INTRODUCTION.

These drill holes were initially sampled in detail with the object of establishing the lithology contrasts with facies from the central parts of the Tennant Creek field. After making megascopic comparisons, the number of samples was reduced to three suites, each of which took in the major facies groups for each drill hole. This report deals with this final selection of representative samples.

The petrographic descriptions are brief to avoid repetitive description. The major features of texture, structure and mineralogy are emphasized; and classifications are given for each core sample.

SUMMARY.

There is much incompatibility between the descriptions and classifications arrived at from petrographic study; and those arrived at by megascopic logging.

The most important difference is in the classification of the "iron formations" which are considered on the basis of microscopic work, to be specific varieties of banded iron formations of the volcano-sedimentary type. As such, these "iron formations" are different from the massive hematite lodes of the central part of the field; but they are comparable with the "hematite shale" facies in which the massive hematite lodes commonly occur.

It will be seen from the separate summaries provided for each of the drill holes, that very satisfactory correlations are possible. Taken together, the set of drill holes penetrated arenaceous facies of various types in the upper sections. The intermediate sections contain the tuffaceous chloritic and/or quartzitic B.I.F. facies; and in each case, the drill holes bottomed in crystal-lithic tuff.

The various arenites and conglomerates in the upper sections can
seldom be proved to be tuffaceous sediments, but their characteristics suggest that they are. All material below these arenites is either tuffaceous sediment characterised by copious stratiform martite (varieties of B.I.F.), or they are direct pyroclastic deposits (tuff).

Incipient alteration involving penninitisation (Stage 2), carbonatisation (Stage 3) and silicification, appears in the areas of facies change from tuffaceous sediments to pyroclastics. These pyroclastics are probably sub-aqueous pyroclastics.

Small amounts of quartz-magnetite-hematite vein material with trace sulphides and gold, are contained in the tuffaceous sediments in proximity to the zones of rock alteration.

The facies sequence at Warrego South is therefore highly contract-ed by comparison with the thicker sequences elsewhere in the field. There is otherwise no significant difference since all of the facies represented at Warrego South are present as much thicker beds in various parts of the field.

A feature of significance is the presence of the tuffaceous band-ed iron formations. This feature establishes the presence of the "Specific Horizon" in this area. These martite-rich sediments may, furthermore, be the major source of the adjacent magnetic anomalies.

Depending upon the proximity of intrusive granites, the environ-ment may be postulated to have potential. In the presence of granite this setting would be similar to that of the Eldorado-Juno-Nobles Nob line of hematite shales (argillic B.I.F. equivalent), which are in proximity to the Southern Granite intrusives.

Further exploration thus involves the location and delineation of the extent of sub-surface granite; and an investigation of the influence of this intrusive on the B.I.F. sequences. The minor alter-a-tion presently in evidence, indicates that there is already some influence, but manifestations of K-silicate metasomatism should also be sought.
DDH 4.

The uppermost cores are a sequence of schistose or fissile sericitic arenites, porphyroclastic conglomerates and slates which extend to about 284ft. Thereafter, there is a sharp facies change to rocks which are tuffaceous and very similar to the banded iron formations in volcanogenic sedimentary sequences. Chlorite is a major component of these. Tuffaceous arenites and slates occur at intervals in the B.I.F. sequence which continues to the crystal-lithic tuff beds at the bottom of the hole. The only other feature is the stressed-retrograded andesite flow which occurs at about 415ft.

Evidence of Stage 2 and Stage 3 alterations was noted at 381ft. close to barren vein quartz at 370ft. There is otherwise no alteration or mineralisation of significance.

20 - 125ft. : 96ft. : sericitic sandstone.

This is a fissile irregularly granular sandstone facies containing sericite as the intergranular medium. At intervals there are thin sericitic slate lamellae.

There are only sparse felspar grains and several % small martite euhedra. The original facies, prior to metamorphism, was argillaceous sandstone with thin intercalated shale lamellae.

150 - 216ft. : 212ft. : intercalated sericitic siltstone and phyllite.

The phyllite and siltstone facies alternate at short intervals, and both display a high degree of cleavage structure.

The siltstone facies contains either oriented sericite or biotite amongst dominant silt-grade quartz. The original slate facies was recrystallised to a phyllite facies; and it consists in the various lamellae, mainly of biotite, or of muscovite, or of biotite and chlorite, with subordinate amounts of kaolinised felspars, and finer or coarser quartz.
The original facies were intercalated argillites and argillaceous siltstones.


The metamorphism was sufficiently advanced to produce a recrystallised strongly fissile and partly foliated rock. The darker foliae consist mainly of oriented biotite, with lesser chlorite and 10-20% fine grained euhedral magnetite. The lighter coloured foliae consist of evenly granoblastic quartz intergrowths with small amounts of biotite, and with either a few % or some 40% fine grained euhedral magnetite.

The palispeest structure in the quartzitic foliae preserves the aspect of pre-consolidation slump within the micaceous foliae. This structure persisted through the metamorphism.

The original sediment was possibly of a tuffaceous type involving intercalated magnetite-bearing micaceous siltstones and shales. The magnetite is an inherent clastic component.


This is an example of Elliston's "porphyroidal rocks" which he postulates to have formed by colloidal accretion of clays and of quartz, within fluidised sediments. The colloidal accretions are claimed to ultimately become the 1-2 cm diameter "clots" of felspar and of quartz.

The rock is here interpreted as a fissile conglomerate containing the components released during weathering, from porphyritic acid igneous rocks. These rocks were quartz-felspar porphyries.

The large quartz individuals retain ovoidal and embayed outlines, and they contain many inclusions of fine grained sericitised groundmass components. The large felspars include orthoclase and acid plagioclase with the usual quartz and fine grained groundmass inclusions. They retain in part, their original subhedral shapes.
These large porphyroclasts are contained by a fine grained fissile matrix composed of irregularly granular quartz and oriented sericite, with enclosed intergrowths of biotite. This matrix has grain size gradations, and changes in the quartz-sericite proportions across the bedding.


The rock displays irregular, often discontinuous and lenticular bedding by virtue of compositional contrasts, as well as changes in the grain sizes of the components.

There are sequences of slightly micaceous felspathic quartzitic lamellae in which the grain size fluctuates sharply between silt and sand sizings. The sand-grade lamellae contain grit size fragments of plagioclase, orthoclase and quartz.

There are amongst the thicker essentially quartzitic beds, thinner finer grained sericitic siltstone, and thin felspathic-chloritic-biotitic slate lamellae.

The sequence is the greenschist facies equivalent of felspathic-siltstones, sandstones and shales derived from the weathered products of acid igneous rocks.

284 - 338ft. : 286ft. : chloritic B.I.F.

This rock has the characteristics of a banded iron formation. It displays clearly defined bedding, and grain size classifications. It consists of sequences of lamellae composed of major quartz and magnetite with minor chlorite; and of major chlorite with subordinate magnetite. The magnetite grains are abraded euhedra. Thin quartz veins intersected the bedding planes.

This type of sediment is usually composed of the weathered products from a volcanic terrain; and it might confidently be regarded as tuffaceous.
-- as above -- : 297ft. : tuffaceous chloritic B.I.F.

The banded structure is less well-defined in this case; and chlorite greatly exceeds in quantity, both the magnetite and the quartz.

There are relatively thick highly chloritic bands which contain rather large biotite-kaolinised felspar fragments, single biotite individuals, and small amounts of fine grained magnetite and quartz. Most of the magnetite is concentrated into thin quartz-magnetite lamellae which contain small amounts of biotite.

This rock is very probably tuffaceous in origin since the biotite-felspar fragments may be from volcanic rock. The abundance of chlorite, and the heavy mineral lamellae containing the magnetite, are further features which suggest that volcanic products constitute the sediment.

-- as above -- : 309ft. : chloritic B.I.F.

This clearly laminated rock is a facies similar to that at 286ft. with the difference that the lamellae are very much thinner. The lamination is a function of the changing proportions of the two main components, quartz and chlorite. The abraded magnetite crystals are prominent in both the quartz-rich and the chlorite-rich lamellae.

-- as above -- : 322ft. : chloritic B.I.F.

The facies is similar to those at 309ft. and 286ft. with the differences that this one contains a higher proportion of magnetite, and in addition, epidote exists in some of the lamellae. Since the epidote is indicative of former plagioclase, the probability is that the rock is tuffaceous.

Banding is mainly a function of both the changing quartz-chlorite proportions; and of the layered distribution of the magnetite.
-- as above -- : 33\(\frac{3}{4}\)ft. : **tuffaceous chloritic-felspathic siltstone/sandstone.**

The sequence displays closely spaced bedding, and a strong cleavage structure. Within some of the thicker beds there are elongate lithic, and single felspar fragments of several mm size. The lithic fragments are from fine grained acid volcanic rock which contained felspar phenocrysts.

The sequence includes kaolinised felspathic siltstones and fine sandstones in each of which there are more or less oriented chlorite or biotite. At short intervals the arenite sequences are broken by thin lens-like intercalations of chloritic slate, with or without small muscovite crystals and magnetite.

The presence of lithic and large felspar fragments positively establishes the tuffaceous aspect of the sediment.

-- as above -- : 338ft. : **chloritic B.I.F.**

The B.I.F. is much more strongly fissile than the former examples, but it is otherwise similarly constituted of major chlorite, with subordinate amounts of fine grained partly oxidised magnetite, quartz and minor carbonates.

341 - 372ft. : 357ft. : **tuffaceous chloritic-felspathic siltstone.**

The core embodies a sequence of siltstone lamellae in which there are fluctuating proportions of quartz, felspars, chlorite and sericite. Most of the lamellae contain a few relatively large fragments of felspar, or of felspar within the fine grained quartzo-felspathic groundmass of volcanic rock. These fragments establish the tuffaceous characteristic of the sediment.

-- as above -- : 370ft. : **vein quartz in brecciated chloritic siltstone.**

The vein material, which is a subhedral granular aggregate of
well-crystallised quartz, entered the chloritic siltstone in the zones where it was brecciated. The surrounding rock was extensively silicified. Ore minerals are not contained by the quartz.

Quartz of silt-grade size and chlorite are the only components of the host rock.


The slate consists of the usual clinohlore, with no other inherent component of significance. There are both transgressive and conformable quartz-chlorite, quartz-hematite, and quartz-carbonate veinlets. Copious carbonate crystals of considerable size are also dispersed throughout most of the slate.

Some of the clinohlore was converted to penninite (Stage 2 alteration); penninite also exists as a component of the vein assemblages. The carbonate crystals within the slate were formed by replacement of the slate, hence they constitute a Stage 3 alteration phenomenon. Hematite was the only ore mineral introduced.

385 - 418ft : 415ft. : retrograded andesite.

This rock has an apparent massive structure when viewed in hand specimen, but it displays a strong lineation in the thin section. It is fine grained, and composed mainly of parallel-oriented hornblende amongst which are the sericitised-epidotised pseudomorphs of plagioclase, as well as euhedra of accessory magnetite of 1-2 mm size.

The mode of breakdown of the plagioclase is indicative of retrogressive metamorphic change through stress. This is in accord with the imposed lineation displayed by the amphiboles.

418 - 448ft : 437ft. : chloritic B.I.F.

Closely spaced banding is manifest in the distribution of the fine grained magnetite within the chloritic host rock. There is very little quartz, but the rock is otherwise very similar to those at higher
levels. The original sediment was surely tuffaceous.
Quartz-kaolinised felspar veins are present in this rock.

456 - 465ft. : 461ft. : recrystallised chloritic B.I.F.

This rock is very distinctly banded in thin layers which consist
of randomly oriented coarse grained recrystallised chlorite and
sericitised felspars, with small amounts of magnetite and secondary
quartz. There is a greater quantity of very much coarser and optical-
ly continuous secondary quartz in the thinner layers.

This is probably a recrystallised magnetite-bearing tuffaceous
rock; and because of its resemblance to others in this hole it is
tentatively regarded as chloritic B.I.F.


The well-laminated rock consists mainly of crystal and of fewer
lithic fragments which are contained within a fissile chloritic fine
grained quartzo-felspathic matrix.

The crystal fragments are irregularly shaped and unsorted in
respect to size. There are copious plagioclase, and less abundant
quartz, orthoclase and muscovite fragments. The lithic fragments range
in size to 6.0 mm. These are fine grained felspar-biotite intergrowths;
and microcrystalline quartzo-felspathic intergrowths which embody small
plagioclase phenocrysts. These are fragments of dacite; and their
composition is compatible with the proportions of major plagioclase -
subordinate quartz, orthoclase, micas and chlorite in the finer grained
parts of the tuff.
DDH. 10.

A sequence of arenaceous sediments, including greywacke and strongly porphyroclastic or conglomeratic rocks, occupies the upper 500ft. These may be directly correlated with the sequence in the upper 280ft. of DDH. 4. These rocks are considered to be of a tuffaceous nature even though positive proof of this is generally lacking.

There is a sharp transition below 500ft. to sequences of chloritic B.I.F. and tuff. Further correlation with DDH. 4 is therefore possible.

At about this transition point, rock alteration involving chloritisation, silicification and carbonatization (Stages 2, 3) is in evidence. Adjacent to this, there are quartz, quartz-epidote and quartz-calcite veins which introduced minor sulphides. There is no positive evidence to indicate that magnetite was introduced.

The bottom of the hole is in crystal-lithic tuff, thus completing the correlation with DDH. 4.

60 - 92ft. : 86ft. : kaolinised porphyroclastic siltstone.

The facies is mainly kaolinised felspathic siltstone showing poorly-defined bedding only by changes in the grain size of the quartz component. The rock contained porphyroclasts of both felspars and biotite, both of which were either kaolinised or chloritised. The sediment is considered to be tuffaceous.

185 - 209ft. : 205ft. : porphyroclastic sandstone.

The average grain size of the components is greater than in the case of the siltstone at 86ft., hence the facies is a fine sandstone. It consists mainly of quartz with subordinate proportions of felspars, muscovite and biotite. There are grain size gradations from one lamellae to another. At close intervals, there are thin discontinuous slate lamellae composed of strongly concentrated micas.
Porphyroclasts of plagioclase, and of smaller quartz fragments are distributed at random through the felspathic sandstone lamellae. The sediment is considered to be tuffaceous.


This greywacke facies displays very distinct bedding by virtue of the presence of recurrent thin biotite-rich lamellae. In contrast to this, the major felspathic greywacke facies displays very weak bedding. It constitutes thicker layers composed of unsorted assemblages of quartz, altered felspars, micas, tourmaline and small rock fragments. It is therefore a distinctly tuffaceous sediment.

The greywacke acquired a fissile structure due to the parallel alignment of most of the biotite and muscovite.

-- as above -- : 308ft. : micaceous-felspathic sandstone and siltstone.

The sequence displays clearly defined bedding. The darker coloured lamellae contain greater proportions of altered felspars, micas and chlorite, while the lighter coloured lamellae are richer in quartz. In addition to these compositional contrasts, there are both grain size contrasts and moderate grain size gradings from one lamella to another.

Clastic martite exists in small amounts in most of the beds. Both transgressive and conformable thin quartz veinlets are present.

324 - 357ft. : 352ft. : schistose sericitic-chloritic quartzite.

The felspar content is very low. There is a closely spaced repetitive sequence of thin sericitic quartzite foliae, and of thin sericitic-chloritic schist foliae. The latter are discontinuous; and they merge with the quartzitic foliae, hence the facies as a whole is a sericitic-chloritic quartzite.

Clastic martite, sphene and apatite, as well as a few coarse felspars are widely distributed through the rock.

This is an example of Elliston's "porphyroidal rocks" in which he considers the large felspar and quartz porphyroids were developed by colloid colloidal accretion.

The rock is interpreted as essentially a fissile micaceous quartzitic sediment which is a conglomeratic facies because of its content of 1-2 cm pebbles of quartz, of quartz-biotite-magnetite rock and of felspar. The quartz pebbles are ovoidal with highly embayed borders which suggests that these may have been eroded from porphyritic acid volcanics. The felspars are generally larger, and they contain inclusions of quartz, of very fine grained biotite, and of sericitised fine grained quartz-felspar intergrowths. The latter could have been the groundmass component of volcanics which contained felspar phenocrysts. The origin of these porphyroclasts can scarcely be regarded as colloidal because of their inclusions, and embayments. The fragments of quartz-biotite-magnetite rock display grain sizes which are of a size relevant to acid porphyries rather than volcanics.

-- as above -- : 377ft. : micaceous-felspathic quartzite.

The rock is a sediment with a highly irregularly granular texture. It consists of quartz, felspars, biotite, chlorite and sericite.

There is a fissile matrix which consists of oriented micas and sericite amongst fine grained quartz. The matrix encloses numerous irregularly shaped fragments of quartz, felspar, and quartz-felspar intergrowths, most of which are 1-2 mm in size. These are the coarser clastic grains from eroded acid igneous or volcanic terrain.

It cannot be shown that the coarser components are of volcanic origin, hence the term tuffaceous is not strictly justified. However, it seems probable that the sediment is a tuffaceous variety.


The tuffaceous characteristic of the rock can be demonstrated
in this example which is very much the same facies as that at 377 ft. This rock contains numerous 1-2 mm fragments of porphyritic acid volcanic rock within the dark coloured fissile matrix composed of copious biotite with quartz, chlorite, epidote, and minor mafite.

The fragments are slightly epidotised-sericitised porphyritic acid volcanic materials which contain small felspar or quartz phenocrysts in very fine grained biotitic quartz-felspathic groundmasses.


The quartzite is the very fine grained evenly granular fissile derivative of a siltstone. It consists of quartz and felspar with plentiful oriented sericite, and local concentrations of oriented chlorite. Fine grained mafite constitutes several % of the rock.

The quartzite was brecciated; and the fractures were filled by quartz-felspar-hematite veins.

---as above--- : 457 ft. : porphyroelastic tuffaceous quartzite.

The sediment is well-bedded; and it consists of successive layers of very fine grained quartz, and of others which are coarser grained and composed of acid plagioclase, chlorite, quartz, opaque minerals and zircon. The laminations are irregular and discontinuous.

Fragments of orthoclase, plagioclase, and of quartz-felspar intergrowths constitute the randomly scattered porphyroclasts of about 1 mm size. The sediment consists of the products of acid volcanism.


The tuff was probably stressed or sheared since it has a strongly fissile structure. However, it was also recrystallised, partly during stress, but also as a result of the chloritisation of the bulk of the biotite component. The original felspars were replaced either by quartz, or by calcite.

Chlorite of coarse grain size presently constitutes the bulk of
the rock, and it encloses the silicified or carbonised felspars, remnant biotite, and some 10% fine grained opaque minerals.

These alterations, and the minor quartz veining, are considered to indicate the incipient stages of mineralisation within a zone of shear in a tuffaceous horizon.

507 - 528 ft.: 525 ft.: quartz-epidote vein.

The vein assemblage consists partly of banded fine grained quartz and epidote; and partly of massive coarse grained quartz-epidote intergrowths. Minor amounts of magnetite and chlorite are enclosed.

528 - 541 ft.: 531 ft.: quartz-calcite veins in quartzitic-chloritic B.I.F.

This sediment was initially well-laminated with thin repetitive sequences of layers rich in quartz-magnetite, and in chlorite-magnetite. It is a B.I.F. of the volcanogenic type, and similar to those in DDH. 4.

The magnetite is considered to be an inherent component of this sediment. This magnetite is unrelated to the thin quartz and calcite veins which entered along certain bedding planes. These were barren veins.

542 - 547 ft.: 546 ft.: vein quartz in recrystallised B.I.F.

The rock, which presently consists mainly of coarsely recrystal-

lised biotite and magnetite, is considered to have developed from a chloritic B.I.F. Some of the chlorite persists.

Vein quartz appears in small amounts, following the rock cleavage. Trace amounts of sulphides were introduced by the quartz, but there is no relationship between the quartz and the magnetite.

547 - 556 ft.: 553 ft.: recrystallised tuff.

This strongly fissile rock consists mainly of oriented biotite which encloses fine grained quartz and felspars, coarser porphyroblastic
quartz-felspar intergrowths, and small amounts of opaque minerals, apatite and zircon. The changing proportions of biotite, quartz and felspars across the rock are indicative of the irregular bedding of an acid tuff. There is no alteration in this rock.

556 - 610ft. : 602ft. : crystal-lithic tuff.

The texture and structure of this tuff shows scarcely any modification. It consists mainly of fragments of plagioclase crystals which are irregularly dispersed amongst subordinate proportions of quartz, orthoclase, micas, chlorite, opaque minerals and fine grain-sized lithic fragments composed of quartz, felspars and chlorite. This is dacitic tuff; and it is similar to the rock at the bottom of DDH. 4. (493ft.).
DDH. 11.

Sericitic siltstone which contains clastic martite, occupies the upper 200 - 300ft. of the drill hole. This facies correlates with those in the upper parts of DDH. 4, 10.

With increasing depth, the arenaceous and chloritic sediments acquire the characteristics of B.I.F., but lose this feature below about 350ft. Beyond 350ft., there are tuffaceous arenites and tuff. The crystal tuff at the bottom of the hole is comparable with that at the base of the other two drill holes.

Chloritisation and carbonatisation are associated with quartz-magnetite vein assemblages near the transition to the tuff sequence. Sulphide mineralisation was virtually undeveloped.

172 - 190ft. : 181ft. : sericitic sandstone.

This is a simple well-laminated sediment composed mainly of fine sands and sericite, each of which constitutes separate thin lamellas. There is a small amount of biotite, and some opaque mineral granules. The rock cleavage is at 30° to the bedding.


The siltstone contains a few larger quartz grains of sand-grade size, but it consists mainly of silt-grade quartz and subordinate felspars, oriented biotite and muscovite, and of some 10% silt-grade martite. These are the products of the erosion of calc-alkaline acid igneous (or volcanic) rocks, but there is no criterion to indicate that the rock is definitely tuffaceous.

-- as above -- : 291ft. : chlorite-martite-biotite schist : B.I.F.

The schist facies indicates a sharp change from the arenaceous sediments above. The high degree of cleavage structure, and the coarse grain size of the micas and chlorite, indicate localised incidence of stress.
The schist, which contains abundant recrystallised martite, and elongate foliae of recrystallised quartz, displays a trend towards the B.I.F. facies. The original rock may have been a chloritic slate containing clastic martite and quartz, but it cannot be positively shown to be tuffaceous.


It is probable that this was a tuffaceous sediment but this feature again, cannot be demonstrated. The two intercalated facies were recrystallised to a sequence of fine grained quartzites and chloritic-martitic schists. Small amounts of biotite are contained by this schist, but it is nevertheless similar to the chloritic B.I.F. facies.

-- as above -- : 342ft. : recrystallised tuffaceous sediment : B.I.F.

The schistose rock is the recrystallised form of an irregularly granular micaceous quartzitic rock which contained small fragments of rock composed of fine grained quartz, felspars and micas. These could have been dacitic rock fragments.

Biotite and martite are major components. The biotite and quartz constitute separate and irregularly dispersed intergrowths, most of which contain copious martite and some chlorite. The altered felspars exist together with very fine quartz and micas in what appear to be separate lithic fragments.


This rock is probably tuffaceous, but the absence of rock fragments poses some doubt. It contains however, numerous small phophyroclasts of plagioclase and perthite.

The main mass of the rock is a laminated sequence of very fine grained felspathic siltstones, and of coarser biotitic-chloritic sandstones containing small amounts of muscovite and minor martite. The
larger felspar fragments are randomly scattered through both facies, as in tuffaceous sediments.

-- as above -- : 500ft. : felspathic chloritic quartzite, ?tuffaceous.

This sediment is generally similar in texture and structure to that at 399ft. It contains chlorite instead of biotite, and there is a small amount of muscovite.

It is laminated in finer felspathic siltstone and coarser felspathic sandstone, each of which contains the random large felspar fragments, as well as chlorite, muscovite, and small amounts of opaques and apatite. It cannot be positively established as tuffaceous.

529 - 609ft. : 533ft. : quartz-martite-chlorite-carbonate vein.

The coarse grained texture and the irregularly granular structure are characteristic of vein material. The assemblage is mainly quartz and martite with subordinate amounts of specularite, chlorite and carbonates. Sulphides are not present.

-- as above -- : 574ft. : quartz-chlorite-magnetite vein in tuff.

The vein material contains no sulphides, and only small amounts of magnetite within the quartz-chlorite intergrowths. This vein material penetrated along shears within a partly recrystallised chloritised-epidotised crystal-lithic tuff.

The tuff consists of altered biotite, fine grained felspars, quartz and martite, amongst which there are numerous 2-5 mm fragments of fine grained rock composed of quartz-felspars and micas. These are considered to be portions of acid volcanics which were partly re-crystallised by the incidence of stress.

-- as above -- : 597ft. : quartz-magnetite-chlorite-carbonate vein.

The vein assemblage is moderately coarse grained, with a decussate structure which is manifest mainly in the chlorite. Magnetite is
complexed with both the chlorite and the quartz which are the major components of the assemblage.

The calcite occurs amongst the chlorite and within the magnetite individuals. There is a small amount of green biotite remaining within cleavage traces in the chlorite, thus indicating that biotite was formerly a major component. This vein material contains traces of sulphides.

609 - 647ft. : 616ft. : crystal tuff.

This is a characteristically poorly sorted, very irregularly granular tuff composed mainly of oligoclase and potassic felspar crystal fragments. These are dispersed in great abundance within a much finer matrix medium composed of quartz, chlorite, finer felspars and minor magnetite. There are only small numbers of distinguishable fine grained lithic volcanic fragments.

The tuff is generally comparable with that at the bottom of DDH. 4 and DDH. 10.

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