

APPENDIX C

DESCRIPTION OF LOCATIONS

All levels are in metres above ordnance datum (A.O.D.), unless otherwise stated, and any values in feet refer to depths below surface.

DRAWING NO 1

Roman Shaft - 135m Level

An extensive set of generally 18th/19th century workings accessed via the 145m level (60 ft. level) in Roman Shaft or from the 'wagon gate' level at 121m (150ft.) level in Treweek's Shaft. Many of the workings on the northern section have clearly been driven using drill and blast techniques, while workings centred about the main stope show signs of secondary enlargement of older workings by blasting. Continuing south, these indications for early activity become more obvious with increasing numbers of stone hammers, spoil with charcoal fragments, and characteristic worked surfaces.

A number of 19th century artefacts and stone hammers were discovered in these workings and those on the 123m level during the late 1960s. Many of these were subsequently removed by members of the Shropshire Caving Club and later explorers. They are now in the possession of Great Orme Mines Ltd. and displayed at the mining centre.

Location 1

Some rock surfaces within this area, heading north, display profiles consistent with early activity. However, secondary enlargement and production working from the last century has destroyed many of these features, so they are not entirely obvious. The direction and elevation of the passages towards the south provide indications of former, now buried early entrances in the vicinity of the small Water Board building marked on the plan. During the 1970s it was possible to see the underside of iron water pipes that connected with the nearby reservoir. Collapse of material around these pipes has now covered and obscured them. An attempt to relocate this entrance during a reclamation work at the site in summer 1989 was unsuccessful.

Location 2

At least four hammer-stones are known from this area and the passage directly north. Traces of early worked surfaces imply that access was gained to these areas by at least

two entrances at the southern extremity of these tunnels. The original entrances are now partly collapsed from weathering and buried beneath mining spoil from last century. Mineral deposits are confined to rotted dolomite directly underlying a mudstone horizon of at least 400mm thickness, with ore minerals exploited in horizontal bands under the mudstone and vertically within the dolomite.

Location 3

A location where 19th century workings have clearly broken into and partly enlarged earlier workings. Mineral exploitation occurs horizontally beneath a unit of mudstone and vertically through the overlying dolomitised strata. The vein at the eastern extremity clearly exhibits all the signs of an early working, with charcoal occurring in sufficient quantities for possible dating. In places the spoil contained within this vein is partly cemented by calcite, indicating a ground water flow from above, possibly with a direct route to the surface. Pieces of chert within the spoil may also suggest emplacement from a higher stratigraphic level where this material is known to occur, having reached this location by collapse or backfill from a working above.

Location 4

This area clearly displays all the signs of 19th century activity with a number of levels driven along the mineral veins, with connections to workings above and to the 123m level below. Because of the complexity of the workings in this area not all of the connecting passages are shown. Generally, these workings are thought to represent those referred to in 1854 as 'Lester's workings' (Vivian 1855). A few 19th century artefacts are also known from this location.

Location 5

Workings here represent one of the more impressive undisturbed systems of early workings on the Great Orme. For clarity the total extent of the mined area is not shown, partly because of the overlapping nature of the passages and also because of the complexity of the inter-connecting system of early and 19th century tunnels. This entire area was discovered during the mid 1970's when an amateur archaeologist excavated through into this area (James 1990). Excavations provided charcoal for the first C14 date for the Bronze Age mining in the British Isles of 2940 +/- 80 BP (HAR-4845). The excavated site exhibited all of the features and artefacts that now characterise early workings on the Great Orme. These include stone hammers, fragmented and complete bone, charcoal from fire setting, characteristic passage morphology, and sequences of calcite flowstone up to 300mm thick with underlying calcite cemented spoil. At least

three levels of early activity were identified, the lower two exploiting ores confined to rotted dolomites beneath units of mudstone, while the upper level has worked the base of a 0.5m thick bed of mudstone containing obvious malachite.

The orientation, flow of ground water and system of back-filling indicates that the entrances to these workings lay to the south, probably driven from a cliff face that would have bordered the northern side of the main opencast. Evidence would suggest that the entrances lay towards or beneath the road to the summit, now buried beneath 10-15m of mining spoil. Samples of calcite flowstone from here have been submitted to Liverpool University for Uranium series dating (see section 5.3).

Treweek's Shaft 135m level

Location 6

A limited sized 19th century working exploiting three minor veins within dolomite and limestone with chert nodules. The continuations of blocked veins to the north appear to connect with workings above, some of which, because of their constricted dimensions may indicate the possibility of early activity. The unusual occurrence of a sheep skeleton located towards the eastern end of the main cross cut suggests the animal does not appear to have fallen into this working and is more likely to have been deliberately placed here.

Opencast

Location 7a

An important area of early workings accessed via a level ('Jackdaws Hole') and shaftway off the eastern side of the open cast . This working displays many of the characteristic features of early activity, notably smooth curved profiles to the passages, bone tool marks, impressive deposits of calcite flowstone and the best example of stalagmite and stalactite formations so far observed through the mine complex. Sequences of spoil with charcoal and bone tools and a single stone hammer are also recorded. There are very few signs of recent activity in the main passage, however there is evidence of pick work and some timbering in the approach passages. No drill holes from blasting were observed.

Another unusual and interesting find was the skeleton of a cat, which, judging from it's position appears to have been purposely placed here. A total of three cat skeletons, a dog and a two sheep are known from various locations through the mine complex. All of

these appear to have been deliberately placed in passages accessed off shaftways. They clearly could not therefore have fallen or wandered to their present positions. It is thought these deliberate placements of animals could be related to miner's superstitions and beliefs that are known to have existed during the 18th and early 19th centuries.

At one location in the diagonal passage on the west side of this area, two hollows in the dolomite wall were found to contain nests of elongate fragments of charcoal. Normally charcoal from fire setting is irregular, almost blocky in shape and these elongate fragments therefore seem unusual and could perhaps relate to some early form of lighting.

All of the above evidence supports the view that the main passage is in a largely undisturbed condition, highlighted also by the fine state of preservation of the stalactites. These do not appear to have been damaged - like so many of the calcite formations in the workings, which were deliberately destroyed last century in the search for ore overlooked by the so called 'old' or 'early Welsh' miners.

The limited pickwork seen within these workings and in a nearby surface shaftway situated on the east side of the opencast, could imply a period of activity prior to the main phases of drill and blast methods that tended to be introduced during the period from 1700 -1750. The pickwork could therefore represent activity anywhere between the Bronze Age and circa 1700.

Clearly this set of workings has the potential for further investigation, and may represent one of the few known largely undisturbed sites of early mining activity. A uranium series date on calcite flowstone and a radiocarbon date on charcoal from this area confirm the observation of other evidence that these workings are of a Bronze Age origin.

Location 7b/7c

A series of exclusively early workings underlie the rock mass on the west side of the opencast. Access to these areas was gained during removal of spoil from the opencast during winters from 1991 to 1994/95. Generally there are few signs of recent disturbance within the underground workings. Like many other areas, deposits of spoil infill some of the passages, denying access to what appear to be interconnecting network of passages, a proportion of which remain buried beneath the main mass of spoil at the northern limit of the opencast.

Copper mineralisation occurs throughout the veins within the rotted dolomite, with former extraction producing the characteristic smooth rounded profile of early activity. Often the impressions of bone tools are retained in areas of the softer rock, while the harder vein wall displays 'pock marks' attributed to working by stone hammers. Limited quantities of fragmented charcoal from likely firesetting also occur. Mineralisation terminates abruptly at a thick mudstone horizon (Pyllau Mudstone), this forms the roof to some workings, and is seen outcropping as a weathered and friable reddish-purple unit on either side of the opencast. The undisturbed condition of these workings provide an ideal area for future study, probably representing some of the first true underground workings at the site. The need to control access and excavation here is therefore important.

At the time of writing (July 1995) further areas of early mining activity continue to be uncovered during an excavation programme of surface spoil. New areas having been located to the north-west corner of the opencast. Two samples of charcoal from a small gallery on the north-western cliff of the opencast have provided C14 dates of 3220+/-70BP (BETA-65895) and 2970+/-70BP (BETA-65896).

Owens Shaft 133.5m level

This level provides one of the more marked contrasts between early workings and those of a distinct 19th century nature, with the eastern cross-cut from the shaft acting as the main boundary. To the north, virtually all of the passageways are cut using drill and blast methods, having roughly rectangular profiles, driven through dolomitised limestone, with mudstone forming the ceiling level. A few 19th century artefacts are recorded, but nothing of great interest, only a few chisels and some timbering. The southern set of passages are all clearly of an early origin with numerous hammerstones, spoil with fragmented charcoal, together with some calcite flowstone and occasional areas of calcite cemented spoil. Unusually, no bone tools have been found at this location.

Location 8

An area of stoping rising about 6m, with an upper section infilled with early spoil, placed or collapsed from some working at a higher level, with even the possibility of direct connections to an original surface. It appears this is an early working along the vein, the base of which is disturbed by 19th century prospecting. A large hammerstone was observed 5m to the south of the stope.

Location 9

Here a 19th century eastern cross cut intersects the northern extremities of two early mined tunnels from the area of location 10. The contrast between these two periods of workings is very distinct. The earlier passages are confined to the mudstone horizon forming the top section of the cross-cut, and are decorated with many small stalactites and calcite flowstone that has cemented much of the back-filled spoil.

Location 10

A small window in the side of the cross cut leads into an extensive area of relatively undisturbed early workings. The ore body here appears to have been confined to the base of a thick horizon of mudstone (500mm) that is directly underlain by a bed of partly rotted dolomite (400mm), itself separated by a thin unit (20mm) of mudstone from the dolomite beneath. This sequence of mudstone-dolomite-mudstone must have provided an ideal host for mineralisation, and its subsequent easy removal. Consequently, many of the resulting passages are rather low, between 0.5-1.0m in height, but are extensive laterally.

Mineralisation is confined totally to the above described horizons, with beds dipping to the north at 5-7 degrees. By extrapolating the inclined beds to the south it appears the original entrances to the workings lay in the fields approximately half way between Owens Shaft and Pyllau farmhouse. However, the passageways towards these original entrances have collapsed, due predominantly to the fractured nature of the mudstone and dolomite. Undoubtedly surface processes and ground water coupled with mined out areas has weakened the rock partly by accentuating existing fractures and also by creating new ones. The main ores observed here are malachite and azurite. They are confined largely to the junction of the mudstone base with the underlying dolomite.

Much of the spoil encountered within the workings contain small fragments of charcoal, on average 2-5 mm across. This appears to be fairly evenly dispersed, but occasionally concentrations of larger fragments are found. Firesetting must therefore have been utilised extensively in this area. Much of the generated spoil is found back-filling many passageways and the laterally extensive workings. At certain locations some of this material has been deliberately cleared and faced off with stone walling, which is thought to have been constructed by more recent miners prospecting these older workings. These workings display one of the best collections of complete and damaged stone hammers found throughout the known mine. A total of 16 implements have been recorded, with many in what appear to be *in situ* positions, carefully placed to one side of the passageway or sometimes in groups of two or three. A number of areas which display the

characteristic 'pock' marks made by these tools are also present.

One of the most unusual features of these workings is the total absence of any bone tools or associated tool markings. It would appear that ores from here were exclusively removed by fire setting and use of stone hammers. It may be possible, as discussed in section 4.3, that bronze tools may have been used at certain locations in the mine, as here, where there is an absence of bone tools. Perhaps these particular mining techniques represent an improvement in mining methods corresponding with later stages of development in the mining complex, when bone tools were superseded by bronze tools. It is hoped that C14 dates from this area will help to further this argument.

The passageways to the north-east of location 10 exhibit a number of small stalactites up to 100mm long. Towards the centre of the passageways, many of these formations have been damaged, probably by recent miners exploring the workings. Nearly all display some secondary growth where the original broken surface has been covered by new calcite growth of a few millimetres in thickness. To the sides of the passage and in adjacent working areas the stalactites are complete. This simple observation therefore provides an indication of the growth rate of the stalactites, suggesting that relatively recent exploration has partly damaged these formations. It may eventually be possible to determine the growth rate of these stalactites so that the time of disturbance to these formations can be determined.

Location 11

At this location a 19th century level driven from the south using drill and blast has undercut the earlier workings. A shaft driven upwards from this level has holed through about 1.5m of rock into the earlier tunnel, which is partly filled with spoil up to 0.8m thick. Fragmented charcoal occurring as distinct horizons within the spoil is to be submitted for C14 dating.

DRAWING 2

Roman -Treweek's Shaft 121-124m level

This is an area of exclusively 19th century workings, similar in some respects to those at the 135m level, but exhibiting fewer features and artefacts indicative of early mining activity. The ore body tends to follow the base of two defined mudstone horizons, an upper one 1.0m thick (base of Pyllau Mudstone), separated by a unit of dolomite 1.0-1.2m thick from the lower unit 0.3-0.4m thick. Various 19th century tools and artefacts are known, including chisels, shovels, chain, shot hole scrapers, iron mugs, flange pipe, straw fuses, clay pipes, and leather clogs. Many of these remain *in situ*, some have been retrieved for display purposes.

These workings linking with ones above are likely to correspond with descriptions given by mine Captain William Vivian who in 1855 refers to this area as 'Lester's Workings'.

Location 12

A junction of passages, known as the 'Wagon Gate' links a series of working with a tramming level of cross head rail that connects to Treweek's shaft. A passage to the north east leads via a small shaft 5m high to the 135m level.

Location 13

A flow of air and water seepages at this location strongly suggests a former link to surface or to others areas of workings. At present, the collapsed and unsafe condition of the mudstone roof prevents further continuation through a passage which has the appearance of an early working and is conjectured to have once connected to the main opencast towards the south. Any excavation to find a route here would require rock support. Another collapsed passage directly to the west also exhibits the characteristic shape of an early working.

Location 14

This passage is partly enlarged by drill and blast from the northern end, while the southern section is clearly of an early origin. At the southern extremity, behind a short drop to a lower level, back-filled material conforms with descriptions of early spoil containing fragmented charcoal. Many of the workings to the north are likely to have been enlarged along earlier and more restricted routes. It is likely that a thorough investigation of ways to the north and south east of this location may prove that early activity was more extensive than originally envisaged here.

The short drop mentioned above leads to a narrow northward trending lower passage containing a pair of miner's clogs. These are likely to have been placed here as part of the folklore traditions in the 18th -19th centuries, connected with the belief of making offerings to mine spirits known as "knockers".

Location 15

Routes here link with other south and south-east trending mineral veins. Many are at a higher elevation than the main level from the 'Wagon Gate', and eventually link through a passageway with a collapsed mudstone roof to a shaftway rising to about 8m. These upper workings are predominantly recent and contain lengths of pumping pipe, two clay pipes and unusual initials of the miners written in candle soot on the ceiling of the working. Investigation within this little visited area may prove worthwhile for identifying new evidence for early activity, although a certain amount of clearance will be necessary to provide a safe route for access.

Location 16

The mineral vein here has been worked through the thick unit of mudstone. A number of interesting minerals have been recorded, including needle like crystals of gypsum (variety - selenite), jarosite, olivenite (copper arsenate) and erythrite (hydrated cobalt arsenate). This unit of mudstone is the same unit which is exposed within the first section of the passageway northwards from the 'Wagon gate' (location 12).

Owens Shaft 123m level

Workings at this level are exclusively 19th century, agreeing with descriptions given in the Mine Managers reports from last century (Vivian 1855). At least five mineralised fractures were observed, striking through similar mudstone-dolomite formations to those described in Roman Shaft. The southern extremity of the main passage terminates in a short winze 4.5m deep, with stacked rubble facing a back-filled continuation along the vein, while the northern extremity ends in a flooded passage about 5m in height. Generally, the indications are that very little ore was gained from this level.

Vivian's Shaft 115-123m Level

A complex system of interconnecting passages at differing levels characterise these workings. For simplicity of presentation only the most obvious ways are included on the

drawing. None the less, the plans do give an impression of the scale and extent of known and potential evidence for early mining in this area of the Great Orme.

Location 17

Up until December 1990 this entire area lay beneath up to 12m of spoil. By careful removal of this material, part of the original prehistoric mined landscape has been exposed. Here the dolomitised limestone has been worked along several mineralised fractures, forming grooves or trenches in the exposed rock. Mineralisation terminates at a bed of pale fine-medium grained sandstone, 1.5m thick, and then appears again within the underlying dolomite. This sandstone forms a controlling horizon for the mineralisation, defining the route of the entrance passages ("tourist route") and also other locations, notably the large chamber at Location 18. Mineralisation is observed to comprise chalcopyrite altering to goethite with secondary carbonates of mainly malachite with some azurite.

A number of stone hammers, bone implements and associated tool marks are recorded both from spoil at surface and underground. The eastern limb of the 'tourist route' (ref. 219) also contained accumulations of calcite flowstone which capped sequences of early spoil. Sections of this flowstone damaged by miner's last century and further removed by GOML have been submitted for Uranium series dating.

Location 18

This large chamber was considered to be the result of 19th century activity when re-discovered in January 1989. However, further examination with limited excavation of back-filled spoil provided a number of hammerstones and bone tools. More detailed excavation identified sequences of early and recent spoil, with earlier material confined to the north-eastern and south-eastern boundaries where the chamber connected with more restrictive sized workings. These two sites provided items of bone from stratified contexts which have been C14 dated to 3230 +/-50BP (BM-2751) and 3070 +/-50 BP (BM -2752). Continued investigations of the chamber have revealed stone tools, numerous bones with associated tool marks and fragmented charcoal. Many rock surfaces in the chamber were also similar in profile and form to those identified at other locations as being indicative of early mining. This information therefore supports the view that the majority of the chamber is in fact the result of Bronze Age mining, with final enlargement to its present form occurring during the 18-19th centuries.

The chamber measures 10 x 15 m across and is up to 8m high in place, with an estimated

extracted volume of about 500 m³. This really gives an impression of the quantity of ore removed by the early miners. A number of both early and recent passages radiate from the chamber, generally they trend to the north and south, with fewer and smaller passages to the east and west along minor cross and oblique veins. Shaftways in the floor of the chamber are known to connect with further workings to the 100m A.O.D. level.

Location 19

A 19th century cross-cut driven from the large chamber (location 18) leads to a complicated and often tortuous network of early workings forming three distinct but interconnecting levels. Generally, these passages, some of which are backfilled, follow the ore body laterally while others are confined vertically to the more prominent veins, with probable connections to the surface. Disturbance by recent activity at some locations is minimal, comprising only of removal of early spoil backfill and limited prospects by iron pick. Characteristic evidence for early activity includes, hammerstones, bone tools, fragmented charcoal, characteristic shaped passages and well preserved bone and stone tool markings.

Location 20

Here, two 19th century routes have intersected an area of early workings, evidence includes fragmented charcoal, characteristic passage morphology and calcite cemented spoil, with minor calcite flowstone and stalactite. The orientation of the workings indicate an original access from above, along the line of the north-south zones of mineralisation, possibly coinciding with the base of the opencast. A small quantity of charcoal has been collected here, but not in sufficient quantity to justify radio carbon dating. Part of this area was exposed during excavations through the winter of 1995-96 by GOML as part of an extended tourist route.

Location 21

The passage here, leads to a tortuous system of interconnected early workings that trend predominantly to the south. Particular locations have provided a number of interesting finds covering the complete suite of evidence for early activity. At one site a stratified sequence of early spoil partly fills one narrow tunnel, between 0.3-0.5m wide. A detailed excavation of which has provided numerous fragments of charcoal, some unusually large, up to 30mm across. Sampling of this material gave a C14 date of 3000+/-50 BP (BM - 2641).

Other finds from the same spoil deposit include numerous small fragments of bronze

between 2-10mm in size. Initially, two fragments found during charcoal sampling prompted more detailed investigation of the spoil, leading to the detection of about 70 fragments, many of which were located by careful sieving and limited use of a metal detector. Recent analysis of two fragments at Bradford University indicate compositions similar to the Acton Park series of axes, conventionally dated between 1400-1250 BC (Budd, *pers. comm.*).

Continuing workings from this location proceed generally to the south to depths of about 7m (108m A.O.D. level). Some are barely wide enough to pass through. Many are totally or partly back-filled with spoil or collapsed rock, and some are partly filled with cemented spoil, giving the impression these workings are more extensive than they appear. In general this area has seen little disturbance from recent activity and so many of the original early features and artefacts have been preserved. At one location a vein wall of dolomite is pitted by hammerstone markings, while towards the roof, where the vein pinches, the softer rotted dolomite displays the marks of bone tools. Mineralisation throughout this system of passages is predominantly confined to rotted channels of dolomite comprising carbonate ores and partly altered chalcopyrite with goethite.

Unfortunately, severe thunder storms and associated flooding of the mine entrances in July 1993 caused quantities of spoil to be deposited, blocking off about 60% of the workings accessed from location 21.

DRAWING NO 3

Owens Shaft 112-106m Levels.

A cross cut from the 112m level leads to two systems of workings. The main shaft continues for another 10m where continuation is blocked by rubble.

Location 22

This is an area of 18th and 19th century workings exploiting at least three veins that pass through dolomite and overlying mudstone. In a few places earlier workings, many largely back-filled are intersected. Evidence includes spoil with fragmented charcoal, damaged and *in situ* calcite flowstone up to 70mm thick and early mined surfaces. Access to these early areas is thought to have been originally from the south.

Location 23

Access to this system of working is limited because of flooding during wet weather of the main level from the cross cut. Limited evidence for early activity comprises of spoil containing fragmented charcoal, characteristic mined surfaces and deposits of calcite flowstone. A program of charcoal and calcite sampling from this and location 22 are planned.

Location 24

A large shaftway has been blocked above and below by collapsed masonry lining and spoil. The location of this feature on surface is thought to conform with the location of "Higher Shaft", one of the main pumping-winding points during the 19th century. This is the only place where the shaft can be observed, as all other evidence on surface and underground has been lost due to collapse and or back-filling. Recent explorations (October 1995) have discovered a link from here through a series of partly collapsed workings to location 35.

DRAWING NO 4

Treweek's Shaft - Vivian's Shaft 90-110m Levels

These workings describe the extent of early and industrial age mining activity exploiting two main north-south zones of mineralisation: Roman to Vivian's and Treweek's to Owens. For clarity of presentation only the main routes between Vivian's and Treweek's shaft are indicated. Future work to subdivide these extensive interconnecting workings will be necessary to fully interpret the true complexity of these workings.

Location 25

Occasional stone hammers are found in these typical 19th century workings, suggesting that early activity may have occurred to these depths (70m below surface). More detailed examination of these passages may confirm if this is the case. However, this would require a certain amount of excavation of recent spoil from stopes and back-filled tunnels in order to reveal potential early workings.

Location 26

A system of rising stopes and passages extends to a height of about 15m (106m A.O.D.) to where calcite cemented spoil infill prevents further progress. Fragmented charcoal, bone and stone hammers are recorded here. The form of the workings implies that the original access was from above, following the line of worked out veins from higher levels with possible direct links to the former ground surface (140m A.O.D.). These areas are thought to be the deepest early workings known throughout the mining complex.

Mineralisation is confined within at least three veins to the northern section of the marked area, while to the south the workings exploit a laterally extended ore body beneath and within the base of thick mudstone (Pyllau Mudstone). This mudstone, being similar to other locations where it occurs, has become unstable causing collapse and blockage to adjacent workings.

Location 27

Stoping rising to 12m (105m A.O.D.) is likely to link with early workings similar to those at location 26. Unfortunately, the loose and collapsed roof and side walls prevent further investigation above. Other stopes below this area link to extensive 19th century workings at depths of about 15m (78m A.O.D.).

Location 28

Two linking solution cavities define the limit of dolomitisation in the limestone at this location, and correspondingly the limit of copper mineralisation. Deposits of stratified clay and silt filling the base of the chamber suggest an original link to surface. Unfortunately, there is no obvious indication to where this material entered this former cave system.

Location 29

Stoping at this location originally connected with stoping above at the 100m A.O.D. and 123m A.O.D. levels. However, collapse and deliberate backfilling now prevents any direct link between these areas.

Evidence for early mining includes spoil containing fragmented charcoal, bone and occasional hammer stones. The point of origin of these items is uncertain because of the disturbed nature of the spoil, which suggests they may have been derived from collapsed material from above. However, some of the worked rock surfaces at this location display features reminiscent of early activity, signifying that at least some of the artefacts immediate to these areas are in their original contexts.

Location 30

This is an area similar to Location 29, with stoping connecting above to the 120m A.O.D. level. Throughout this area centred at the "central vein" there are many of the usual indications of early activity, such as stone tools, bone fragments, charcoal and characteristic passage morphology. Often though, 19th century activity has partly enlarged or obscured such areas with backfill, making the search for further areas of early mining only possible by excavating the recent material. The vertical extent, up to 20m and widths of 3-4m of the worked veins to the north and south, suggests that these areas were extensively mined during the early period.

Location 31

Early activity at this location comprises of a series of open veins with interconnected passages covering a vertical extent of around 15m. Evidence includes stone and bone implements and charcoal also a number of narrow tortuous and partly back-filled workings displaying smoothed rock profiles characteristic of early ore extraction. Links through to the 'central vein' (Location 30) are known, with workings rising to a point where possible surface derived spoil prevents further progress. Other connections to workings northwards are terminated by collapsed roof and side wall material.

Location 32

Nineteenth century mining here has disturbed earlier activity along the veins, giving rise to stoping up to 12m high. Towards the top of these stopes quantities of early spoil fill the width of the stope, suggesting a source area from above. Stone hammers, bone tools and charcoal are recorded.

Location 33

A site known the 'calcite rift' displays many contrasting features between early and recent mining. A 18th-19th century enlargement along an earlier route here, has broken through the underside of a sequence of calcite cemented spoil revealing a mined chamber of early origin. Much of the cemented spoil remains *in situ*, together with damaged and undisturbed deposits of calcite flowstone up to 150mm thick. A number of stalactite and stalagmite formations also occur, decorating the opening to a back-filled passage that rises to the south. A few bone tools are recorded. Part of the damaged flowstone has been submitted for Uranium series dating.

Location 34

Between locations 33 and 34 the central vein and associated veins have been worked to vertical heights of at least 15m. Many places display the characteristic signs of early activity, including a proportion of back-filled workings. These areas have clearly been investigated in more recent times, attested to by the occasional drill hole. Early backfill has been partially removed with remnant material infilling pockets in the vein wall and adhering to the surface where it is cemented by calcite flowstone. At one location a floor of flowstone hangs in mid air, the underlying spoil having been removed.

Location 34 marks some of the deeper early workings in this part of the mine, being approximately 58m below the present ground surface. Just to the north of the area a narrow passage leads to other partly infilled workings, some with unusual accumulations of aragonite-calcite flowstone occasionally stained pale blue.

Mineralisation appears to be confined to a series of veins with "rotted" and unaltered dolomite providing the host for both carbonate and sulphide copper ores.

Location 35

This recently accessed system of early working is perhaps one of the most unstable and dangerous, but also one of the more interesting. Here, mineralisation is confined to the base of a thick mudstone (Pyllau Mudstone) unit and the upper portion of an underlying bed of dolomitised limestone. The ore body has been mined over a lateral extent of up to

5m, with minimal support to the mudstone roof resulting in the observed collapses. A number of minor veins have been followed through 'rotted' channels into the dolomite, producing some tight and restrictive workings with profiles that typify early activity.

Charcoal and hammerstones are the main forms of early evidence, with an unusual absence of bone tools. Similar to location 10 off Owens Shaft, the lack of bone may suggest that these were late stage workings where bronze tools had superseded those of bone. Charcoal occurs in sufficient quantities for radio carbon dating, this may confirm these working are some of the youngest of Bronze Age origin on the Great Orme.

Malachite coatings up to 5mm thick cover some dolomite surfaces, giving the impression that if quantities of ore of this grade remain, then the original ore body must have been of a significant size and grade.

The system of working at location 35 provides much evidence for further investigation of early mining. However, the unstable nature of the rock is likely to limit this and certain safety procedures will have to be completed before any detailed study can be continued here.