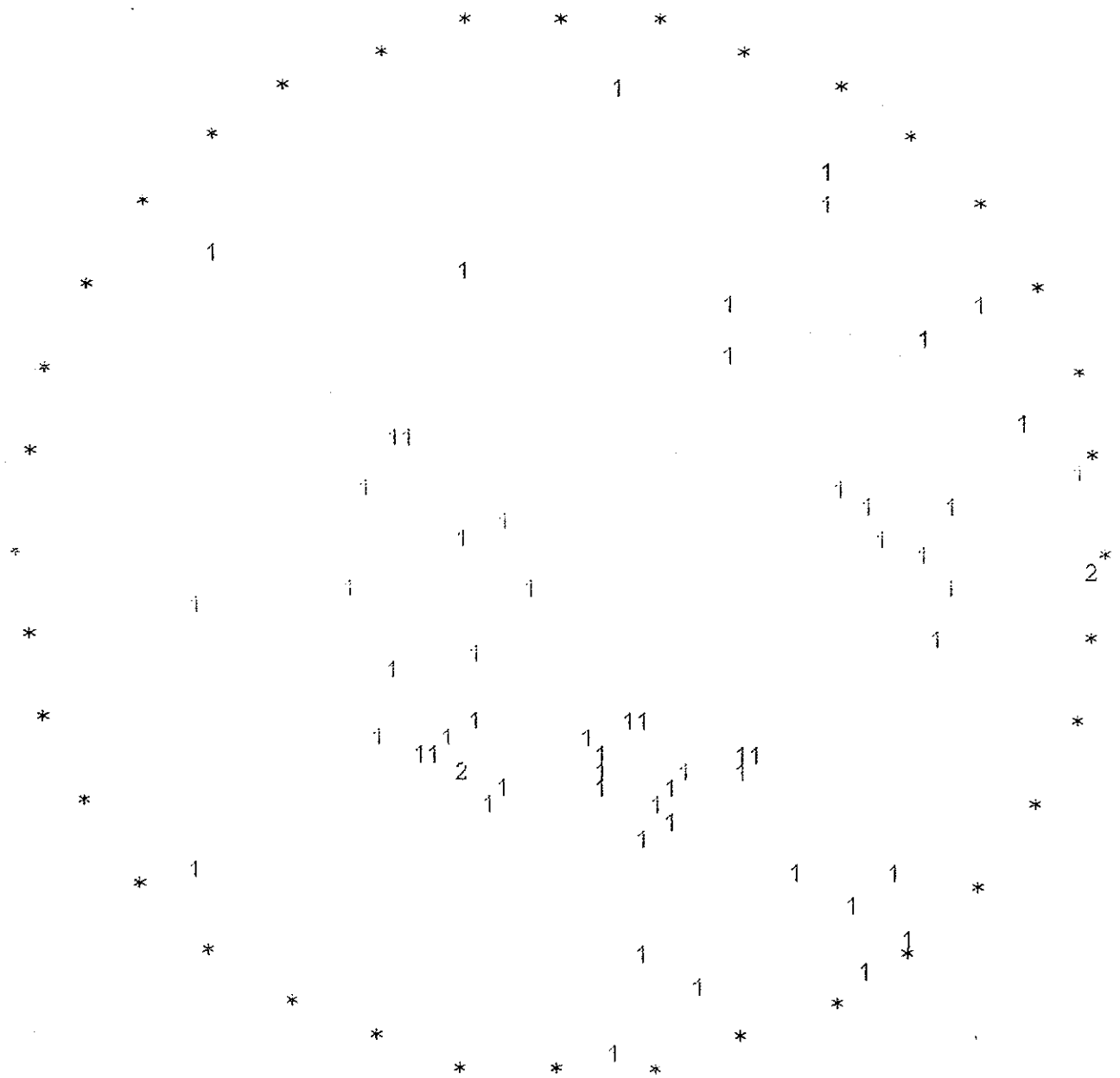
LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 78

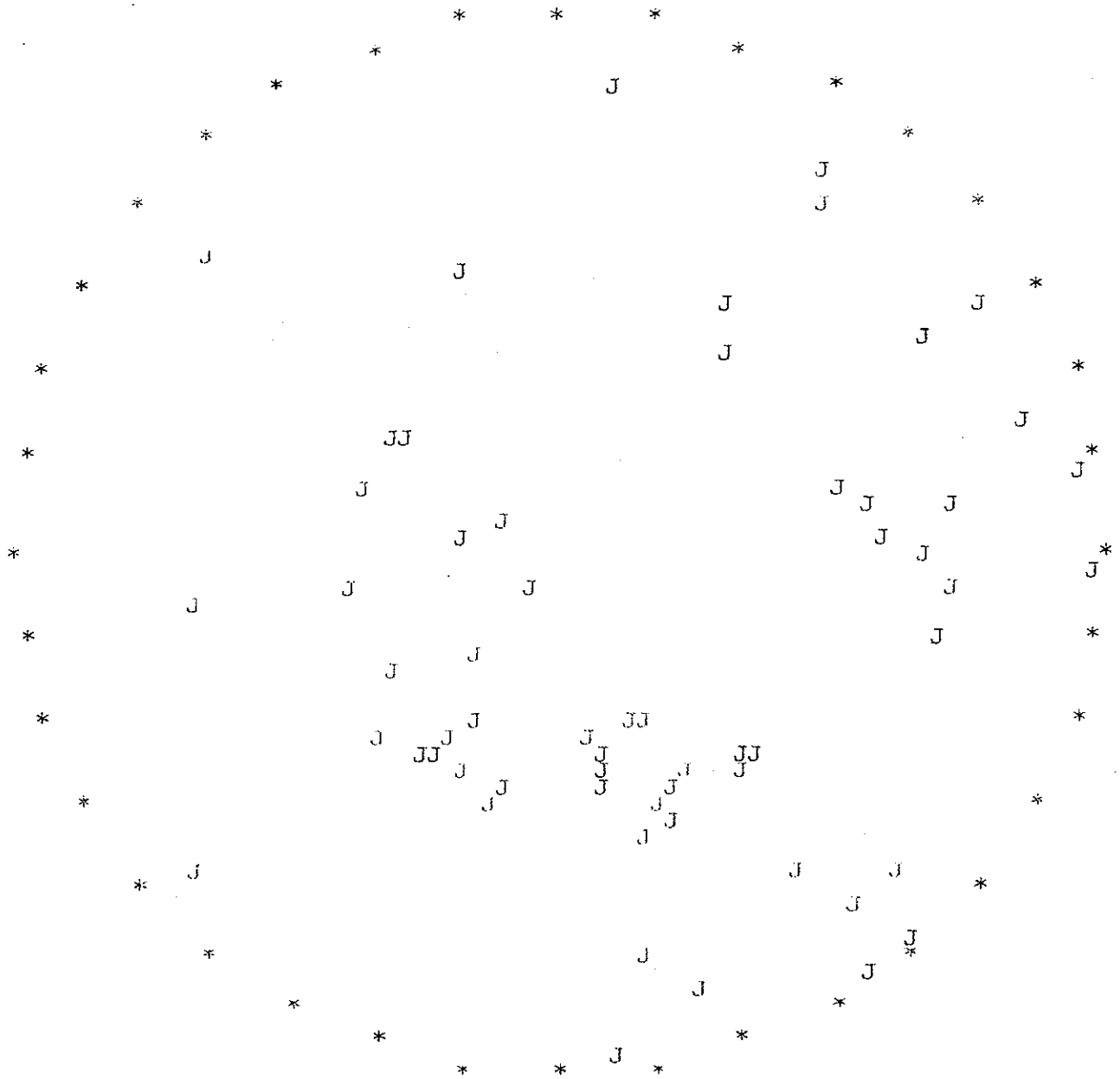
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

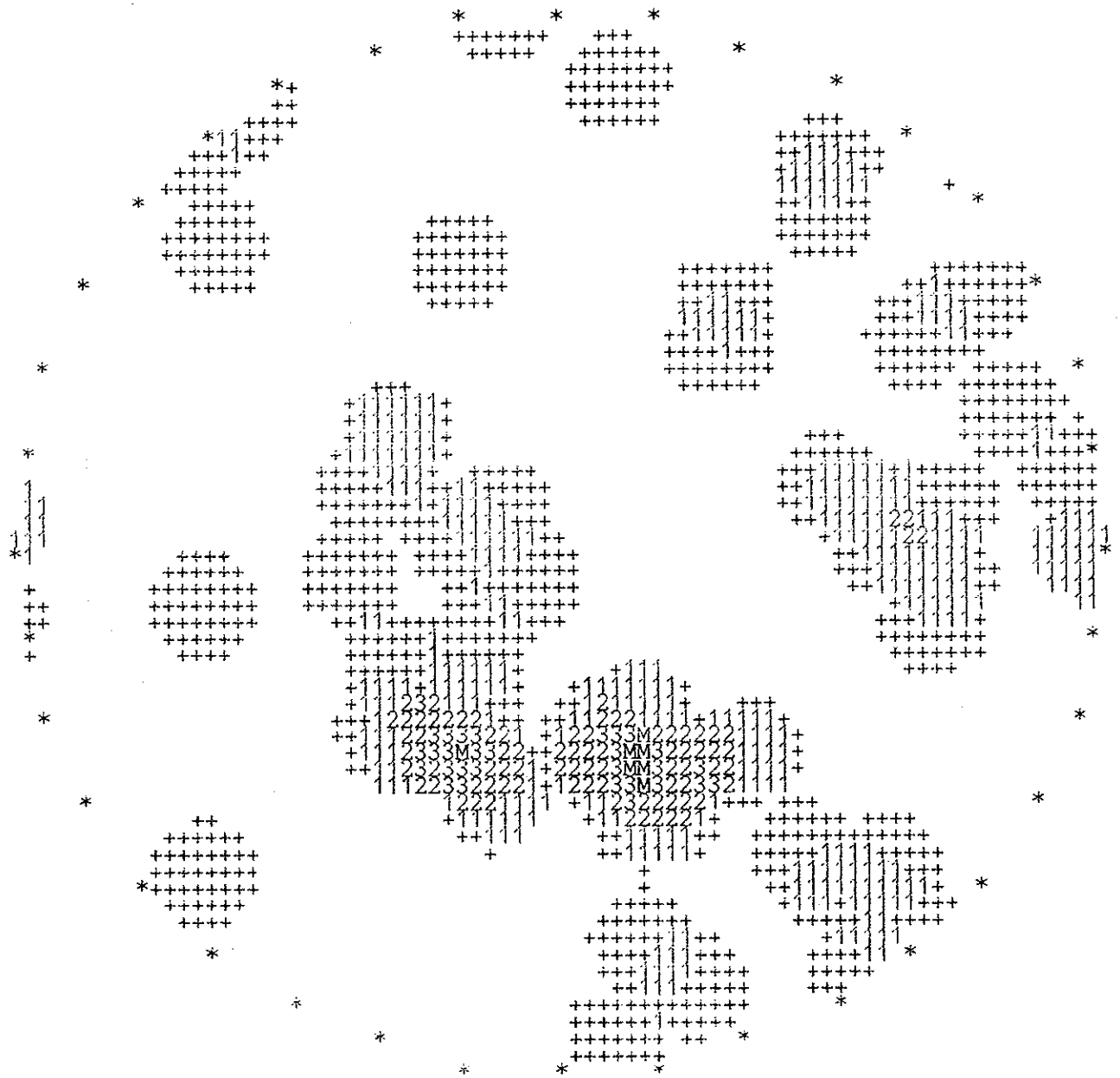
' '	<LT>	1%
'+'	<LT>	3%
'1'	<LT>	6%
'2'	<LT>	9%
'3'	<LT>	12%
'M'	MAX = 11.5	



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 62
ROTATION ANGLES: 0 0 0



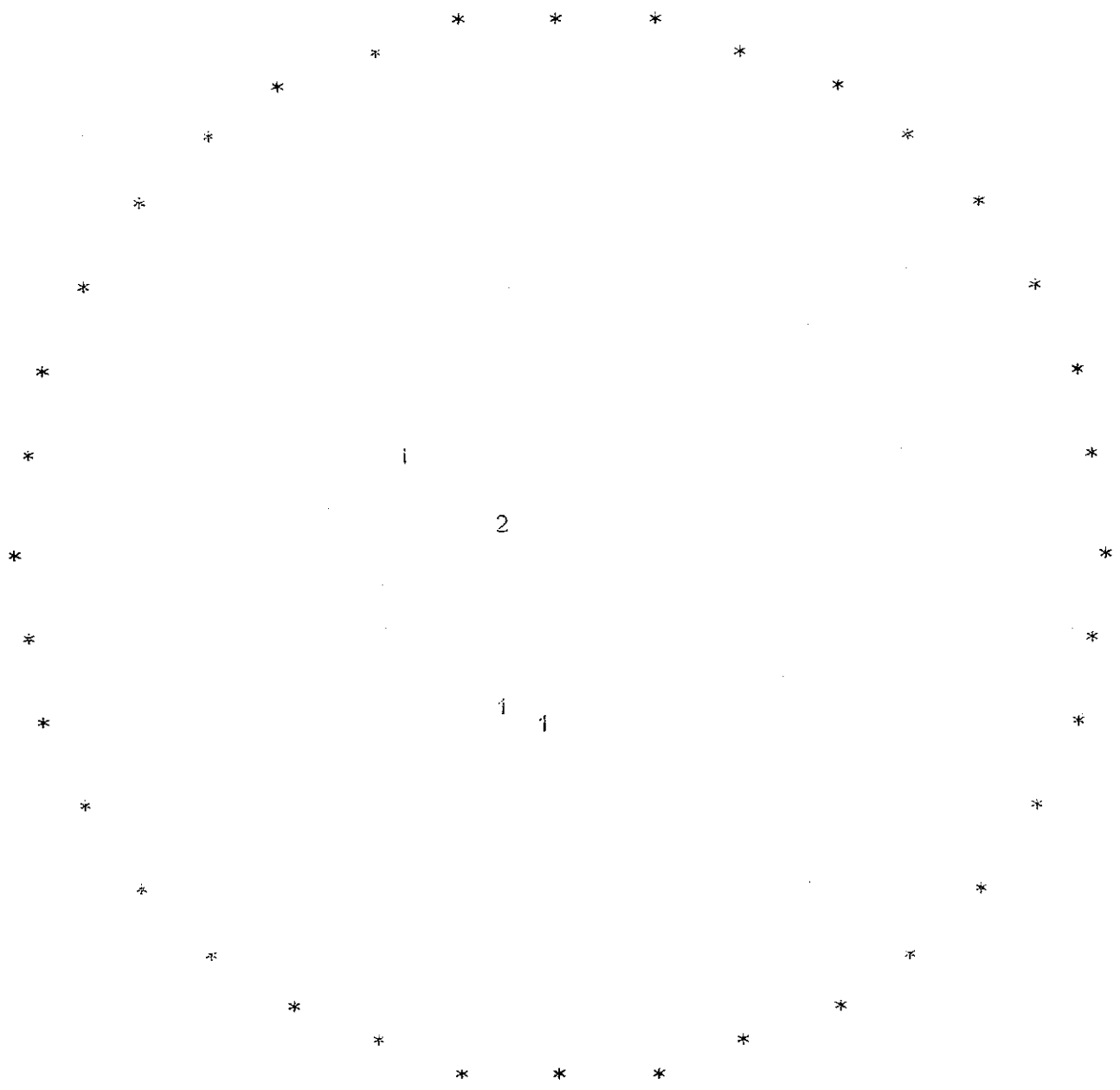
S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 62
ROTATION ANGLES: 0 0 0



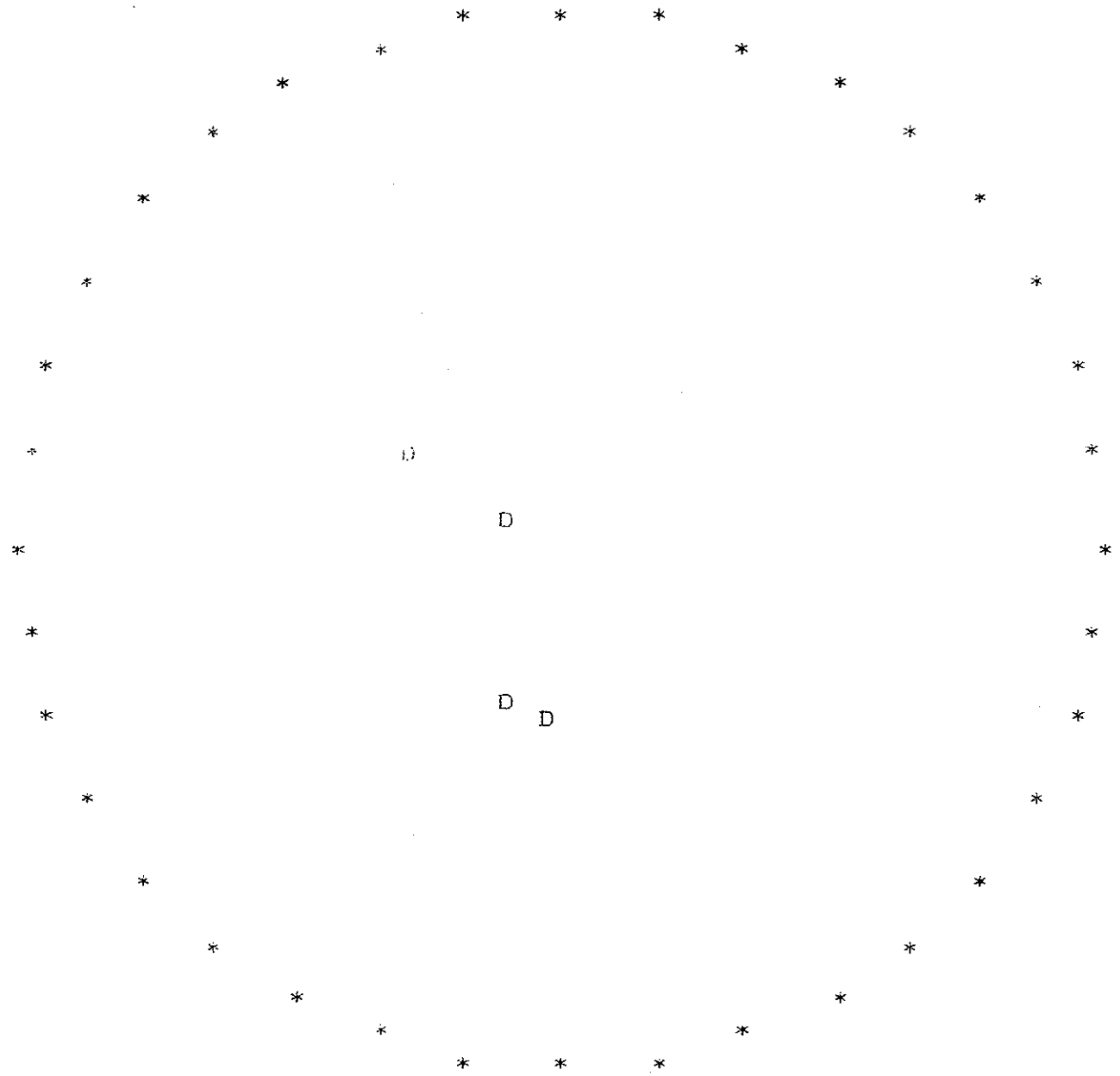
S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 JOINTS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 62
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

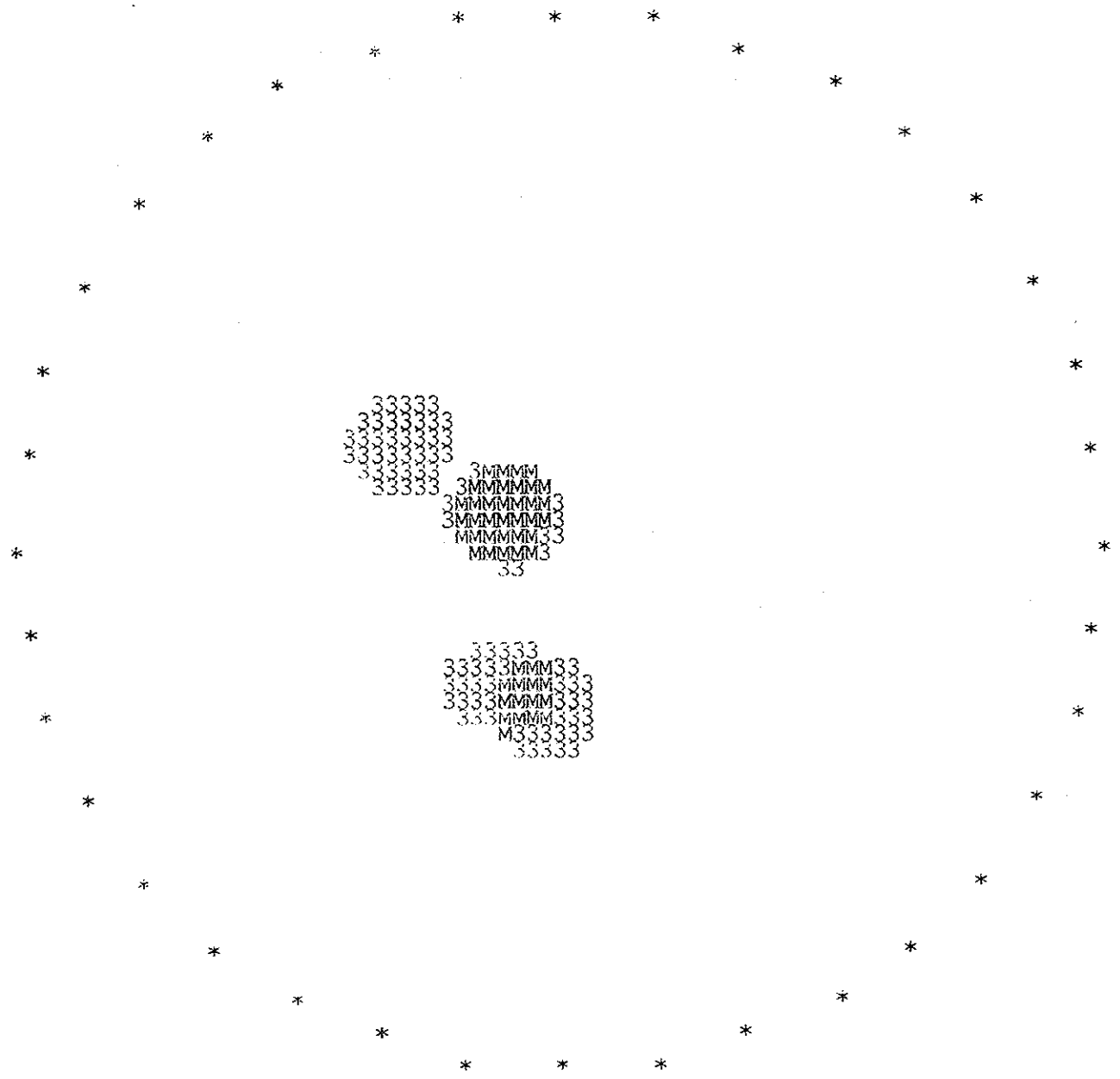
' '	<LT> 1%
'+'	<LT> 3%
'1'	<LT> 6%
'2'	<LT> 9%
'3'	<LT> 12%
'M'	MAX = 12.9



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 5
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 5
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 BEDDINGS

SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES

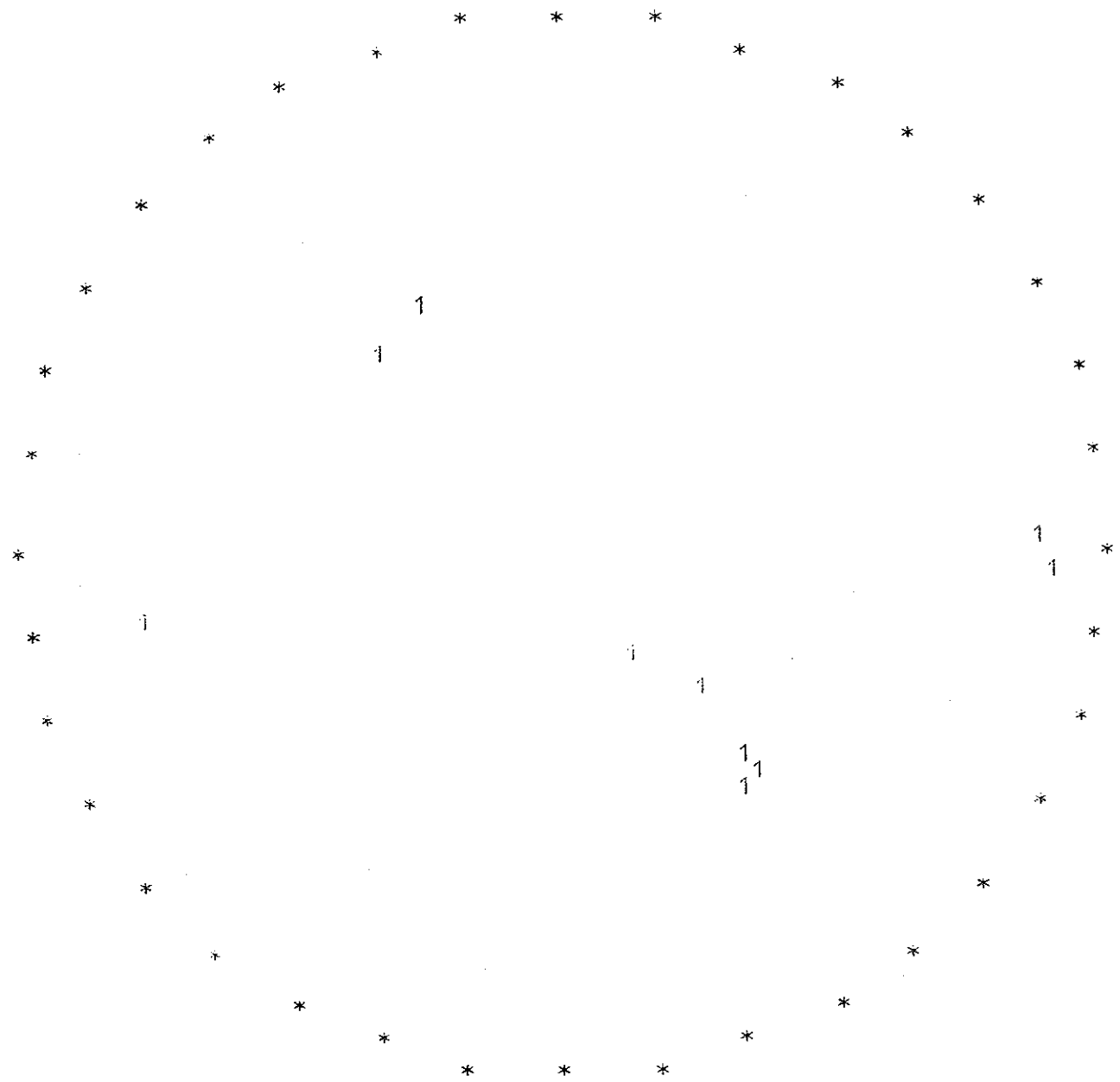
LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 5

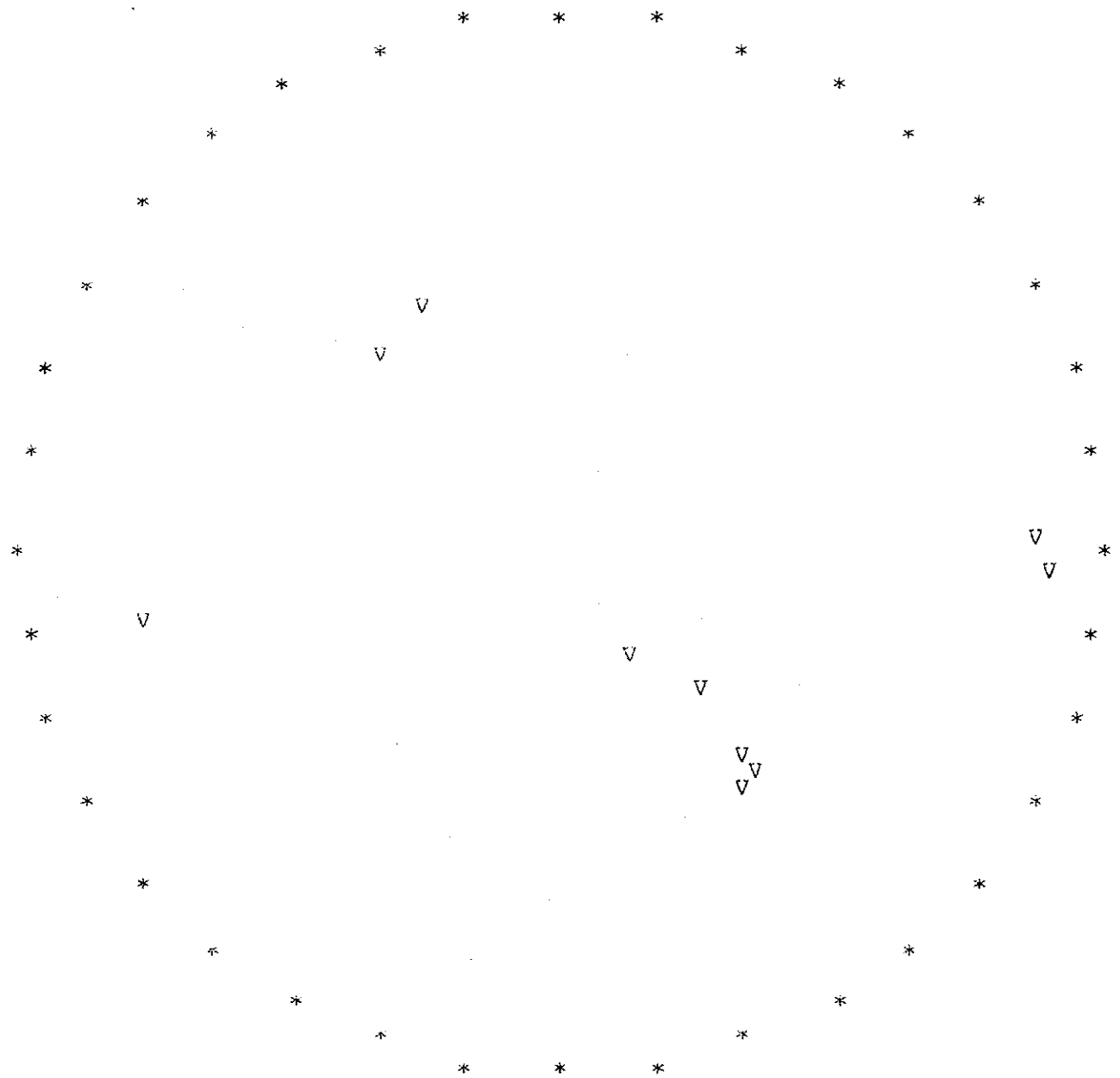
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

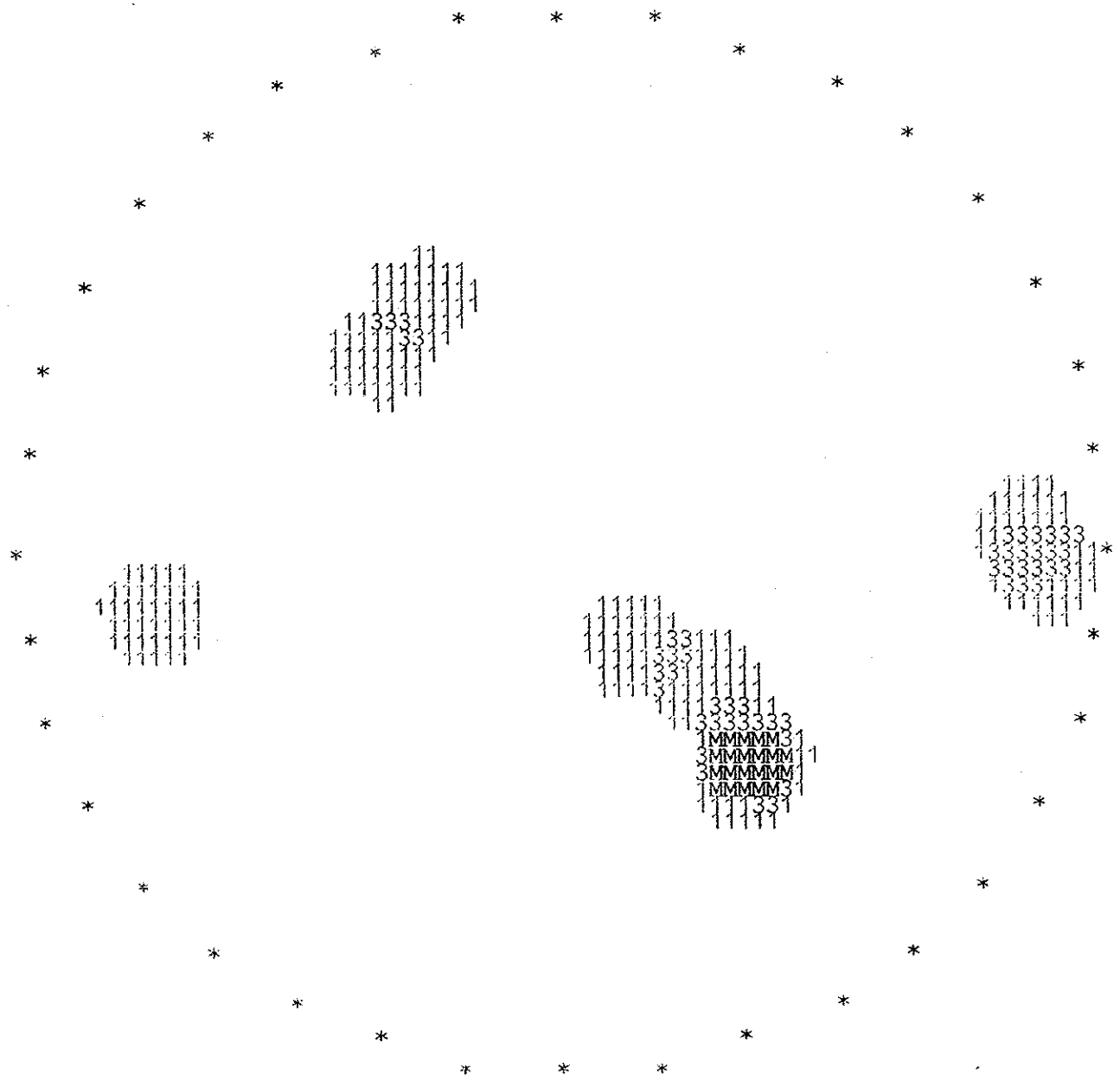
' '	<LT> 1%
'+'	<LT> 5%
'1'	<LT> 10%
'2'	<LT> 15%
'3'	<LT> 20%
'M'	MAX = 40.0



S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 VEINS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0



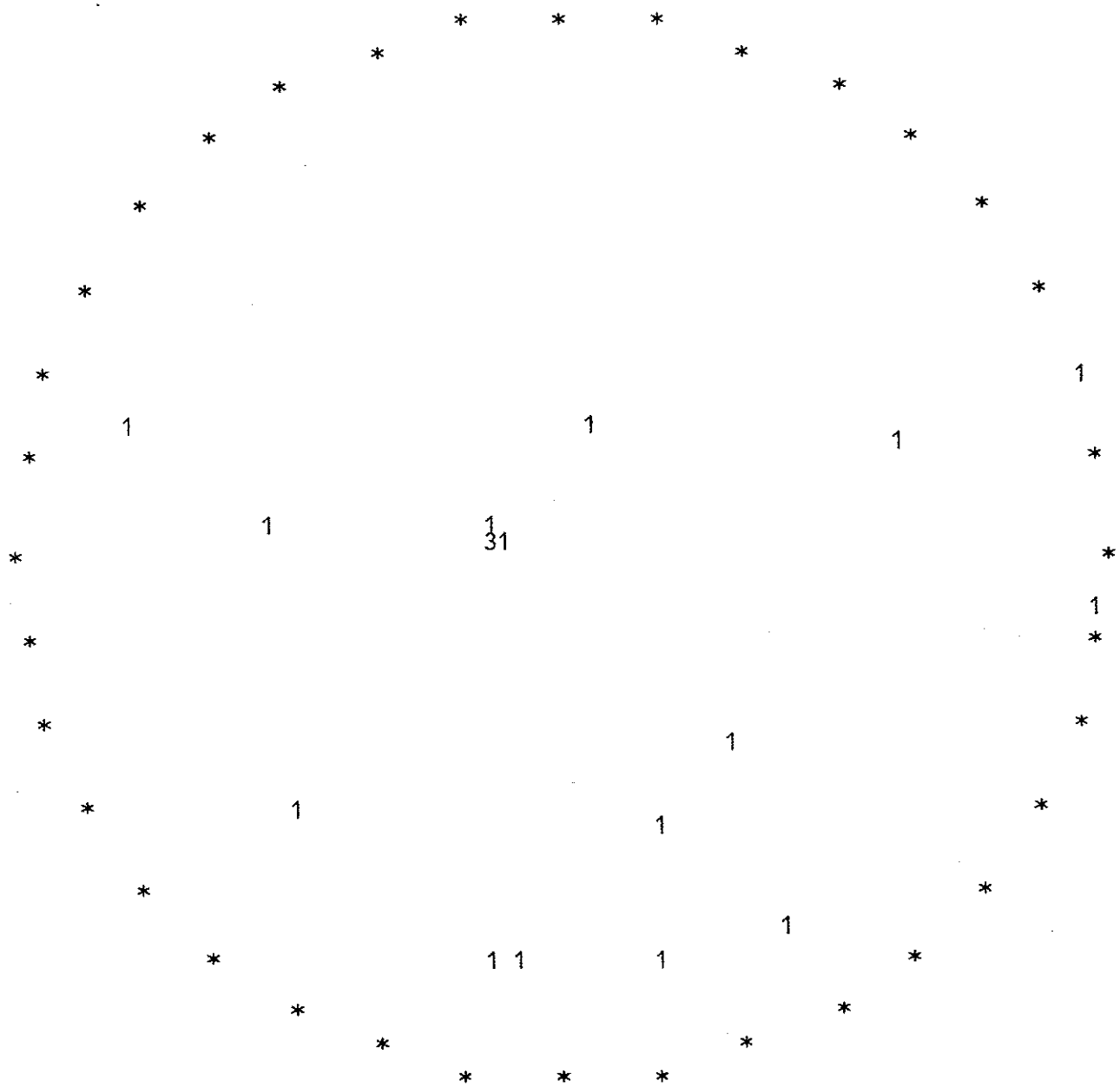
S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 VEINS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0



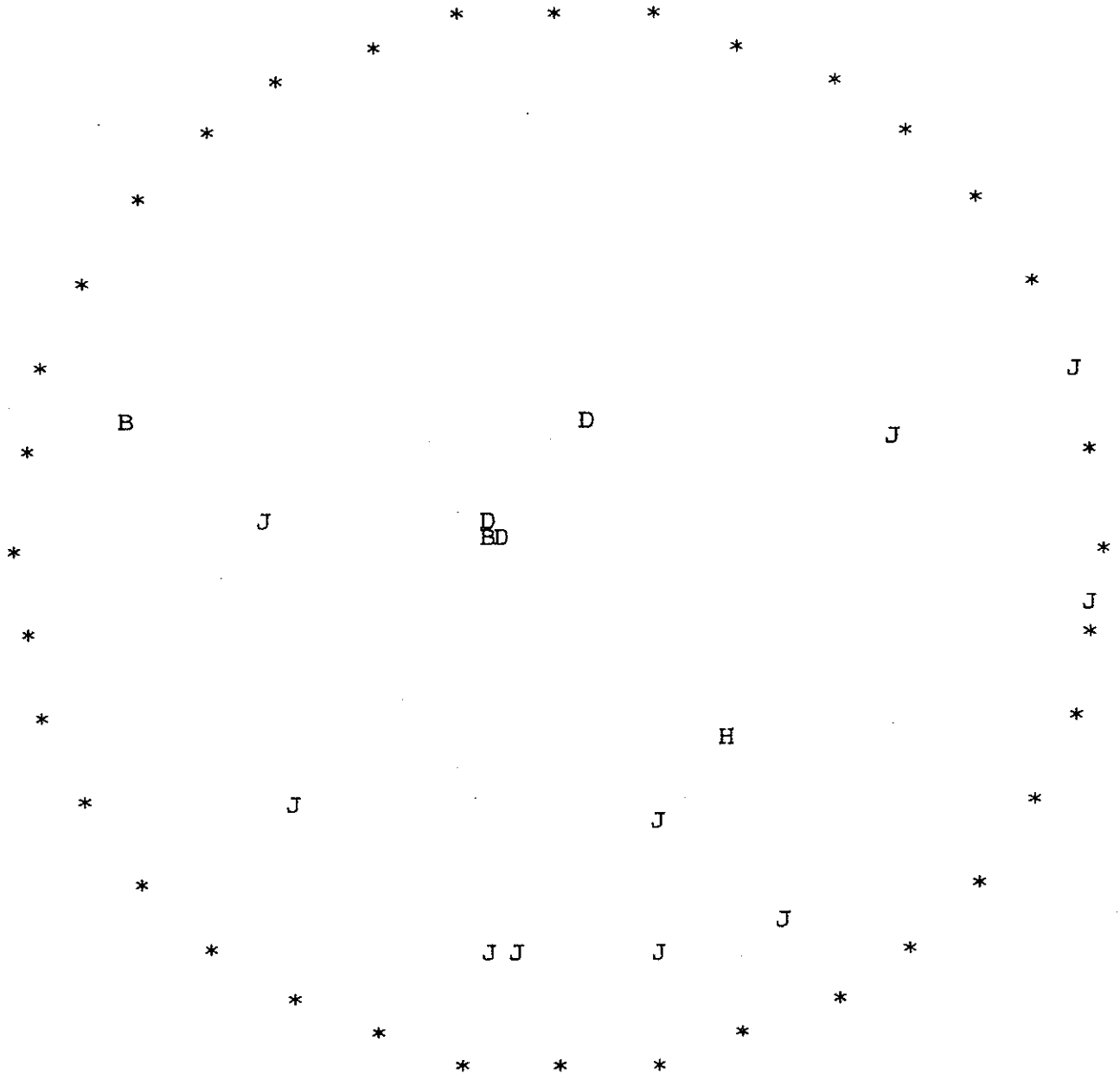
S8463/4 HORNSBY SHIRE COUNCIL -BOREHOLE 102 VEINS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

' '	<LT> 1%
'+'	<LT> 5%
'1'	<LT> 10%
'2'	<LT> 15%
'3'	<LT> 20%
'M'	MAX = 30.0



S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 18
ROTATION ANGLES: 0 0 0



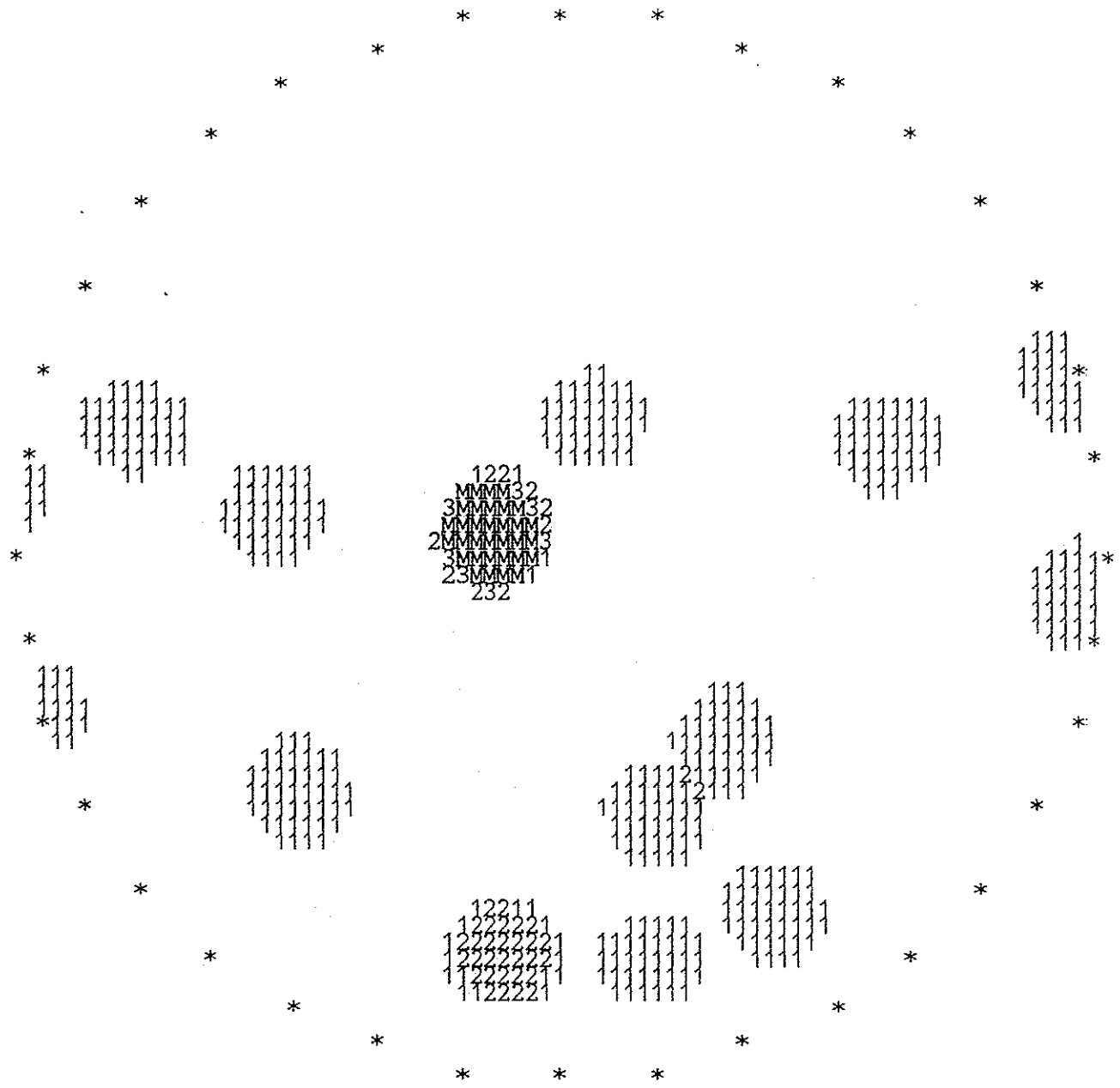
S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103

SCATTER DIAGRAM - POLES TO PLANES

LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 18

ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103

SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES

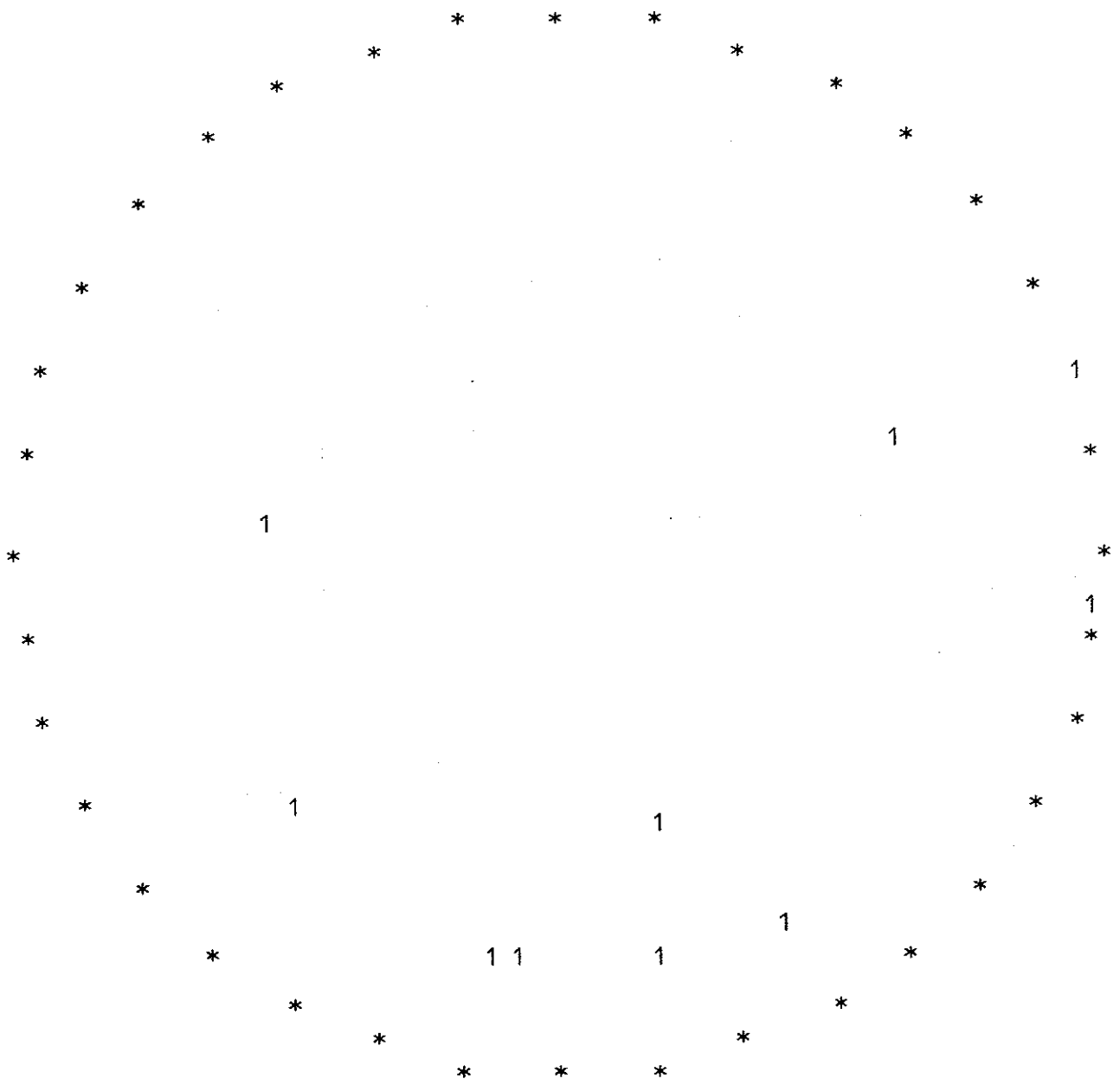
LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 18

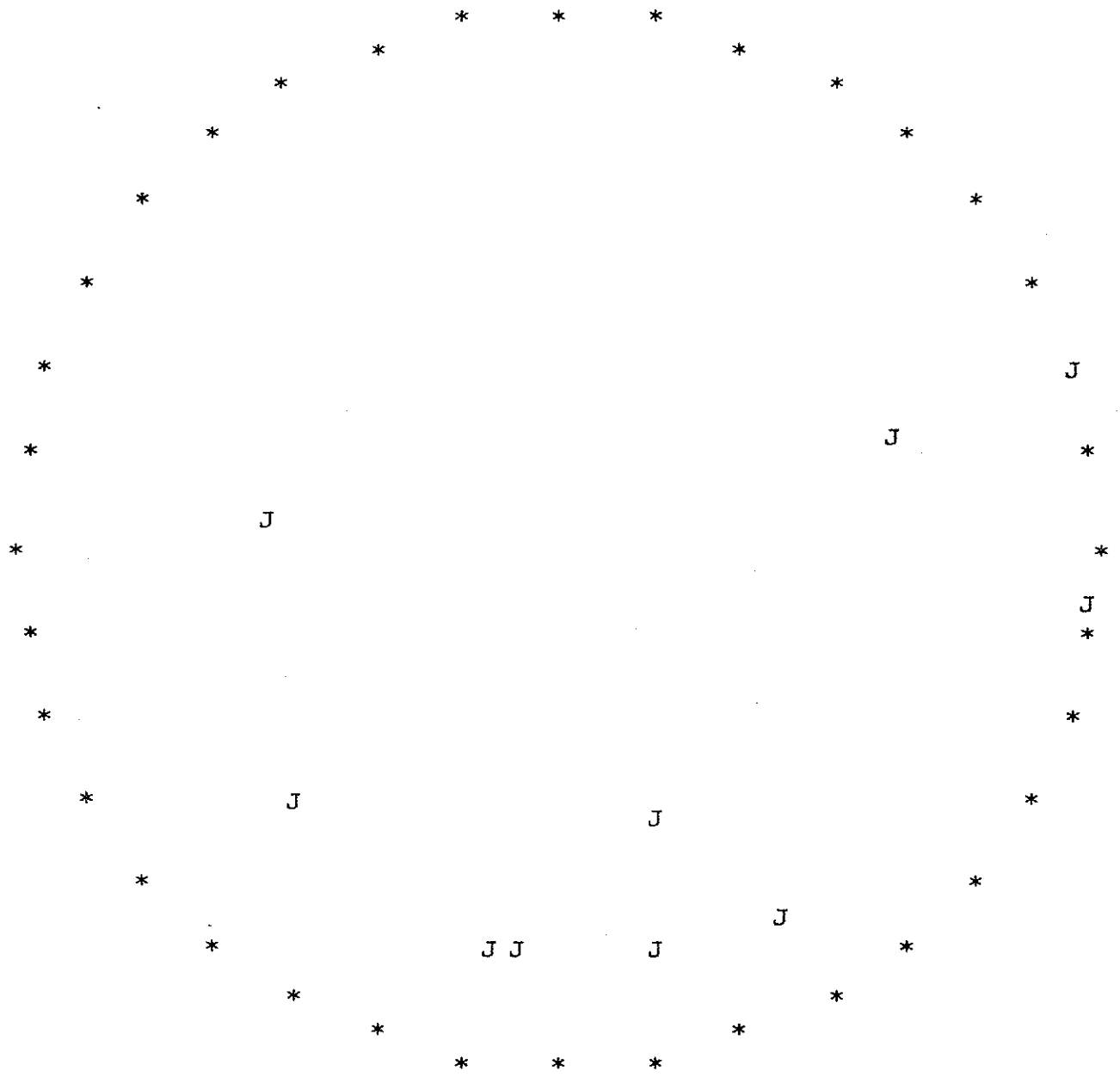
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

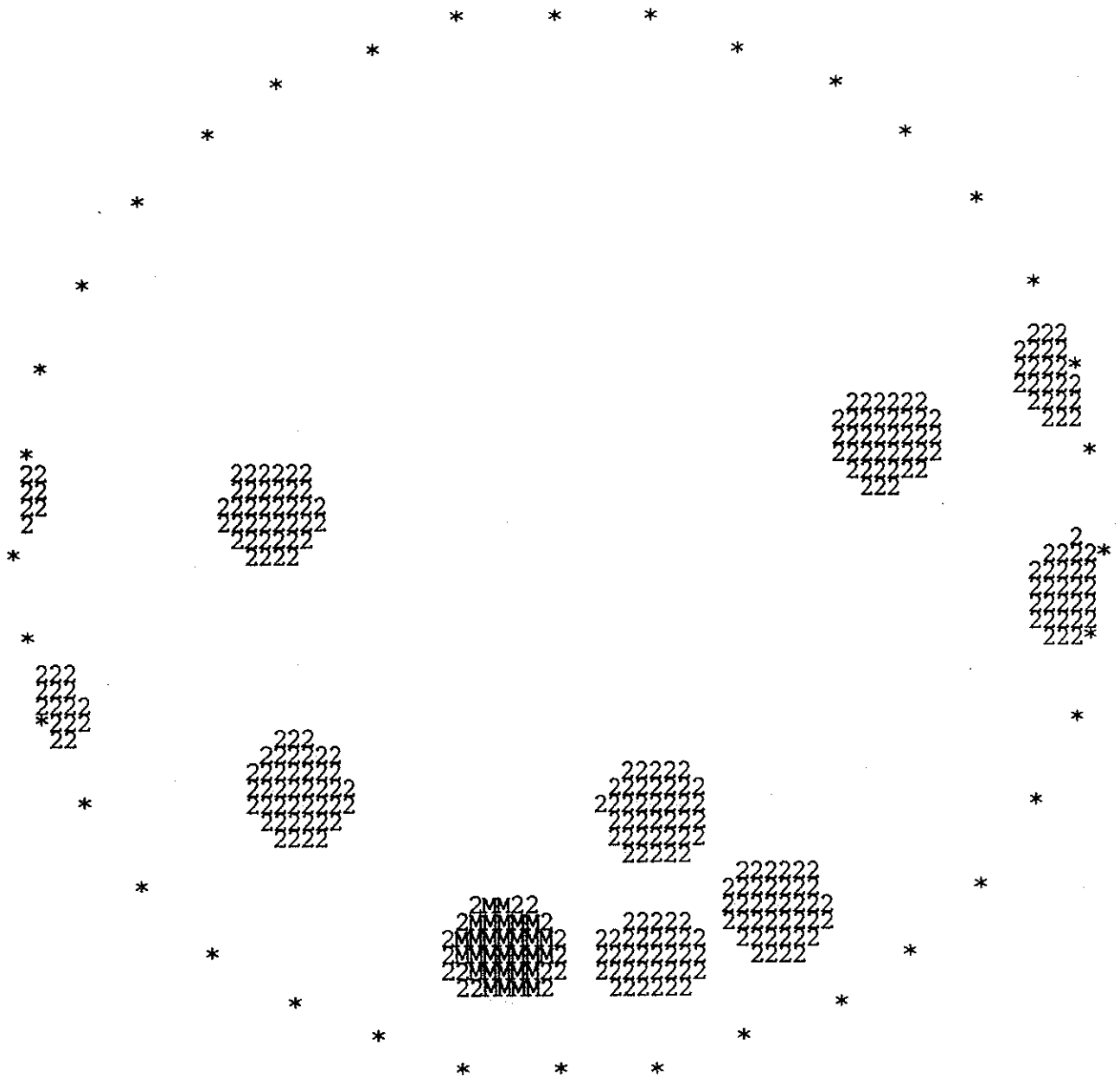
' '	<LT> 1%
'+'	<LT> 5%
'1'	<LT> 10%
'2'	<LT> 15%
'3'	<LT> 20%
'M'	MAX = 27.8



S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0



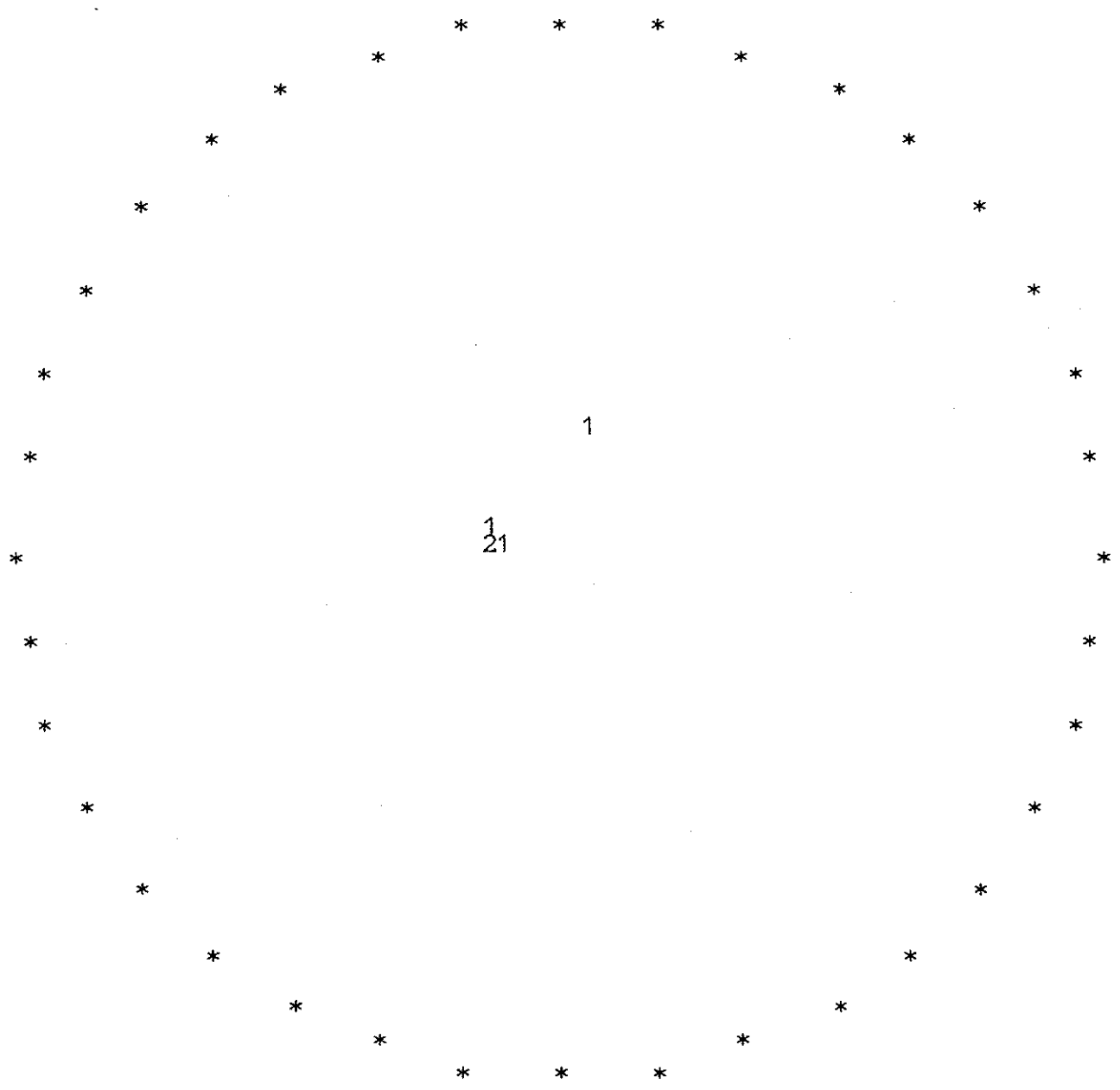
S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 JOINTS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0



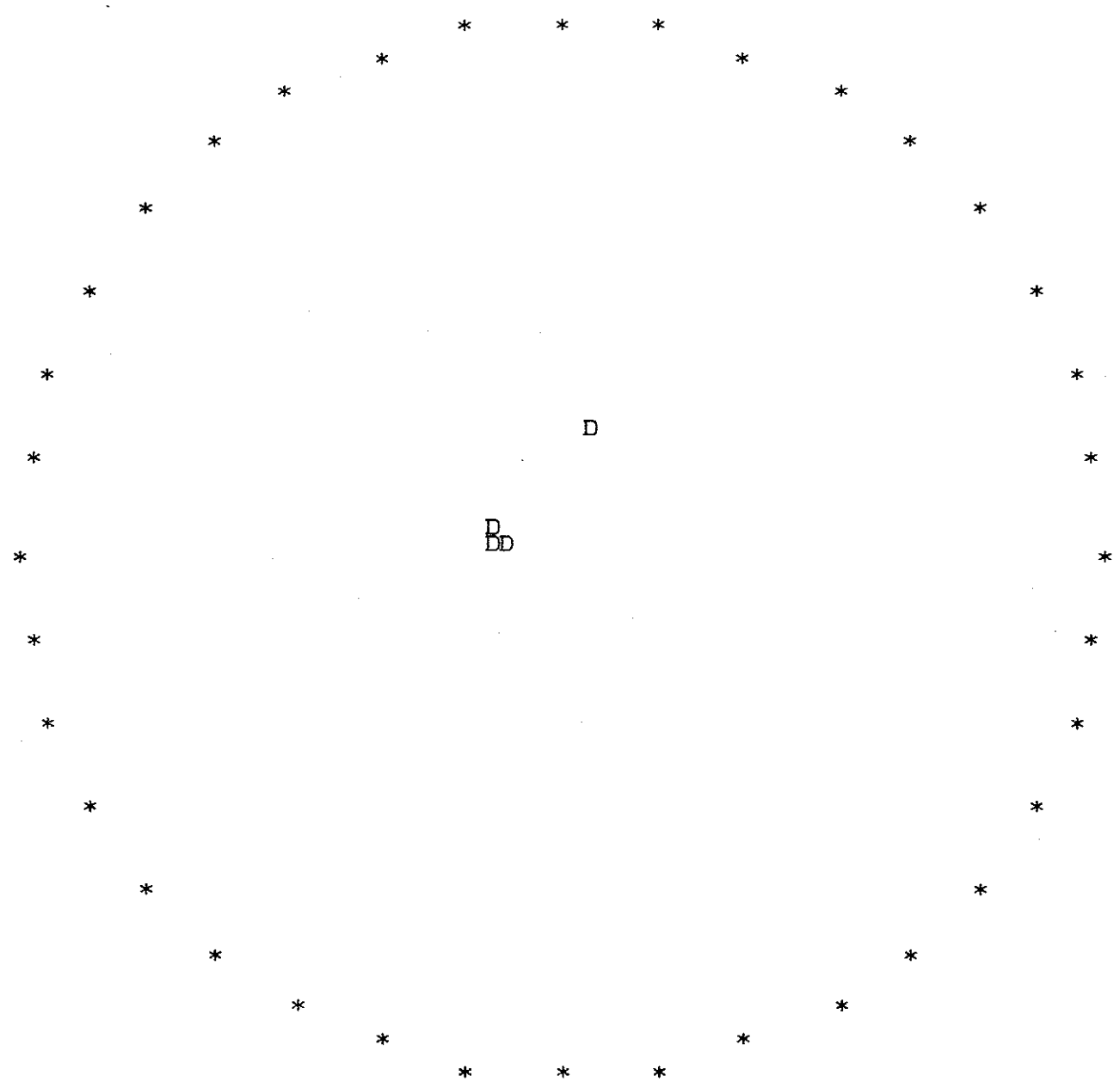
S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 JOINTS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 10
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

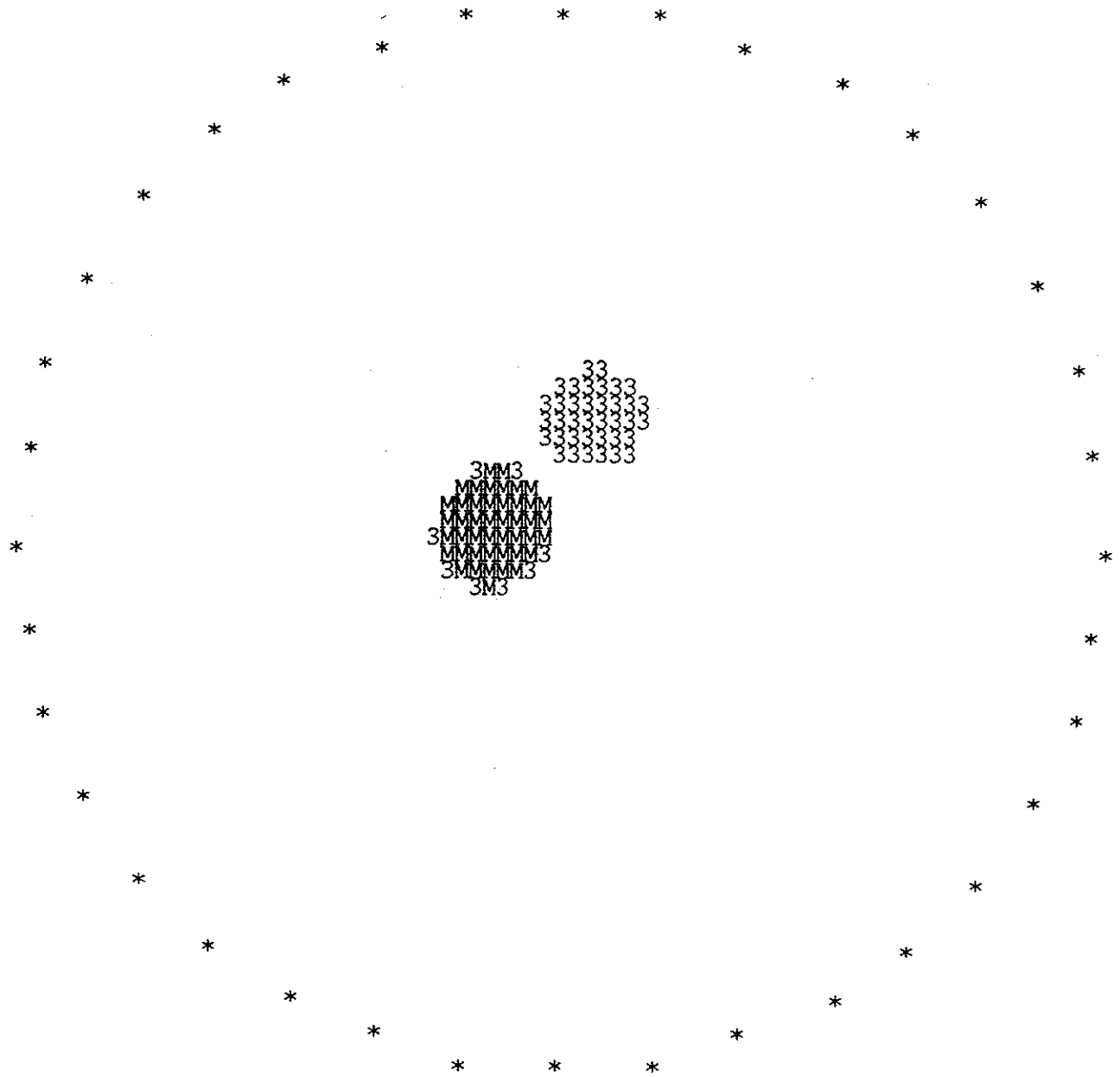
' '	<LT> 1%
'+'	<LT> 4%
'1'	<LT> 8%
'2'	<LT> 12%
'3'	<LT> 16%
'M'	MAX = 20.0



S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 5
ROTATION ANGLES: 0 0 0



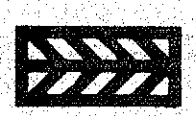
S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 BEDDINGS
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 5
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL BOREHOLE 103 BEDDINGS
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 5
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

' '	<LT> 1%
'+'	<LT> 5%
'1'	<LT> 10%
'2'	<LT> 15%
'3'	<LT> 20%
'M'	MAX = 80.0



APPENDIX D

APPENDIX C

DATA HISTOGRAMS FOR SURFACE LINE MAPPING

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/1

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 08-11-89
logged by: SRM
checked by: PLV

traverse line data

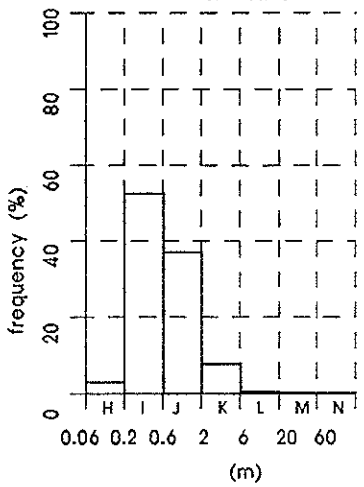
identification: UPPER BENCH OF EASTERN FACE elevation: APPROX. RL. 90M datum: AHD

data selection

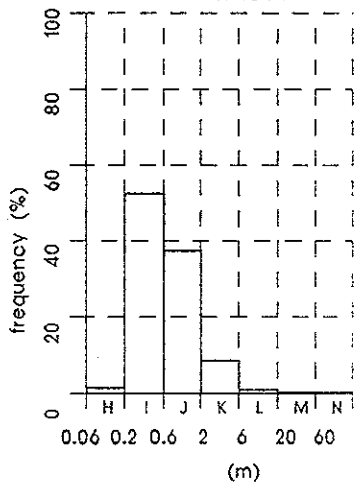
252 defects selected from a total of 252

lithology type: all
discontinuity type: all
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

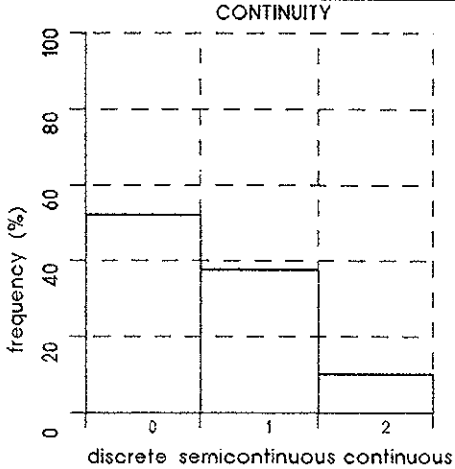
SPACING



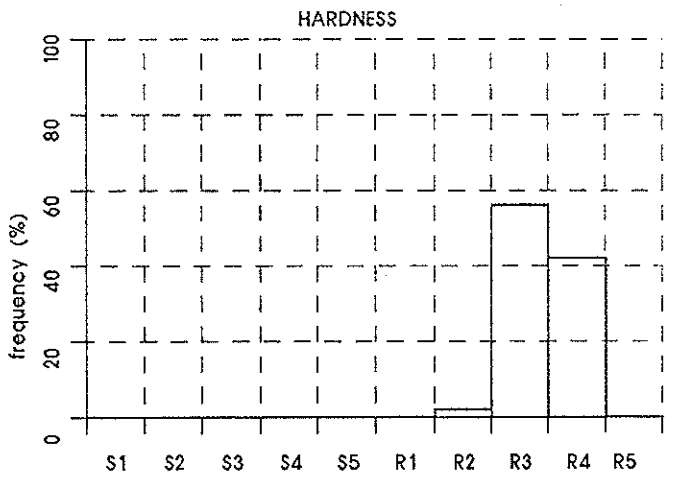
LENGTH



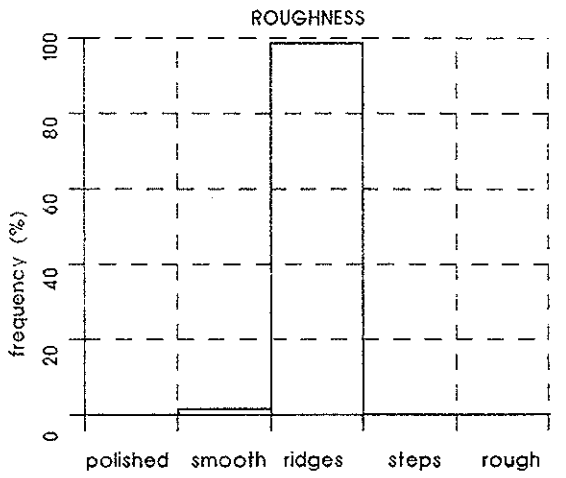
CONTINUITY



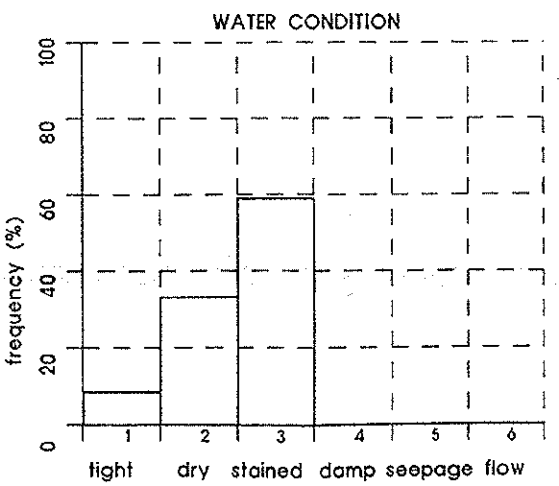
HARDNESS



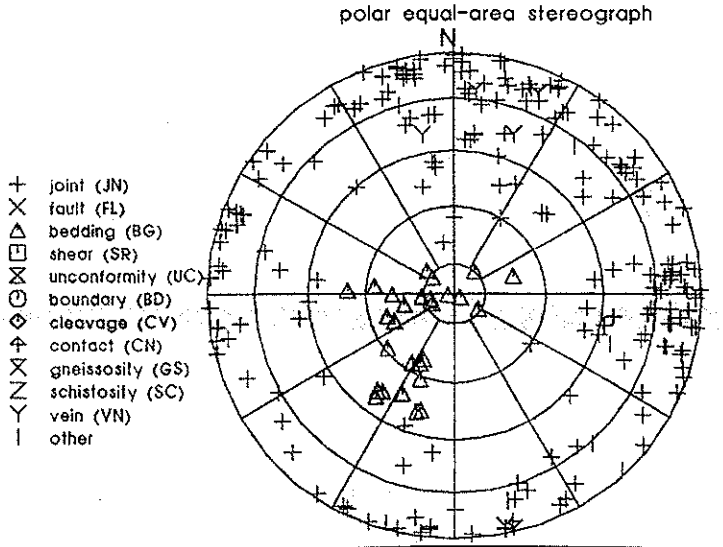
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



T88-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/1

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 08-11-89
logged by: SRM
checked by: PLV

traverse line data

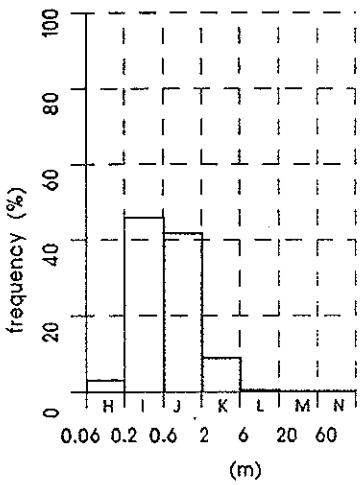
identification: UPPER BENCH OF EASTERN FACE elevation: APPROX. RL. 90M datum: A.H.D.

data selection

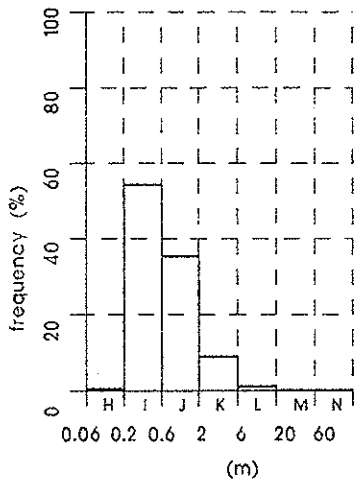
203 defects selected from a total of 252

lithology type: all
discontinuity type: JN
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

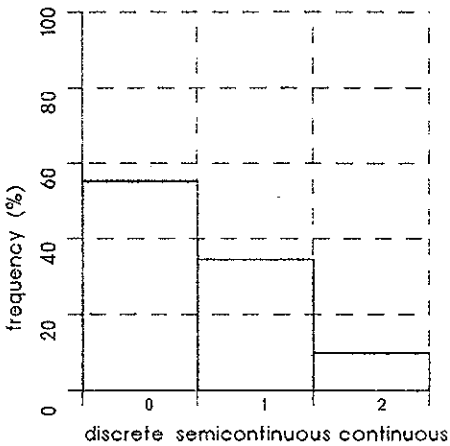
SPACING



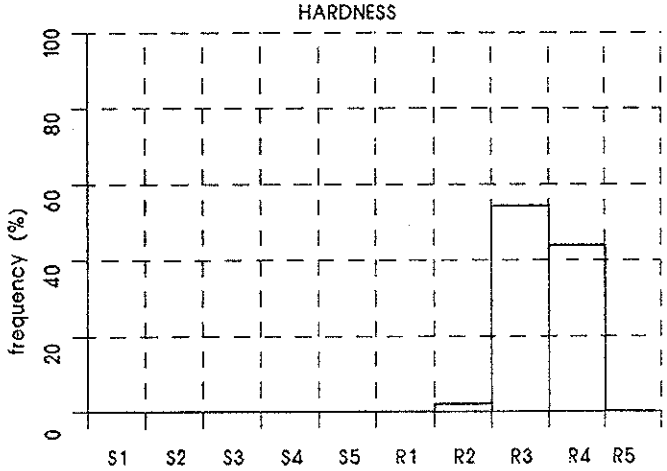
LENGTH



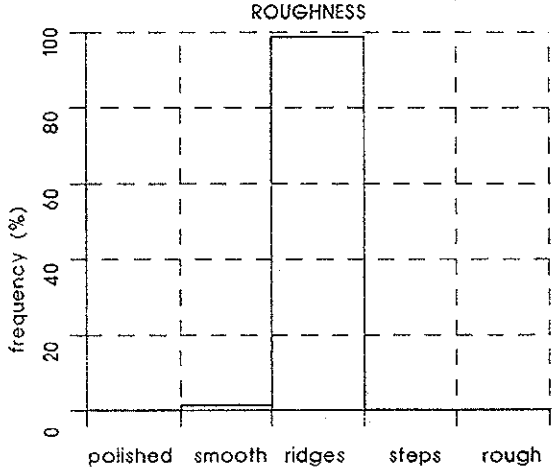
CONTINUITY



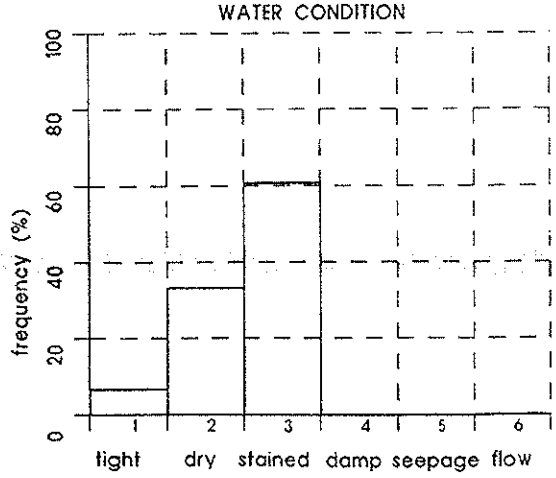
HARDNESS



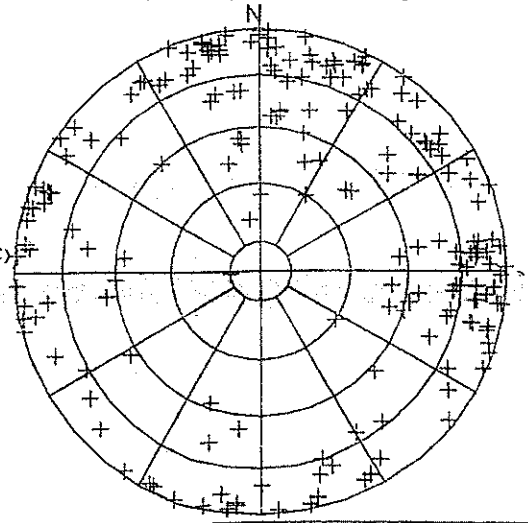
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



T88-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/1

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 08-11-89
logged by: SRM
checked by: PLV

traverse line data

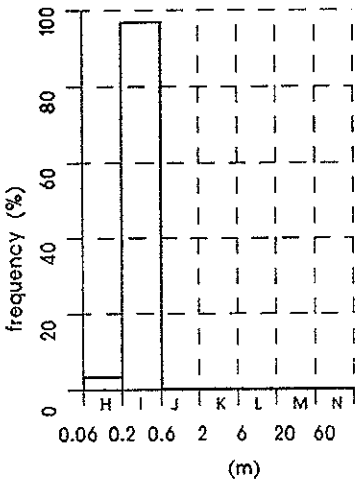
identification: UPPER BENCH OF EASTERN FACE elevation: APPROX. RL 90M datum: A.H.D.

data selection

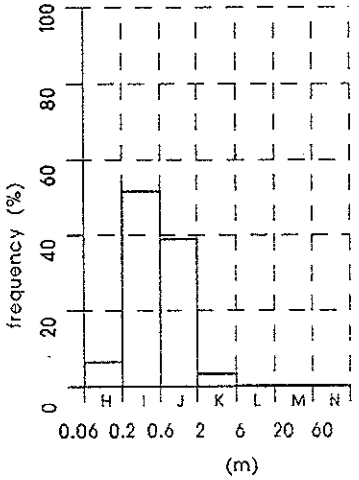
31 defects selected from a total of 252

lithology type: all
discontinuity type: BG
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

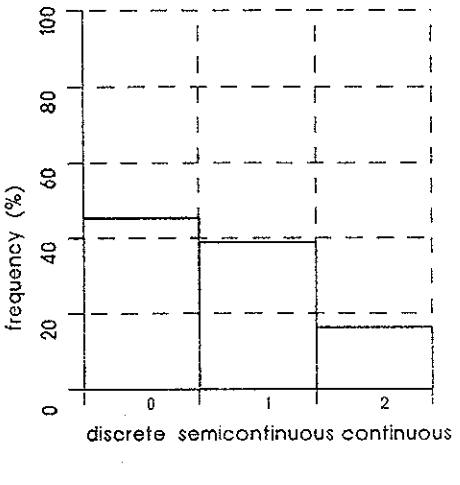
SPACING



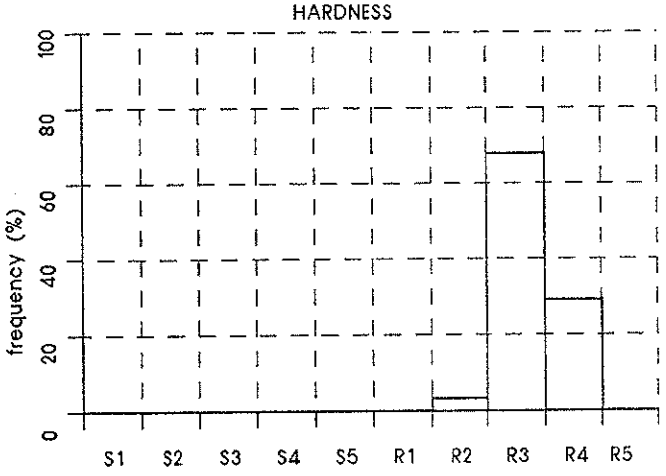
LENGTH



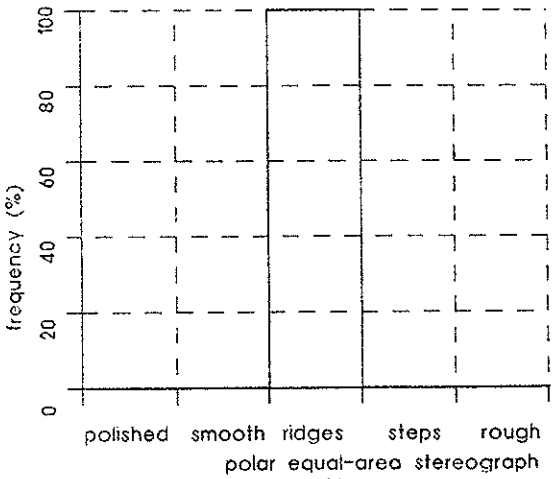
CONTINUITY



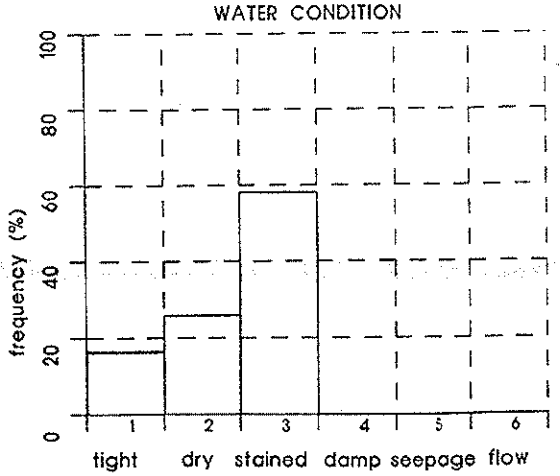
HARDNESS



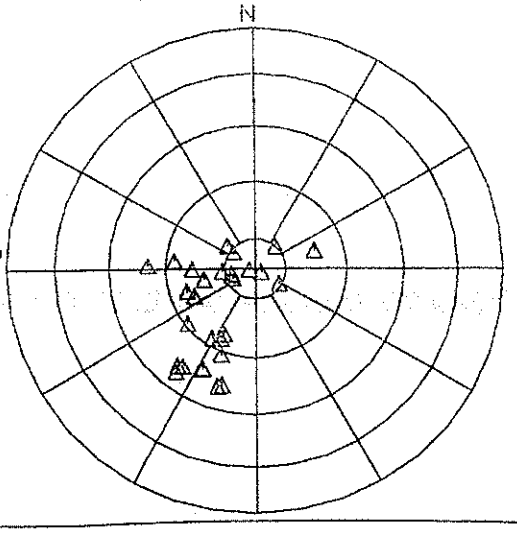
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



188-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/1

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 08-11-89
logged by: SRM
checked by: PLV

traverse line data

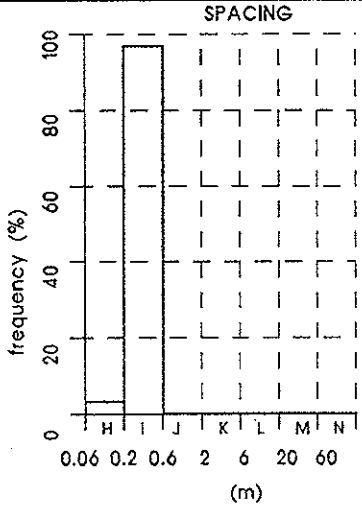
identification: UPPER BENCH OF EASTERN FACE elevation: Approx. RL. 90M datum: A.H.D.

data selection

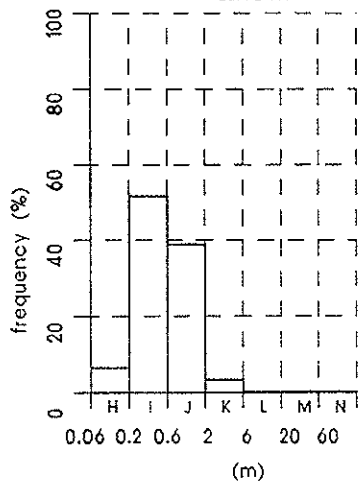
31 defects selected from a total of 252

lithology type: all
discontinuity type: BG
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

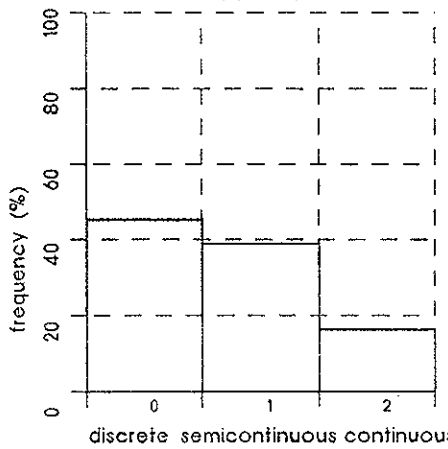
SPACING



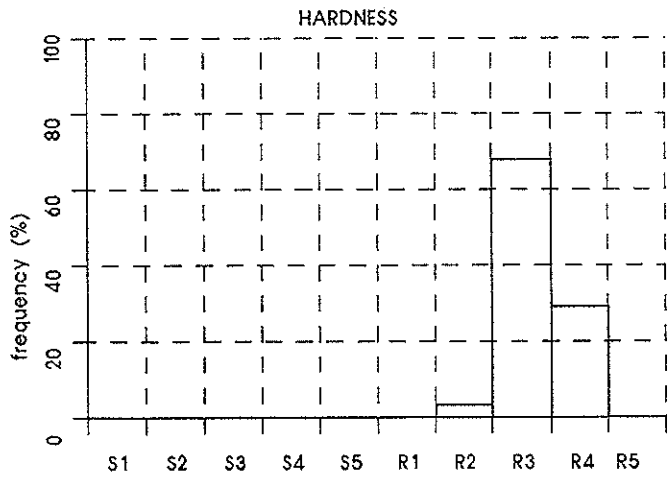
LENGTH



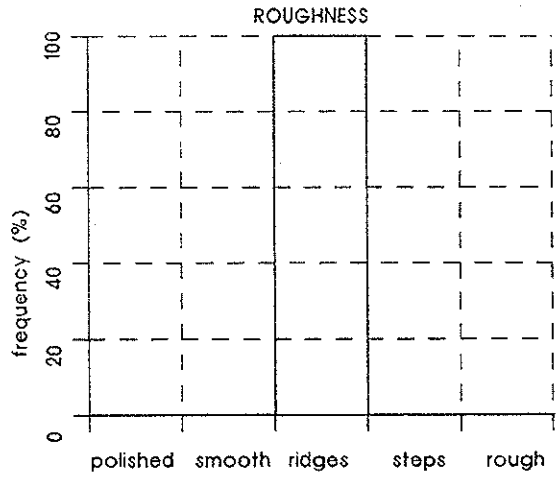
CONTINUITY



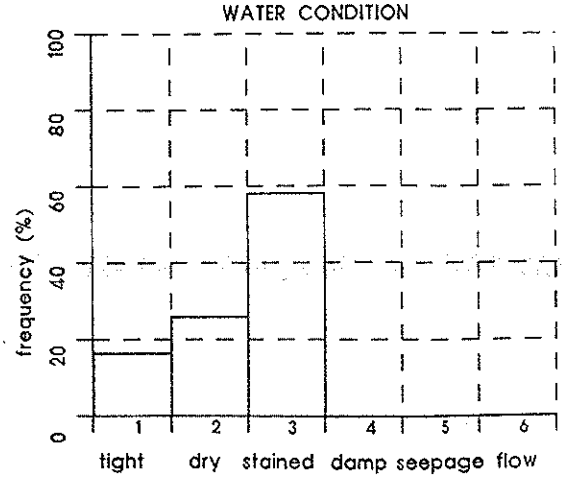
HARDNESS



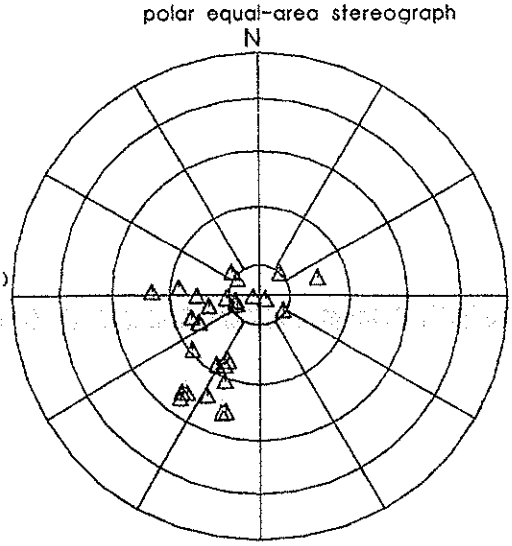
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



T88-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/2

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 20-12-89
logged by: SRM
checked by: PLV

traverse line data

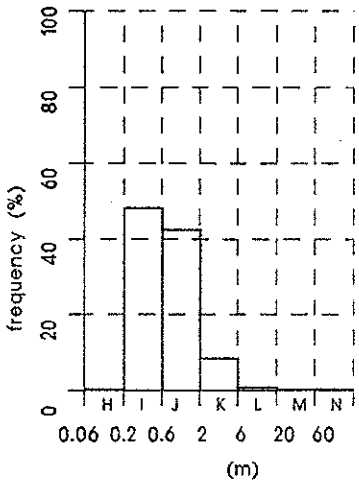
identification: SECOND BENCH OF EASTERN FACE elevation: APPROX. RL. 70M datum: A.H.D.

data selection

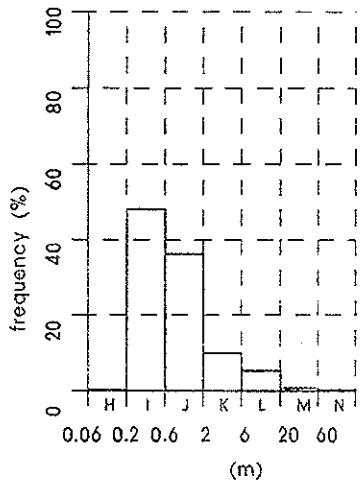
429 defects selected from a total of 429

lithology type: all
discontinuity type: all
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

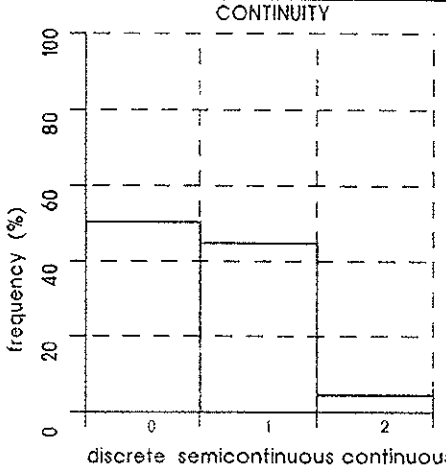
SPACING



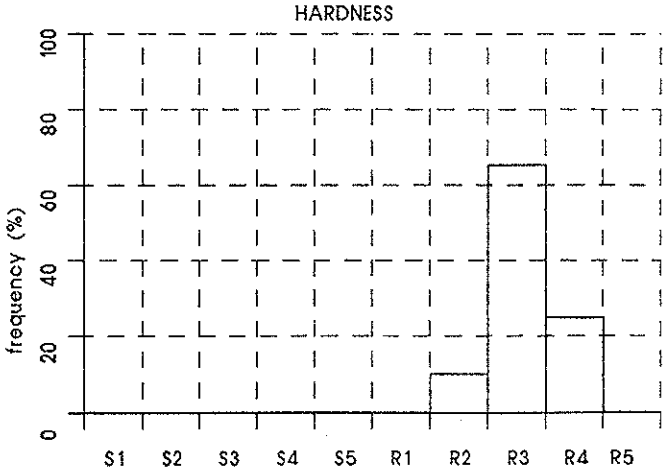
LENGTH



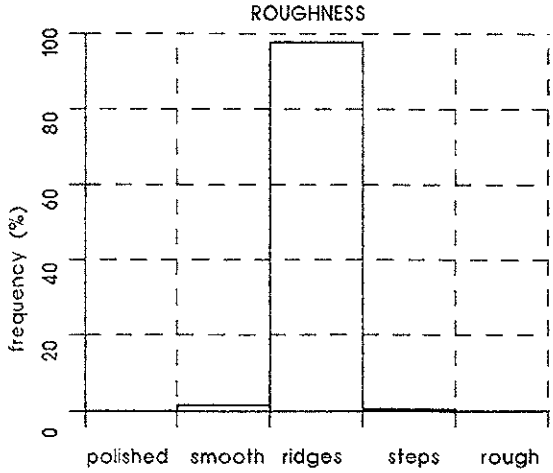
CONTINUITY



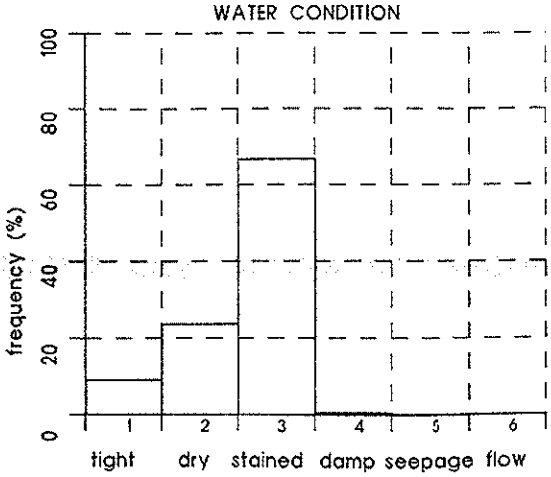
HARDNESS



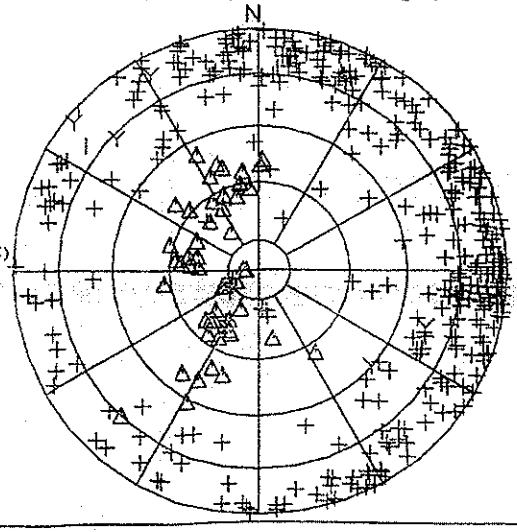
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



188-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/2

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 20-12-89
logged by: SRM
checked by: PLV

traverse line data

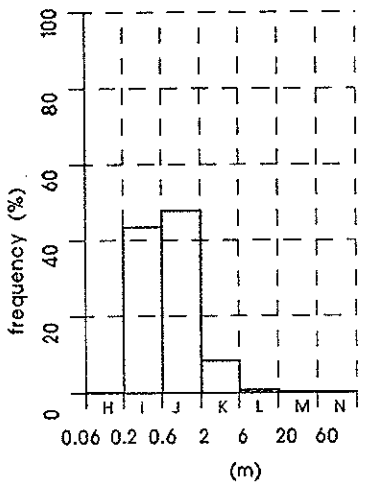
identification: SECOND BENCH OF EASTERN FACE elevation: APPROX. RL. 70M datum: A.H.D.

data selection

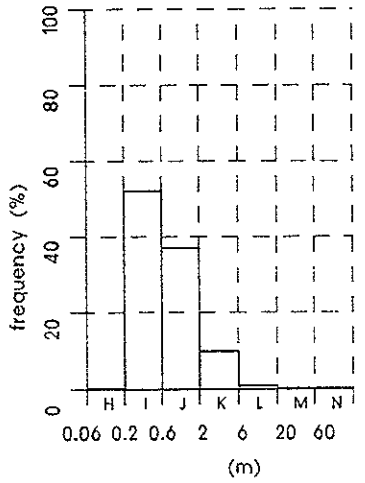
367 defects selected from a total of 429

lithology type: all
discontinuity type: JN
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

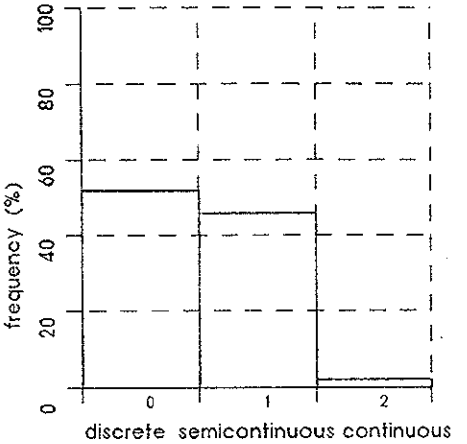
SPACING



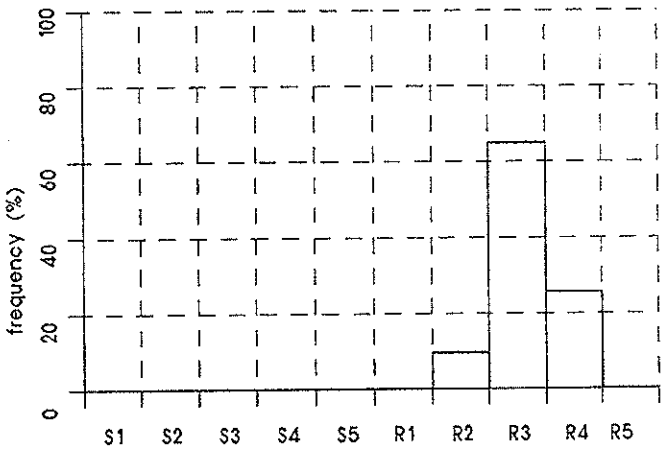
LENGTH



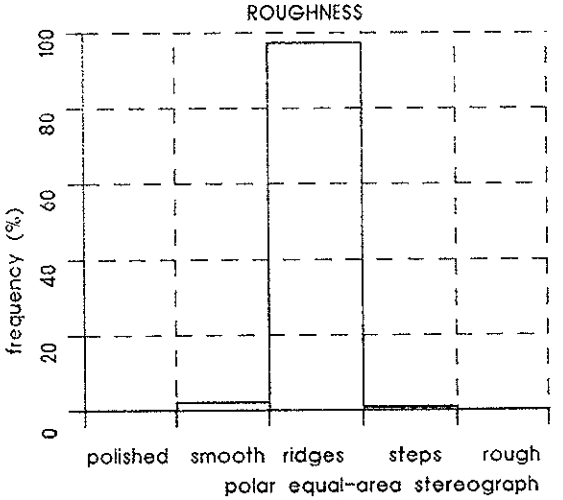
CONTINUITY



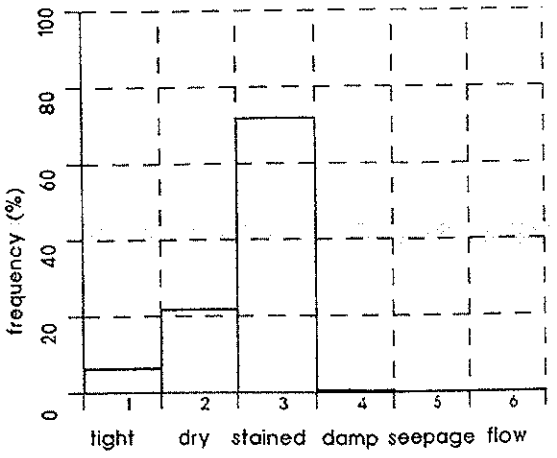
HARDNESS



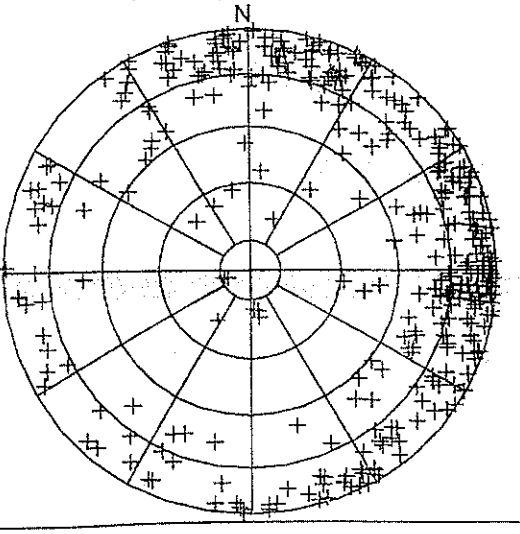
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



T88-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/2

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 20-12-89
logged by: SRM
checked by: PLV

traverse line data

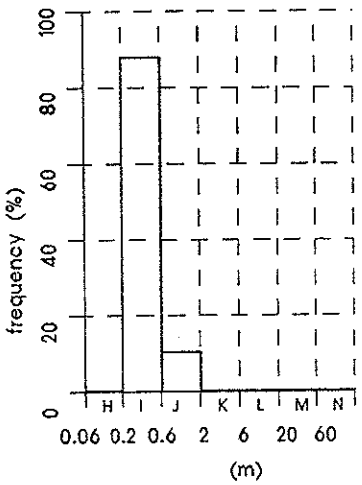
identification: SECOND BENCH OF EASTERN FACE elevation: APPROX. RL. 70M datum: A.H.D.

data selection

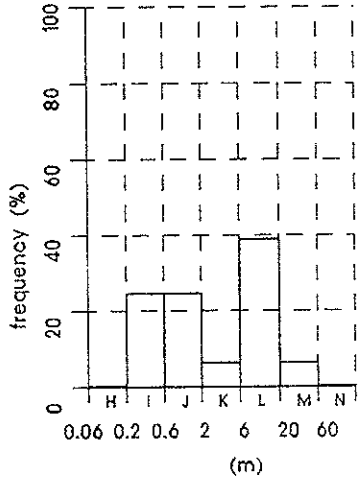
49 defects selected from a total of 429

lithology type: all
discontinuity type: BG
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

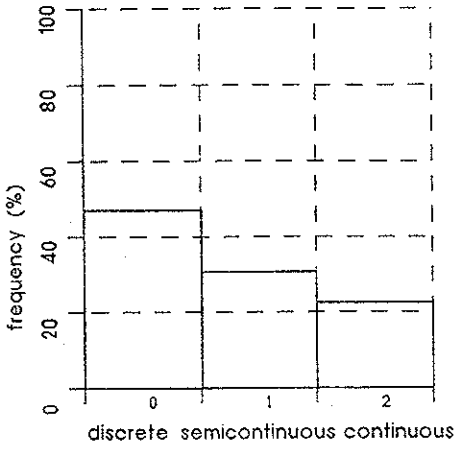
SPACING



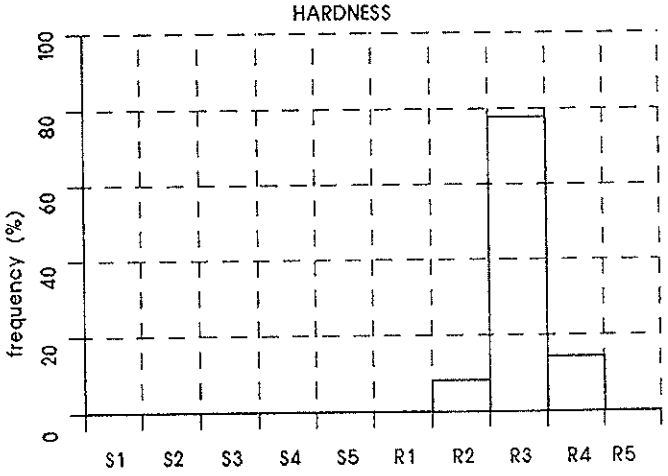
LENGTH



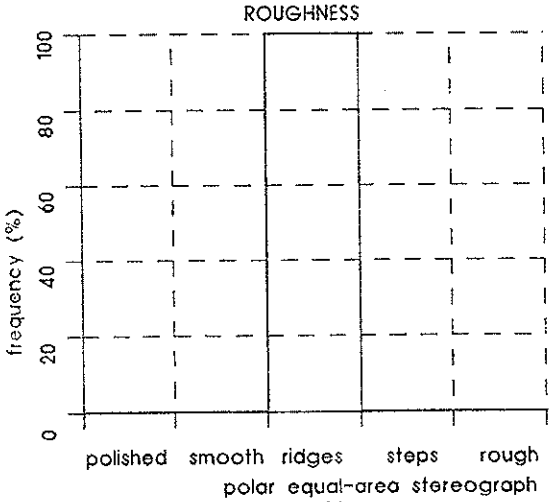
CONTINUITY



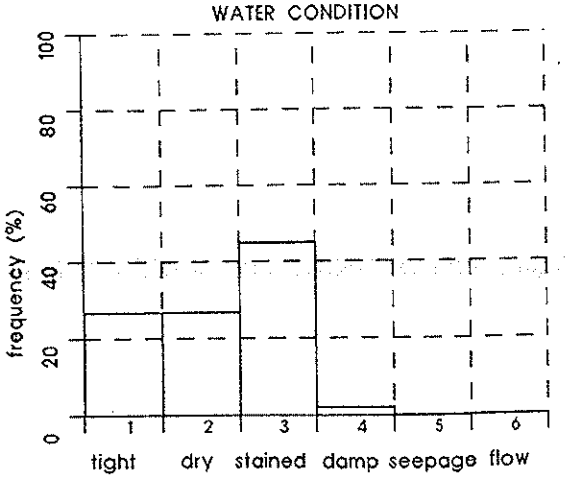
HARDNESS



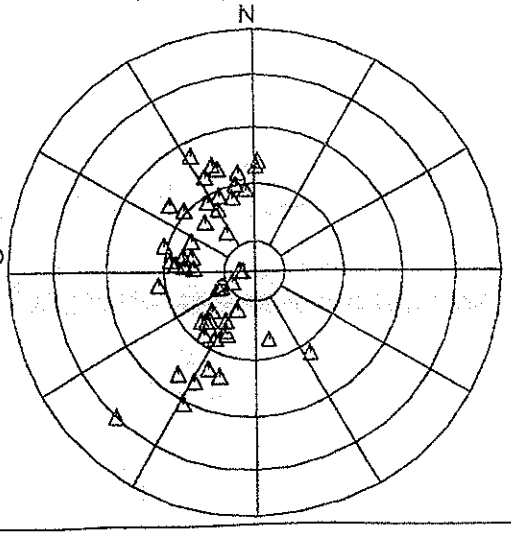
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



188-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland

geotechnical line mapping data histograms

COFFEY

line no: 1989/3

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 21-12-89
logged by: SRM
checked by: PLV

traverse line data

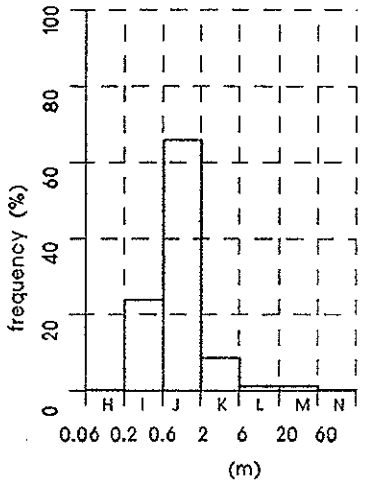
identification: TRAVERSE elevation: APPROX. RL. 40M datum: A.H.D.

data selection

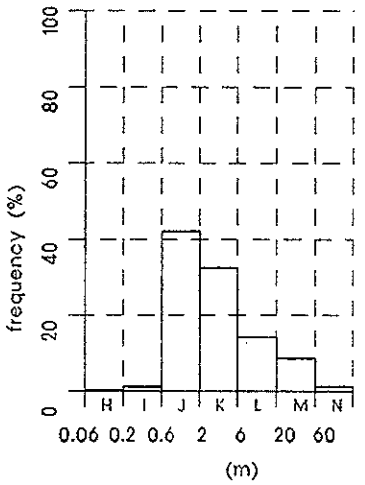
105 defects selected from a total of 105

lithology type: all
discontinuity type: all
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

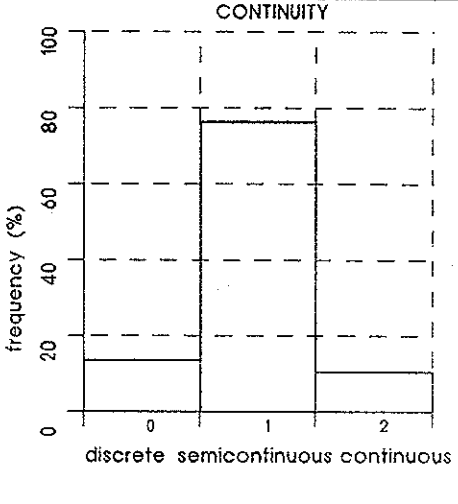
SPACING



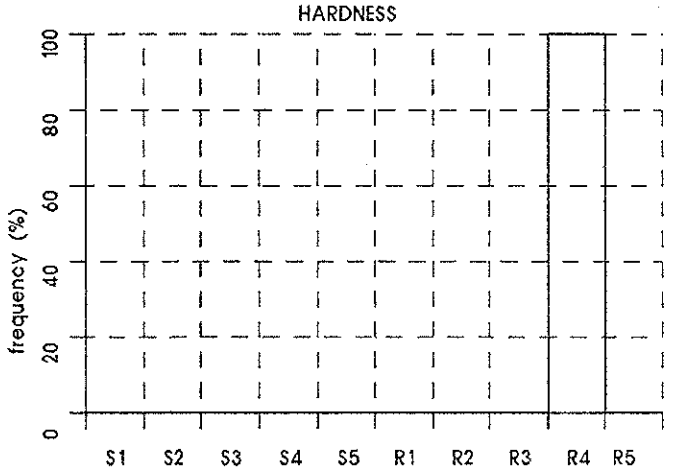
LENGTH



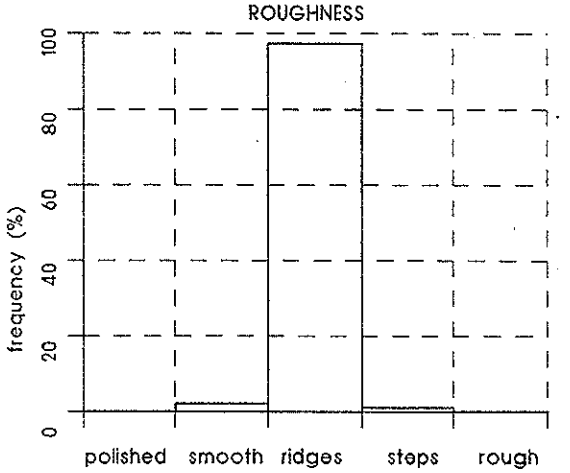
CONTINUITY



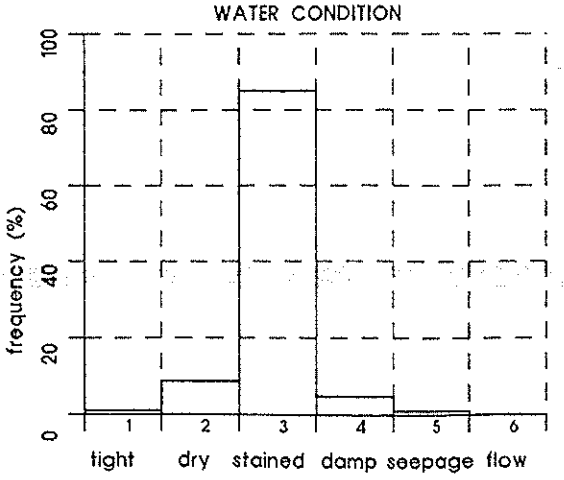
HARDNESS



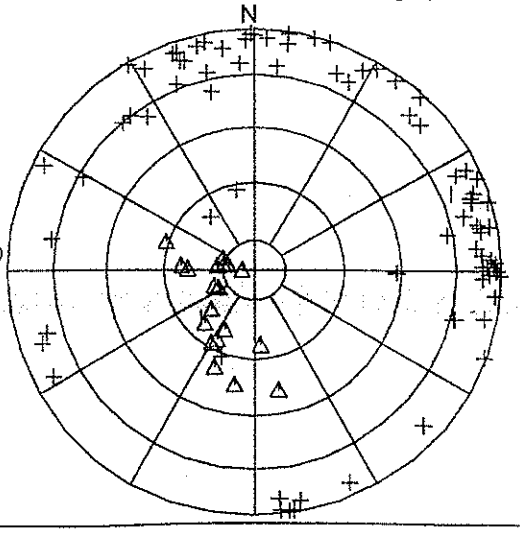
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



188-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/3
sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 21-12-89
logged by: SRM
checked by: PLV

traverse line data

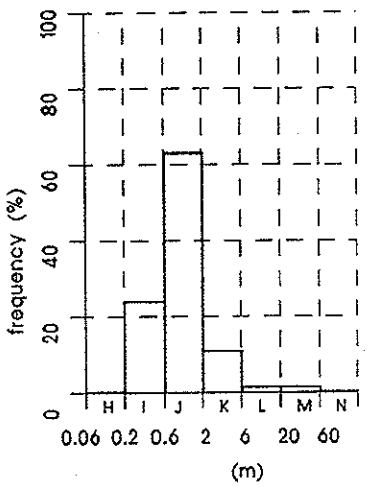
identification: TRAVERSE
elevation: APPROX. RL. 40M
datum: A.H.D.

data selection

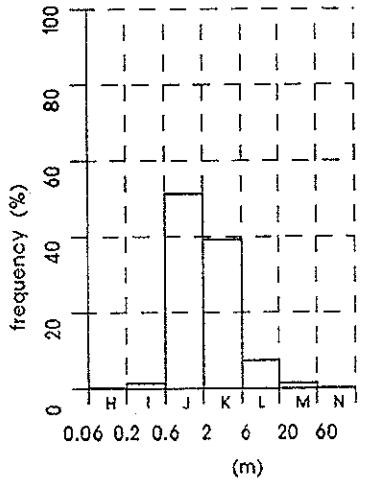
84 defects selected from a total of 105

lithology type: all
discontinuity type: JN
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

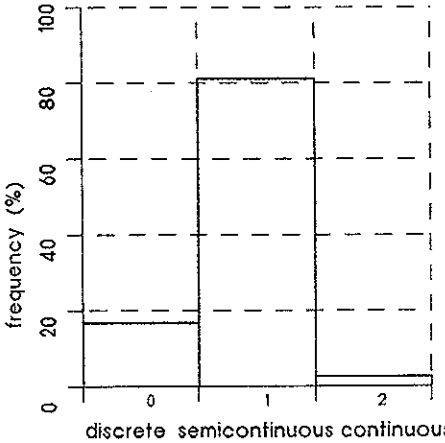
SPACING



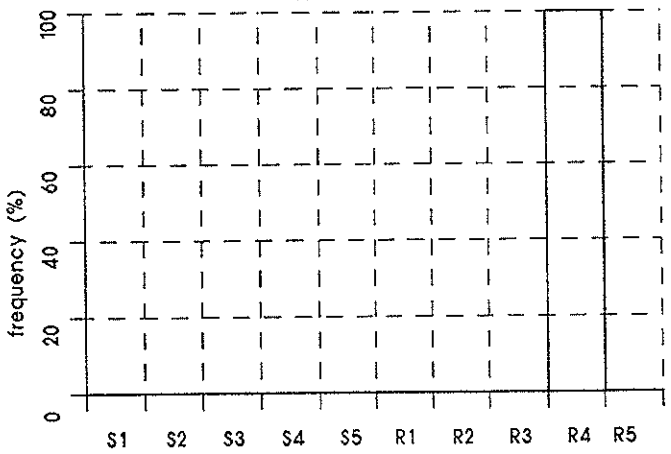
LENGTH



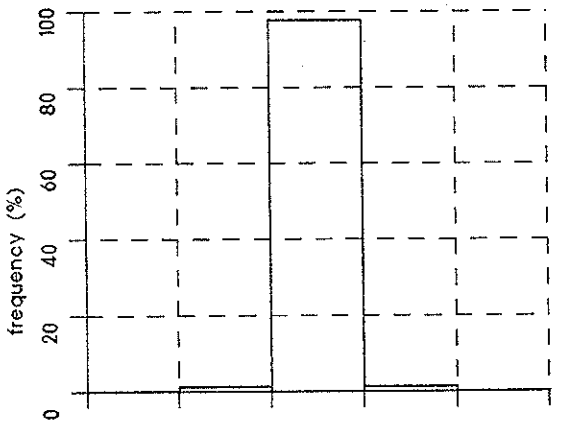
CONTINUITY



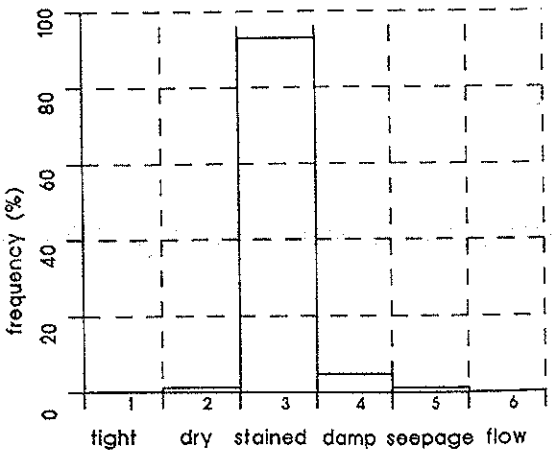
HARDNESS



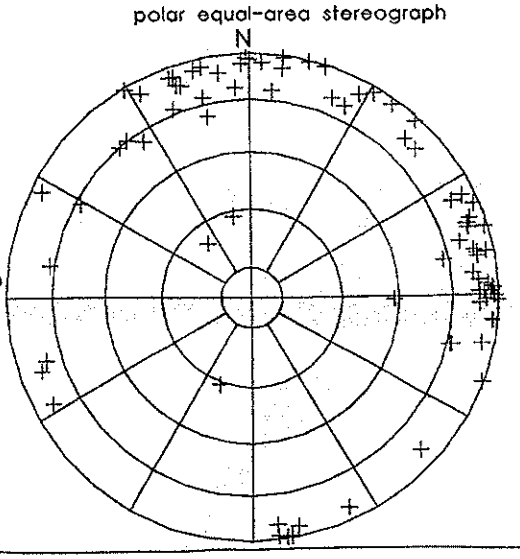
ROUGHNESS



WATER CONDITION



polar equal-area stereograph



188-240

Coffey & Partners Pty. Ltd
Incorporated in Queensland.

geotechnical line mapping data histograms

COFFEY

line no: 1989/3

sheet 1 of 1

office job no: S8463/4

client: HORNSBY SHIRE COUNCIL
principal:
project: OLD MANS VALLEY
location: HORNSBY QUARRY

date: 21-12-89
logged by: SRM
checked by: PLV

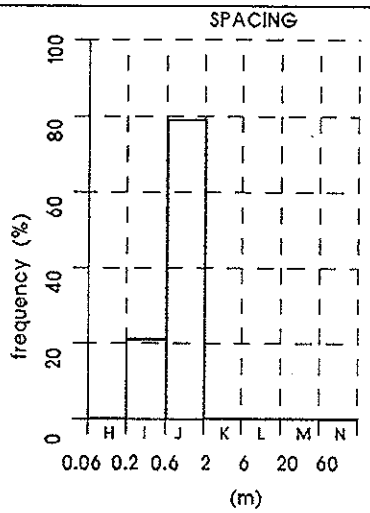
traverse line data

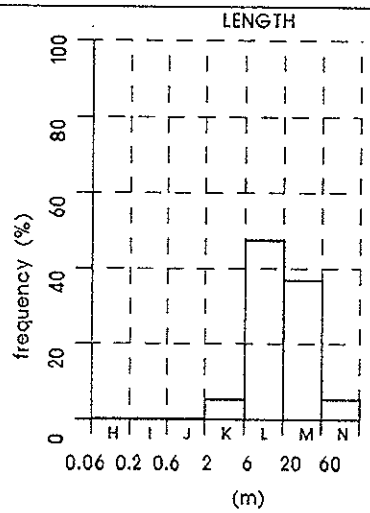
identification: TRAVERSE elevation: APPROX. RL. 40M datum: A.H.D.

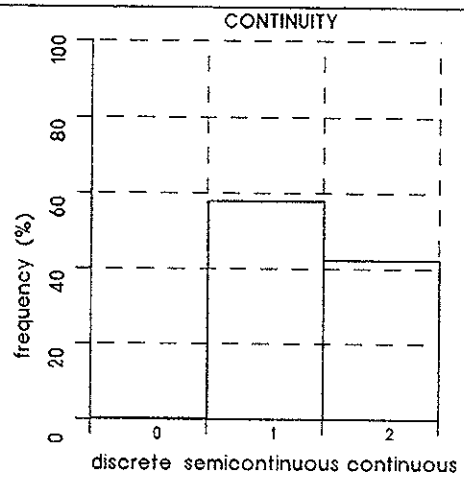
data selection

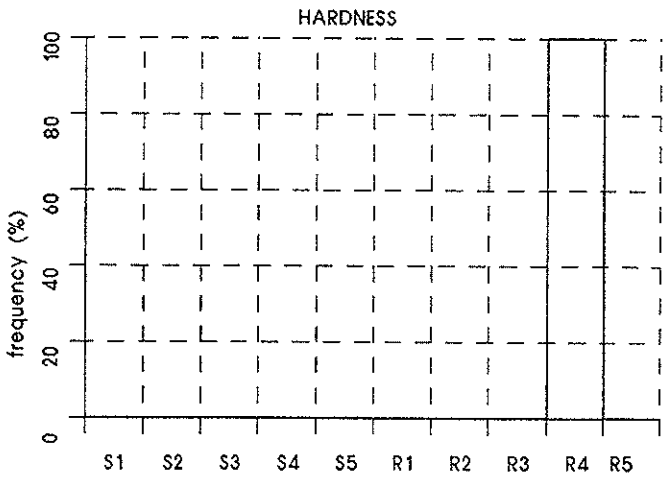
19 defects selected from a total of 105

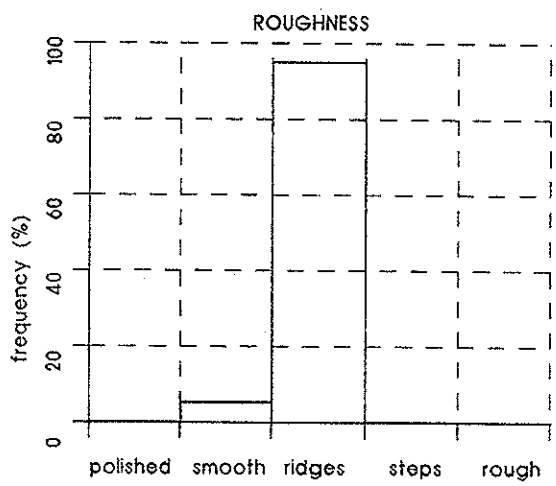
lithology type: all
discontinuity type: BG
length: all
continuity: all
hardness: all
water: all
discontinuity orientation: all
trend: mean, range
plunge: mean, range

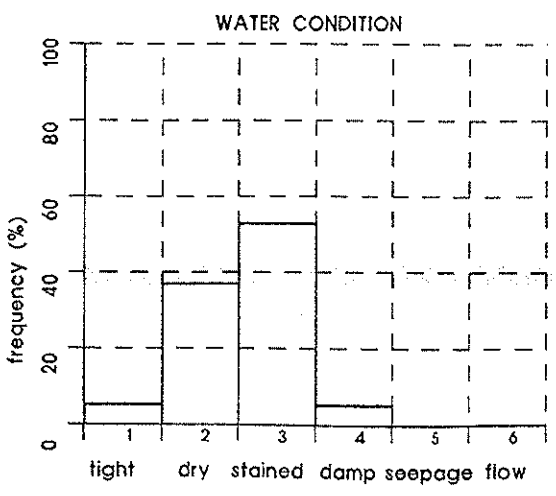




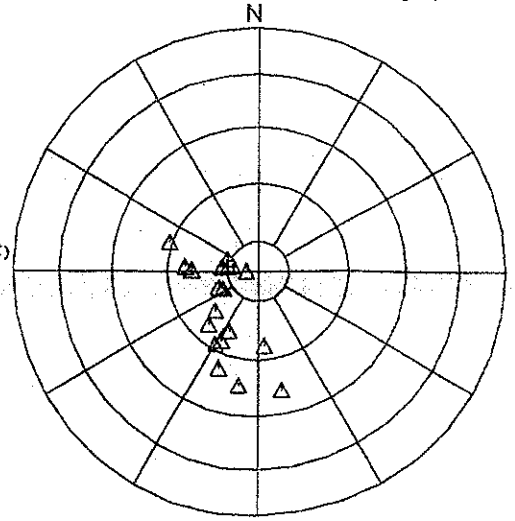








polar equal-area stereograph

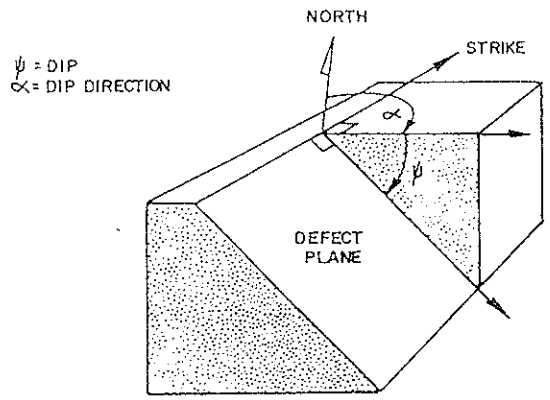


T88-240

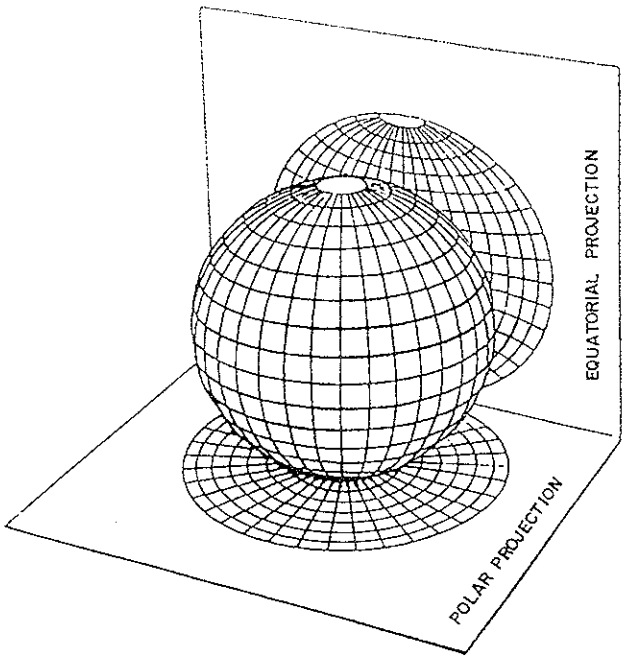
APPENDIX C

APPENDIX D

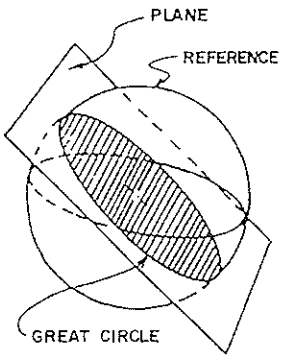
STEREOGRAPHIC PROJECTIONS FOR SURFACE LINE MAPPING

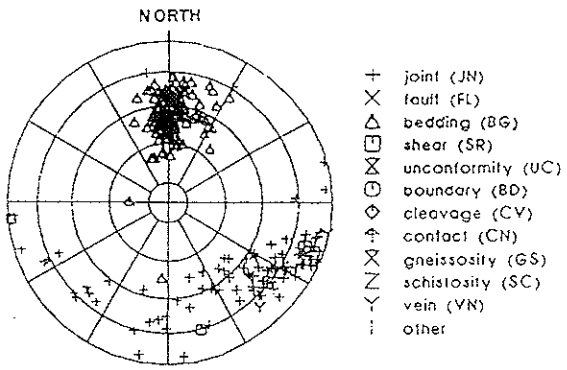


DEFINITION OF GEOMETRICAL TERMS

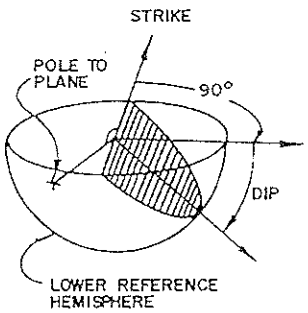


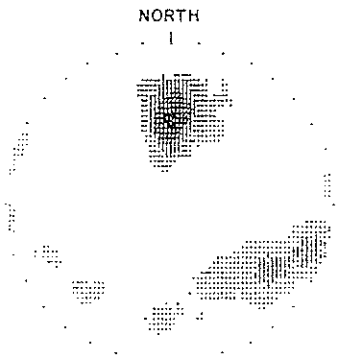
POLAR & EQUATORIAL PROJECTIONS



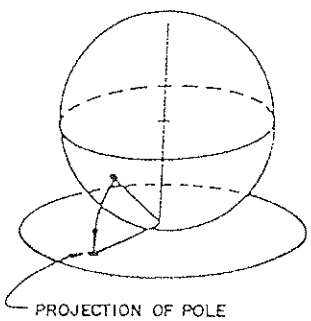


POLAR EQUAL-AREA STEREOGRAPHIC PROJECTION
DISPLAYING DEFECT TYPES





EQUATORIAL EQUAL-AREA STEREOGRAPHIC PROJECTION
OF ABOVE CONTOURED



Coffey & Partners Pty Ltd Consulting Engineers in the geotechnical sciences

drawn	PLV/LT
approved	
date	
scale	NOT TO SCALE

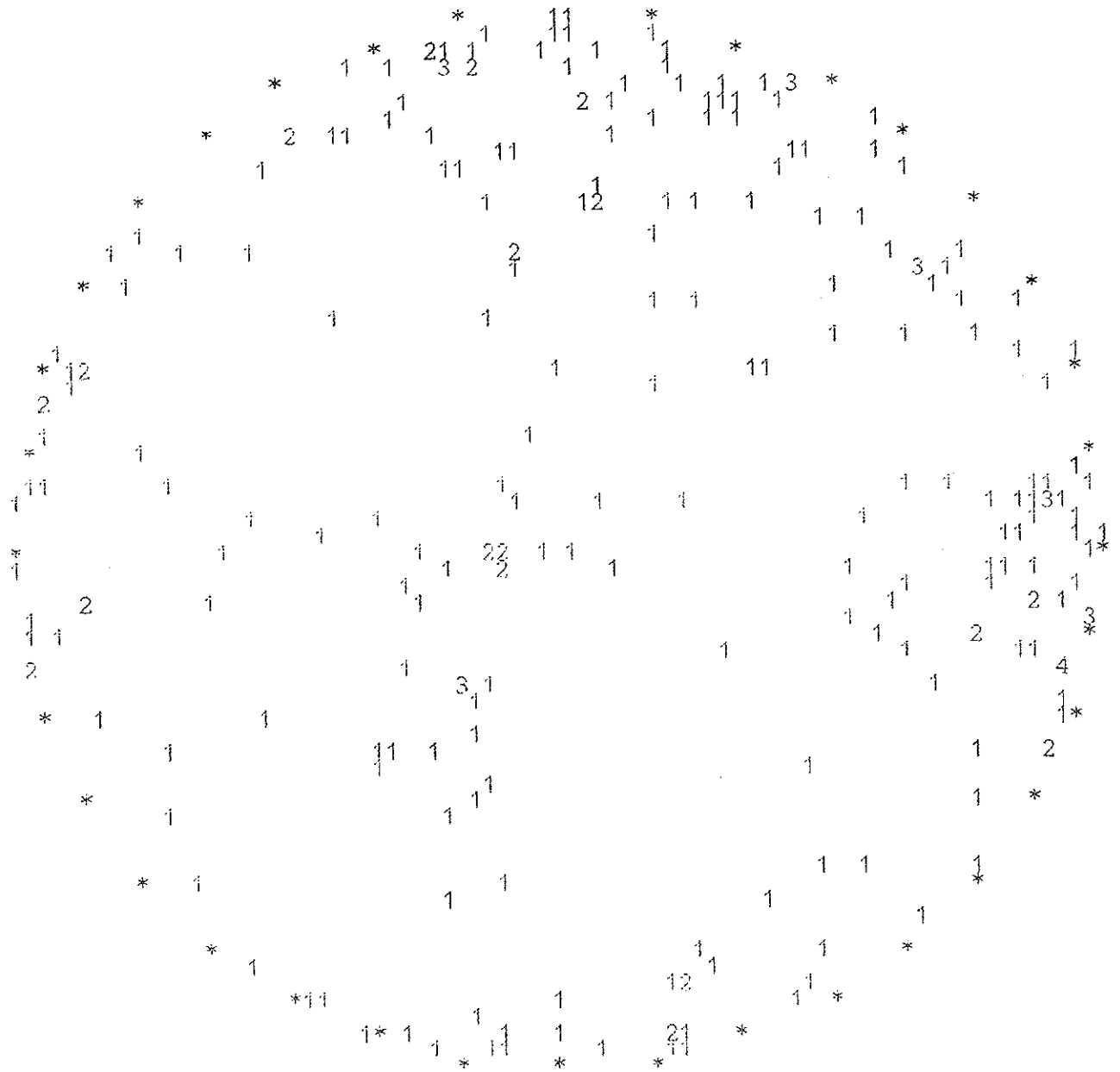
HORNSBY SHIRE COUNCIL
OLD MANS VALLEY

DEFINITION & PRESENTATION
OF STRUCTURAL DEFECTS

COFFEY

FIGURE DI

job no S8463/4



GS863/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/1
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 252
ROTATION ANGLES: 0 0 0

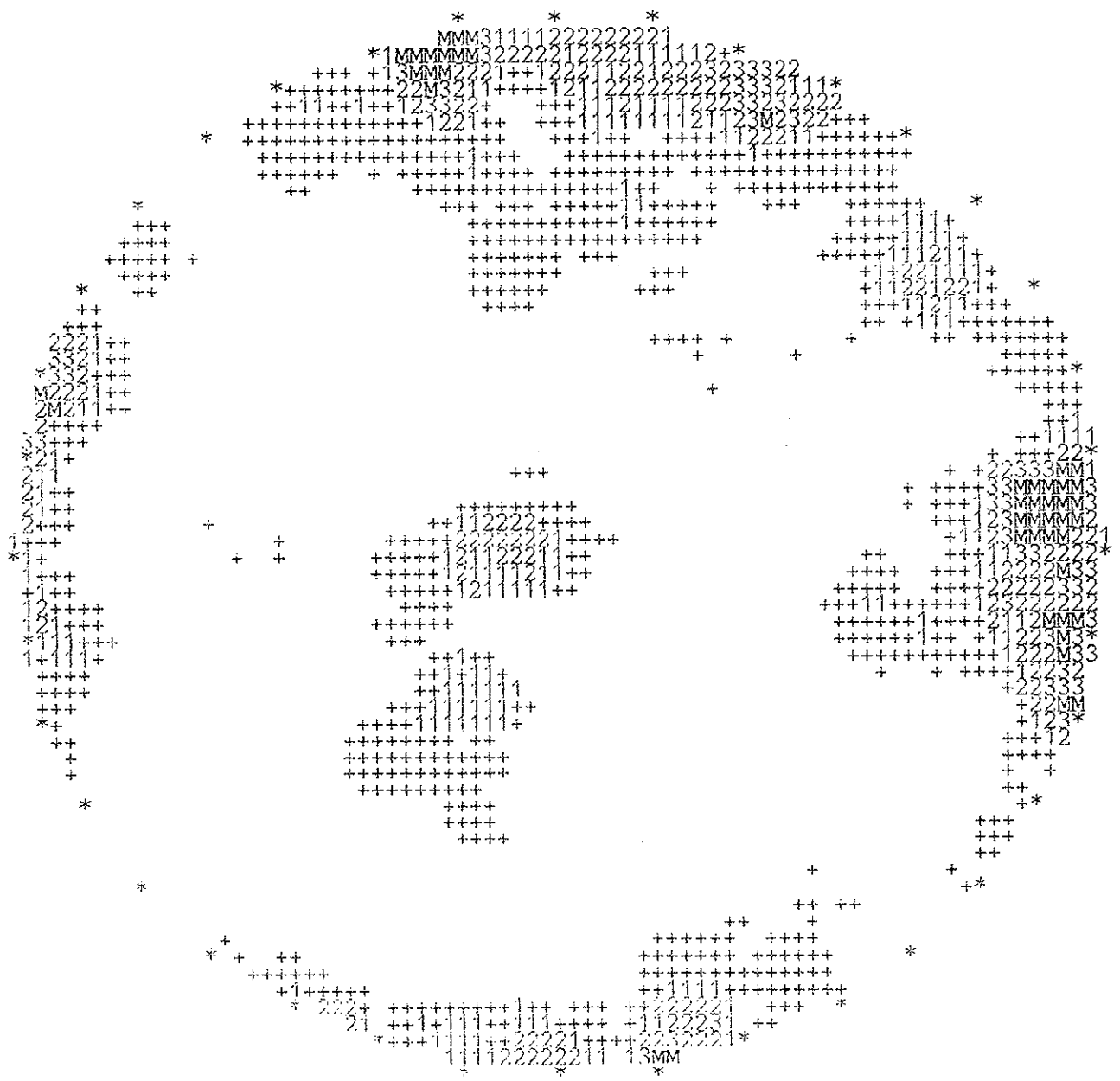
S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/1

SCATTER DIAGRAM - POLES TO PLANES

LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 252

ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/1

SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES

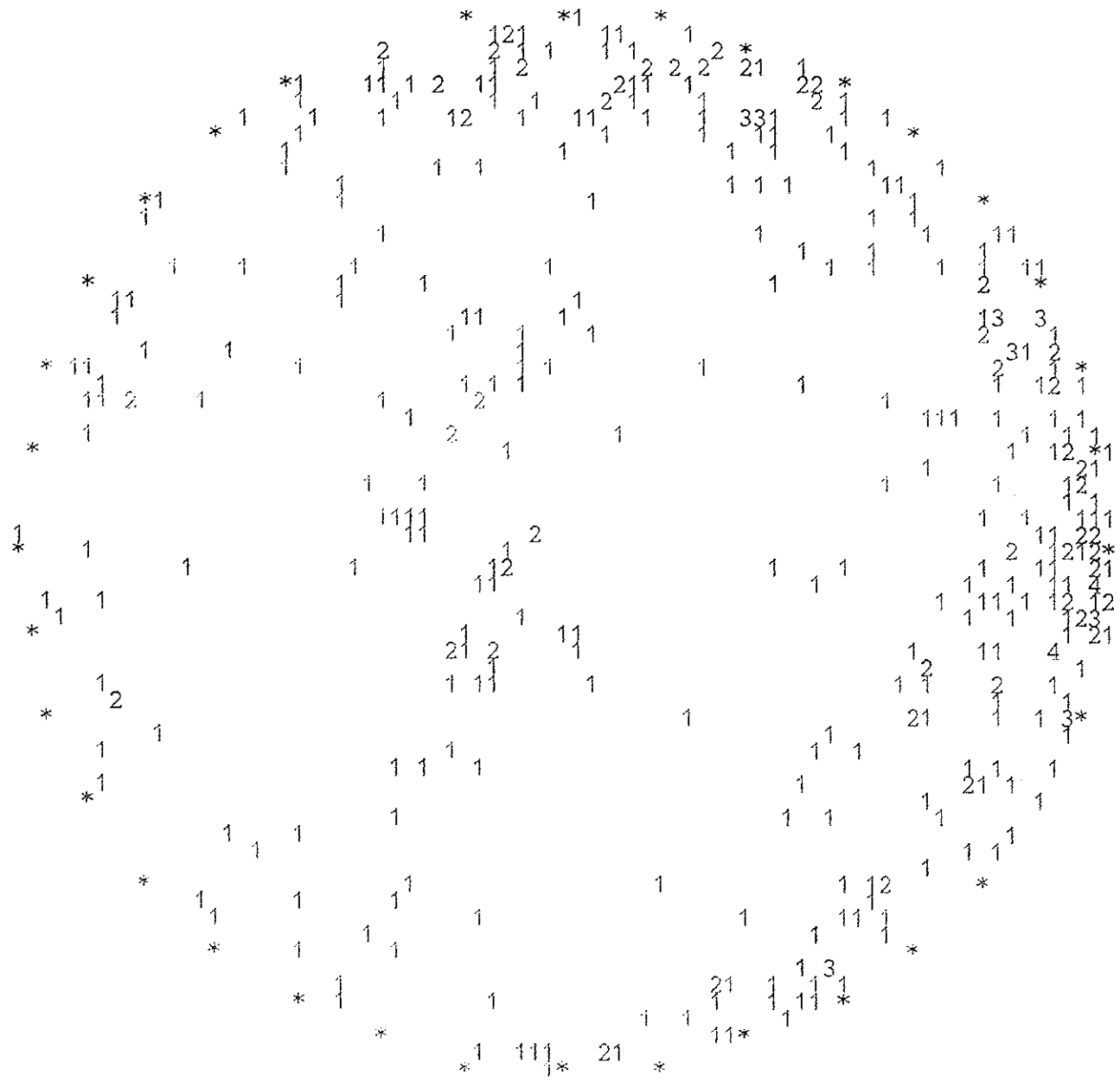
LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 252

ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

' '	<LT>	1%
'+'	<LT>	2%
'1'	<LT>	3%
'2'	<LT>	4%
'3'	<LT>	5%
'M'	MAX =	6.7



S8463/4 BORNSBY SHIRE COUNCIL -TRAVERSE 1989/2

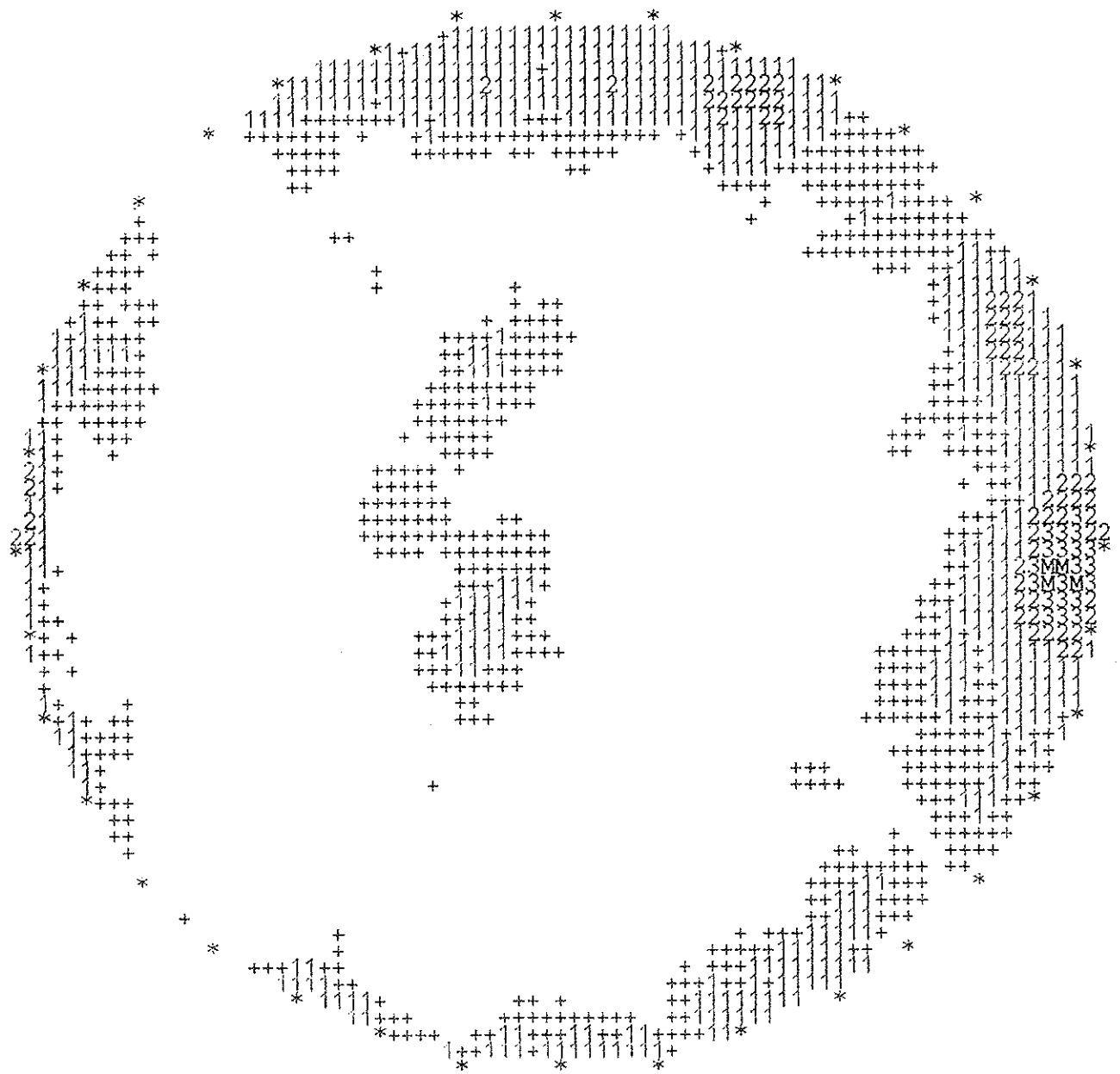
SCATTER DIAGRAM - POLES TO PLANES

LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 429

ROTATION ANGLES: 0 0 0

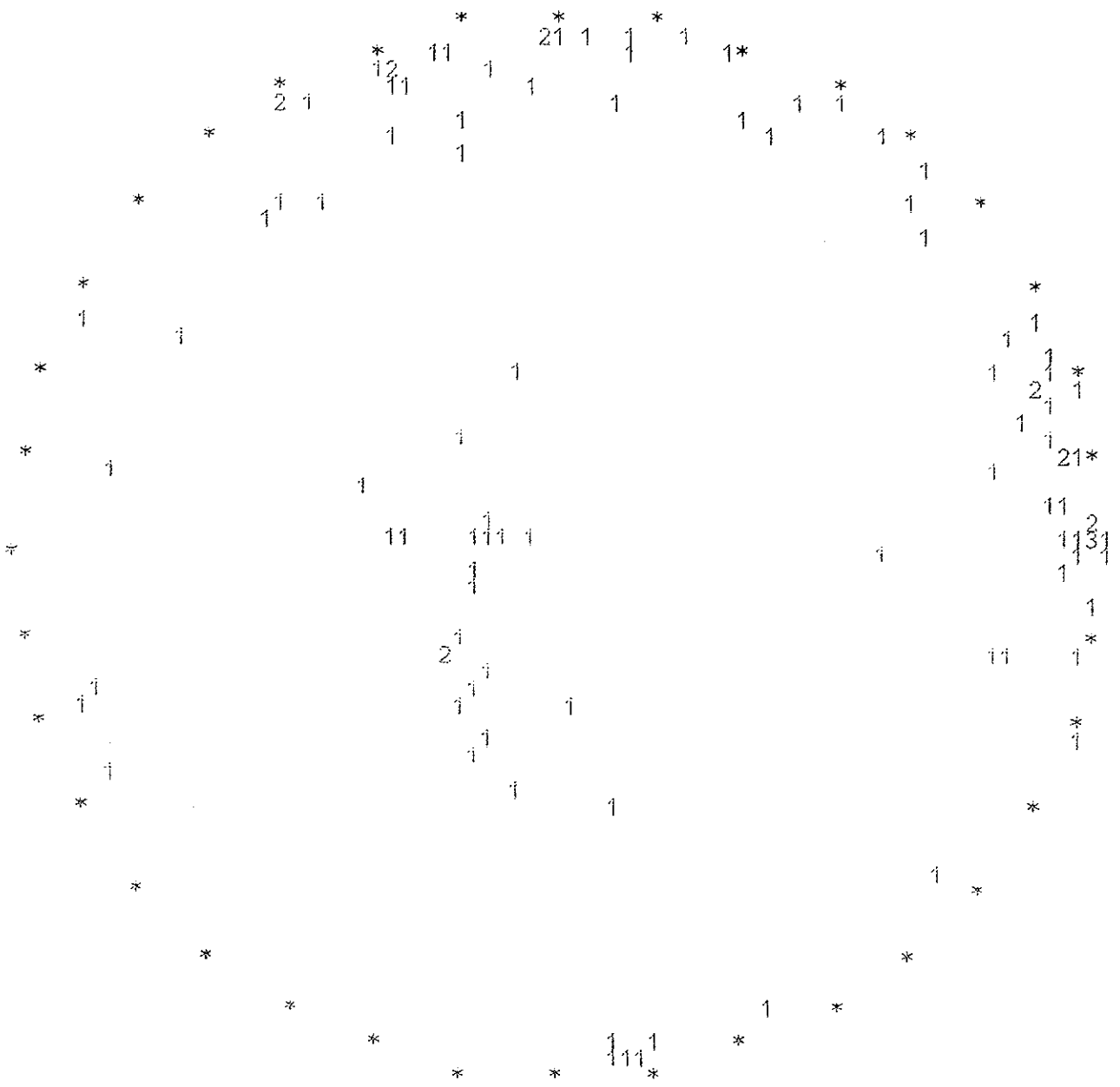
S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/2
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 429
ROTATION ANGLES: 0 0 0



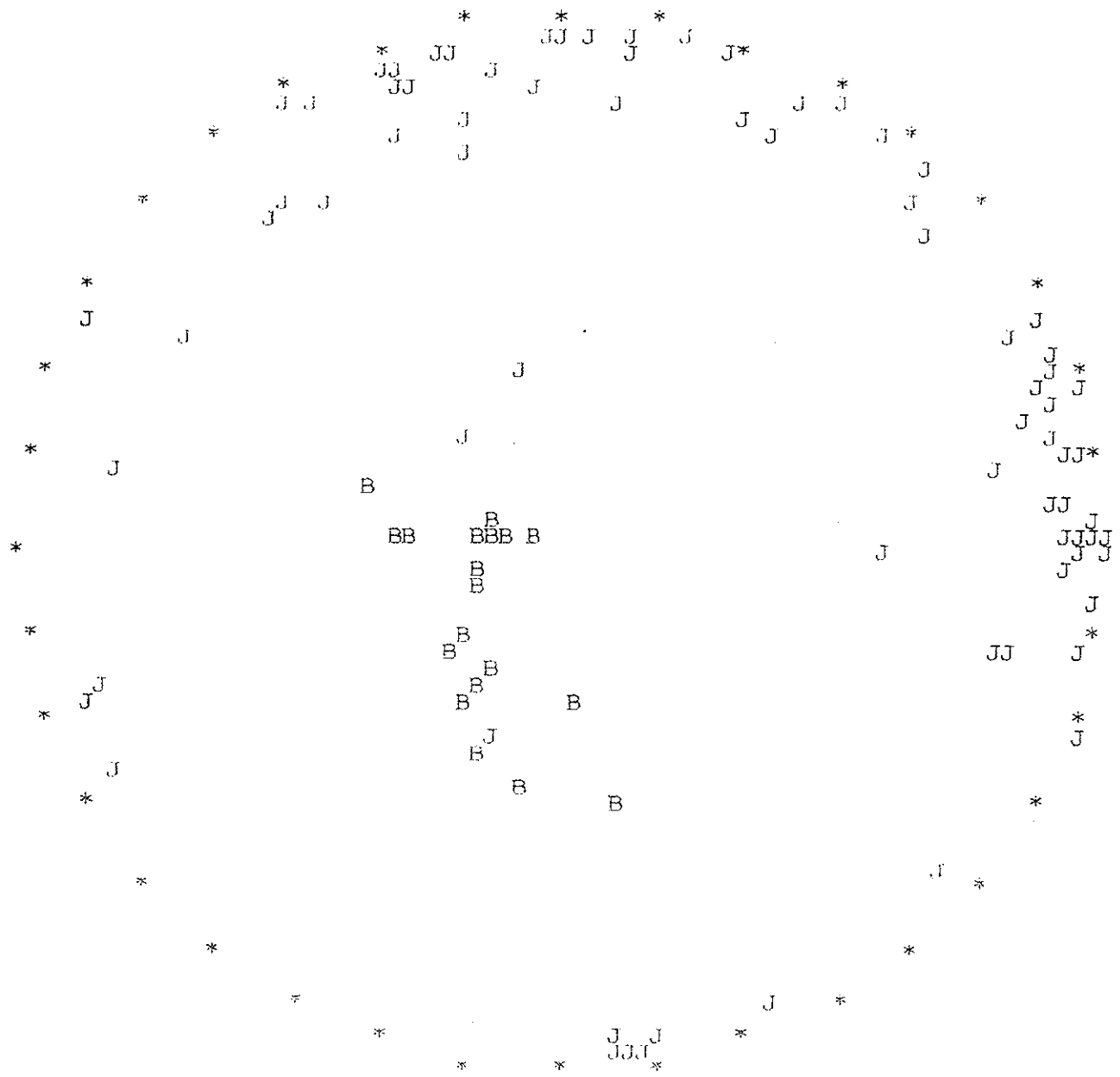
S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/2
SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 429
ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

' '	<LT>	1%
'+'	<LT>	2%
'1'	<LT>	4%
'2'	<LT>	6%
'3'	<LT>	8%
'M'	MAX =	8.6



S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/3
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 105
ROTATION ANGLES: 0 0 0



S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/3
SCATTER DIAGRAM - POLES TO PLANES
LOWER HEMISPHERE - EQUAL AREA PROJECTION
NO. OF MEASURED POLES: 105
ROTATION ANGLES: 0 0 0

S8463/4 HORNSBY SHIRE COUNCIL -TRAVERSE 1989/3

SCHMIDT METHOD - UNCORRECTED - POLES TO PLANES

LOWER HEMISPHERE - EQUAL AREA PROJECTION

NO. OF MEASURED POLES: 105

ROTATION ANGLES: 0 0 0

SHADING SYMBOLS

' '	<LT>	1%
'+'	<LT>	3%
'1'	<LT>	6%
'2'	<LT>	9%
'3'	<LT>	12%
'M'	MAX = 12.4	

APPENDIX E

TABULATION OF BEDDING, JOINT AND VEIN ORIENTATIONS - CORED BOREHOLES

APPENDIX E

ORIENTATION OF BEDDING PLANE

PARTINGS IN CORED BOREHOLES

BOREHOLE NUMBER	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)
101	58.45	9	234
	59.2	15	260
	59.5	21	201
	59.6	17	196
	64.65	12	186
	65.70	18	136
	67.4	10	000
	68.0	29	352
	69.5	18	284
	69.8	19	282
	88.45	5	213
	88.65	5	174
102	13.35	28	122
	14.4	8	115
	14.5	10	115
	24.9	27	004
	25.5	25	021
103	77.65	20	194
	78.15	10	108
	80.35	10	100
	80.45	11	96
	81.35	9	106

APPENDIX E

ORIENTATION OF JOINTS IN

CORED BOREHOLES

BOREHOLE NUMBER	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)
101	28.0	12	224	28.2	35	201
	28.35	81	340	28.55	50	167
	28.70	35	102	28.85	70	107
	29.0	70	107	42.05	70	067
	42.3	30	342	42.9	69	079
	43.2	76	079	43.35	74	099
	43.55	80	295	43.65	82	302
	44.0	73	167	44.1	38	022
	50.2	80	015	50.3	79	010
	50.4	46	127	50.5	72	132
	50.6	54	337	50.7	88	59
	50.8	31	206	50.95	50	017
	51.25	55	059	51.35	87	059
	51.45	82	062	51.70	74	231
	52.10	76	224	52.25	72	000
	52.5	48	199	52.7	44	243
	52.9	35	239	53.2	69	224
	58.0	40	211	58.1	76	010
	58.2	81	040	58.3	78	094
	58.95	72	144	59.10	78	156
	60.3	61	119	60.5	89	039
	62.15	62	146	62.25	80	074
	62.3	46	272	64.3	81	213
	64.5	68	119	65.65	78	131
	66.3	62	144	66.4	61	151
	66.5	63	144	66.6	63	149
	67.9	15	297	71.5	18	198
	72.95	44	169	73.25	81	151
	73.85	83	017	81.3	83	064
	81.95	74	154	86.7	43	109
	88.25	40	176	88.75	35	135
	89.7	44	287	89.85	85	057

S8463/4-AD
3rd April, 1990

BOREHOLE NUMBER	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)
102	13.1	40	013	13.6	10	117
	13.8	75	253	14.1	48	316
	14.2	45	322	14.6	85	354
	14.7	44	319	14.8	77	214
	16.7	46	214	16.8	30	107
	17.1	39	219	17.4	28	125
	17.5	31	125	17.6	39	034
	17.7	38	031	17.8	35	029
	24.4	42	257	24.7	66	239
	25.95	60	284	26.75	67	349
	26.95	78	239	27.05	60	264
	27.05	60	264	27.90	40	041
	28.35	32	080	28.7	47	162
	28.8	21	036	29.0	73	132
	29.1	15	095	32.6	80	046
	32.7	47	344	38.7	64	324
	47.6	47	262	48.35	56	272
	49.0	49	269	61.3	56	080
	61.4	78	344	61.5	47	339
	61.6	43	339	62.2	74	322
	62.6	88	319	62.7	89	326
	62.9	43	322	64.0	30	026
	64.25	42	014	64.35	38	021
	64.45	38	021	64.65	84	262
	65.0	41	332	78.7	38	349
	78.85	31	336	79.0	30	339
	79.5	32	053	80.2	31	351
	80.75	36	349	80.85	34	349
	80.95	41	336	81.25	70	217
	81.55	8	034	81.85	60	276
	81.95	78	187	82.1	86	272
	82.2	86	272			
103	32.5	88	251	32.6	57	045
	32.75	85	276	32.85	44	096
	78.65	70	348	78.9	70	331
	79.4	68	009	79.6	67	006
	80.2	45	341	81.9	53	252

APPENDIX E

ORIENTATION OF CALCITE VEINS

CORED BOREHOLES

BOREHOLE NUMBER	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)	DEPTH (m)	DIP ANGLE (deg)	DIP DIRECTION (deg/magnetic)
101	42.15	32	337	59.7	34	191
	59.8	31	120	59.9	33	204
	60.0	37	184	60.6	30	221
	60.85	88	029	61.40	32	034
	61.50	31	037	61.65	87	209
	61.90	19	191	62.7	32	017
	63.15	31	312	63.25	34	309
	63.35	72	049	63.45	33	317
	67.7	82	114	68.1	87	201
	68.7	30	234	69.6	82	074
	70.8	31	290	70.95	33	307
	71.2	32	037	71.35	78	193
	74.60	73	052	74.85	76	059
	76.2	75	062	77.2	73	054
	78.05	74	057	78.1	74	057
	81.85	80	106	82.7	81	184
	84.5	88	082	86.6	60	007
	88.55	70	292	88.95	87	094
	89.15	87	094	89.35	83	183
102	24.6	40	137	28.9	44	152
	61.7	74	269	61.9	78	274
	62.0	65	080	63.1	46	319
	63.65	47	324	65.2	42	319
	65.5	30	314	65.7	20	326

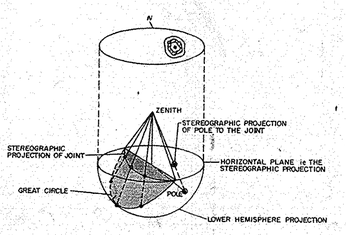
LEGEND

- BOREHOLE - GOLDER ASSOCIATES
- INCLINED BOREHOLE
- 28 STRIKE AND DIP OF BEDDING
- 1A TRAVERSE POINT
- CROSS SECTION

EW EXTREMELY WEATHERED
HW HIGHLY WEATHERED
MW MODERATELY WEATHERED
SW SLIGHTLY WEATHERED
FR FRESH

NOTES:

1. TOPOGRAPHIC INFORMATION PRESENTED ON THIS PLAN IS A COMBINATION OF OLD MAN'S VALLEY 1:500 BY H.S.C. IN MAY, 1989 AND AN ENLARGEMENT OF A 1:1000 PLAN OF HORNSBY QUARRY PREPARED BY QASCO (NSW) PTY. LTD. IN FEB, 1989.



STEREOGRAPHIC PROJECTION OF A JOINT AND ITS POLE ONTO THE HORIZONTAL PLANE FROM THE LOWER REFERENCE HEMISPHERE

Coffey & Partners Pty. Ltd. Consulting Engineers in the geotechnical sciences INCORPORATED IN QUEENSLAND

drawn	PLV/ML
approved	
date	
scale	1:500

HORNSBY SHIRE COUNCIL
OLD MAN'S VALLEY
ROCK MECHANICS STUDY
PLAN OF DEFECT ORIENTATIONS

COFFEY

drawing no S8463/4-1

job no S8463/4

LEGEND

- FILL
- GRAVELLY CLAY
- BRECCIA
- SANDSTONE
- SILTY SANDSTONE
- SILTSTONE

DEGREE OF WEATHERING

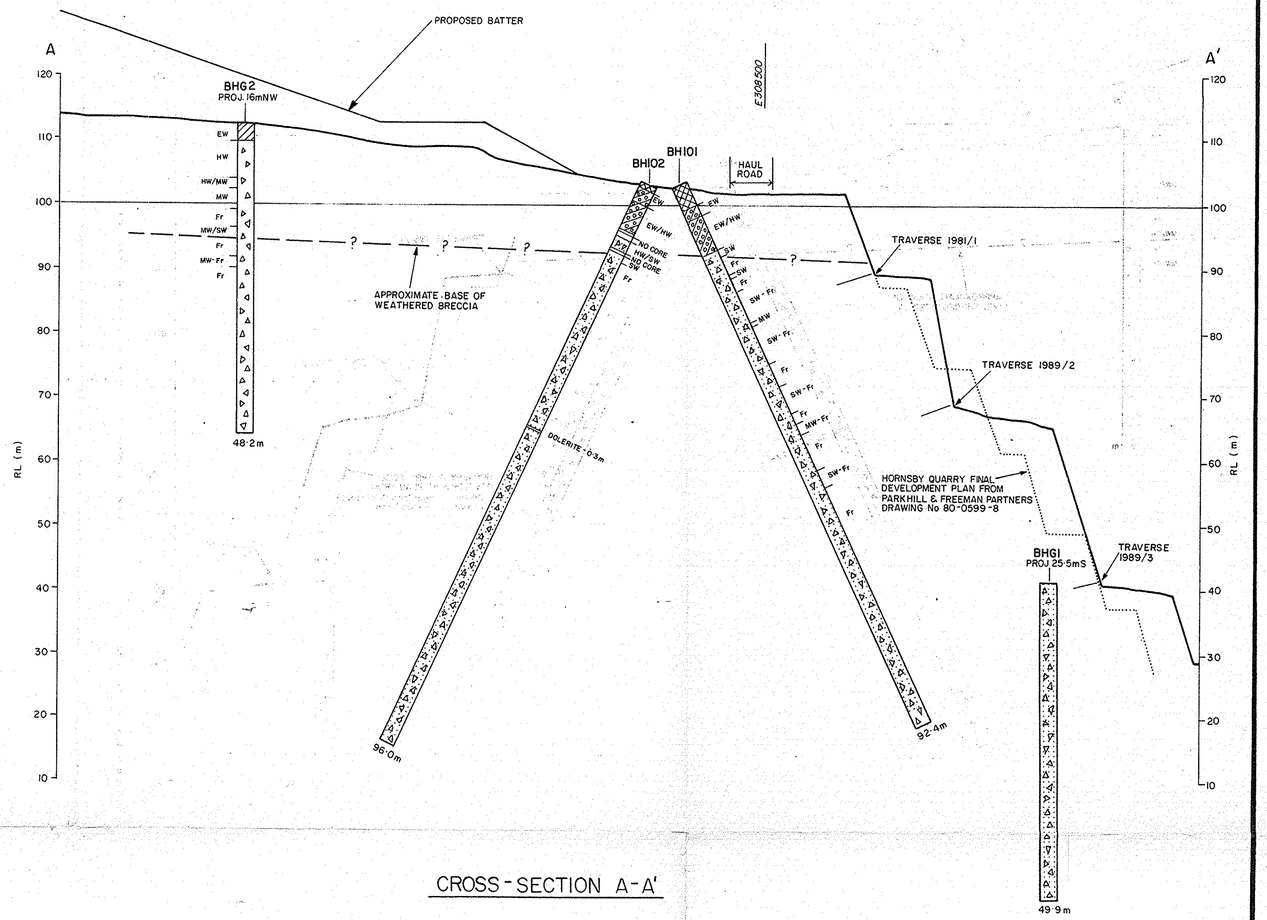
- EW EXTREMELY
- HW HIGHLY
- MW MODERATE
- SW SLIGHTLY
- Fr FRESH

GEOLOGICAL BOUNDARIES

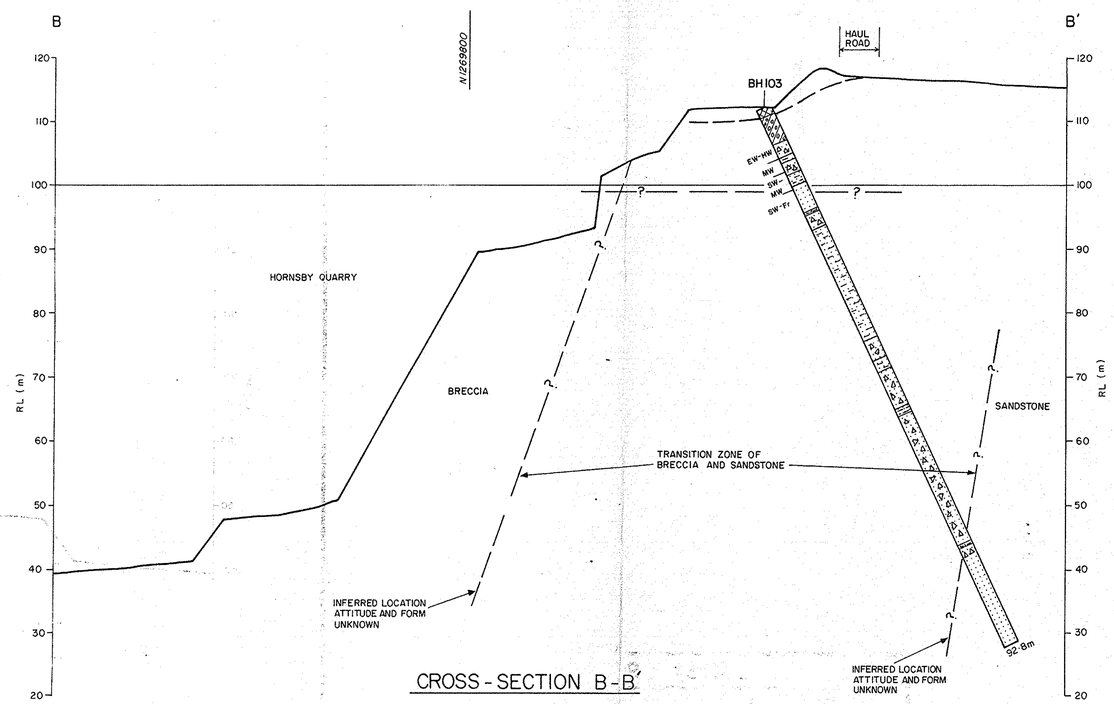
- ——— ACCURATE
- – – – APPROXIMATE
- —?— INFERRED

NOTE

FOR LOCATION OF CROSS-SECTIONS SEE DRAWING No S8463/4-1



CROSS-SECTION A-A'



CROSS-SECTION B-B'

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drawn	PLV/LT	HORNSBY SHIRE COUNCIL OLD MAN'S VALLEY ROCK MECHANICS STUDY GEOLOGICAL CROSS-SECTIONS	COFFEY	drawing no S8463/4-2
approved				
date				
scale	1:500 H&V			job no S8463/4