

April 10, 1980

Your file Votre référence

Our file Notre référence

Mr. Stu Tennant
Atlin Project Manager
Placer Development Limited
700 Burrard Building
1030 West Georgia Street
Vancouver, B.C.
V6E 3A8

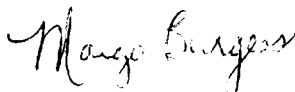
Dear Mr. Tennant:

I have been referred to you by Mr. John Morganti who is in charge of the Howard's Pass Project. Last summer we visited the Howard's Pass area and made some geothermal measurements in a few boreholes on the Anniv claims. Our geothermal studies group is interested in making terrestrial heat flow measurements in the Yukon Territory as part of multidisciplinary study of the Canadian Cordillera.

We will be returning to the Yukon this August to attempt further geothermal measurements and wonder if you might be drilling any boreholes on the Ruby Creek property near Atlin which might be suitable for our purposes. I enclose a plea for boreholes describing the type of drillholes we are looking for and the nature of our measurements. We already have several measurements down to 2000 or more feet in the Surprise Lake Batholith and thus are particularly interested in any holes which might be off the batholith.

Should any suitable boreholes be available we would be interested in arranging a logging trip into the site. Thank you for your help.

Yours truly,



Margo Burgess,
Division of Seismology
and Geothermal Studies.

MB/cmb



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April 14 1980.

Dear Mr Tennant

In my letter to you of April 10, 1980 enquiring about boreholes in the Atlin area which might be available for geothermal measurements, I believe I forgot to enclose the description of the types of boreholes most suitable and of the nature of our measurements. Please find these few pages enclosed with this letter. If you have any suggestions as to other companies working in the area that we might contact, this would be most useful. Thank you again.

Margo Burgess

A PLEA FOR BOREHOLES

The measurement and study of Terrestrial Heat Flow has been going on at the Earth Physics Branch since 1962, when a small group was set up as part of the Canadian Contribution to the International Upper Mantle Project.

Terrestrial Heat Flow is the steady loss of heat from the Earth by conduction, and does not include the more spectacular losses by geyser and volcanic activity. The rate of loss is very small, the average being about 59 mWm^{-2} , but over the whole surface of the globe this amounts to about 30 million MWatts. Volcanic activity puts out heat in enormous quantities in a few small areas, but the annual average energy output is only about 1/3 to 1/2% of the steady loss, which itself is insignificant compared with annual gains and losses of solar energy.

Measurement of Terrestrial Heat Flow is done in two parts. First, a temperature-depth profile is obtained by measurement within a borehole. Second, thermal conductivity of samples, preferably core, from the same borehole is measured in the laboratory. The temperature gradient and thermal conductivities are then multiplied to give the heat flow. Since the heat flow is so small, temperature measurement must be very precise, and the normal equipment will measure to one hundredth of a degree C., or about one fiftieth of a degree F.

Results obtained so far are related to the main structural features within Canada. On the shield heat flow is generally low, between 34 and 54 mWm^{-2} ; in the cordillera the heat flow is high, about 84 mWm^{-2} , and in the plains and the Appalachian area intermediate values are found. It is not yet known for certain how wide an area is represented by any one borehole measurement, but it is suspected that large variations can occur in a few miles, particularly in complex mining areas. Local disturbances due to topographic relief, ground

water movement, and horizontal conductivity contrasts are also severe in the mountainous areas.

A few holes have been drilled specially for heat flow measurement, but this programme has now been stopped by the austerity effort. We have always relied on holes drilled for other purposes to supplement our programme, but now we rely on these holes entirely. We would appreciate hearing about any hole that might be suitable for our purposes. In order to be suitable, holes should generally conform to the following guidelines:

1. Holes should be at least 700 ft. deep if drilled from the surface, but can be 500 feet or more if drilled in a mine;
2. Holes should preferably be vertical, but inclined holes can be used if they are at least 60° below the horizontal;
3. Surface casing should be left in place, so that the holes do not become plugged. Our equipment is very light, and we cannot remove obstructions. Return to equilibrium temperature can take up to two years after drilling, so that the hole should remain available for this period.
4. Samples of the rock penetrated should be available; preferably core and from the same hole. Unsplit core samples of about 4 inches every 25 feet would provide the most precise measurements. Such samples are cut into discs for conductivity measurement and the discs can be returned after measurement if necessary. Split core can be used but either has to be drilled out to obtain a cylinder of a smaller size or must be crushed. Drill-cuttings can also be used. Samples should be typical of the large units penetrated and not of thin untypical units.

5. Disturbing factors such as faulting, water movement, severe topographic relief often make a hole unsuitable, but it is difficult to be specific about these factors.

If your company has any holes that might be suitable for our measurements, and which we would be allowed to use, we would be very grateful if you could let us know. Our address is:

Division of Seismology,
Earth Physics Branch,
Energy, Mines & Resources Canada,
Ottawa K1A 0Y3

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23+	\\	\\	\\	\\	\\	\\	CCCCCDEGGHHIJJJIGFEEDDCCBBBBB+ 20240	
24+	\\	\\	\\	\\	\\	\\	BCCCCCDEGHHHHIHFEEEDDCCBBBBB+ 20210	
25+	\\	\\	\\	\\	\\	\\	BBBBBCCCCDEGGGGGGGFEEDDCCCCBBBBB+ 20180	
26+	\\	\\	\\	\\	\\	\\	CBBBBBBCCDDDDFFFFFEEEDDCCCCBBBBB+ 20150	
27+	\\	\\	\\	\\	\\	\\	CCCCBBBBBCCEDDDFGFFFGEEDDCCCCBBBBB+ 20120	
28+	\\	\\	\\	\\	\\	\\	CCCCCBBCCCCDDDDFGGGGFEDCCCCCCCCBBBBB+ 20090	
29+	\\	\\	\\	\\	\\	\\	CCDDDDCCCCCDDDEEGHHGFEEEDCCCCCCCCBBBBB+ 20060	
30+	\\	\\	\\	\\	\\	\\	CEEEEDDDDDDDDDDEEFGHIGFEDDCCCCCCCCBBBBB+ 20030	
31+	\\	\\	\\	\\	\\	\\	EEEEEEEDDDDDDEEEFFGHHGGFEDDCCCCCCCCBBBBB+ 20000	
32+	\\	\\	\\	\\	\\	\\	CFDDEEFFFFFEEDDEEFGFGGGHGGFEEDDCCCCCCCCBBBBB+ 19970	
33+	\\	\\	\\	\\	\\	\\	BBFFFEDEFFGFFGFEEEDDEEFFFGGGGGGFEEDDCCCCCCCCBBBBB+ 19940	
34+	\\	\\	\\	\\	\\	\\	BBBEEFFFFGGGGGGGEEEEEEFFFFFEEEDDCCCCCCCCCCCCBBBBB+ 19910	
35+	\\	\\	\\	\\	\\	\\	BBBBEEGGGHHHHHGHGFEEFEFFEEFFEEEDDCCCCCCCCCCCCBBBBB+ 19880	
36+	\\	\\	\\	\\	\\	\\	BBBBBEEGHHIJJJHFFFEFFEEFFEEEEEEDDCCBBBBBCCBBBBB+ 19850	
37+	\\	\\	\\	\\	\\	\\	BBBEEFHHIJJJHFFFEFFEEFFEEEEEEDDCCBBBBBCCBBBBB+ 19820	
38+	\\	\\	\\	\\	\\	\\	BBBEEFHHIJJJHFFFEFFEEFFEEEEEEDDCCBBBBBCCBBBBB+ 19790	
39+	\\	\\	\\	\\	\\	\\	BBBEEGHHIJJJHFFFEFFEEFFEEEEEEDDCCBBBBBCCBBBBB+ 19760	
40+	\\	\\	\\	\\	\\	\\	BBBEEJJJHFFFEFFEEFFEEEEEEDDCCBBBBBCCBBBBB+ 19730	
41+	\\	\\	\\	\\	\\	\\	BBBEEDEEEEEEEDDCCBBBBBCCBBBBB+ 19700	
42+	\\	\\	\\	\\	\\	\\	BBBEEEEECCEAAAAAAAABBBB+ 19670	
43+	\\	\\	\\	\\	\\	\\	\\	19640
44+	\\	\\	\\	\\	\\	\\	\\	19610
45+	\\	\\	\\	\\	\\	\\	\\	19580
46+	\\	\\	\\	\\	\\	\\	\\	19550
47+	\\	\\	\\	\\	\\	\\	\\	19520
48+	\\	\\	\\	\\	\\	\\	\\	19490
49+	\\	\\	\\	\\	\\	\\	\\	19460
50+	\\	\\	\\	\\	\\	\\	\\	19430
51+	\\	\\	\\	\\	\\	\\	\\	19400
52+	\\	\\	\\	\\	\\	\\	\\	19370
53+	\\	\\	\\	\\	\\	\\	\\	19340
54+	\\	\\	\\	\\	\\	\\	\\	19310
55+	\\	\\	\\	\\	\\	\\	\\	19280
56+	\\	\\	\\	\\	\\	\\	\\	19250
57+	\\	\\	\\	\\	\\	\\	\\	19220

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	1	2	3	4	5	6		
1+	1234567890123456789012345678901234567890123456789012345678901234						AAA+ 20900.	
2+							BBAAAAA+ 20870.	
3+							BBBAAAAAA+ 20840.	
4+							BBBBAAAAAA+ 20810.	
5+							BBAAAAAA+ 20780.	
6+							BAAAAAA+ 20750.	
7+							BBBBBBAAAAAA+ 20720.	
8+							CCCCBBBBAAAAAA+ 20690.	
9+							CCBBBBBBAAAAAA+ 20660.	
10+							CCBBBBBBAAAAAA+ 20630.	
11+							EDCCBBBBBBAAAAAA+ 20600.	
12+							GFEECCBBBBBBAAAAAA+ 20570.	
13+							GGFECCBBBBBBAAAAAA+ 20540.	
14+							IHGFEEDCCBBBBBBAAAAA+ 20510.	
15+							IHGGFEEDCCBBBBBBAAAAA+ 20480.	
16+							MKIHFFFEEDCCBBBBCCDCCBBBABBBB+ 20450.	
17+							KKJHHHFFFEEDCCBBCCDDEDCDCBBBBB+ 20420.	
18+							HHHHHHIHGHGGEEDCCDDEEEEDDBBBB+ 20390.	
19+							FFEEFHIIHJJIFCCDDEEEEFEDBBBB+ 20360.	
20+							FFFDEEFHIIJMMIGEDDDEFFGGGFEDDBBBB+ 20330.	
21+							FFGFDEEFHIIJKKIGEDDDEFGHIGFEDDBBBB+ 20300.	
22+							DEEEFECDEFGHIIIIIGEDDDEEFHGHFFEDDBBBB+ 20270.	
23+							CDEEEEDCDEFGIJHIIHFEDDDDEFHGHGEEEEBBBB+ 20240.	
24+							BCCDDEECCCEFGIJIHGGGEEDDDEEFGGGFGEEBBB+ 20210.	
25+							BBBCCDDEEEDDEEIIHFFEDDDDDDEEFFFGGFCCCC+ 20180.	
26+							BBBBBBBCEFFEEEGHHFEDCCDDEDDDDDEFFGGGCCCC+ 20150.	
27+							BBBBBBBCEFFEEEGGGFEDCCDDEDDDDDEEFFGGGCCCC+ 20120.	
28+							CCCCCBBBBBCEEEEDDEFGGFEDCCDDEDDDDDEFFCC+ 20090.	
29+							CCCCCCCBCDDEEDDEFGGFEECCDDEDDDDDEFFCC+ 20060.	
30+							CCDDEDDDEEEFGGFEEEDCCDDEDDDDDEFFCC+ 20030.	
31+							CCDDEDDDEEEFGGFEEEDCCDDEDDDDDEFFCC+ 20000.	
32+							CCDDEDDDEEEFGGFEEEDCCDDEDDDDDEFFCC+ 19970.	
33+							CCDDEDDDEEEFGGFEEEDCCDDEDDDDDEFFCC+ 19940.	
34+							BCCCCCDDDDDEEDDDEFFGHIIHGGFEEDDDDDDDDEEE+ 19910.	
35+							BCCCCCDDDDDEEDDDEFFGHIIHGGFEEDDDDDDDDEEE+ 19880.	
36+							BBBBBCCCCCDDDDDEEDDDEFGGGHHGGFFFEEDDDDDCCCC+ 19850.	
37+							BBBBBCCCCCDDDDDEEDDDEFGGGHHGGFFFEEDDDDDCCCC+ 19820.	
38+							BBBBBCCCCCDDDDDEEDDDEFGGGHHGGFFFEEDDDDDCCCC+ 19790.	
39+							BCCCCCFFFEFFFEFFFEFFFGFFFDDDBBBBCCCA+ 19760.	
40+							FFFEFFFEFFFGFFFDDDBBBBCCCA+ 19730.	
41+							IHGGFFFEFFFGFFFDDDBBBBCCCA+ 19700.	
42+							FFFEFFFEFFFGFFFDDDBBBBCCCA+ 19670.	
43+								19640.
44+								19610.
45+								19580.
46+								19550.
47+								19520.
48+								19490.
49+								19460.
50+								19430.
51+								19400.
52+								19370.
53+								19340.
54+								19310.
55+								19280.
56+								19250.
57+								19220.

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	1	2	3	4	5	6	
	123456789012345678901234567890123456789012345678901234	123456789012345678901234567890123456789012345678901234	123456789012345678901234567890123456789012345678901234	123456789012345678901234567890123456789012345678901234	123456789012345678901234567890123456789012345678901234	123456789012345678901234567890123456789012345678901234	
1+	AAAAA+	AAAAA+	AAAAA+	AAAAA+	AAAAA+	AAAAA+	20900.
2+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	20870.
3+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	20840.
4+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	20810.
5+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	AAAAAAA+	20780.
6+	BAAAAAA+	BAAAAAA+	BAAAAAA+	BAAAAAA+	BAAAAAA+	BAAAAAA+	20750.
7+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	20720.
8+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	BBBBBBB+	20690.
9+	DDCCBBB+	DDCCBBB+	DDCCBBB+	DDCCBBB+	DDCCBBB+	DDCCBBB+	20660.
10+	EDCCBBB+	EDCCBBB+	EDCCBBB+	EDCCBBB+	EDCCBBB+	EDCCBBB+	20630.
11+	FFEDCCB+	FFEDCCB+	FFEDCCB+	FFEDCCB+	FFEDCCB+	FFEDCCB+	20600.
12+	HGGFEDC+	HGGFEDC+	HGGFEDC+	HGGFEDC+	HGGFEDC+	HGGFEDC+	20570.
13+	GGGGFED+	GGGGFED+	GGGGFED+	GGGGFED+	GGGGFED+	GGGGFED+	20540.
14+	HHGGFFED+	HHGGFFED+	HHGGFFED+	HHGGFFED+	HHGGFFED+	HHGGFFED+	20510.
15+	IHHGGFFF+	IHHGGFFF+	IHHGGFFF+	IHHGGFFF+	IHHGGFFF+	IHHGGFFF+	20480.
16+	JHHHGGFFE+	JHHHGGFFE+	JHHHGGFFE+	JHHHGGFFE+	JHHHGGFFE+	JHHHGGFFE+	20450.
17+	KHHHHGGFEE+	KHHHHGGFEE+	KHHHHGGFEE+	KHHHHGGFEE+	KHHHHGGFEE+	KHHHHGGFEE+	20420.
18+	LHHHHHGGFFEE+	LHHHHHGGFFEE+	LHHHHHGGFFEE+	LHHHHHGGFFEE+	LHHHHHGGFFEE+	LHHHHHGGFFEE+	20390.
19+	MHHGGHIIHGGF+	MHHGGHIIHGGF+	MHHGGHIIHGGF+	MHHGGHIIHGGF+	MHHGGHIIHGGF+	MHHGGHIIHGGF+	20360.
20+	FFFFFGHIJKI+	FFFFFGHIJKI+	FFFFFGHIJKI+	FFFFFGHIJKI+	FFFFFGHIJKI+	FFFFFGHIJKI+	20330.
21+	FFFFFGHIKKI+	FFFFFGHIKKI+	FFFFFGHIKKI+	FFFFFGHIKKI+	FFFFFGHIKKI+	FFFFFGHIKKI+	20300.
22+	DEEEFECEFGI+	DEEEFECEFGI+	DEEEFECEFGI+	DEEEFECEFGI+	DEEEFECEFGI+	DEEEFECEFGI+	20270.
23+	CCDDDDCEEFH+	CCDDDDCEEFH+	CCDDDDCEEFH+	CCDDDDCEEFH+	CCDDDDCEEFH+	CCDDDDCEEFH+	20240.
24+	ABCCDDCCDDE+	ABCCDDCCDDE+	ABCCDDCCDDE+	ABCCDDCCDDE+	ABCCDDCCDDE+	ABCCDDCCDDE+	20210.
25+	AABBCCCCCCD+	AABBCCCCCCD+	AABBCCCCCCD+	AABBCCCCCCD+	AABBCCCCCCD+	AABBCCCCCCD+	20180.
26+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	20150.
27+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	AAAABBBBCCD+	20120.
28+	CCCAABBBBCC+	CCCAABBBBCC+	CCCAABBBBCC+	CCCAABBBBCC+	CCCAABBBBCC+	CCCAABBBBCC+	20090.
29+	EECCCB BBBB+	EECCCB BBBB+	EECCCB BBBB+	EECCCB BBBB+	EECCCB BBBB+	EECCCB BBBB+	20060.
30+	EEEEEECB BBB+	EEEEEECB BBB+	EEEEEECB BBB+	EEEEEECB BBB+	EEEEEECB BBB+	EEEEEECB BBB+	20030.
31+	EEEEEEEDCB BB+	EEEEEEEDCB BB+	EEEEEEEDCB BB+	EEEEEEEDCB BB+	EEEEEEEDCB BB+	EEEEEEEDCB BB+	20000.
32+	EEEEEEEDDB BB+	EEEEEEEDDB BB+	EEEEEEEDDB BB+	EEEEEEEDDB BB+	EEEEEEEDDB BB+	EEEEEEEDDB BB+	19970.
33+	CEEEEDDEEED+	CEEEEDDEEED+	CEEEEDDEEED+	CEEEEDDEEED+	CEEEEDDEEED+	CEEEEDDEEED+	19940.
34+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	19910.
35+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	BCCCEEEEEEED+	19880.
36+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19850.
37+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19820.
38+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19790.
39+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19760.
40+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19730.
41+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19700.
42+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19670.
43+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19640.
44+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19610.
45+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19580.
46+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19550.
47+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19520.
48+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19490.
49+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19460.
50+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19430.
51+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19400.
52+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19370.
53+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19340.
54+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19310.
55+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19280.
56+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19250.
57+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	BBB BBCCCEEE+	19220.

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