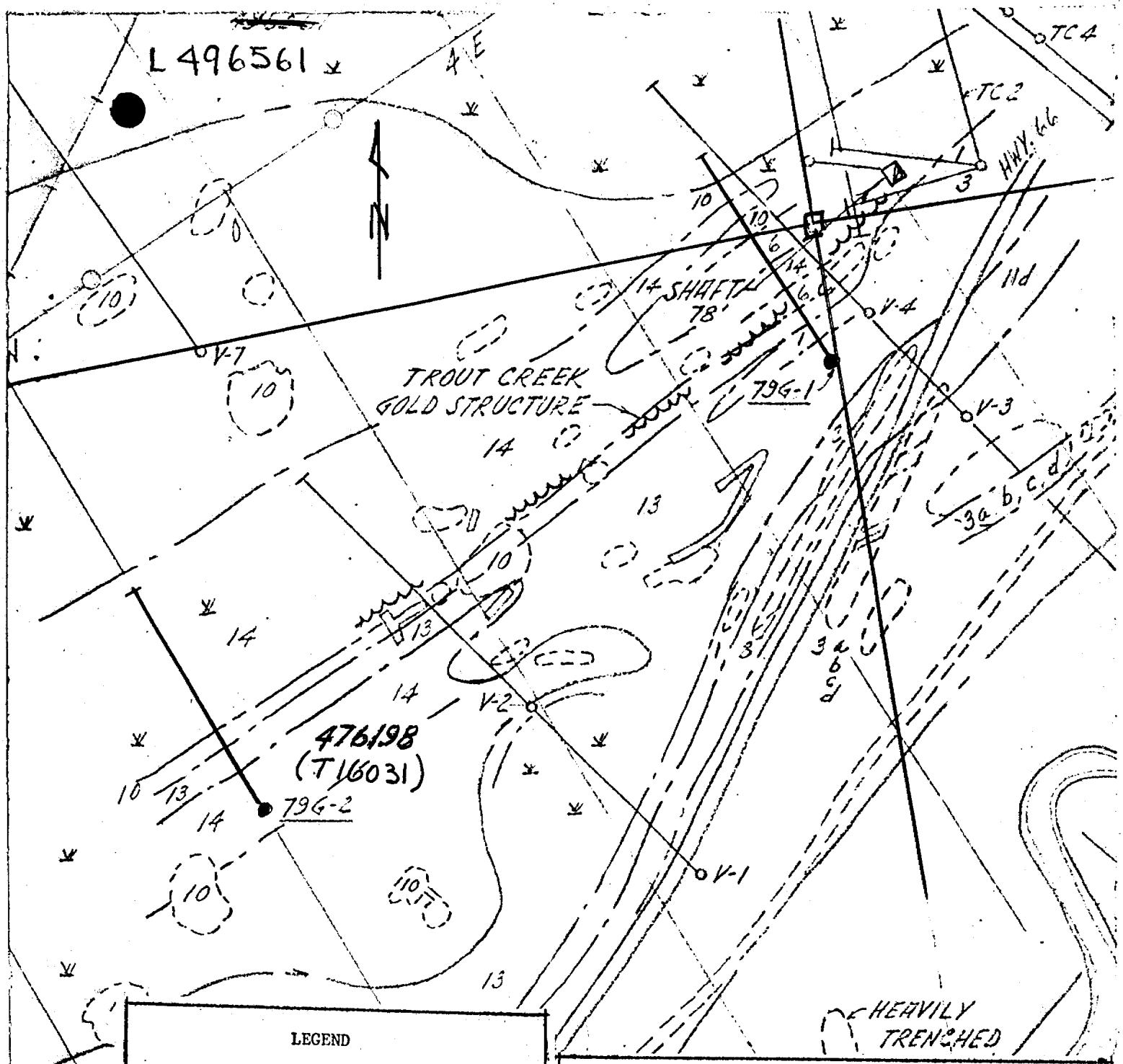
Diamond Drilling

Township TECK **Report N9·** 29

Work performed by: Queenston Gold Mines Limited

Claim N9	Hole N9	Footage	Date	Note
L 476198	79-G-2	518.0	June/79	(1)
	79-G-1	506.0	June/79	(1)

Notes: (1) # 190-1-2/79



LEGEND

14 - TRACHYTE FLOWS & AGGLOM.

13 - BEDDED TUFF & AGGLOM.

11 - DIABASE (d)

10 - SYENITE PORPHYRY

6 - CONG. W/ MINOR GREYWACKE

3 - QUART CARBONATE ROCK
(a) Laminated (b) Massive
(c) Fushite bearing (green)
(d) Conglomerate

1 - KOMATIITIC BASALT

QUEENSTON GOLD MINES LTD.

Teck Project

GEOLOGY

Part of

TECK PROJECT AREA

TECK TOWNSHIP-KIRKLAND LAKE-ONTARIO

SCALE 1" = 200' SEPT./78 L. J. CUNNINGHAM
B.Sc. P. Eng.

PROPERTY QUEENSTON GOLD MINES LTD.
Kirkland Lake West Project

HOLE No. 79-G-2

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)

LATITUDE:

DEPARTURE:

ELEVATION: L4W 7 + 50 S

STRIKE:

DIP: Collar 50° - @ 500' - 44°

DATE DRILLED: 7 - 14th June 1979

PAGE No. 1

PURPOSE: To locate & confirm the Trout Creek Structure

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE
				GOLD
0 - 8	Casing			
8 - 22	Cream-grey-pale green - siliceous rock, motley appearance - trachyte agglomerate - essentially all trachyte fragments - cut by numerous, narrow, erratic, discontinuous stringers of quartz 1/4" wide			
22 - 81.5	Predominantly dark redish fragments 1" - 3" in diameter of TRACHYTE, PORPHYRY & SYENITE dark chloritic & mafic fragments. Fragments angular to rounded cut by numerous, random, narrow 1/4" quartz stringers. Some porphyry fragments have diss pyrite Trachyte agglomerate? Some fine to coarse pyrite in sections as described below - occasional seam of specularite			
	44.5-46.5 coarse to fine pyrite 3% in matrix & concentrated in seams with qtz. stringers at 45.5 stringers & fractures @ 30°/core	30019	2.0'	0.005
	48-50 3% coarse to fine pyrite in seams and diss. in matrix seams @ 30°/core often with specularite	30020	2.0'	0.02
	50-52 Narrow 1/2" cherty dark qtz. wispy & irregular 20°/core with hematite seams & slips	30021	2.0'	nil
	63-65 fracturing with irregular whitish & discontinuous 1/4" qtz. fractures 20°/core a little hematite	30022	2.0'	nil
	66-68 qtz. filled fractures mz. 1" creamy qtz. 60°/core no mineralization chloritic	30023	2.0'	nil
	72-74 fractured zone with qtz. chloritic filling narrow 1/4" sparse pyrite 1%	30024	2.0'	0.002
	74-76 pyrite rich zone - 5% - coarse & fine a few 1/4" white qtz. fractures and a few 1/4" pale blue, wispy, cherty quartz seams or located with the greatest concentration of pyrite	30025	2.0'	0.005
	76-78 same	30026	2.0'	0.002
81.5-83	BEDDED TUFF - 80°/core, bedding not sharp but readily evident - colour brick red to dark grey - some thin 1/4" brick red cherty layers thought to be a chemical sediment seams & blobs of specularite ± 2% & irregular grey cherty stringers 1/8" - 1/4"	30027	1.5'	0.002
83 - 110	BEDDED TUFF - 80°/core - bedding not sharp but readily evident 1/4" - 1/2" thick Colour dark grey with some deep red horizons A few pink trachyte fragments to 2" diameter. Qtz.-carb stringers white to pink colour @ 91 - 1" grey qtz. 50°/core across bedding 93-94 1/2" & 3/4" grey qtz. 80°/core conformable to bedding 105 1" banded white to pink qtz.-carb. conformable to bedding at 80°/core			

DRILLED BY Heath & Sherwood Drilling

SIGNED

L.J.Cunningham, B.Sc., P.Eng.

PROPERTY QUEENSTON GOLD MINES LTD.
Kirkland Lake West Project

HOLE No. 79-G-2

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)

PAGE No. 2

LATITUDE:
DEPARTURE:
ELEVATION: 14W 7 + 50 S

STRIKE:
DIP: Collar 50° - @ 500' - 44°
DATE DRILLED: 7 - 14th June 1979

PURPOSE: To locate & confirm the Trout Creek Structure

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE GOLD
110 - 143	TUFF Lapilli to agglomeratic in size to 2" diameter motley - red-grey-black colour. Distinct red, grey, black fragments of pea size & smaller. Crude bedding evident occasionally. Sections with fine diss. pyrite as noted below. Cut by 1/8" irregular white qtz. stringers.			
	115-117.5 diss. pyrite ass. with 2 x 1" grey banded qtz. veins 45°/core	30030	2.5	0.002
	124-126 Fine diss. pyrite in tuff	30028	2.0	0.002
	126-128 Fine " " " 2 x 1/4" grey qtx. stringers 50°/core	30029	2.0	0.01
143.5-151.5	Massive, salmon pink rock brecciated & fractured with 1/8" - 1/4" random qtz. stringers fine diss. pyrite est. 2% contains distinct red fragments or clasts generally 1/4" size in a few narrow sections which may be tephra or broken fragments of the unit. Upper contact sharp @ 30°/core Lower contact brecciated or rubbley Syenite intrusive? or Trachyte flow?			
	143-145)	30031	2.0'	0.002
	145-147) 3/4"	30032	2.0'	nil
	147-149) irregular	30033	2.0'	0.002
	149-151.5 white qtz. 20°/core	30034	2.5'	0.002
151.5-158.5	GREYWACKE with a few pebbles - dark grey, green, hard, with red grains & small fragments & red syenitic pebbles to 3" dia.			
158.5-163	PINK ROCK, brecciated & fractured with 1/8" - 1/4" random quartz veins, some sections with considerable sericite Contacts distinct @ 30° & 45°/core top & bottom May be a brecciated trachyte flow or syenite intrusive Top section shows distinct fragments			
163 - 165	GREY, GREEN, FINE GRAINED, MED. HARDNESS ROCK, fractured with fine qtz. veinlets Contact conformable @ 50° - 60°/core The top of the underlying trachyte flow.			
165 - 249	MOTLEY COLOURED, HIGHLY BRECCIATED, SILICEOUS ROCK considerable sericite development. varigated colour, red, grey, cream, brown & green. Cut by swarms of thin 1/8" random white qtz. stringers. Many distinct fragments 1/4" to 2" size. A BRECCIATED TRACHYTE flow?? Contains scattered thin seams & blebs specularite. Short sections are porphyritic, altered, brecciated with fine sericite development. These may be narrow dikes or large locks Contacts are irregular			

DRILLED BY Heath & Sherwood Drilling

SIGNED
L.J.Cunningham, B.Sc., P.Eng.

PROPERTY QUEENSTON GOLD MINES LTD. Kirkland Lake West Project

HOLE No. 79-G-2

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)

ATITUDE:

DEPARTURE:

ELEVATION: I4W 7 + 50 S

STRIKE:

DIP: Collar 50° - 500' - 44°

DATE DRILLED: 7 - 14th June, 1979

PAGE No. 3

PURPOSE:

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE
				GOLD
165 - 249	continued Sections are 183 - 186 207 - 210 225 - 229 234 - 236 Last 25 feet shows more green angular fragments 1-2" dia.			
249 - 260	SHARP change to a light coloured, creamy grey, red spotted & black spotted brecciated siliceous rock. Crude foliated. 30°/core Weakly magnetic in spots Contains 1" highly brecciated white chert or quartz with seams of specularite A trachyte flow?			
260 - 293	SHARP change to a dark reddish purple coloured rock. denser - finer grained with prominent red grains or fragments or phenocrysts and occasional larger fragments 1/4 irregular bands of red cherty looking material bisect the core. hard cut by numerous random angle white quartz stringers & veinlets to 1/4" wide maybe trachyte flow?			
293 - 295	BRICK RED CONFORMABLE DIKE 60°/core finely porphyritic very small grey to whitish roundish spots unidentified Cut by thin random white qtz. stringers.			
295 - 330	SAME AS 260 - 293. Trachyte flow? with thinly laminated cherty hematite in wispy discontinuous bands at 299, 304, 309. 1/8"-1/4" wide - 20°/core			
330 - 350	GRADATIONAL CHANGE in colour to a light coloured pale grey to mauve red & black spotted siliceous rock highly brecciated & fractured with narrow 1/8" random white qtz. veins. Sections are weakly magnetic due to magnetite developed as spots. 333-334 possibly a syenite dike 338 - 2" white banded qtz. 20°/core - brecciated trachyte flow?			
350 - 518	GRADATIONAL CHANGE to rock unit as 260-293 Trachyte flow?			
518	END OF HOLE			
	SLUDGE SAMPLES ATTACHED			

DRILLED BY Heath & Sherwood Drilling

SIGNED

L.J.Cunningham, B.Sc., P.Eng.

SWASTIKA LABORATORIES LIMITED

P.O. BOX 10, SWASTIKA, ONTARIO P0K 1T0
TELEPHONE: (705) 642-3244
ANALYTICAL CHEMISTS • ASSAYERS • CONSULTANTS

Certificate of Analysis

Certificate No. 47947 Date: June 14 1979

Received June 11 1979 53 33 Samples of D.D. Sludge

Submitted by Queenston Gold Mines - Kirkland Lake, Ont.-Samples per: Mr. L.J. Cunningham

SAMPLE NO.	GOLD Oz./ton
HOLE 79-G2	
8'-13'	0.002
13'-18'	0.002
18'-28'	0.002
28'-38'	0.002
38'-48'	0.002
48'-58'	0.002
58'-68'	0.002
68'-78'	0.002
78'-88'	0.002
78'-88'	0.005
98'-108'	0.002
108'-118'	0.002
118'-128'	0.002
128'-138'	0.002
138'-148'	0.002
148'-158'	0.002
158'-168'	0.002
168'-178'	0.005
178'-188'	0.005
188'-198'	0.005
198'-208'	0.005
208'-218'	0.005
218'-228'	0.005
228'-238'	0.002
238'-248'	0.002
248'-258'	0.005
258'-268'	0.005
268'-278'	0.01
278'0288'	0.005
288'-298'	0.005
298'-308'	0.01
308'-318'	0.01
318'-328'	0.02
328' - 338'	0.01
338' - 348'	0.01
348' - 358'	0.01
358' - 368'	0.005
368' - 378'	0.01
378' - 388'	0.005
388' - 398'	0.01
398' - 408'	0.005
408' - 418'	0.01
418' - 428'	0.02
428' - 438'	0.01
438' - 448'	0.01
448' - 457'	0.01
457' - 467'	0.002
464' - 468'	0.005
468' - 478'	0.005
478' - 488'	0.005
488' - 498'	0.002
498' - 508'	0.002
508' - 518'	0.002

Per G. Lebel - Manager

Member Canadian Testing Association

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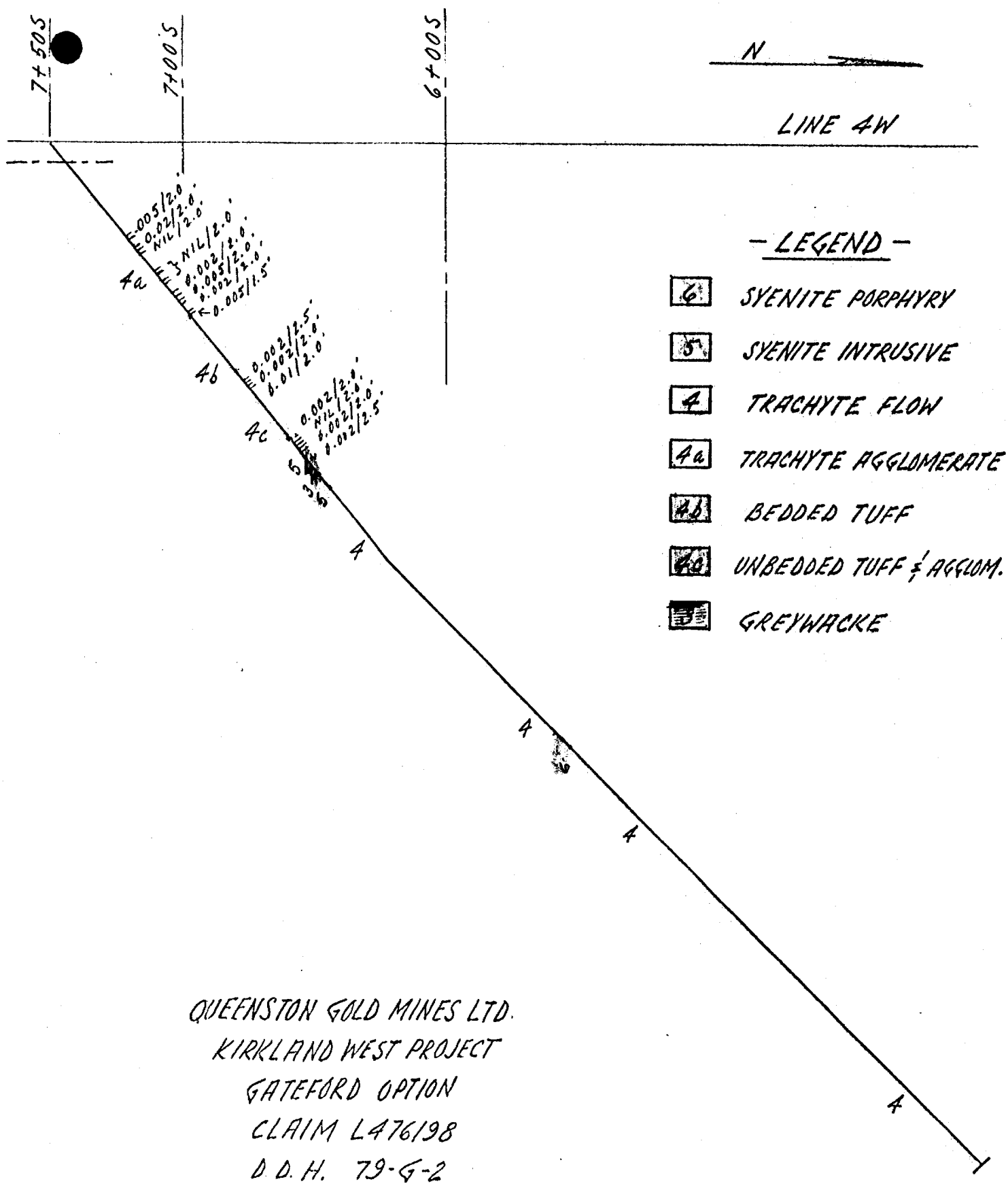


QUEENSTON GOLD MINES LTD.
KIRKLAND WEST PROJECT
GATEFORD OPTION
CLAIM L476198
D.D.H. 79-G-2
SCALE-1" = 50'
7-15 JUNE-1979
L.J. CUNNINGHAM

PROPERTY QUEENSTON GOLD MINES LTD.
Kirkland Lake West Project

HOLE No. 79 G 1

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)

PAGE No. 1

LATITUDE: STRIKE:

DEPARTURE: DIP: Collar 50° - 46° @ 400'

ELEVATION: L 6 E - 6 + 75 S DATE DRILLED: 28 May - 6 June, 1979

PURPOSE: To test the Trout Creek Structure & Gold Occurrence

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE
0 - 14	CASING			
14 - 22	MOTLEY grey pink siliceous rock, highly brecciated, distinct fragments usually pink. 1/4 to 1" size Cut by swarms of highly irregular narrow 1/8" white qtz. veins. Fits H.C. Cooke's (Memoir 131 G.S.C.) excellent description of trachyte - see attached. A trachyte flow			
22 - 26	FAULT broken, oxidized, vugy 20%/core contains 2' brecciated pink syenite recemented with qtz. Contains 1% pyrite & 20% white vein quartz			
	22 - 24	30035	2'	0.002
	24 - 26	30036	2'	NIL
26 - 43	LIGHT TO DARK OLIVE GREEN FINE GRAINED MAFIC intermediate rock cut by Q.C. stringers, considerable sericite development as pale green yellow wispy bands & hairs. 41-43 pinkish & possibly altered by the following unit. A Mafic Flow or a phase of the trachyte flow?			
43 - 49	SALMON PINK coloured, rather massive, hard - a little pyrite ± 1%, brecciated, cut by qtz. stringers. shows very fine 1/16" black specks hematite & grey indistinct phenocrysts of 1/16" size. Contacts brecciated & irregular. A syenite porphyry intrusive?			
49 - 52	DISTINCT bright red angular to rounded 1/4" - 1/2" fragments with grey, black & dard green similar fragments in dark f. g. matrix. A volcaniclastic conglomerate term used by R. G. Roberts, Ph.D. Waterloo University			
	43 - 45	30037	2'	NIL
	45-47	30038	2'	0.002
	47 - 49	30039	2'	NIL
52 - 74	SAME as 43 - 49 little or no pyrite A syenite intrusive?			
74 - 79	SAME as 49 - 52 Volcaniclastic conglomerate?			
79 - 98.5	DARK GREY fine grained dense, hard rock - massive to 89 reddish colour, balance dark grey colour. Densely packed, fine, general dark grains with small percentage 5% red grains Occasional 1/4" to 1/2" red fragment cut by numerous fine 1/8" irregular qtz. stringers Greywacke			
98.5 - 102	FAULT ZONE brecciated, broken, fractured 30°/core			
	98.5-99.5 1" pink fine grained rock, highly brecciated recemented with quartz (50%) Syenite dike?	30040	1'	NIL
	99.5-102 brecciated white qtz. & pink fragments, some grey siliceous cementing material	30041	2.5'	0.002

DRILLED BY: Heath & Sherwood Drilling

SIGNED: L.J.Cunningham, B.Sc., P.Eng.

PROPERTY QUEENSTON GOLD MINES LTD.
Kirkland Lake West Project

HOLE No. 79 G 1

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)

PAGE No. 2

LATITUDE: STRIKE:

DEPARTURE: DIP: Collar 50° - 46° @ 400'

ELEVATION: L 6 E - 6 + 75 S DATE DRILLED: 28 May - 6 June, 1979

PURPOSE: To test the Trout Creek Structure & Gold Occurrence

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE
102 - 131	DARK GREEN massive fine grained showing rare 1/16" - 1/4" red fragment in a f.g. granular ground mass. Cut by numerous very narrow ± 1/16" qtz. stringers. Greywacke			
131 - 224	HIGHLY BRECCIATED siliceous rock, motley coloured - green to grey to mauve to pink Spotted varying from red to grey to black to white Considerable sericite Cut by swarms of iregular random 1/4" to 1/2" white qtz. stringers			
	187-189 pink f.g. rock highly fractured & recemented with qtz. Syenite dike?	30042	2.0	0.002
	189-193 same	30043	2.0	NIL
	Short sections show pale indistinct feldspar lathes in a green ground mass Last 25 feet pale creamy green colour Trachyte flow?			
224 - 235	SALMON PINK, f.g. siliceous rock, brecciated, some variation in colour Highly fractured & cut by fine qtz. stringers Syenite intrusive?			
235 - 324	GREY TO GREY to pale pink hard clastic rock - multi colour grains with scattered clasts, rounded to angular 1/4" to 1" size coloured red, grey, cream, green Greywacke			
324 - 333	FAULT ZONE consists of approximate 5' of recemented breccia pale salmon coloured siliceous fragments, angular to rounded 1/4" to 1/2" size in dark green matrix			
	1.5' green gouge			
	2.5' green sheared material with qtz. fragments & veinlets, green chlorite, sericite about 30°/core Greywacke			
	324 - 326 Breccia	30044	2'	NIL
	326 - 328 "	30045	2'	NIL
	328 - 331 gouge (only 2' of core)	30046	2'	0.002
	331 - 333 sheared material	30047	2.	NIL
333 - 367	MASSIVE PINK FELSIC ROCK showing vague, indistinct feldspar lathes in upper section but distinctly porphytric in lower half; highly fractured with fine hairlike qtz. veinlets. Scattered black ferromagnesian Zenoliths to 1/4" size Syenite porphyry intrusive?			
	upper contact brecciated			
	lower contact sharp @ 35°/core			
367 - 383	MOTLEY GREEN TO GREY ROCK, intermediate hardness with short reddish sections showing short section of red & green spots! a trachyte flow?			
383 - 414	A DARK GREEN F. G. MASSIVE ROCK mafic to intermediate composition intermediate hardness includes a few inclusions of trachytic porphyry at 389-391 & 415-422			

DRILLED BY Heath & Sherwood Drilling

SIGNED

L.J. Cunningham, B.Sc., P.Eng.

PROPERTY QUEENSTON GOLD MINES LTD.
Kirkland Lake West Project
HOLE No. 79 G 1

LOCATION: SW¼ Teck Twp. Claim 476198 (originally T.16031)
LATITUDE: STRIKE:
DEPARTURE: DIP: Collar 50° - 46° @ 400'
ELEVATION: L 6 E - 6 + 75 S DATE DRILLED: 28 May - 6 June, 1979
PAGE No. 3

PURPOSE: To test the Trout Creek Structure & Gold Occurrence

FOOTAGE	DESCRIPTION	SAMPLE NO.	WIDTH	ASSAY VALUE
383 - 414	continued 6" white brecciated qtz. at top contact A mafic flow or maybe a phase of the trachyte flow - See Cooke Description			
414 - 433	A DEEP RED PURPLISH PORPHYRITIC MASSIVE ROCK distinct pale pinkish feldspar lathes in darker ground mass. Occasional zenoliths to 1/4" of pink syenitic material or black chloritic material. Contact zone are noticeably darker than the centre section. A syenite porphyry intrusive?			
433 - 440	A LIGHT SLAMONK PINK MASSIVE ROCK well brecciated in part porphyritic with indistinct pale feldspar lathes Sericitic recemented with thin black chloritic seams A syenite porphyry intrusive			
440 - 506	A PALE GREEN FOLIATED, BRECCIATED ROCK on intermediate hardness to about 455 A large fragment at 443 shows fine hairlike laminatinns suggestive of bedding 445-450 shows sections of soft creamy grey material suggestive of silt 455 - on increasing in grain size to a recognizable fine grained greywacke a dark grey green massive unit with a reddish horizon (478-486) In last 25' distinct fragments to 1/4" size grey green pinkish and occasional bright red grain or clast thought to be chert jasper Greywacke increasing in grain size down the hole NOTE 458 - 460 thin bedding - 65°/core			
506	END OF HOLE			

DRILLED BY Heath & Sherwood Drilling

SIGNED L. J. Cunningham

L. J. Cunningham, B.Sc., P.Eng.

SWASTIKA LABORATORIES LIMITED

P.O. BOX 10, SWASTIKA, ONTARIO P0K 1T0
TELEPHONE: (705) 642-3244
ANALYTICAL CHEMISTS • ASSAYERS • CONSULTANTS

Certificate of Analysis

Certificate No. 47912 Date: June 7 1979

Received June 4 1979 49 33 Samples of D. D. Sludge

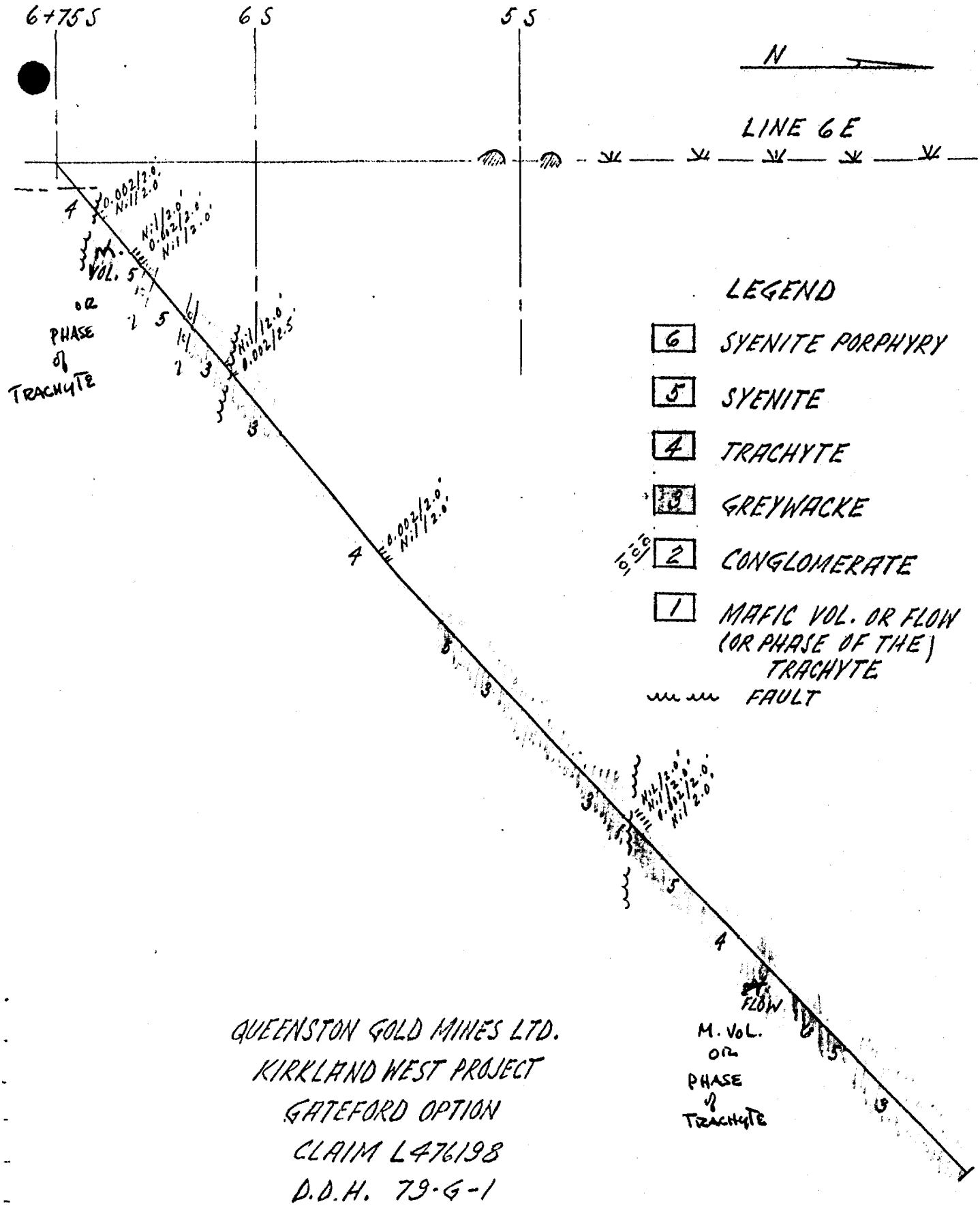
Submitted by Queenston Gold Mines - 1 McPhee Ave., Kirkland Lake
Per: Mr. L.J. Cunningham

SAMPLE NO. 79-G1	GOLD Oz./ton
20'-30'	Nil
43'-53'	0.002
53'-63'	Nil
63'-73'	0.002
73'-84'	Nil
80'-90'	0.002
90'-100'	0.002
100'-110'	0.002
110'-120'	0.002
120'-130'	0.002
130'-140'	0.002
140'-150'	0.002
153'-163'	0.002
163'-173'	0.002
173'-183'	0.005
180'-190'	0.002
190'-200'	Nil
200'-210'	Nil
213'-223'	Nil
223'-233'	Nil

SAMPLE NO. 79-G1	GOLD Oz./ton
233'-238'	0.002
238'-248'	Nil
248'-258'	Nil
258'-268'	0.005
268'-278'	0.002
278'-288'	0.005
288'-298'	0.002
298'-308'	Nil
308'-318'	Nil
318'-328'	0.002
328'-338'	0.002
338'-348'	Nil
24' sample	0.002
348' - 358'	Nil
358' - 368'	0.002
368' - 378'	Nil
378' - 388'	Nil
388' - 398'	Nil
398' - 408'	Nil
408' - 413'	Nil
413' - 418'	Nil
418' - 420'	0.002
418' - 428'	0.002
418' - 428'	Nil
428' - 438'	Nil
438' - 448'	0.002
448' - 458'	Nil
493' - 503'	0.002
503' - 506'	Nil

Per Ghislain Lebel
G. Lebel - Manager

ESTABLISHED 1928



QUEENSTON GOLD MINES LTD.
KIRKLAND WEST PROJECT
GATEFORD OPTION
CLAIM L476198
D.D.H. 79-G-1
SCALE - 1" = 50'
28 MAY - 6 JUNE - 1979
L.J. CUNNINGHAM

Soda Trachyte

A lava of unusual composition and striking appearance is a prominent member of the Timiskaming series in the Larder district. It is composed of albite feldspar and common hornblende in proportions of about 2 to 1 and, being thus the effusive equivalent of a hornblende syenite rich in soda, the name soda trachyte is applicable. Förstner has described a somewhat similar rock from the island of Pantelleria, in the Mediterranean, which he has termed pantellerite; this differs, however, from the Larder trachyte in its larger content of potash. The true pantellerite is characterized by such minerals as anorthoclase, or soda-orthoclase and soda-microcline, and ægirite or soda-augite. Neither of these was identified in the Larder trachyte.

Different phases of the lava vary so widely in appearance that the casual observer would not suppose the possibility of any relationship between them, more particularly since they are not commonly found together in the same outcrop. The base of the thicker flows is usually a coarse-grained porphyritic rock of warm brown to brownish-grey tints. It has a strong resemblance to the earlier intrusive porphyry of the district and up to the present has been confounded with it. Albite phenocrysts up to 0·5 mm. in length compose approximately 10 per cent of the volume of the rock. Phenocrysts of common hornblende of about the same size and more or less altered to chlorite, form 15 per cent to 20 per cent. The phenocrysts are embedded in a groundmass of about 0·01 mm. average grain, consisting, as nearly as can be determined, largely of oligoclase-albite feldspar with small needles of actinolite and some sericite. The actinolite may be secondary. The feldspar phenocrysts are rather badly sericitized and kaolinized, the hornblende phenocrysts more or less chloritized.

A flow breccia, found in a number of places, consists of trachyte, somewhat finer-grained than that described, filled with angular fragments of fine-grained reddish material. Under the microscope the matrix is seen to be identical in composition with the coarser phase described, whereas the fragments are finer-grained—probably bits of an earlier crust. One such fragment consists of about 15 per cent of hornblende phenocrysts averaging 0·5 mm. in length together with a very few feldspar phenocrysts of about the same size, in a clear, almost glassy matrix.

The coarse massive phase commonly grades upward, with or without the intermediate occurrence of the brecciated phase, into a rock made up of irregular masses of the glassy, reddish-brown lava, in a small amount of dark grey matrix. The lava masses seldom have a sharp boundary, but grade into the matrix, which varies in colour from dark grey to grey with a pronounced reddish-brown tinge.

The phase described grades upward into types containing a decreasing proportion of the glassy reddish-brown lava, and an increasing proportion of the dark grey matrix; and the lava nodules also become progressively duller and darker grey in colour approaching the matrix.

The upper parts of the flow, finally, are dark grey, fine grained, and massive, strongly resembling unbedded argillitic greywacke, and distinguished from it only by the presence of numerous small needle-like phenocrysts of hornblende, which may be observed most easily in the light grey weathered surface zone of any specimen. Under the microscope it is seen to consist of about 70 to 75 per cent chlorite, the remainder fine-grained feldspar, determined from its refringence to be albite-oligoclase. About 1 per cent consists of the hornblende phenocrysts noted in the hand specimen. They attain sizes of 1 mm., and are now entirely altered to chlorite. The remainder of the chlorite in the rock has irregular leaf-like forms. The gradations described were traced carefully over good clean outcrops in many places, particularly on the shore of Bear lake and near the west end of H. S. 128, west of Bear lake.

It will be observed that there is a great difference in composition between the bottom and top of the same flow. The base is composed of about 35 per cent hornblende and 65 per cent albite or albite-oligoclase,

the top of approximately 75 per cent chlorite and 25 per cent albite-oligoclase. The variation, in a rapidly cooling lava, cannot be ascribed to differentiation. On the contrary, the freshness of the fragments of glassy trachyte in the middle parts of the flows, and their increasing chloritization as the original surfaces are approached, indicate that the change of composition is due to secondary alteration, and further, that the solutions causing the alteration worked down from the original surface of the flow, not from any later surface such as the present one.

Near the west end of H. S. 128 there is a series of flows averaging about 50 feet in thickness. Each flow lies directly on the clean surface of the underlying flow, no sediment, old soil, or evidences of erosion having been observed at the contacts. Each flow varies in composition from coarse, fresh lava at the base through mixtures of glassy fragments and chloritic matrix into thoroughly chloritized rock at the top. It is evident, therefore, that the change in composition was complete in each flow before it was covered by the next flow. The absence of sediments or evidences of erosion between the flows indicates that the extrusions must have followed one another fairly rapidly, so that chloritization must also have taken place very quickly after extrusion. The conclusion seems justified, therefore, that the chloritization was caused by juvenile solutions accompanying the flows. The changes they wrought in the composition of the trachyte indicate that they carried and introduced considerable quantities of magnesium and probably also of iron.

The textures and structures of the trachyte are such as to prove absolutely its extrusive origin. In addition to the change in texture of the flows from bottom to top, and the occurrence of flow breccias, as already described, other peculiarly volcanic textures may everywhere be observed. Amygdaloidal structures, though uncommon, were observed in the chloritized upper parts of the flows, on H. S. 129, McVittie township, about 15 chains east of the southeast corner of R.S.C. 296, McVittie township, and on the east shore of Bear lake. Explosive breccias, composed of coarse-grained sharply angular fragments of trachyte in a fine-grained matrix of lava or ash, are found near the northwest corner of mining claim L. M. 51, McVittie township, along the east side of H. S. 189, McGarry township, along the west boundary of L. M. 3, McGarry township, on the west boundary of H. F. 32, McGarry township, and in many other places. Tuffs, varying in grain from coarse sand to clay, sometimes showing a little bedding, were found at the northeast corner of H. F. 171, about 15 chains east of the southeast corner of R.S.C. 296, McVittie township. They probably occur in other places, but were overlooked on account of their resemblance to the true sedimentary greywackes. Under the microscope the difference is easily seen, in that they contain no quartz, as the true sediments do, but are made up of angular fragments of feldspar, hornblende, and trachyte.

A single unusual example of flow texture was observed, near the northeast corner of L. M. 3, McGarry township. The texture simulates pillow structure on a small scale, and had perhaps a similar origin. The "pillows" are oval bodies averaging about 6 inches in length by 3 inches in width, and consist of coarse-grained porphyritic trachyte. They are separated from one another by thin bands of dark chloritic material, which, as before, is probably chloritized glass.

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