

## DIAMOND DRILL LOG

Company: SHAKWAK EXPLORATION CO. LTD. Hole No: 86-6  
 Drilling Co: KLUANE DRILLING Project: Vesuvius Hill  
 Started: 23 September 1986 Code: 312  
 Completed: 25 September 1986 Location: NTS 105-D-6  
 Grid Co-ordinates: 168.44N/1251.70E  
 Elevation: 1552.38 m Dip: -50°  
 Azimuth: 230° Horizontal Advance: 58.80  
 Depth: 91.44 m Vertical Depth: 70.04  
 Core size: NQ Acid Test: 47° @ 91.44 m  
 Logged by: RR/CC

PRINCIPAL UNIT	SUB-UNIT	DESCRIPTION/NOTES
0.00-6.10		<u>Overburden</u> ; cased to 6.10; casing removed.
6.10-26.52		<u>Grey Breccia</u> ; many large clasts (5-20 cm diameter), larger clasts often show incipient brecciation (narrow crosscutting zones of fine grained breccia) into smaller clasts. Larger clasts originally andesite?, medium to coarse porphyritic texture, tabular plagioclase phenocrysts altered to yellow or green clays. Large clasts separated by pale grey to dark grey breccia (colour varies with clay and pyrite content) with clasts in 1 cm or lower size range, matrix supported (locally clast-supported over short intervals). Clast alteration produces pale cream rims with dark cores in larger clasts (both areas siliceous), smaller clasts entirely cream, and second type of smaller clasts alter entirely to grey-green clay; wide variation in clast roundness and sphericity; matrix mostly rock flour with variable clay and silica content. Pyrite content locally heavy in matrix; also occurs disseminated in clasts and as fine rims around clasts and narrow veinlets cutting clasts. Locally, minor chalcedony in matrix.
	6.10-9.80	<u>Type 2 Breccia</u> : broken, low recovery. Strongly bleached by weathering down to approximately 9 m. Clasts in two distinct size ranges (0.25 mm - 1.5 cm and 3-5 cm). Dark grey to black pyritic matrix; pyrite content variable, always very fine grained. Occasional large clasts of porphyritic volcanic

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		rock; phenocrysts altered to yellow-green clay. Fractures at 15-20° to C.A. and 72° to C.A. at 9.10 m, 9.50 m with oxidized surfaces. Gradational, weakly banded contact at 9.80 m to Type 1 Breccia below.
	9.80-12.20	Type 1 Breccia: smaller clasts (2 cm or less) altered grey-green or cream colours in grey-green matrix. Low content of pyrite in matrix. Several short intervals of Type 3 Breccia (silica rich, difficult to distinguish clast edges from matrix, approx. 0.3% fine diss. pyrite). Occasional colour banding in Type 1 matrix - defined by changes in pyrite and silica content, generally 35-45° to C.A. Section is strongly fractured at 35-50° to C.A.; most fracture surfaces oxidized or show clay gouge. Narrow pyrite rims on clasts at 10.40 (Type 3) and 11.40-12.20 (Type 1).
	12.20-15.20	Type 3 Breccia: sharp upper contact (colour and textural contrast). Mottled grey appearance overall, incipient brecciation with siliceous overprint(?), matrix and clasts have similar colour and composition. Pyrite more abundant than in Type 1 Breccia - clast rims, in hairline fractures (60-65° to C.A.) and veinlets, replacing phenocrysts. Minor colour zoning of clasts. Local minor patches of Type 1 Breccia infill between larger clasts. At 14.85 m, 5 cm clast of altered porphyritic andesite(?) - phenocrysts altered to yellow-brown clay. Well-fractured at 30-70° to C.A. Lower contact transitional to Type 1 Breccia (55° to C.A.;) pyrite content 1-1.5%.
	15.20-19.40	Type 1 and Type 3 Breccias Interbanded: alternating short (20-30 cm true width) sections with contacts 45-55° to C.A. Type 1 sections relatively clay-rich with abundant small (less than 5 mm) cream or grey-green clasts in dark grey matrix; locally crudely banded or bedded. Type 3 sections pale, low clay content, higher silica and pyrite (0.5%) than Type 1, matrix-poor or overprinted by silicification but clasts more obvious and matrix generally more abundant than typical Type 3; more textural variety in clasts than usual.

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	(15.20-15.60)	Type 1 Breccia with clasts locally to 5 cm.
	(15.60-16.30)	Type 3 Breccia: clasts distinct, varieties of porphyritic andesite (2-5 cm range, up to 20 cm). Patches of matrix look like fine-grained Type 1, often with abundant pyrite. Pyrite also as replacement of phenocrysts in andesite. Large clast broken by 5 mm veins of Type 1 breccia.
	(16.30-16.70)	Type 1 Breccia as 15.20-15.60 but fewer large clasts.
	(16.70-18.00)	Upper and lower contacts 90° to C.A. Type 3 breccia developed in pale pink lapilli tuff (down to 17.30 m), then short mixed section with large clasts and some Type 1 breccia; then (17.70-18.00) mostly in altered porphyritic andesite. At 16.90-17.07, large angular clasts of tuff brecciated by Type 1 material, then rebrecciated and open spaces filled by grey banded silica (banding and later cracking may indicate gel silica) and minor white chalcedony in vugs. Pale grey green softer clasts (pyrite cubes) introduced with Type 1 breccia or possibly with late silica.
	(18.00-19.40)	Type 1 Breccia at top and base but central section resembles Type 3 (banded 11° to C.A., Type 1 breccia with alteration overprint). Fractures near lower contact 30-45° to C.A., parallel to crude stratification defined by changes in clast size and in clast abundance.
	19.40-20.57	Type 2 Breccia - dark matrix with abundant very fine-grained pyrite encloses abundant strongly altered pale cream clasts of very varied sizes and shapes. Larger clasts (5 cm max. diam.) are angular, low sphericity, have altered pale rims, fresher cores; include flow banded rhyolite and porphyritic andesite. Distinct banding, defined by variations in pyrite, clay, silica content of matrix; bands curved, 1 mm to 2 cm, attitude from subparallel to 45° to C.A. Local white silica filling. Pyrite also as thin rims on clasts and occasional small blebs (clasts?) Specks of pale blue chalcedony in pyrite-rich bands.

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	20.57-22.35	Type 1 - Type 2 Breccia Transition: upper section dominantly Type 1 with narrow sections of Type 2. Core badly broken esp. in clay-rich zones near base of interval. Section 21.00' - 21.25 looks like Type 2 with "Type 3 overprint" (silicification). At 21.30 in 10 cm section of Type 1, fracture surface at 25° to C.A. has common pyrite cubes (parallel to banding and contact to Type 2 below). Similarly at 21.95, sharp, curved contact between Type 1/Type 2, sub-parallel to C.A.
	22.35-24.90	Cobble Breccia - unusual facies of clasts in 2-20 cm range, mostly altered porphyritic andesite (varied textures). Dominant matrix is pyrite-rich and virtually free of clasts; very fine grained, laminated pyrite and grey silica. Occasional matrix areas are similar to Type 2 but still pyrite-rich and clast-poor. Inferred slow precipitation in open spaces between large clasts. Some slump and offset features in pyrite-silica areas; sedimentation and gel features? Overall 60-70% clasts and 30-40% matrix; overall pyrite abundance 10-15%. At 22.50, large porphyritic andesite clast shows incipient brecciation (hydrofracturing?) with locally abundant pale blue chalcedony filling small open spaces. Elsewhere minor chalcedony occurs at blebs, clast rims associated with pyrite-silica areas. Facies is matrix-supported above becoming clast-supported at base. Note unidentified black mineral as rare thin laminae (0.5 mm or less) between clast and pyrite bands. Hydrofracturing(?) with pyrite-silica fracture filling at 24.75. Minor chrome-green clay on fracture surfaces at 24.85.
	24.90-26.52	Type 2 Breccia predominant - minor sections similar to Type 1 Breccia and short pieces of pumice/lithic tuff (at 25.70 ; as upper part of underlying unit). Type 2 has some clasts up to 5 cm and (25.45) rebrecciated volcanic clast (2nd event broke clast so alteration rim now seen on one side only). At 25.50 note sharp colour change (dark, pyritic above; pale below) 90° to C.A., cuts across clasts (secondary feature?)

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26.52-42.72		<p>Green Andesite Crystal Lithic Lapilli Tuff (and short intervals of grey breccia); tuff variable pale to medium green colour, general weak propylitic alteration (deuteric?) Always matrix-supported. Varied clast size and type. Yellow-green altered flattened pumice fragments common in top 1.5 m (generally 1-2 cm long). Lithic fragments all sizes up to 2-3 cm, varied lithologies/textures; mostly dacite-andesite volcanics, well-rounded (7-9), spherical (7-9), with narrow pale reaction rims. Matrix of ash and tiny rock fragments. Pyrite throughout from 0.01 to 0.5%; commoner and in larger grain size in zones of later alteration. Tuff always much fresher than breccia sections; occasional breccia clasts in tuff. Tuff shows crude stratification subparallel to C.A.</p>
	26.52-27.74	<p>Green Crystal Lithic Ash Tuff: yellow-green colour, dominantly coarse ash tuff with abundant fiamme, approximately 10% small lithic fragments (volcanics; under 5 mm) and occasional larger volcanic clasts (5 mm to 5 cm). Matrix of ash and glass shards, now devitrified or altered. Fiamme and other glassy material altered to yellow-brown clay (Mont Morillonite ?) Upper 15 cm looks like mixture of tuff with Type 1 breccia material.</p>
	27.74-32.53	<p>Dark Green Crystal Lithic Tuff - core deteriorates after drilling because of clay matrix. Occasional lithic fragments to 10 cm; most lithics under 2 cm down to less than 1 mm. Clasts dominantly well rounded, high sphericity. Minor alteration at rim of larger clasts (almost all identifiable as varieties of andesite-dacite volcanics); small clasts (under 5 mm) unidentifiable (cannot separate tiny rock and crystal fragments). Matrix of mixed ash and glass with variable moderate amounts of clay alteration causing colour changes from dark green to paler yellow-green shades. Strongest alteration from 31.30-32.00; sharp top and bottom contacts, latter has clay gouge on fracture at 70° to C.A. From 32.00-32.53, mostly fresher tuff as above but perhaps some mixing with grey breccia material; core becomes badly broken and ground towards base with core loss and clay zone at base.</p>

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	32.53-33.56	<p><u>Grey Breccia</u> - sharp but non-parallel upper and lower contacts (upper 20° to C.A., lower 50° to C.A.) Immediate upper contact is 0.5 cm band of "welded" (glassy, clay-altered) breccia with rodding, slickensides on surface. Both contacts are 15 cm wide zones of grey breccia (like fine grained version of Type 2). Crude banding parallel to external contacts. Most clasts under 3 mm, rarely to 1 cm. Small pyrite blebs (clasts?) common. Central section is rather typical bleached-looking Type 3 with some large clasts (to 7 cm) showing incipient brecciation and large areas of smaller clasts masked by clay-silica overprint (?)</p> <p>Locally high pyrite content as narrow zones in matrix, often occurring around larger clasts.</p>
	33.56-37.10	<p><u>Altered Green Crystal Lithic Tuff</u> - essentially as interval 27.74-32.53 with clay alteration as 31.30-32.00. Some variation in clast type and abundance not seen before (e.g. abundant smaller altered clasts between 34.50-35.10).</p> <p><u>Note:</u> some mixing with Type 2 breccia material from 36.45 downwards, particularly 2 cm clast at 36.63 of very fine-grained banded pyritic breccia with one narrow pyrite-silica band showing lamination on 0.1 mm scale and "gel-desiccation cross-fracturing". <u>Note:</u> at 36.79-37.00, zone of black glassy (chilled?) tuff with most clasts under 2 mm (rare 1 cm clasts). Upper contact narrow, gradational, 15° to C.A. Lower contact in broken core, seems gradational with some "veining" (remnant area?) of black material in altered green tuff below.</p>
	37.10-37.67	<p><u>Type 2 Breccia</u> - badly broken and sheared at 35° to C.A. Locally abundant pyrite in 1-2 mm veinlets, fracture fillings (pre-shear), and some 1-2 cm white quartz patches (vein broken by shear?) Lower 20 cm is single altered porphyritic andesite clast with narrow pyrite rim; lower contact is 45° to C.A. along clast edge. This interval may be a large breccia clast within the tuff.</p>
	37.67-39.80	<p><u>Green Crystal Lithic Ash Tuff</u> - essentially a fine-grained version of 26.52-27.74 unit. Much core badly fractured, in part broken by deterioration after drilling. <u>Note:</u> Type 2</p>

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		breccia material 38.90-39.10 apparently as piece of breccia with clasts to 4 cm incorporated by tuff. <u>Lost core:</u> 39.30-39.60.
	39.80-41.60	Grey Breccia - apparently Type 2 breccia with bleaching and/or moderate clay-silica overprint as Type 3. Sharp upper contact 20° to C.A. Large clasts predominant (0.5 - 5 cm) - single large clast (30 cm) shows incipient brecciation. Matrix of tiny rock fragments with variable pyrite-silica-clay. Sharp lower contact 55° to C.A. (with very broken core below).
	41.60-42.72	Green Crystal Lithic Tuff - similar to both 26.52-27.74 and 37.67-39.80 tuff units with range of clast sizes typical of both these units. Much of core is fractured, broken. Rubble and clay zone between fractures 50-60° to C.A. at 42.46-42.55.
42.72 - 58.22		Oxidized Breccia - strongly oxidized (white-pink-red-purple), often vuggy and leached, versions of Type 2 and 3 Breccias. Siliceous appearance from removal of much clay but little or no addition of silica. Degree of oxidation is variable and fracture-controlled; some sections still show dark grey pyrite-silica matrix, becoming gradually dominant from 54.10 downwards. Original textures obscured by hematite, limonite, leaching, clay removal. Top contact shows immediate sharp green-orange colour change in tuff but tuff-breccia contact is lost in next 20 cm of orange-buff-white gouge and rubble; <u>suspected fault</u> . Fracturing in upper 5 m primarily on surfaces between 25-50° to C.A. (sometimes two intersecting sets at 40-50° to C.A.) with fractures between 40-90° to C.A. becoming dominant below. <u>Note:</u> 5 cm clay gouge zone at 54.00 between fractures 60-70° to C.A. Several large (10-20 cm) pale green clay-altered volcanic clasts deteriorated rapidly after coring (e.g. at 55.45, 57.45). <u>Note:</u> 56.68-57.00 - unusual pale grey breccia with siliceous clasts in clay-rich matrix with fine-grained pyrite and some larger patches of white clay and dark brown-green clay. Veinlets in large clast immediately above look like

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		ankerite.
		Section at base (57.65-58.22) is very broken clay-rich breccia with minor chrome-green clay.
58.22 - 60.34		<p>Porphyritic Andesite Flow - plagioclase phenocrysts moderately abundant (5%), tabular, zoned, size range 1-7 mm.</p> <p>Groundmass dull olive to pale yellow-grey, aphanitic. Mild propylitic alteration; variable from pale phenos. in dark matrix to dark green phenos. in grey matrix. Occasional pyritic veinlets at 25-50° to C.A. Ground core at upper and lower contacts; unit may be a large clast.</p>
60.34 - 91.44		<p>Coarse Grey Breccia (Type 2) - essentially a single unit to end of hole subdivided into 3 intervals based on oxidation changes. Unit is coarse blocky Type 2 breccia with many porphyritic andesite sections from 5 cm to 1 m (all interpreted as clasts).</p>
	60.34-69.00	<p>Grey Breccia: plagioclase phenos. in andesite clasts are yellow, clay-altered; clay areas in breccia matrix (including plag. crystals) are also yellow (bright brown-yellow to dull olive). Yellow colour acquired after drilling.</p> <p>Clast margins often show fracturing with pyrite-silica filling. Breccia matrix has variable amount of small clasts in silica-pyrite-clay mixture. Shear zone at 60.80-61.20 subparallel to C.A. in rubbly clay-rich breccia - small pyrite cubes on clay partings and minor green "chrome coloured" clay.</p>
		<p>Lost core: 64.46-64.55</p> <p>65.50-65.70</p> <p>68.35-68.50</p> <p>69.60-69.80</p>
	69.00-83.00	<p>Oxidized Breccia - as coarse grey Type 2 breccia above but quite strongly oxidized with abundant red-purple matrix hematite, limonite. Clasts generally pale, bleached cream or pale green. Core badly broken in areas of clay-rich clasts or matrix. This interval is much less siliceous</p>



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		(less leaching) than upper oxidized interval of hole.
		71.45 - narrow clay gouge zone 50° to C.A.
		72.34-72.54 - zone of shearing with rubble and 10 cm sandy gouge; 45° to C.A.
		77.30 - narrow clay gouge zone.
		80.20-80.50 - badly broken core with sandy clay gouge;
		lower contact 30° to C.A.
		80;75-80.80 - fracturing 20° to C.A.
		81.45 - narrow clay gouge zone in broken core.
		Lower contact to less oxidized breccia below is gradual colour change in large andesite clast (80 cm) with hematitic breccia above and pyritic breccia below. Arbitrary contact at base of clast.
	83.00-91.44	<u>Coarse Grey Breccia</u> - similar to both units above; slightly more oxidized than 60.34-69.00 (matrix grey and pyritic but most andesite clasts are cream or pale green - somewhat oxidized). Unit also has distinctive pink siliceous clasts (0.5 - 5 cm) with plag. phenos. - similar to red silicified andesites in DDH 86-14. Shattering, fracturing and gouge zones become more abundant down-hole.
		<u>Note:</u> 83.42-83.52 - shattering and gouge in breccia at clast margin.
		84.30-84.35 - fracture at 45° to C.A. along clast margin with abundant clay in breccia below.
		84.40-84.55 - broken banded quartz veins at 30° to C.A.
		±89.40 to end of hole - strong clay alteration of some clasts (others highly siliceous) with similar alteration of clay and silica in matrix. Core badly broken in clay zones 90.90-91.15. Hole ends in 15 cm section of strongly clast-supported breccia.
91.44		END OF HOLE