

Appendix A. Core Logs from summer 2008 and 2009

Log of Hole HEB 01. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 615256/5373108, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 8	Overburden					
8 - 21.4	Basalt		Massive. Medium grey colour. Fine grained. Cut by 1 - 2 % carbonate and quartz veins. Traces, to 1 - 2 % locally, of carbonate vesicles up to 2 mm. Locally there are traces of chlorite filled vesicles. From 14.4 to 14.8 there is a zone of "brecciation". It is possibly hyaloclastite but the matrix is very chlorite altered. The fragments are not really angular and are not in situ, they are 1 - 2 cm across.	There is disseminated pyrite associated with this area.	There is some vein associated epidote alteration and sericite alteration traces.	HEB 01 - 01 18.4 - 18.65
21.4 - 22.55	Exhalite		See exhalite descriptions: HEB-01-Ex 1			
22.55 - 33.25	Rhyodacite		Medium grey. Hard. Massive. Spherulitic, but this is a different texture from seen in other holes. The spherules are discrete, up to 2 mm across and do not coalesce. Traces of quartz phenocrysts, very small up to 1 mm. At 25.35 m for 10 cm there is an area of hydrothermal brecciation. Angular fragments 2 - 3 cm that are very silicified in a matrix of quartz and sericite.	There is locally 2 - 3 % pyrite and pyroite, mostly vein associated.	There is epidote and sericite alteration locally and the rock is cut by 1 - 2 % quartz carbonate veins.	
33.25 - 50.37	Dyke		Medium grained to coarse grained, but does get finer towards the margins. The upper contact has been placed following the cogitore log, but the contact is difficult to see. There is no chilled margin. The lower contact is sharp with a good chilled margin, orientated at 30 degrees C/A.		There is patchy epidote alteration throughout, forming discrete alteration zones.	
50.37 - 80.20	Rhyodacite		This is where Vicki took the geochron sample. Lots of core missing, will mostly have to use the log of Cogitore. Can see that it has the same spherulitic texture as seen elsewhere in this unit. The spherules coalesce, they are 1 - 2 cm across, and there are intervals of completely coalesced spherules. Benoit reports two intervals of hyaloclastite, but looks more like intense alteration very chlorite and silica altered but there is a spherulitic texture. The rock is predominantly massive. Medium grey in colour and there is none of the "Messy rock" previously seen in this interval. There are traces of quartz phenocrysts up to 1 mm across.		There are no obvious fragments in the hyaloclastite, just zones of different alteration: chlorite, silica, sericite and possibly epidote.	HEB 01 - 02 70.45 - 70.7
80.2 - 90.28	Dyke		Massive. Medium grey. Fine to medium grained. Fines towards upper margin. The upper contact is sharp but undulose, and the chilled margin is not obvious. Lower contact is sharp and almost perpendicular to C/A, again no chilled margin.	Traces of disseminated pyrite.	There are 1 - 2 % quartz veins, some sericite alteration	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
90.28 - 91	Andesite? Block?		This is possibly a block within the dyke. The lower contact is unseen, so cannot be parallel, but the upper contact is not parallel to the top of the dyke and the dyke resumes afterward. Medium grey. Fine grained and with a spherulitic texture, discreet spherules, up to 2 mm, they do not coalesce. There are no quartz phenocrysts. Same as seen previously, lower contact is occupied by a vein.		Cut by 1 - 2 % quartz veins.	
91 - 92.04	Dyke					
92.04 - 108.5	Rhyodacite		This is most likely the same unit as seen before the dyke. The first 53 cm are spherulitic but after this the rock is spherule free. The spherules are 1 - 2 cm, white in colour and coalesce. There are no quartz phenocrysts in either the spherulitic or non-spherulitic regions. The previous logger has reported breccia intervals through this unit, but I think they are false fragmental textures as a result of silicification: the fragments are very dark in colour, the matrix is silica. The fragments have very diffuse edges and corners. There is one very good possibility for a clast at 93 m, but it is completely isolated from the "Breccia" intervals. It is white coloured with a dark rim, chilled margin?		In the last 1 m there is intense sericite alteration.	
108.5 - 115.92	Rhyodacite		Similar to what was seen in the previous interval. No real contact with the previous unit. The rock is medium grey in colour. Fine grained and contains 2 - 3 % quartz filled amygdaloids. The previous logger reported feldspar crystals but I don't see them. There are no straight edges and they look like silicification flecks. The rock is variably spherulitic with spherules between less than 1 mm to 5 mm, and they coalesce locally.			
115.92 - 116.8	Mafic dyke		The rock is fine grained and a greenish grey colour. There are sharp contacts with good chilled margins, the upper is at 30 degrees C/A, the lower is at 20 - 30 degrees C/A.		There is local sericite alteration.	
116.8 - 119.26	Rhyodacite		This is the same as the rhyodacite seen previously, spherulitic across the entire length and coalescing locally. The spherules are 0.5 to 2 cm across. The last metre is not spherulitic and has 3 - 4 cm thick dykes injected sub-parallel to C/A. The dykes are very fine grained with chloritised mafic phenocrysts and good chilled margins.			HEB 01 - 03
119.26 - 120.9	Dyke		Same as previous dyke. Upper contact is sharp and chilled, 30 degrees C/A. Lower contact is in broken core.			116.75 - 116.9
120.9 - 121.7	Rhyodacite		Same as rhyodacite seen previously.			
121.7 - 122.3	Dyke		Same as previous dyke, contacts sharp and chilled, lower 25 degrees C/A, upper 30 degrees C/A			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
122.3 - 141.6	Rhyodacite		This is the same rhyodacite as seen before. It is massive, with again a false fragmental texture seen before (black clasts, diffuse margins). Traces of quartz phenocrysts that are less than 1 mm. There is 2 - 3 % quartz filled vesicles. The rock is predominantly non-spherulitic, however from the start until 126.4 there are large spherules, fully coalesced for most of the length, with an average size of 1 - 2 cm. There are spherules from 139 until the end of the interval, but here the spherules are less than 1mm and do not coalesce, except in places. There is one region of real hyaloclastite, 128.25 - 128.3. It is of clasts 0.5 cm average, with much finer clasts in the matrix. Clasts are angular and are not in situ, white matrix, green clasts, matrix supported.			
141.6 - 142.13	Dyke		Fine grained. Greenish colour. The upper contact is sharp but undulose, at approximately 40 degrees C/A. There is a clast of rhyodacite within the dyke. The clast is perfectly square - pepperite? - There is 1 - 2 % quartz filled vesicles at the upper margin. The lower contact is sharp at approximately 40 degrees C/A. There is a chilled margin.			
142.13	Rhyodacite		Same as before the dyke		2 patches 3 - 4 cm long of extreme silicification	
- 147.85						
147.85 - 153.8	Dyke		Medium grained, finer at the margins. White flecks, possibly plagiocrystals. Contacts are sharp with good chilled margins, upper at 30 degrees C/A, lower is undulose approximately perpendicular to C/A.		1 % quartz veins.	
153.8 - 169.45	Rhyodacite		Same as before the dyke. There is 110 cm thick mafic dyke at 162.3 with good chilled margins, but irregular contacts.			
169.45 - 189.5	Pillow/Pillow Breccia		Basaltic andesite, according to the Cogitore chemistry. The pillows are an average of 80 cm thick. The pillow margins are characterised by epidote altered hyaloclastite. The matrix is very fine grained and green in colour. The fragments are angular and jigsaw fit, completely chloritised but they do show zoning in some regions, where they have white centres and chlorite altered rims. The clasts are an average of 0.5 - 1 cm across, although in some places they are larger, 2 - 3 cm. In the first 5 m there are pillows that are less than 12 cm across, with chilled margins all the way around, may be pillow breccia here. The pillows are massive, medium grey and fine grained. They are mostly spherulitic with 1 - 2 cm spherules that are completely coalesced away from the margin. Some of the pillow margins appear to have flow			HEB 01 - 04 174.1 - 174.35

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			banding, often defined by lineations of spherules, if it was for the Cogitore chemistry then I would say lobe margin. Some pillows are spherule free.			
189.5 - 195.65	Andesite		Massive. Fine grained. Medium grey to greenish colour. Homogenous. There are traces of chlorite filled vesicles, that are less than 1 mm across.		The rock is cut by 1 % quartz or calcite veins.	
195.65 - 198.93	Dyke		Medium to coarse grained in the centre. The rock does fine toward the margin. The upper contact is sharp and irregular, no chilled margin. The lower contacts sharp and very irregular, with a good chilled margin. The rock contains chloritised mafic minerals and possibly feldspar phenocrysts.			
198.93 - 200.4	Andesite		Same as seen above the dyke.		2 - 3 % veinlets, quartz and calcite	
200.4 - 200.72	Dyke		Same as previous dyke. LC, sharp, no chilled margin, 40 degrees C/A. UC, Sharp, chilled margin, very irregular.			
200.72 - 206.35	Andesite		Same as before the dyke, but from 202.45 for 25 cm there is a patch of hyalacastite. The clasts are zoned with a greenish colour in the centre and a thick-ish rim of chlorite, then a thin white rim of quartz. The clasts are angular and in situ, with a 0.5 cm average.			
206.35 - 211.3	Dyke		Same as dyke seen previously. The upper contact is sharp with a good chilled margin and very irregular. The lower contact is sharp with a good chilled margin, at 40 degrees C/A.			
211.3 - 218.52	Andesite, pillows		Predominantly massive. May be pillow. Periodically, at repetitive intervals the rock shows de-coalescing spherules that seem to show flow banding?? In these regions there is a hint of hyalacastite. The last 60 cm of this interval is real hyalacastite, with angular chloritised clasts with a jigsaw fit aspect, the average clast size is 1 cm. The massive intervals are medium grey, homogenous, non-vesicular and aphyric.		Extremely chlorite and epidote altered locally	HEB 01 - 05 211.5 - 211.7
218.52 - 232.88	Shear zone		The rock is intensely sheared and altered. It is very difficult to see anything. The shear is orientated at approximately 30 degrees C/A. although it varies slightly through the interval. There are two possible dykes although they are difficult to see and impossible to tell margin angles, as they are also sheared. The dykes are at 220 - 223 and 232 - 232.9		There is intense epidote and sericite alteration, prior to and affected by the shear. There are also flecks of chlorite alteration, aligned parallel to the shear.	
232.88 -	Andesite		This is the same andesite as seen previously. It is massive until 238.3, when there is 30 cm of hyalacastite, with 1 - 2 cm average clasts,		There is more chlorite and epidote alteration in the	HEB 01 - 06

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
290.51			which are completely chloritised. Then it is massive again until 247.29 - 250.8, where it is pillowed, the margins are characterised by 1 - 5 mm spherules and hyaloclastite, with less than 0.5 cm fragments. The margins are between 60 and 90 cm apart. Then the rock is massive until 255.9, where there is a faint spherulitic with large amorphous spherules up to 3 cm across, but this is not a pillow margin. From 255.9 - 285.5 it is pillowed and the pillow margins have the same characteristics as above, the fragments are slightly larger here, 1 cm average and the spherules are more amorphous but less than 2 cm. The margins are an average of 1 m apart, max 160 cm, min 60 cm. From 268.4 - 290.51 the margins are 120cm apart average, max 170, min 60		margins.	263.8 - 264.1
		265.5 - 268.4	Dyke. Same as last seen dyke. Upper contact is chilled sharp and irregular. The lower contact is sharp 30 - 40 degrees C/A			
		270.2 - 272.9	Same as above			
		275.14 - 175.48	Same as above			
290.51 - 300.9	Dyke		Similar to dykes seen previously. Possibly feldspar phynic for first 20 cm, but there is a lot of chloritised mafic minerals. The upper contact is sharp with a good chilled margin orientated at 55 degrees C/A. The lower contact is very irregular but displays a chilled margin. The rock fines towards the margins. At 298.43 - 299.2 there is a dyke within a dyke, contacts are sharp with good chilled margins, upper contact 30 - 40 degrees C/A, lower contact is irregular.			
300.9 - 322.92	Andesite Pillows		Same unit as before the dyke. Pillows. Margins are an average of 90 cm apart, min 30 cm, max 170 cm. There are dykes at 304.4 - 305.5; 312.77 - 313.35 and 315.85 - 316.93			HEB 01 - 07 311.3 - 311.6
322.92 - 324.14	Dyke		Same as dykes seen previously. Upper contact is sharp with a good chilled margin 30 degrees C/A. Lower contact is sharp with a good chilled margin at 30 degrees C/A.			
324.14 - 370.82	Andesite pillows		Pillows same as before the dyke. Margins are approximately 1 m apart, min 80 cm, max 210 cm.			HEB 01 - 08 369.1 - 369.35
370.82	Dyke		Upper contact is sharp with a very good chilled margin, orientated at			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
- 375.3			70 degrees C/A. The rock gets coarser towards the centre, then fines towards the lower margin. There are patches of chlorite alteration throughout, and there are 1 - 2 % quartz and calcite veinlets. The lower contact is very irregular but has a good chilled margin.			
375.3 - 397.8	Andesite		Very similar to the pillow's seen previously. Pillow margins are between 70 and 150 m apart.			
		386 - 387.06	Dyke.		Very chlorite altered.	
397.8 - 404.05	Dyke		Very similar to previously seen dykes, upper contact is sharp and irregular with good chilled margin, same for the lower contact.			
404.05 - 405.63	Andesite Pillows		Same as previously seen pillows. Only one pillow margin, very chlorite altered.			
405.63 - 414.62	Dyke		Upper contact is relatively arbitrary. This is similar to dykes seen previously, but very altered. At 413.8, there is a series of contacts with small dykes injected into this one, none bigger than 5 cm, there are 3 of them. The lower contact is sharp with good chilled margin orientated at 30 degrees C/A.		There is no evidence of brecciation, may be false fragmentation, with epidote, sericite, silica and chlorite alteration. 5 - 10 % veins of quartz and carbonate	
414.62 - 426.31	Andesite		Pillows. Very similar to what was seen previously. The margins are 30 - 40 cm apart			HEB 01 - 09 424.2 - 424.5
426.31 - 448.44	Dyke		Similar to those seen previously. Aphanatic at the lower margin, slightly coarser toward upper margin. Lower margin is sharp and chilled. Upper margin is sharp and very chilled, almost 2 cm of chilled margin. Both orientated 30 - 40 degrees C/A.		Cut by 1 - 2 % quartz carbonate veins, with some epidote alteration.	
448.44 - 449.34	?		Definitely some fragments in there, 1 - 2 cm across, white and silicified. If it is fragmental it is matrix supported. Looks massive for most of the length, only last 10 cm has breccia look. Block transported and altered in the dyke? Probably		Lots of silica and sericite alteration, some epidote too	
449.34 - 519.83	Dyke		This is the same dyke as seen above. Good chilled margin sharp contact 30 - 40 degrees C/A. There are some chilled margins within the dyke indicating multiple injection events, but clearly the same dyke. Medium grained for most of the length. Fines slightly at the margins. Chloritised mafic phenocrysts, 2 - 3 %. From 480.47 - 485.1		There are traces of epidote veinlets. 2 - 3 % quartz carbonate veinlets.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			the rock is possibly andesite. The contacts are very arbitrary but the rock displays a spherulitic texture and a chloritised patch that may have been a pillow margin. There are no hard contacts - dissolution at margins? Dyke fines towards the lower contact which is in broken core, but can see pieces of chilled margin.			
519.83 - 521.7	Coarse Tuff		No evidence of grading or lamination. Clasts vary between very fine grained and 0.6 mm. Clasts are green, white and black. Black clasts are chloritised. The clasts are subangular to subrounded. The rock is cut by 1 % quartz and carbonate veins. The lower contact is sharp.	There are traces of disseminated pyrite.		
521.7 - 556.85	Pillow Breccia		The rock is a medium grey green colour. The breccia consists of a variety of clasts, ranging from less than 0.5 cm to greater than 1 m. Most of the breccia regions are matrix/cement supported. 50 -60 % of the clasts have chilled margins and 100 % of the clasts that are greater than 30 cm have chilled margins. Most fragments are rounded but some have fluidal shapes, or are angular. Some clasts have 1 - 3 % chlorite filled vesicles 1 - 2 mm. A very few clasts have large quartz filled vesicles up to 0.5 cm. The first 4 m is massive and the base has a chilled margin. It is the same as many of the clasts. The polymictic nature suggests that this is not primary pillow breccia, maybe resedimented with the largest clasts representing new pillow or new fragments. The last 3.5 m of this interval display white clasts up to 10 cm, that are rounded these are mixed with the other clasts present higher up. These clasts have chilled margins and 3 - 5 % chlorite filled vesicles, less than 1 - 2 mm across	Some clasts have blebs of sulphide.	The matrix is generally chloritised or silicified. Some clasts are completely sericite altered.	HEB 01 - 10 524.5 - 524.75
		539.27 - 540.54	Dyke. Maybe felsic, previous logger called it QFP but I have only seen 1 possible phenocryst, that is probably an amygdales. The rest is definitely amygdales, up to 1 %. There is no feldspar. The contacts are sharp, but not chilled.			
556.85 - 566.38	Basalt		Massive and medium grey. The first 1.5 m are amygdular with 3 - 4 % chlorite filled vesicles and less than 1 % glomerophyritic feldspar phenocrysts. After this there is less than 1 % of the chlorite filled vesicles until the end of the interval, but there is 10 - 20 % glomerophyritic phenocrysts of feldspar. They are white and can be up to 2 cm across. Sometimes they are a bit green around the edges, which may be the result of epidote alteration.	There is less than 1 % disseminated pyrite in this rock.	There is 1 red vein, may be hematite or carbonate. Traces of quartz veinlets. Traces of sericite veinlets.	HEB 01 - 11 565.5 - 565.8
566.38 - 610.2	Dyke (Dio)		Similar to dykes described above (not QFP). Medium to fine grained, grey green colour, massive and homogenous. Fines toward margins. The upper contact is relatively arbitrary, it is a very veined region. In		There is variable epidote alteration throughout, weak to moderate and the first 1 m has	

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			places the same glomerous, < 1 % as seen above are visible, but the rock here has the same texture as where they are absent, this is still the dyke.		patches of chlorite alteration, which is also variable throughout.	
610.2 - 610.7	Exhalite		See exhalite descriptions: HEB-01-Ex 2			
610.7 - 623.45	Bas And		Massive mafic. Fine grained. Greenish grey in colour with varioles that may just be epidote alteration patches, 3 - 5 % locally.	Traces to 1 % disseminated pyrite.	Less than 1 % quartz/carbonate veinlets. Local black chlorite alteration patches.	HEB 01 - 12 618.3 - 618.6
623.45 - 624.05	Exhalite		See exhalite descriptions: HEB-01-Ex 3			
624.05 - 663.3	Tuff		The first 2.5 m show normal grading. From coarse tuff at the top with average grain size 1 - 2 mm, rounded to subangular clasts, predominantly chloritised, sometimes displaying an in situ look, down to real breccia with 3 - 4 cm fragments in a matrix supported rock. The matrix is silicaceous and does contain 3 - 4 mm fragments. All fragments in this unit are chloritised with the exception of up to 1 % green fragments. After this the same general pattern is repeated until 640, with three graded units, however in this lower section more of the clasts are unchloritised. 3 graded units until 640. After 640 until 652 there is no grading, no finer grained units, just the breccia but now there is 3 - 5 % angular white clasts 1 - 2 cm across, does not look pumiceous despite what the previous logger reported. After 652 the breccia is the same but the white fragments are dominant and here they are clearly rounded, 2 - 3 cm across. They look a little like silica alteration patches but are probably fragments, they are very hard. From 658 - 658.4 the breccia consists of coarse fragments 3 - 5 cm, with a sort of in situ aspect. The fragments are chloritised, black. There is no matrix, but there is a quartz cement. From 658.4 to 661.09 there is a graded tuff. There are three graded units, 60 cm, 1 m and 110 cm. From very fine grained tuff at the top to coarse grained at the base. The top unit has the coarsest coarse grained region 1 - 2 mm, the other coarse regions are up to 1 mm. Then until the end of the hole the white fragment breccia resumes. The fragments are 5 - 6 cm across, both angular and rounded. No in situ look.	1 - 2 % disseminated pyrite associated with the matrix. There is sulphide associated with the larger fragment breccias, 1 - 2 % pyrite.	There is some carbonate alteration in the clasts of the lowest unit.	HEB 01 - 13 660.1 - 660.
End of hole						

Log of Hole HEB 02, Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 614713/5372815, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 37.75	overburden					
37.35 - 39.86	Basalt		The rock is medium grey to pale grey, and aphanitic to very fine grained. The rock is probably a lava, it is massive.		There are 1 % quartz veins.	HEB 02 - 1 38.73 - 38.98
39.86 - 40.44	Andesite? Dyke		The rock contains 3 % quartz filled amygdalae, that are sometimes filled with calcite and occasionally chlorite. The rock is magnetic in places, and the magnetism is associated with yellow subhedral crystals. The contacts of this rock are sharp	There is 1 % disseminated pyrite		
40.44 - 48.45	Basalt		The rock is massive and a medium grey colour. The rock is fine grained. There are no vesicles. The rock has a false fragmental texture as a result of patchy chlorite alteration.		There is patchy sericite and silica alteration, and there are traces of dissolved calcite veins	
48.45 - 51.62	Dyke		The lower contact of this unit is very sharp but is not obviously intrusive, it is orientated at 40 - 50° C/A. The upper contact is intrusive, orientated at 45° C/A. There is 3 % amygdalae, locally up to 5 %, the amygdalae are filled with chlorite and are up to 2 mm across. The rock does not contain as many magnetic crystals as the previous dyke, but the rock is still magnetic near the upper margin.		There are 2 - 3 % quartz veins, that are up to 2 cm thick.	
51.62 - 52.68	Basalt		The rock is the same as the previous basalt intervals, the rock is light grey to dark grey. There are quartz filled amygdalae.			
52.68 - 64.66	Tuff/ Exhalite??		The rock is a coarse to fine grained tuff. The fine sections are laminated at 45° C/A. An example is at 60.6 m. There are fragments up to 2 mm across in the coarsest fraction. The fragments are chloritised and sub-angular to sub-rounded. There are white feldspar fragments, but most of the fragments are basaltic. The coarsest sections are thickly bedded, > 1 m. There are no bedded sulphides.			Exhalite 64.7 - 66.2
		56.13 - 58.69	This is a dyke. The rock is fine grained to aphanitic at the margins and up to 1 cm in centre.		There are traces to 1 % of quartz veins, some of which are associated with metallic minerals.	

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64.66 - 65.20	Exhalite		It is difficult to see anything because the core is rusted. The rock contains sulphides and exhalitive sediment. There is also black argillites. The rock is finely laminated, and the laminations are 1 - 5 mm thick, they are orientated at 50° C/A. The black sediment is interbedded with very fine tuff and pyrite. From 64.9 - 65 m the rock appears brecciated, but is again difficult to see. There may be spherulites in some lamina. The first 5 cm of the interval are cherty. See Exhalite descriptions: HEB-02-Ex 1			
65.20 - 95.78	Basalt		The rock is medium grey and massive. It is fine grained and aphyric. There is 1 - 2 % calcite and epidote filled vesicles, that have very irregular shapes and are less than 2 mm across. Locally there is 2 % carbonate spheroids, that are more likely to be a result of alteration than devitrification. There is locally a false fragmentation texture, which is a result of intense chlorite and silica alteration, however there may be an aspect of hydrothermal brecciation, for example at 81.9 - 82 m. From 78.5 - 78.6 m the core is broken, the previous logger suggested a fault but there is also broken core at 77.9 - 78.1 m and 82.3 - 82.7 m. None of these intervals are associated with gouge. From 86 - 98 m there is a strong schistosity orientated at 37° C/A.	There is patchy sphalerite and pyrite	There is carbonate alteration throughout, mild. There is 2 - 3 % calcite veins. From 84.5 m until the end of the interval the alteration becomes more intense, chlorite, silica and sericite alteration. The rock is completely silicified in places and shows a false fragmentation texture	HEB 02 - 2 78.1 - 78.4
95.78 - 111.5	Gabbro dyke		The upper contact is unclear and is occupied by sericite, chlorite and silica alteration. The lower contact is sharp and marked by graphitisation. The contact is at 35° C/A. The rock is fine grained to aphanitic at the margins. With a maximum of 2 mm grainsize at the centre, but the average grainsize is 1 mm. The plagioclase crystals are epidotised and there is almost complete replacement of mafic minerals by chlorite. From 107.6 m there is 1 % calcite filled amygdaloids, they are not seen above this, suspicions of a contact, but it is not clear.		There is also a high percentage of sericite veins. There is 2 - 3 % carbonate veinlets overall and there are traces of quartz veinlets. There is sericite associated with some of the quartz veinlets and there is patchy sericite alteration throughout.	
111.5 - 136.30	Basalt		The rock is medium grey to pale grey and aphyric. There is 3 % quartz filled amygdaloids, that are more concentrated locally, some of the vesicles are chlorite or carbonate filled. The rock is massive overall. There are 2 - 3 % devitrification spheroids locally. From 115.36 - 116.02 m there may be real breccia here, the clasts are angular and chloritised. From 123.68 - 123.94 m there is also real breccia here. From 121.13 m there	There is some pyrite associated with the chloritisation	The rock is slightly silicified in places, patchily. There is patchy chloritisation. There is a false fragmentation, with "clasts" 0.1 - 1 cm, locally as a result of chlorite and sericite alteration and a black chloritised matrix.	HEB 02 - 3 122.2 - 122.45

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			is a possibility of peperite, with very fine fragments in a massive matrix, for about 30 cm. From 127.71 - 129.37 m there is also breccia with clasts up to 2 mm. The clasts are epidotised and chloritised. There are also massive clasts that have calcite filled vesicles. The matrix is chloritised, and there is patchy sericite alteration			
136.36 - 140.5	Rhyodacite tuff		Medium grey to green fragmental rock. The fragments are rounded and 8 - 12 mm. The fragments are epidote altered. From 139.1 m until the end of the interval there is > 90 % spheroids that have coalesced in places. The spheroids are siliceous with no internal structure. Locally 10 % of the fragments are quartz with angular shapes. The contacts of this interval are sharp at 40° C/A.		The whole rock is altered by chlorite, epidote and silica	Exhalite 139.7 - 145.4
140.5 - 143.3	Rhyodacite tuff and exhalite		The lower contact is unseen, there is core missing. The rock consists of interbedded black argillites and lapilli tuff from the previous unit. There is sulphides within the lamina. The laminations are at 40° - 50° C/A.			
		140.5 - 140.75	Interbedded black argillites and some chert. The beds are up to 1 cm thick. The upper 5 cm has a fragmental aspect and there is a large, 4 cm thick, quartz vein invading and obscuring some of the beds.	The argillites contain sulphides		
		140.75 - 141.35	The rock here is massive and aphyric, there are 3 % vesicles that are less than 2 mm across. This rock is either basalt or very fine tuff. The original logger said that this was tuff, but there is no evidence of fragments.		The rock contains 1 % chlorite veins and 1 - 2 % calcite veins.	
		141.35 - 143.3	The rock here is interbedded tuff and argillite with sulphides in the tuff beds. The argillite beds are a few mm to 1 cm thick, the tuff beds are a maximum of 17 cm thick.	There is 1 bed of massive pyrite	There is 2 - 3 % calcite veins. There are traces of quartz and sericite veins. There is 1 orange carbonate veins.	
143.3 - 150.32	Rhyodacite?		The rock is a medium grey colour. There are traces of quartz filled vesicles that are less than 2 mm across. The rock is aphyric although there are quartz spots, but they are probably alteration rather than phenocrysts. The rock is massive although at 144.41 m there is hydrothermal brecciation associated with a quartz vein. From 146.08 - 146.23 m there is brecciation, but is probably a result of alteration, the clasts are sub-angular, but the fragments are all bounded and defined by veins. The same texture is seen at 147.65 - 147.72 m.		There is 1 % quartz veinlets and 1 % carbonate veinlets. There is moderated sericite alteration and mild silicification	
150.32	Rhyodacite		The rock here is definitely a breccia, although the origin is	There are clumps of		HEB

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
- 152.49			unclear. The clasts are up to 5 cm across and they contain vesicles. The vesicles are quartz filled and less than 2 mm across. The clasts do not have chilled margins. The matrix is black and hard, and is probably argillite. Some of the fragments are dark green, others are white, there may also be fragments of lapilli tuff.	pyrite crystals in the matrix, < 1 %.		02 – 20 150.2 - 150.5
152.49 - 155.40	Rhyodacite		The rock here is probably the same unit as the one above. The rock here is massive. The rock is aphyric and very fine grained. The rock is a medium grey to green colour. In the last 45 cm there is a lapilli tuff aspect with rounded fragments up to 2 mm across. There is a gradational transition with the massive region above		Patchy alteration, silica and sericite. There is also chlorite alteration.	
155.40 - 156.4	Breccia		The rock here is fragmental, although the fragments are larger than seen previously. The fragments are angular and contain chlorite filled vesicles, that are 1 - 2 mm across. The fragments have a jigsaw fit aspect. The matrix is fine grained and chloritised. The fragments are 3 cm across on average, but can be as little as 0.5 cm at the lower margin. The upper contact is unclear. Some of the fragments are white and siliceous.			
156.4 - 157.65	Breccia		The breccia here is large with fragments greater than 2 cm across. The fragments are black and white in colour. The fragments have angular shapes. The rock looks as though it has a jigsaw fit in places. The matrix is black and hard, either silicified chlorite or black argillite. The rock is intensely altered in places, destroying the original texture. Some clasts are green and contain small chlorite filled vesicles			
157.65 - 161.49	Massive rhyolite		The rock is massive and homogenous. The rock is a medium grey colour. There are traces of quartz filled vesicles with carbonate rims. There are also strange globular, circular silica textures locally, for example 158.6 m.	There are traces of disseminated pyrite.	There is 1 - 2 % calcite veinlets. Alteration patches of sericite and chlorite.	
161.49 - 164.96	Tuff/Lapilli tuff		The contact of this unit with the one above is wavy. The rock here is fragmental and coarsens downwards, the clasts are 2 mm at the upper margin but up to 1 cm elsewhere. The rock is a medium grey colour. The breccia appears clast supported. At 161.73 m there is a patch of hydrothermal brecciation with calcite cement		There is traces of calcite veins and silicified patches, overall the rock is 2 - 3 % silicified	HEB 02 – 4 163.28 - 163.43
164.96 -	Dacite dyke		This unit has sharp contacts, both upper and lower, but they are irregular. The lower contact is occupied by a quartz vein.		There is 1 % quartz veinlets.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
166.35			the upper contact is orientated at 10° C/A. The rock is medium grey with good chilled margins at the contact. There is 1 % calcite filled amygdaloids. The rock is fine grained and homogenous.			
166.35 - 168.21	Lapilli tuff		The rock contains small rounded clasts in a fine grained matrix. The rock is a medium green colour. The clasts are an average 2 mm and the rock is 90 % fragments. The matrix of this rock is chloritised. At the upper margin there is a hydrothermal breccia associated with the vein that occupies the contact with the dyke		There are patches of silicification. There is 1 % calcite veins	
168.21 - 170.9	Rhyodacite (check chemistry)		The rock here is massive and has 70 - 90 % spheroids. The spheroids are hard and silicified. The spheroids coalesce locally. The rock looks similar to the texture seen in the basaltic andesite in previous holes. From 169 - 169.42 m the rock is broken up into chips less than 3 cm big. The spheroids occasionally have radial fibres, but are mostly devoid of internal structure			HEB 02 - 5 168.5 - 168.75
170.9 - 173.58	Tuff/Lapilli Tuff?		This unit contains rounded fragments in a fine grained matrix. The clasts are green to white in colour and are 3 - 4 mm across. From 173 - 173.4 m there is a hydrothermal breccia with jigsaw fit clasts that are 0.5 - 1 cm across. The cement is quartz and calcite. There are devitrification spherules at the margins of the unit.		There are 5 - 6 % calcite veinlets. The rock is intensely altered and primary texture is difficult to see.	
173.58 - 187.61	Tuff/Lapilli Tuff		The fragments of this rock are angular and the matrix is fine grained. The fragments are up to 2 mm across. Some of the fragments are quartz crystals. After the first 75 cm the fragments are rounded. There is no grading in this rock.		The rock contains traces of calcite and sericite veins. The matrix is chloritised and there is complete silica replacement in places. In places the chlorite and sericite alteration completely obscure the primary texture.	
187.61 - 190.7	Rhyodacite		The rock is massive and medium grey. The rock is aphyric. At 188.31 m for 10 cm there is a real breccia, with angular fragments that are less than 2 mm across, there is a fine grained matrix and quartz cement.	There are traces of disseminated pyrite.	There are traces of quartz and calcite veins. There is a false fragmental texture given by a sericite overprint of chlorite alteration.	
190.7 - 193.4	Dacite dyke		The upper contact of this rock is sharp and has a good chilled margin, the contact is orientated at 80° C/A. The lower contact is sharp and has a good chilled margin, the lower contact is orientated at 20° C/A. The rock is medium grey and homogenous. The rock is aphyric, fine grained to aphanitic at		There are traces to 1 % carbonate veinlets.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			the margins and up to 1 mm in the centre. For the first 20 cm the rock contains 3 - 5 % orange carbonate filled vesicles, elsewhere there is only traces of these vesicles.			
193.4 - 199.7	Tuff/Lapilli tuff		The overall colour of the rock is dark grey. The fragments are angular to rounded and composed of quartz and chloritised material. The rock is clast supported. The first 40 cm has complete silica replacement, leaving only a few patches of protolith that are 5 - 10 cm across. Ghosts of the fragmental texture are visible beneath the silica alteration.		The rock is strongly to intensely chlorite altered. There is 1 - 2 % carbonate veins.	HEB 02 - 6 197.85 - 198.15
199.7 - 205.4	Andesite		The rock is massive and medium grey. The rock is homogenous. There are traces of quartz filled vesicles, the vesicles are up to 2 mm across. The rock is aphyric. From 201.11 m the rock develops spheroids, which may be associated with devitrification, there are 10 % spheroids and locally up to 90 %. The average size of the spheroids is 5 mm.		There are traces of calcite veinlets and there is moderate sericite locally	
205.4 - 206.6	Mafic dyke		The upper contact is sharp and clearly intrusive, the contact is orientated at 60° C/A. The lower contact is perpendicular to C/A and is also clearly intrusive. The rock is massive and homogenous. There are traces of calcite filled amygdalae. There are also traces of chlorite filled vesicles. All the vesicles are up to 2 mm across. The rock is aphyric and aphanitic.		There are traces of pyrite, in clumps. There are 2 % calcite veinlets.	
206.6 - 208.95	Andesite pillows?		The unit here is fragmental. The clasts are an average of 2 - 3 mm but have a maximum size of 1 cm. The clasts are sub-angular to sub-rounded. Some clasts have chilled margins. The rock is clast supported. The breccia does not have an in situ aspect. The rock has a quartz cement. There are a variety of clast types but most are chloritised. The rock is a medium grey to green colour. Could be resedimented hyaloclastite.		The rock is chlorite and sericite altered. There are traces of calcite veinlets	
208.95 - 209.72	Andesite		The rock is massive and homogenous. There is 1 % calcite filled vesicles at the upper margin, but only traces elsewhere. At 209.34 - 209.46 m there is 90 % spheroids, that are very small, less than 2 mm across. There are traces of quartz filled vesicles at the lower margin.			
209.72 - 209.82	Hyaloclastite		The rock is fragmental and contains angular clasts that are chloritised and less than 2 cm across. The rock is monomictic and has quartz cement			
209.82 -	Andesite pillows		There are spheroids at the upper margin, which are less than 1.5 cm. The spheroids coalesce completely and there are no			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
214.31			spheroids after except at 212.68 - 212.77 m there is a brief patch of spheroids that are up to 7 mm across. At 210.52 - 211.33 m there is another patch of spheroids that has 90 % chlorite in between and at 213.46 - 216.56 there is possibly a perlitic texture, not really clear but noted by the previous logger. The rock is homogenous and medium grey, it is also aphyric and fine grained. There are traces of chlorite filled vesicles.			
214.31 - 214.66	Hyalacastite		Angular fragments that have a jigsaw fit aspect, and the fragments are chloritised. Some of the fragments still show chilled margins. The average clast size is 4 - 5 mm, although there are some that are 2 cm. The breccia is monomictic and has quartz cement.			
214.66 - 215.46	Massive andesite		The rock is massive and homogenous. It is fine grained and aphyric. There are spheroids that are highlighted by chlorite alteration. The spheroids are less than 2 cm across. The spheroids have a radial pattern and coalesce. From 214.8 m for 40 cm the spherules are fully coalesced.			
215.46 - 216.44	Hyalacastite		The fragments in this rock are angular. Most of the fragments are chloritised, but some are white. There are traces of disseminated pyrite on the clasts. Some of the clasts contain spheroids that are less than 1 mm across. The clasts are an average size of 1 cm and have a maximum size of 3 cm.		There is very intense sericite alteration at 216.1. There is a 2 cm thick quartz vein at 215.79	
216.44 - 217	Andesite pillows		The rock here is massive and homogenous. The rock is fine grained and aphyric. There are devitrification spheroids that are less than 1 cm across, and coalesce. The rock is medium grey.		There are traces of calcite veinlets	
217 - 292.28	Andesite pillows		The rock here has the same pattern as the previous four intervals. The massive parts of these units represent pillows, while the hyalacastite parts are the interpillow material. Some of the massive regions have spheroids. Some of the pillows have flow banding? at the margins. At 224.1 - 224.35 m there is an aphanitic, homogenous and medium grey felsic dyke. The dyke has sharp contacts and chilled margins. The hyalacastite is all very similar, see the interval for 215.46 - 216.44 m for a description. From the point 250 m the hyalacastite becomes thicker, possibly reflecting a change to pillow breccia facies. From the point 262.49 m the maximum			HEB 02 - 7 240.63 - 240.88 HEB 02 - 8 280 - 280.28

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			size of the massive intervals is 12 cm, and they have irregular edges, they are clasts of pillows. From 267.85 m pillows can be seen until the end of the interval with the interstitial hyaloclastite being no thicker than 10 cm. Also from the point 267.85 m the spherules are only located in the last few cm of the margins.			
292.28 - 300.77	Diorite Dyke		The rock here is medium grey and fine grained. The rock is aphanitic at the margins. The contacts are sharp and have chilled margins. The rock is aphyric and has traces of quartz filled vesicles that are 1 - 2 mm across. The contacts are orientated at 45° C/A. The rock is homogenous.		There are traces of quartz veins, 1 % carbonate veinlets and traces of chlorite veinlets.	
300.77 - 308.65	Andesite pillows		This is the same as the unit before the dyke. The pillow margins are no thicker than 10 cm.		There are calcite veinlets that are transposed. There are traces of epidote veinlets	
308.65 - 469.06	Diorite Dyke		The rock is medium grey and massive. The rock is homogenous. It is aphanitic at the upper margin, and there is a chilled margin. The contact is sharp and orientated at 55° C/A. The grain size is up to 2 mm away from the margin. The rock is feldspar phyric, although the feldspar has been altered to epidote. There are 2 - 3 % of these crystals, and up to 10 % locally. The mafic minerals have been altered to chlorite, and are needle shaped. At 321.4 m there is a very low angle contact with a chilled margin, this minidyke is aphanitic and the lower contact is at 322.03 m. There is another mini-dyke at 330.98 - 331.11 m, the upper contact is obscured by alteration and the lower contact is 70 - 80° C/A, and this dyke is also feldspar phyric. There is another minidyke at 334.25 - 335.05 m, the contacts of this dyke are sharp, and the upper contact is orientated at 30° C/A and the lower is at 45° C/A. There is a third dyke at 353.65 - 354.22 m and the contacts are both sharp and orientated at 50° C/A, this dyke is aphanitic and 15 % feldspar phyric. There is yet another mini-dyke at 383.45 - 384.29 m, this dyke also has sharp contacts and good chilled margins, the lower contact is perpendicular to C/A, the upper contact is at 35° C/A. From 390.26 - 390.75 m the core is broken into chips smaller than 2 cm. From 401.5 - 403.5 m there is evidence of shear in the form of transposed chlorite veins, there is also concentrated quartz and sericite veins in			HEB 02 - 9 322.1 - 322.35 HEB 02 - 10 370.15 - 370.45 HEB 02 - 11 460.62 - 466.82

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
469.06 - 479.8	Andesite		<p>this area, and 1 calcite veins. At 443.9 - 444.63 m the core is broken up into fragments less than 2 cm across. The contact is very gradational and is only marked by a decrease and cease of mafic minerals, it is not sharp.</p> <p>This rock is medium grey, fine grained and homogenous. There are traces of chlorite filled amygdalae, that are 1 - 2 mm across. From 474.55 m the rock is pillow breccia, and is mostly hyaloclastite with clasts of the homogenous material seen above. There are 1 - 2 % chlorite filled vesicles in the clasts. The clasts can be up to 70 cm across. The matrix of the breccia is chloritised and so are most of the clasts. Some of the clasts are green or white. The clasts are all angular and have an in situ character in most places. There are very small spheroids present on some of the clasts, they are less than 1 mm across. The base of the unit is not seen, but the original logger has the contact at 480.4 m, but this is in the missing box.</p> <p>BOX MISSING!</p>		There are traces of quartz veins. There is complete silica replacement locally	HEB 02 - 12 469.31 - 469.56
480.4 - 487.43						
487.43 - 492.25	Basalt/Intrusion		<p>Medium grey and homogenous rock. The rock contains silicified, white rounded shapes interpreted by the previous logger as feldspar glomerophyres. There are 10 - 20 % of them, although at the lower margin there are none. The rock also contains 10 % very small chlorite filled vesicles, some of which contain pyrite. The contacts of this unit are difficult to see but they are definitely not sharp, although they may be hidden by alteration. The previous logger thought it was an intrusion.</p> <p>There is 1 % quartz crystals that are less than 1 mm across. The rock is dark grey. There is very little primary texture left as a result of silicification until 497.1 m. Below 497.1 m the rock is fresher and contains micro-spheroids that are less than 1 mm across, they have variable presence. From 497.1 - 501.06 m the rock is flowbanded and still contains quartz crystals. There are spheroids in the flow bands. In places the rock has a fragmental aspect, which may be as a result of alteration. The previous logger suggested autobrecciation, but the clasts are rounded and the rock is matrix supported. An example of the "breccia" is at 501 - 501.5 m. From 521.3 - 522</p>		The rock is silicified	HEB 02 - 13 490.94 - 491.17
492.25 - 532.16	QP Rhyolite		<p>There is 1 % quartz crystals that are less than 1 mm across. The rock is dark grey. There is very little primary texture left as a result of silicification until 497.1 m. Below 497.1 m the rock is fresher and contains micro-spheroids that are less than 1 mm across, they have variable presence. From 497.1 - 501.06 m the rock is flowbanded and still contains quartz crystals. There are spheroids in the flow bands. In places the rock has a fragmental aspect, which may be as a result of alteration. The previous logger suggested autobrecciation, but the clasts are rounded and the rock is matrix supported. An example of the "breccia" is at 501 - 501.5 m. From 521.3 - 522</p>	There is pyrite and sphalerite mineralisation, with traces of chalcopyrite between the start of the interval and 497.1 m	The rock is intensely silicified. There are patches of vein controlled silicification at: 522 - 522.6 m, 523.72 - 523.89 and 525.1 - 525.7	HEB 02 - 14 502.55 - 502.81 HEB 02 - 15 531.38 - 531.67

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
532.16 - 561.1	QFP Rhyolite		<p>m the rock is broken up into chips less than 5 cm, and is probably a fracture zone.</p> <p>The rock contains 2 - 3 % quartz and feldspar phenocrysts in a medium to dark grey rock. The contact with the overlying unit is not sharp. The alteration gives a false fragmental texture at 543.25 - 543.79 m, although this may be real breccia, if it is, it is matrix supported with white and green fragments. Some of the fragments have flow banding, the average clast size is 2 cm and the max is 10 cm, the clasts are angular and chloritised. There are massive intervals and intervals of flow banding. At 543.1 - 559 m the rock is all flow banded and has traces of spheroids that are 1.5 - 2 cm across. From 559 - 561.1 m the unit is massive. There is a spherulite texture in the last 30 cm.</p> <p>The rock is very similar to the basalt seen earlier. There is 10 % large chlorite filled vesicles that are less than 3 mm across. There are 15 - 20 % glomeroporphyres of feldspar that are up to 1 cm. The rock is medium grained and medium grey. Mafic minerals can be seen. From 568.9 m the glomeroporphyres are not present, neither are the vesicles. The upper contact is sharp and intrusive and orientated at 10° C/A. There are traces of the glomeroporphyres in the last 50 cm. The lower contact is sharp and intrusive and is perpendicular to the C/A. The rock is not magnetic.</p>		There are patches of moderate to intense silica and sericite alteration. Overall there is 1 - 2 % quartz veinlets and weak to moderate chlorite alteration.	HEB 02 - 16 536.79 - 537.09 HEB 02 - 17 560.58 - 560.8
561.1 - 592.75	Gabbro dyke		<p>There are traces to 1 % quartz phenocrysts. The first part of the unit is massive and homogenous. The rock is a medium grey colour. The rest of the unit is flow-banded, and the bands are orientated at 30° C/A. There are suspicions of brecciation in places, but is likely to be alteration, the "clasts" are 2 cm across, rounded and the rock is matrix supported. There is no in situ aspect.</p>	There is 1 % disseminated pyrite and less than 1 % chalcopryite	There are traces of quartz-calcite veinlets and there is patchy chlorite alteration.	HEB 02 - 18 584.56 - 584.96
592.75 - 640	QP Rhyolite				There is vein controlled sericite alteration and moderate silicification. There is 1 % quartz veinlets and weak to moderate chlorite alteration. The rock has 1 % carbonate veinlets.	HEB 02 - 19 612.4 - 612.65
End of hole						

Log of Hole HEB 03. Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 615838/5373310, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0.0 - 7.25	Overburden					

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
7.25 - 18	Leucotonalite		The core is very broken up. The rock is fine grained and a pale beige to grey colour. The rock is aphyric.	There is weathered pyrite everywhere that is probably the result of sulphides that have been left out in the weather	There is 4 - 5 % chlorite veins. In places the rock is weathered to an orange colour which is probably an iron carbonate, but does not react with HCl. In other places there is a pinkish colour, which is probably the result of haematite alteration. There is 1 % calcite veins that have dissolved and there is also calcite associated with the chlorite veins.	
18 - 42.5	Diorite dyke		The rock is fine to medium grained. The upper contact is unclear as it is in broken core. The rock is a medium grey to green colour. The rock is not magnetic. The rock is aphyric and homogenous. The lower contact is sharp and intrusive and is orientated at 65° C/A.		The rock is cut by 2 - 3 % epidote veinlets and traces of carbonate veins. There are traces of quartz veins and there is some chlorite associated with the quartz veins.	HEB 03 - 01 19.16 - 19.4
42.5 - 52.66	Basalt		For the first 30 cm there is what appears to be laminations, some including pyrite. The original logger identified this as a ductile shear zone, and there is some evidence of deformation in this area. The rock is very fine grained. The rest of the interval is intensely sheared until 48 m. The shear is orientated at 40° C/A. After the first 30 cm the rock is fine grained and a medium grey colour. The rock is cut by 3 - 4 % carbonate veins. It is aphyric. From 48 m until the end of the interval the rock is massive and unsheared. There are spherules, from 1 - 70 %, they are rounded and are less than 1 mm across, they do not coalesce.		The rock is cut by 5 % calcite veins.	HEB 03 - 02 52.26 - 52.56
52.66 - 57.0	Dyke?		The upper contact is intrusive and sharp with a good chilled margin, but it is difficult to see which side it is on. The contact is orientated at 25° C/A. The rock is medium grey and fine grained. There is 1 - 2 % chlorite filled vesicles and traces of quartz filled vesicles. The vesicles are 1 - 2 mm across. There are no spherules.		There is 1 - 2 % carbonate and quartz veinlets	
57.0 - 58.65	Diorite dyke		The rock is a medium grey to dark grey colour. The rock is massive and homogenous. It is fine grained and aphanitic at the margins. The rock is aphyric. The upper contact is sharp and is orientated at 70 - 80° C/A and has a good chilled margin. The lower contact is sharp with a good chilled margin, it is wavy and is orientated at 20°		The rock is cut by 1 - 2 % calcite veins	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
58.65 - 60.00	Dyke? Dacitic?		C/A. The rock is a pale grey to beige colour. It has 2 - 3 % quartz filled vesicles that are less than 2 mm across. The rock looks silicified, but is easy to scratch. There is a very strange texture locally, almost fragmental but this is probably the result of sericite alteration. The rock is fine grained to aphanitic. The origin is unclear The upper contact is sharp and has a good chilled margin. The rock is orientated at 25° C/A. The rock is very fine grained to aphanitic at the margins. It is a medium grey colour and is aphyric. The rock is non-vesicular. The lower contact is at 85° C/A, and is occupied by a vein.			
60.00 - 61.74	Diorite dyke		The rock is a medium grey and massive and contains 60 - 70 % sphenules that are 1 - 3 mm across and they do not coalesce. There is 1 % rose quartz filled amygdalites that are 2 - 3 mm across and irregularly shaped. There is 2 - 3 % quartz filled vesicles that are circular to irregular in shape and they are 2 - 3 mm across. There is a gradational contact with the lower unit.	There are traces of pyrite associated with the veins and disseminated throughout the rock	There is 1 % carbonate veins and traces of quartz veins	
61.74 - 67.2	Basalt?		This is similar to a unit seen higher up. There is 2 - 3 % chlorite filled vesicles that are 1 - 3 mm across. There are traces of quartz filled vesicles and the rock is medium to dark grey colour. The rock is very fine grained and aphyric. There is an irregularly shaped dyke at 69.16 - 69.6 m. The dyke has an aphanitic groundmass and chilled margins it is phytic with a mafic mineral that has been altered to chlorite and there are traces of quartz crystals.			
67.2 - 70.36	Basalt		The rock is aphanitic at the upper margin and has sharp intrusive contacts orientated at 60° C/A. The first 20 cm contains 10 % white feldspar phenocrysts that are up to 3 mm across, after this the phenocrysts are less than 1 mm across. The rock is a medium grey colour, and is massive and homogenous. At 78.5 m there is quartz-carbonate vein that is 5 cm thick.		There is 1 - 2 % calcite veinlets and traces of quartz veinlets. There is one epidote veinlet. There is also some epidote associated with the quartz veinlets	
70.36 - 91.02	Diorite dyke		The contact with the diorite is sheared, and the first 15 cm are laminated and there is pyrite in the laminations. There is no cherty material. The shear is orientated at 40 - 50° C/A. The rest of the rock is a medium grey with 20 %		The rock is cut by 5 - 6 % calcite veins with traces of quartz veins. There is a patchy sericite alteration in spots that are rounded and are less than 1.5 cm across	
91.02 - 97.53	Rhyodacite/ Exhalite?			There is 1 % pyrite disseminated throughout the rock	The rock is cut by 1 - 2 % calcite veins. There is patchy sericite alteration.	HEB 03 - 3 92.01 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
97.53 - 100.70	Tuff/Exhalite		<p>spherules that are 1 - 2 mm across. The spherules do not coalesce and there is 1 - 2 % quartz filled amygdals that are 1 - 2 mm across. The vesicles are circular to irregular in shape. There are traces of quartz phenocrysts.</p> <p>The first 60 cm are massive tuff. It is very fine grained and there is no visible grading. There are traces of hydrothermal brecciation in places. Then for 9 cm there is a clast or small flow of the rhyodacite seen above. Then for 40 cm there is a normally graded massive tuff with traces of pyrite in it, the rock has a green colour and is cut by an epidote veinlet. Then for 24 cm there is disturbed sediment, which almost looks fragmental and there is evidence of former bedding and there are pyrite "beds" as well as pyrite superimposed on the rock. There is silicification and quartz veining. Then there is a 1 cm thick lamination of very fine tuff, after this there is 5 cm of disturbed tuff lamina and the pyrite here looks superimposed. Then there is laminated tuff and pyrite for 15 cm then there is 5 cm of black hyaloclastite fragments. Then for 45 cm there is a massive very fine tuff with patches of sericite alteration and 1 % quartz veins, there is 1 % pyrite disseminated throughout this section and associated with the quartz veins. Then the core is broken up for 23 cm but there is evidence of lamination and soft sediment deformation. Then for 6 cm there is nicely laminated fine tuff and pyrite. Then for 15 cm there is disturbed sediment and evidence of soft sediment deformation. Then until the end of the interval there is massive ungraded coarse tuff. There is what appears to be clasts of the underlying rhyodacite that vary from 3 to 15 cm across, rip-up clast?</p>		The tuff is cut by traces of calcite veins	92.27
100.70 - 190.17	Rhyodacite		<p>The contact with the tuff is unclear and irregular. There is a concentration of chlorite filled vesicles, nearly 30 %, that are 2 - 3 mm across in the first 20 cm of the rock. There are only traces of quartz filled vesicles in the rest of the rock. There are traces of quartz filled vesicles throughout the rock. The rock is massive and medium grey. The rock has 2 types of spheroids, 1 type is small,</p>		<p>There is patchy sericite and chlorite alteration. The rock is cut by 2 - 3 % calcite veinlets, there are traces of quartz veinlets and local silicification. There is 2 - 3 % vein controlled sericite alteration</p>	<p>HEB 03 - 4</p> <p>141.1 - 141.3</p> <p>HEB 03 - 5</p>

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
190.17 - 198.32	Andesite		less than 2 mm across, they are circular or slightly irregular in shape, they are white and well defined. This type does not coalesce and there is 3 - 5 % throughout the rock. The other type is white to pale beige and they are 5 mm to 1.5 cm across, they coalesce locally and there are up to 90 % locally but they are absent elsewhere. The second type of spheroids are very similar to the texture seen in basaltic andesite in previous holes. The second type are more poorly defined, amorphous and have softer edges. The rock has a brecciated texture at 131.1 - 137.43 m. The breccia is matrix supported and the clasts are composed of the rhyodacite. The clasts are angular and they are 0.5 to 5 cm across. The breccia texture may be the result of alteration, as it is monogenic and has a silicified matrix. At 146.8 - 147.2 m the rock is fractured in places and friable in others, this is probably a fault or fracture zone. The same fragmental texture that was seen previously in this rock is again observed at 158.45 - 159.95 m, the matrix in this area is haematite altered. After this there are patchy intercalations of the brecciation that are less than 70 cm long.		below the dyke.	187.4 - 187.65
		133.95 - 134.14	There is a small dyke, the core is broken up so the contacts are difficult to see. The rock is medium grey and aphanitic.			
		137.43 - 139.5	There is a mafic dyke, the upper contact is at 70 - 80° C/A and the contact is sharp and has a good chilled margin. The lower contact is unclear. The rock is dark grey and homogenous and there is patchy silicification and 1 % quartz veins.			
		150.2 - 152.36	There is a diorite dyke. The rock is fine grained and aphanitic at the margins and aphyric. The rock is a medium grey to green colour. The upper contact is sharp and has a chilled margin. Both contacts are orientated at 40 - 50° C/A.			
			This rock is pillow breccia. It is mostly hyaloclastite, the fragments are 0.5 - 1 cm and they are angular and chloritised. There is a jigsaw fit aspect to the rock. There are chilled margins on the clasts. There are larger with			HEB 03 - 6 191.7 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			fluidal shapes, they are up to 15 cm and they have chilled margins. The large fluidal clasts are aphyric and non-vesicular, but they are probably pillow fragments. There are spheroids in the pillow fragments, the spheroids are up to 1 cm and are a beige-whitish colour, they coalesce locally. The last 3 cm are massive, aphyric and contain the same spheroids as in the pillow clasts described above. Some of the spheroids are a dark green in colour.			192
198.32 - 201.94	Diorite dyke		The rock is a medium green colour and is very fine grained. It is weakly magnetic. The rock is aphyric. The upper margin is sharp and has a chilled margin. It is orientated at 70 - 90° C/A. There are traces of spherules in the diorite that are less than 1 mm and seem to cluster around a vein. There are traces of quartz filled vesicles.			
201.94 - 214.60	Andesite pillows		There are massive intervals separated by hyaloclastite. The massive intervals range from 30 to 70 cm in length. The hyaloclastite intervals range from 10 - 30 cm in length. Because of the thickness of the hyaloclastite intervals this may be pillow breccia rather than pillows. The massive intervals are spheroidal, the spheroids are white and silicified, the surrounding rock is black as a result of chlorite alteration. The spheroids are 0.5 - 2 cm across and coalesce locally. There are radial fibres visible within some of the spheroids. There are also quartz filled vesicles that are irregularly shaped and less than 1 mm across visible in the massive regions. The hyaloclastite intervals have angular clasts that are clearly jigsaw fit, the fragments are up to 2 cm in size. Most fragments are chloritised, but some are completely epidote altered. The cement is quartz and sericite. In places there are very small spheroids, less than 1 mm, visible on the hyaloclastite clasts. From 206.63 - 207.13 m the core is broken up, but quartz and haematite veins can be seen. On average the rock is a medium grey colour.		There are traces of calcite alteration in blobs. There are traces of quartz veins.	
214.60 - 223.58	Diorite dyke		The rock here is completely homogenous and massive. There are traces of quartz filled vesicles and traces of chlorite filled vesicles. There is 2 - 3 % needles of a mafic mineral that has been altered to chlorite. The rock is		There are traces of quartz veinlet	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			medium to fine grained. In the centre the rock is coarser grained and shows feldspar laths. The upper contact is sharp at 50° C/A but there is no real evidence of a chilled margin. The lower contact is sharp and orientated at 70° C/A and there is a good chilled margin.			
223.58 - 228.46	Andesite		This is the same andesite as before the dyke but there is only one hyalaclastite interval, at 223.7 m that is 5 cm across. There is 60 - 70 % spherules either side of the hyalaclastite but only traces elsewhere. The rock is mostly massive. From 227.04 m the rock is sheared, and there is intense sericitisation accompanying the shear. There are also traces of hydrothermal brecciation with quartz and chlorite cement. The lower contact is unclear.		The rock is intensely	
228.46 - 254.67	Diorite dyke		The rock is a medium grey colour and homogenous. There are less than traces of chlorite filled vesicles that are circular and 1 mm across. The upper contact is graphitised and the rock is strongly sericitised for the first 50 cm, after this there is 5 % sericite veins until 233.36 m where the rock is strongly sericitised again until 234.17 m. There is a small unsericitised dyke within the second sericitised zone at 233.92 - 233.97 m. There is hematite within the small dyke. The small dyke cuts a graphitised region in the sericitised zone, which could be a small fault. Towards the end of the second sericite region the rock develops a false fragmentation texture. At 244.3 - 244.9 m there is a fracture zone, and the core is broken up. The lower contact is sharp with a good chilled margin and is orientated at 45° C/A.	There is 1 % disseminated pyrite throughout the rock. There is also traces of pyrrhotite	There is 2 - 3 % calcite veins. Overall there are traces of chlorite veinlets. From 252.1 - 253 m the rock is completely bleached and there is patchy hematite alteration	
254.67 - 290.33	Andesite pillows/massive		The upper part of the rock is clearly pillows. The massive intervals are up to 1 m in length. The pillow margins are characterised by hyalaclastite that has fragments that are less than 1 cm across. The fragments are angular and chloritised, the cement is quartz and the fragments are jigsaw fit. The hyalaclastite intervals are no thicker than 7 cm. There are spheroids on either side of the hyalaclastite that are up to 5 mm across and coalesce locally. There is either no spheroids within the massive regions or the spheroids have completely coalesced. There are no		There are traces of quartz veinlets	HEB 03 - 7 258 - 258.3

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
290.33 - 302.52	Gabbro dyke		<p>vesicles. In places the hyalacastite intervals are silicified. There is a mini dyke that is 5 cm thick that has good chilled margins and is aphanitic, it cuts a hyalacastite interval at 261.9 m. There is a very thick interval of hyalacastite with silicification and epidote alteration at 270 - 271.3. There is pyrite associated with this hyalacastite, 2 - 3 %. After the thick hyalacastite the rock is completely massive until 277 m then there are pillows until the rest of the interval. At 280.61 - 281.17 m the core is broken up into small pieces, and this is probably a fracture zone.</p> <p>The rock is massive and aphanitic at the margins. It is coarse grained at the centre. There are mafic minerals that have been altered to chlorite and there are feldspar crystals visible. The rock has an orange colour in places which could be carbonate alteration or the weathering of sulphides. The rock is not really magnetic, but is slightly more magnetic at the margins. There is evidence of shear that is noticeable by the mineral alignment orientated at 20° C/A, from 298.30 - 299 m. The lower contact is difficult to see because of the alteration.</p>		There is intense silicification at 297 - 298.1 m. There is sericitisation in the last 30 cm.	
302.52 - 315.52	Diorite		<p>The rock is medium grey and fine grained and homogenous. The lower contact is irregular and is orientated at approximately 20° C/A. The contact has a good chilled margin. The rock is not magnetic.</p>		There are traces of quartz veins	
315.52 - 344.14	Andesite pillows		<p>This is the same as the pillow interval described previously, the pillow margin/hyalacastite intervals are less than 7 cm. At 324.2 - 325 m there is 3 - 4 % chlorite and quartz filled vesicles that are 1 - 2 mm across and circular in shape. From 342.37 m the rock becomes pillow breccia, with large rounded clasts that have spheroids. There are also smaller angular clasts that have chilled margins and lots of hyalacastite.</p>			HEB 03 - 8 316 - 316.3
344.14 - 347.44	Tuff lapilli		<p>The rock is clast supported and the fragments are angular to subrounded, some of the clasts look a lot like the rounded and angular clasts with the chilled margins that were seen in the previous interval. Most of the clasts are less than 1 cm across, but some of the large rounded clasts</p>			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
347.44 - 374.6	Pillow breccia		are 5 - 6 cm across. The small clasts are chloritised and have sharp edges but rounded corners. Locally there is a jigsaw fit texture, but mainly not. Some of the clasts have chlorite filled vesicles. This was previously interpreted as a polymictic tuff, but it looks like a pillow breccia. There are massive regions that are spherulitic and sometimes contain quartz vesicles, these massive regions are less than 10 cm across and often 3 - 4 cm. There are also angular clasts that are 1 - 2 cm across that have chilled margins and sometimes have vesicles. Most of the clasts are less than 1 cm across, chloritised and have a jigsaw fit aspect, these are clearly former hyalaclastite fragments. The cement is quartz. In some places there are clasts of the hyalaclastite that are completely formed of very fine grained pyrite. The previous logger called these massive sulphide clasts, but they still have a jigsaw fit aspect. In areas there is hydrothermal brecciation which further confuses things.	There is often pyrite associated with the hyalaclastite, both on the fragments and in the cement. There is also chalcopyrite and sphalerite associated with the hyalaclastite.		HEB 03 - 9 353 - 353.25
374.6 - 378.92	Diorite dyke		The rock has sharp contacts with good chilled margins. The upper contact is orientated at 40 - 45° C/A and the lower unit is perpendicular to the C/A. The rock is massive, homogenous and medium grey. The rock is fine grained and aphanitic at the margins. The rock is aphyric. The rock is weakly magnetic.		There is 1 - 2 % calcite veins.	
378.92 - 392.52	Andesite pillow breccia		This is the same unit as before the dyke. It becomes real pillows for the last 4 m		There is 1 - 2 % quartz veins in the massive intervals	
392.52 - 394.45	Rhyodacite (Dyke?)		There is a sharp contact that is orientated at 50° C/A. The rock is medium to dark grey, fine grained to aphanitic. There are 4 - 5 % feldspar phenocrysts, they are very small and white in colour, they are less than 1 mm across. The previous logger thought that this may have been a dyke because of the sharp contacts	There is 1 % pyrite in blebs	The rock is silicified and sericite altered	HEB 03 - 10 392.62 - 392.84
394.45 - 399.68	Diorite dyke		The upper contact is sharp and has a good chilled margin. The contact is orientated at 50 - 60° C/A. It is aphanitic at the margins and fine to medium grained at the centre. The rock is aphyric and there are traces of quartz filled vesicles that are 1 - 2 mm across and circular in shape.		There is 1 - 2 % quartz veins and traces of carbonate veins and traces of chlorite veins. There is possibly silicification.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
399.68 - 433	Rhyodacite		<p>There are possibly mafic minerals that have been altered to chlorite. The lower contact is sharp and has a good chilled margin, the contact is orientated at 70° C/A.</p> <p>The rock is massive. The rock is medium grey to dark grey. The rock contains 1 - 2 % spheroids that do not coalesce and are white and rounded. There are also traces of quartz filled vesicles. The rock is homogenous. In places there is a false fragmentation texture as a result of silica and sericite alteration. At 403.22 - 403.53 m there is a mafic dyke that has clearly visible mafic minerals that are probably altered to chlorite, it has sharp contacts that are orientated at 80° C/A and the contacts have chilled margins, there is 1 % quartz veins in the dyke. A very similar dyke to this is seen at 404.91 - 404.96 m. At 408.2 - 408.72 m there is a dyke of the same composition as the preceding diorite dyke, with contacts that are very irregular and wavy.</p>			HEB 03 – 11 427.2 - 427.5
433 - 469.87	Andesite		<p>The core is very altered by sericite and is broken up into small pieces for the first 1.5 m. Then there is strong silicification and chloritisation until 436 m, there epidote associated with the chloritisation, in veins. There are also veins of a yellow mineral - Sphalerite?. After this the rock is massive andesite with sericite alteration that is patchy, there are also quartz veins until 436.7 m. Then there are hyalacastite intervals with spheroids to either side. The spherules coalesce locally and are 0.5 - 1 cm across, they have circular to irregular shapes, they are either white and silicified or sericite altered. The hyalacastite fragments are an average of 0.5 cm across, they are chloritised and have a jigsaw fit characteristic. The cement is quartz but there is also epidote alteration in many of the hyalacastite intervals. The hyalacastite intervals make it likely that this is pillows. Locally there is evidence of shear, in that the fragments and spherules are elongated at an orientation of 30° C/A, this is the result of tectonic deformation.</p>		There is 1 - 2 % quartz veins, traces of epidote veins and traces of veins of an orange carbonate.	
469.87 - 496	Massive andesite (maybe diorite)		The rock is medium grey, massive and homogenous. The upper contact is covered by a patch of sericite alteration,		The rock is cut by 1 - 2 % calcite veinlets and patchy sericite alteration	HEB 03 – 12

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
496 - 524.1	Polymictic breccia		<p>but the rock is very different to either side. There are calcite filled vesicles, that are up to 2 mm across and circular in shape. There are traces of chlorite filled vesicles that are up to 1 mm across. The lower contact is gradational. The argument for this to be andesite is supported by hyalacastite intervals at 482.18 - 482.36 m. The intervals are less than 5 cm across, and there are spheroids to either side of the hyalacastite intervals. From 494.54 m the rock is pillows until the end of the interval, there are spheroids at the pillow margins and they are less than 1 mm across and there are 80 - 90 % of them, they coalesce locally.</p> <p>The upper contact is sharp. The clasts are angular to subrounded. The previous logger called this a rhyodacite tuff, and there is 70 % felsic fragments, they are white silicified, angular and rounded, they are 1.5 - 2 cm across, in places the matrix is also of this composition. There is also 20 % mafic fragments that are angular and chloritised and are less than 1 cm across, in places this type of fragment has a jigsaw fit aspect, the matrix is of this composition in places. There is also large subrounded pink clasts that are hematite altered. The rock is matrix supported. Locally there are regions of pure hyalacastite and pure pillow margins. For example hyalacastite at 506.5 - 507 m and pillow breccia at 510 - 515 m. From 515 - 516.97 m there is an intensely silicified unit that looks like a feldspar phyric rhyodacite in the fresher part. It is a dark grey colour and develops a false fragmental texture for the last 7 cm. There is a sharp but very irregular and wavy contact, then the pillow breccia resumes. The previous logger has marked the core here as "Rhy Sph Tuff", but it really looks like pillow breccia, with large rounded clasts, up to 8 cm, that contain spheroids. These large clasts are surrounded by hyalacastite. This continues until the end of the interval. From 519.3 - 520.1 m the core is broken up into small pieces, and this is probably a fracture zone</p> <p>The rock is a medium to dark grey colour, and there is 1 -</p>			473.6 - 473.9
524.1 -	Basalt pillow				There are patches of silicification	HEB 03 - 13 510 - 510.26

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
530.18			2 % chlorite filled vesicles. There are white specks throughout the rock which are probably feldspar phenocrysts, 2 - 3 %. The rock is very altered. The pillow margins are characterised by hyaloclastite, the clasts are angular and chloritised and jigsaw fit, they are less than 0.5 cm across. The hyaloclastite intervals are less than 5 cm across and there are no spheroids on the margins of the hyaloclastite intervals.			
530.18 - 530.35	Exhalite?		There is core missing and the core is broken in places. There is 2 cm of very fine grained ungraded tuff. Then there is 10 cm of very fine grained pyrite that is ungraded and massive. There are two quartz veins cutting the pyrite, they are 0.5 cm across. Then for the rest of the interval there is coarser pyrite, 3 - 4 mm across and this is mixed with lapilli tuff with rounded clasts that are also 3 - 4 mm across.			Exhalite 530.18 - 530.35
530.35 - 531.75	Breccia		The rock is a matrix supported breccia, the clasts are rounded to subrounded and 3 - 5 cm across. There are quartz filled vesicles within some clasts. The clasts are white or grey. The matrix is green in colour and fine grained. There are also rounded clasts that are 1 - 2 mm across, they are white. The rock is very silicified in places.			
531.75 - 532.4	Mafic dyke		The rock has good chilled margins. The upper contact is orientated at 20 - 30° C/A and the lower contact is perpendicular to C/A. The rock is fine grained to aphanitic. There are traces of chlorite alteration spots. There are glomerophenocrysts of feldspar, less than 1 %			
532.4 - 552.35	Breccia		This is the same breccia as before the dyke. There are however completely chloritised clasts visible as well, these clasts are 3 - 4 cm across. There are also clasts that are composed of calcite, they are 0.5 cm across. Some of the clasts can be up to 25 cm across, and there may be quartz crystals as well as the amygdales in this clast. From 543 m until the end of the interval all of the clasts become smaller, < 1 cm, and more rounded and equant. In places the breccia texture looks like the result of alteration. From 538.6 m until the end of the interval there are only a few fragments, 1 every 70 cm, they are white and very		There is patchy, sericite alteration and patchy chlorite alteration	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
552.35 - 553.1	Mafic Dyke		irregularly shaped and they are less than 1 cm across. The rock is a green colour and silicified. The rock is medium to fine grained and has chilled margins. The upper contact is orientated at 30° C/A and the lower contact is orientated at 45° C/A. There is 2 - 3 % quartz filled vesicles and 1 - 2 % mafic minerals that have been altered to chlorite can be seen.			
553.1 - 558.71	Breccia		This is the same as before the dyke, except that there are even less fragments, < 1 % and the false fragmentation texture is more obvious.	There is 2 - 3 % disseminated pyrite and there is also 1 - 2 % pyrite veins.	The rock is very silicified and chlorite altered. There are chlorite alteration spots in some of the silicified regions.	HEB 03 - 14 556.8 - 557.1
558.71 - 570	Rhyodacite		The rock is massive. It is also fine grained to aphanitic, there is 9 - 10 % quartz filled vesicles that are 2 - 3 mm and very irregularly shaped, they are randomly elongated. There is also 1 - 2 % feldspar phenocrysts that are 1 - 2 mm across. Locally there is 2 - 3 % spherules that are white and have irregular shapes, they are 0.5 - 1 cm across. They do not coalesce.	There is 1 - 2 % disseminated pyrite	The rock is strongly silicified in places	
570 - 575	Rhyodacite		The first 5 cm of this interval are brecciated, then for 10 cm there is a massive aphanitic and feldspar phyric rhyodacite, there are 1 - 2 % of these crystals. Then there is 3 cm of hyaloclastite, the fragments are chloritised and angular, they are less than 1 cm across and have a jigsaw fit aspect. Then the rock is massive and fine grained with 3 - 4 % spherules that are white and silicified, they are less than 2 mm across and have round shapes. There are patches of silicification that are more intense locally than the general silicified character of the rock. There is patchy intense sericite alteration and haematite alteration that gives the rock a pinkish character. In places there is a false fragmentation texture which developed as a result of the various alterations. There are traces of chlorite filled vesicles and there are 2 - 3 % quartz phenocrysts that are less than 0.5 cm across. There is core missing at the end of the interval.			
575 - 576.2	Breccia		The clasts vary in size from less than 0.5 cm to 2 - 3 cm in size. The clasts are angular and monomictic. There is no			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			matrix only quartz and sericite cement. The clasts are a green colour. There is 2 - 3 % disseminated. There is sericite alteration and silicification of some of the clasts. This unit is probably the result of hydrothermal alteration.			
576.2 - 580.68	Rhyodacite		The rock is massive although there are patches of hydrothermal brecciation producing clasts that are 0.5 cm across, they are angular with quartz cement. There is 1 - 2 % calcite filled vesicles and locally there is 1 - 2 % spherules that are less than 1 mm across. There is 1 - 2 % quartz phenocrysts that are less than 0.5 mm but they are only visible locally	There is 3 - 4 % disseminated pyrite and 1 % pyrite blebs. There are traces of pyrite veins	There is strong silicification and sericitisation, there are patches of strong chlorite alteration. There is haematite alteration to give the rock a pinkish colour	
580.68 - 585.25	Diorite Dyke		The contacts of this rock are sharp and have chilled margins, both contacts are orientated 70 - 80° C/A. The rock is not magnetic. The rock is aphanitic at the margins, fine grained at the centre. There are traces of feldspar phenocrysts. The rock is a grey green colour and is massive and homogenous.		There are traces of calcite veinlets	
585.25 - 601.43	Rhyodacite		This is the same as before the dyke.			HEB 03 - 15 591.83 - 592.13
601.43 - 602.3	Mafic Dyke		The rock is massive and homogenous. It is fine grained, the contacts are sharp and have chilled margins. The lower contact is orientated at 45° C/A, the upper contact is 20° C/A.	There is 1 - 2 % pyrite blebs	There are traces of calcite veinlets. There is 1 - 2 % mafic minerals that are altered to chlorite.	
602.3 - 625.1	Andesite		The rock could be massive or could be pillow breccia. Overall it is a medium grey green colour and is very altered by chlorite and sericite, and it is silicified in places. There are quartz filled in the "clasts", they are 2 - 3 mm across and are irregularly shaped. There is intense chlorite alteration locally. The "clasts" have chilled margins but it could be sericite alteration. The clasts are very irregularly shaped and range in size from 1 cm to 30 cm. There are traces of chlorite filled vesicles.	There is 2 - 3 % disseminated pyrite and traces of pyrite veins. There is 1 % pyrite blebs.	There is 1 % quartz veinlets	HEB 03 - 16 604.7 - 605
625.1 - 629.49	Diorite		The upper contact is sharp and clearly intrusive and is orientated at 70° C/A. The rock is a medium grey colour and is massive and homogenous.	There is 1 - 2 % disseminated pyrite and traces of blebs.	The rock is calcite altered, it reacts locally with acid.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
629.49 - 630.47	Exhalite		There is laminated cherty material interbedded with very fine grained pyrite after 15 cm of massive very fine grained tuff. The pyrite beds show evidence of soft sediment deformation. Then there is massive ungraded lapilli tuff for 9 cm. The clasts are rounded and some are chloritised, then there is massive chert for 4 cm. Then there is massive ungraded lapilli tuff again until the end of the interval.			Exhalite 629.49 - 629.81
630.47 - 631.46	Mafic Dyke		There are sharp contacts with good chilled margins, the upper contact is orientated at 20°C/A and the lower contact is orientated 20°C/A. The rock is fine to medium grained and massive and homogenous. There is 1 - 2 % mafic minerals altered to chlorite. There are traces of calcite filled vesicles.		There is 1 % calcite veinlets	
631.46 - 644.7	Rhyodacite breccia		This is a polymictic breccia and the rock is matrix supported, there is 60 % clasts. The clasts vary in size 0.5 - 2 cm but the average is 1 cm. Some of the fragments are completely chloritised and some are silicified, they are all angular to subrounded in shape. The lower contact is in broke core and is not observed	There are traces of disseminated pyrite and 1 % blebs	There is patchy sericite, silica and chlorite alteration that is strong to intense.	HEB 03 - 17 640.8 - 641.1
644.7 - 657	Spheroidal rhyodacite?		The rock is massive and a medium grey colour, there are 70 - 90 % spheroids and they coalesce locally. They are up to 1.5 cm across. Some of them have a rim of a lighter white colour that is 1 - 2 mm thick, the origin of this is uncertain.	There is 1 % pyrite veins and 1 % disseminated pyrite	There is strong sericite and chloritisation locally. There are traces of quartz veins	HEB 03 - 18 653.4 - 653.7
End of Hole						

Log of Hole HEB 04. Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 613006/5372215, Intended Azimuth: 340

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0.0 - 19.2	Overburden					
19.2 - 47.39	Basalt		The rock is a medium green colour. There is 3 - 5 % quartz filled vesicles, locally up to 10 %, they are 4 mm to 1 cm across and some are filled with calcite. The rock is fine grained and there are mafic minerals. The rock contains spheroids locally, they are less than 1 mm across. At 36.85 - 37.31 m there is a diorite dyke that is	There is 1 % pyrite and pyrrhotite veinlets, they are magnetic.	There is strong to intense epidote alteration. There is patchy, strong silicification. There is 1 % quartz veins and 1 - 2 % calcite veins. There is sericite associated with	HEB 04 - 1 35.35 - 35.56

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			aphanitic, epidote altered and cut by a calcite vein. The dyke has sharp intrusive contacts that are orientated at 50° C/A and 20° C/A. At 39.1 m there is another dyke that is 5 cm across and the same as the one described above. At 44.40 m there is a zone of ductile deformation orientated at 30° C/A.		the quartz veins	
47.39 - 52.81	Diorite dyke		The rock is a medium green colour. There is up to 20 % locally feldspar phenocrysts. There is chlorite replacement of mafic minerals. The rock is medium grained and has a sharp lower contact perpendicular to C/A.		There is medium to strong epidote alteration. There is moderate to strong silica alteration. The rock is cut by 1 % quartz veins.	
52.81 - 56.80	Fault		The core is really broken up and there are whole pieces of quartz veins. The rock is very soft and friable, possibly as a result of alteration or it could be fault gouge.			
56.80 - 63.44	Diorite dyke		This is the same as the unit before the fault but much coarser grained. There is greater than 20 % feldspar phenocrysts. From 62.50 - 62.72 m there is a ductile shear zone orientated at 45° C/A. The rock fines towards the lower contact and is aphanitic at the margin. The contact is very sharp and irregular.		The rock is cut by 1 % quartz and chlorite veins. There are traces of calcite veins.	
63.44 - 66.40	Feldspar phyric basalt		The rock is medium grey with a greenish aspect, it is fine grained and homogenous. There is 5 - 7 % feldspar phenocrysts that are 1 - 2 mm across. There are traces of quartz and chlorite filled vesicles, but they are difficult to see under the alteration. The lower contact is sharp with suspicions of a chilled margin. it is orientated at 45° C/A. Could be a dyke? Between 64.66 - 65.08 m is a more felsic dyke, not affected by alteration, it is medium grey and aphanitic the contacts are orientated at 40° C/A and 50° C/A.		The rock is cut by 1 - 2 % calcite veins. There is moderate epidote alteration.	
66.40 - 135.52	Pillow Basalts		The rock has massive intervals that are a green colour. The massive intervals are epidote altered and there is 2 - 3 % vesicles overall, but locally there are up to 20 %. The vesicles are 2 - 3 mm across and are filled with quartz and occasionally chlorite. There is some concentration of vesicles toward the pillow margins, but it is not significant. Some of the margins are spherulitic. The interpillows are characterised by hyaloclastite. The fragments are epidote and or chlorite altered. The fragments are angular and average 3 - 4 mm across, they can be up to 1 cm. The hyaloclastite intervals are thicker in the upper part of the unit, a maximum of 30 cm. After the first 5 m the hyaloclastite is a maximum of 10 cm across. The hyaloclastite is preferentially affected by the silica alteration. The upper 5 m may be pillow breccia. There are some regions of	There is some pyrite mineralisation associated with the hyaloclastite intervals, there is less than 1 % crystals.	There is 1 - 2 % quartz, calcite and chlorite veins. There are traces of epidote veins. From 113.58 - 114.88 m, in the upper margins of the rhyolite dyke, there is complete silica replacement, the rock almost looks cherty, there is no primary texture left.	HEB 04 - 2 69.8 - 70 HEB 04 - 3 110.82 - 111.07

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
135.52 - 136.1	Andesite Dyke		hydrothermal brecciation, e.g. 94.2 m. At 114.88 m there is a rhyolite dyke that is a very pale beige colour, it is very hard and aphyric, with sharp contacts, the lower contact is at 70° C/A and the upper contact is at 30° C/A. At 120.67 - 121.43 m there is a false fragmental texture that may be the result of chlorite alteration, as the fragments and the matrix are chloritised, the "fragments" are very angular and greater than 2 cm and is very different from the hyaloclastite intervals. From 121.13 m there is more of the breccia/pillow breccia, the rock is mostly hyaloclastite with no real pillow intervals, only large rounded clasts that are up to 15 cm across, they are vesicular and were probably pillows. This continues until the end of the interval. The rock is homogenous and a grey colour. There are 1 % chlorite filled vesicles that are up to 2 mm across. The rock is aphanitic. The rock is spherulitic, and there is a concentration of spheroids toward the upper margin, there are 30 - 40 % and they are less than 1 mm. The contacts are intrusive and the upper contact has a chilled margin. The upper contact is perpendicular to C/A. The lower margin is orientated at 70° C/A, the chilled margin of this contact is in the underlying rock. The rock is aphyric. The rock is fine grained and homogenous. The rock is dark green to grey in colour. The rock is aphanitic and aphyric. The upper contact is sharp and has a chilled margin, it is orientated at 70° C/A. The lower contact is sharp but irregular, with a good chilled margin. The contact includes a clast, which may be a xenolith and the contact looks transposed The rock here is medium grey and is possibly the same as the unit before the dyke. This rock is possibly not a dyke and contains traces of chlorite filled vesicles that are up to 2 mm across. The rock contains small white spheroids that are less than 2 mm across, there is 1 - 2 % but locally up to 90 %. There is an uneven distribution and in one case they cluster around a hairline chlorite-sericite vein. The rock is aphanitic at the upper margin. The contact is sharp and has a chilled margin. The rock is homogenous and massive. There are 1 % chlorite filled vesicles and traces of quartz filled vesicles. The vesicle are 2 - 3 mm across. The grainsize coarsens to 1 mm in the centre. There is chlorite replacement of mafic minerals. There is a concentration of vesicles at 141.65 m. The rock beyond this			
136.1 - 136.4	Andesite Dyke				The rock is cut by 1 % quartz veins	
136.4 - 137.59	Andesite Dyke				The rock is cut by 1 % calcite veins. The whole rock is epidote altered and chloritised.	
137.59 - 144.93	Andesite ?Dyke				The rock is cut by traces of calcite veins	
				There is pyrite and pyroclite mineralisation in the lower part, less than 1 %.	The rock is cut by 2 - 3 % calcite veins.	HEB 04 - 4 141.25 - 141.5

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			concentration is much more altered but the freshest areas are the same as the area above. There is a more even distribution of quartz and chlorite filled vesicles after 141.65 m. This could be 2 separate units, the possible contact is unclear.			
144.93 - 148.37	Rhyolite Dyke		The upper contact is occupied by a quartz vein. The rock is white to pale green in colour. The rock is aphyric and aphanitic. It is difficult to see any primary texture due to the alteration. The dyke is cut by 2 black aphyric and aphanitic dykes. These dykes have black chlorite alteration spots, they are at 146.13 - 146.33 m and 146.52 - 146.93 m.		The rock is very silicified. There is patchy sericite alteration.	
148.37 - 151.60	Pillow Breccia		The rock is very similar to the pillow breccia seen before all the dykes. The rock is mainly hyaloclastite with chloritised fragments that are 2 - 4 mm across. They are angular shapes in quartz and chlorite cement. There are large fragments that are greater than 15 cm, 10 % of them. They are massive and vesicular basalt clasts. The large fragments have fluidal shapes, chilled margins and vesicles concentrated around the margins.		The rock is cut by 1 % carbonate veins and traces of quartz veins.	
151.60 - 158.50	Diorite dyke		The rock is massive and homogenous. It is fine grained and contains 7 - 8 % feldspar phenocrysts that are up to 2 mm across. The rock is medium grey and there are traces of quartz phenocrysts. This is similar to the diorite seen previously. The contacts are sharp and intrusive, the upper contact is orientated at 45° C/A and the lower contact is orientated at 30° C/A.			
158.50 - 172.09	Basalt		The upper part of this interval has the same pillow breccia as before the dyke, but at 161.12 m the rock is massive until 163.65 m and medium grey. The massive region is homogenous and there is 1 - 3 % quartz filled amygdaloids. After 163.5 m the rock is very altered by epidote and sericite but is generally massive but with a few intervals of brecciation. The brecciation is different to the hyaloclastite with much larger fragments, that are an average of 2 cm. They are angular and there is no matrix only quartz and chlorite cement. These may be hydrothermal brecciation. The brecciated intervals are 6 - 10 cm across. Some of these intervals may be a false fragmental texture as a result of alteration, but it is not clear. Some of the fragments have chilled margins. At 170.66 - 170.84 there is a well developed foliation that is orientated at 70 - 80° C/A.		There is 1 - 2 % carbonate veins.	HEB 04 - 5 171.15 - 171.40
172.09 -	Rhyolite Dyke		The rock is aphanitic and aphyric. The rock is silicified and has a green colour. The contacts are sharp and orientated at 40-50° C/A.		There is 10 - 15 % quartz veins	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
172.77 - 209.56	Basalt		This is possibly the same unit as before the dyke, but very altered and veined. From 172.87 - 173.70 m the rock is very heavily veined with a suspicion of bedding, although it is unclear. The rock possibly contains tuff, although it is unsure. There is no chert and no argillite, but there is lots of mineralisation. After this interval the rock is extremely silicified, and this is another rhyolite dyke, until 176.50 m, the upper contact is in broken core at approximately 144.4 m, so it is unseen. The lower contact is sharp and intrusive and orientated at 70° C/A. Below the dyke the rock is massive with 2 - 3 % quartz or chlorite filled vesicles. Between 176.5 - 176.9 m there is a foliation orientated at 60 - 70° C/A. The rock is then massive with the vesicles still present until the end of the interval. There are several aphanitic dykes at 199.1 - 199.18 m, 199.70 - 200.06 m and 200.13 - 200.16 m. The dykes are black in colour. The pillow material is the same as the preceding unit, with 2 - 3 % quartz and calcite/chlorite filled vesicles. There is some concentration of the vesicles toward the margin, but it is not obvious. The interpillow material is hyalacastite with quartz cement and chlorite alteration of the clasts and matrix. One of the margins is very strange, there is possibly a very small pillow inside. From 233.9 - 234.28 m the rock is broken up into small chips, this is probably a fracture zone. At 234.47 - 235.63 m the rock becomes pillow breccia, all hyalacastite, the fragments are less than 1 cm. The fragments have chilled margins and there is quartz cement and there are some larger fragments of pillows that are less than 10 cm across and they have fluidal shapes and vesicles. The pillows are less than 1 m across.	Between 178 and 184 m there is 2 - 3 % patchy pyrite and pyrotite in patchy clumps and veins.		
209.56 - 238.8	Pillow basalts		The rock is fine grained and has a medium green to grey colour. The rock is massive and homogenous. There are 0 - 10 % chlorite filled vesicles. In places there is hydrothermal brecciation with veins, with veins of chlorite, calcite and a purple carbonate, for example at 246.3 - 247.1 m.	There is pyrite associated with the hyalacastite regions		HEB 04 - 6 211.55 - 211.80
238.8 - 279.5	Massive basalt		This is the same unit as the previous one, but now pillow margins can now be seen. The pillows are between 70 cm and 1 m across. They are homogenous with only traces of chlorite filled vesicles. They are aphyric. The interpillow material is hyalacastite. The fragments of the hyalacastite are angular and up to 2 mm, they are	There is patchy sericite alteration. There are traces of haematite in veins and there is 1 - 2 % calcite veins. There are traces of quartz veins.		HEB 04 - 7 251.90 - 252.2
279.5 - 298.18	Pillow Basalts			There is 1 % pyrite in the hyalacastite	The rock is cut by 2 - 3 % calcite veins.	HEB 04 - 8 289.7 - 290

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
298.18 - 300.19	Gabbro		often chloritised. The matrix of the hyaloclastite is chloritised and sericitised. The rock is a greenish colour. The rock is massive and homogenous. The dyke has chlorite spots that up to 2 mm. They may be replacement of mafic phenocrysts or they may be alteration. The rock is not magnetic. The average grainsize is less than 1 mm. The upper and lower contacts are sharp and intrusive, they are orientated at 60 - 70° C/A.			
300.19 - 314.56	Basalt		This is the same unit as before the dyke. There may be pillow lavas. The rock is generally homogenous, and has massive intervals, with traces of quartz filled vesicles and 1 % chlorite filled vesicles. The pillow margins look different to the margins seen in previous intervals, they look as though they could be hydrothermal brecciation. Some of the clasts have chilled margins, the clasts are angular and have a jigsaw fit character. There is a lot more cement than seen in the previous pillow margins. The upper and lower contacts of this interval are sharp, with good filled margins. Both of the contacts are orientated perpendicular to C/A. The rock is aphanitic at the margins and the average grainsize is up to 1 mm in the centre. There are mafic minerals visible in the centre. The rock is massive and aphyric, and is not cut by veins.		The rock is cut by 2 % calcite veins	
314.56 - 315.76	Andesite		The upper and lower contacts of this interval are sharp, with good filled margins. Both of the contacts are orientated perpendicular to C/A. The rock is aphanitic at the margins and the average grainsize is up to 1 mm in the centre. There are mafic minerals visible in the centre. The rock is massive and aphyric, and is not cut by veins.		There is 2 - 3 % quartz veins	
315.76 - 316.93	Basalt		The rock is massive and homogenous and has traces of quartz filled vesicles. The rock is fine grained and is a greenish colour. The rock contains up to 70 % spheroids, locally. The spheroidal texture is patchy.		There is 2 - 3 % quartz veins	
316.93 - 317.39	Intermediate? Dyke		The rock is aphanitic and aphyric. The rock is very altered. The rock is a beige colour to green. The rock may be spheroidal at the margins, the possible spheroids are up to 1 cm across. The upper and lower contacts are intrusive. The upper contact is orientated at 45° C/A, the lower contact is perpendicular to C/A.		The rock is silicified.	
317.39 - 317.92	Dyke		The rock is aphanitic at the margins and fine grained at the centre. The rock is non-vesicular. The rock is aphyric and green coloured. The contacts are sharp and intrusive and the contacts are perpendicular to C/A.		The rock is cut by 1 % quartz veins	
317.92 - 318.77	Basalt		The rock is a green to grey colour and is possibly the same as the basalt that was before the dyke. There are traces of quartz filled vesicles. The rock is homogenous and fine grained. There is a strange texture forming angular to elipsoidal shapes, possibly made of sericite. The origin of this texture is unknown.		The rock is cut by 1 - 2 % quartz veins	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
318.77 - 320.53	Dyke		The rock has sharp contacts at the margins, and the contacts are clearly intrusive. The upper margin is orientated at 40 - 50° C/A. The rock is aphanitic at the margins and fine grained at the centre. There is 1 % chlorite filled vesicles at the margins and traces elsewhere.		There is 1 % calcite vesicles and there is sericite alteration associated with some of the calcite veins	
320.53 - 327.53	Basalt pillow breccia		The rock here is mostly hyaloclastite, with some large clasts that are up to 15 cm across. The clasts have chilled margins. The cement of the hyaloclastite is quartz. There are areas that look to be hydrothermally brecciated as well as the hyaloclastite. The massive clasts are spherulitic in places. This is probably the same basalt as the before the dyke. The hyaloclastite clasts are 3 - 4 mm and angular. The hyaloclastite clasts have chilled margins and the massive clasts are not vesicular.	The hyaloclastite has some pyroxene associated with it	Overall the rock is cut by 2 - 3 % quartz veins.	
327.53 - 330.04	Diorite? Dyke		The rock is massive and homogenous. The rock has sharp contacts with chilled margins. The upper contact is irregular and the lower contact is orientated at 45° C/A. The rock is a medium grey colour to green. The rock is aphanitic at the margins and 1 - 2 mm grainsize at the centre. There is chlorite replacement of some mafic minerals. There is 3 - 5% feldspar phenocrysts that are 2 - 3 mm across.	There is 1 % disseminated pyrite and blebs of pyroxene.	The rock is cut by 1 % calcite veins. The whole rock is epidote altered and chloritised.	
330.04 - 333.33	Basalt pillow		This is the same unit as before the dyke but now the massive intervals are longer, 50 - 70 cm long. So is most likely real pillows in this area. There is a very small aphanitic dyke that is 5 cm across with chilled margins. There are chlorite filled vesicles at the margin of the pillow.		There is 1 - 2 % quartz vein.	HEB 04 - 9 333.0 - 333.25
333.33 - 333.54	Dyke		The rock is aphanitic with sharp contacts and good chilled margins. The rock has a spotty texture, that could be feldspar phenocryst or devitrification spherules. The upper contact has 40 - 50° C/A, the lower contact is irregular.			
333.54 - 355.42	Pillow basalts		This is the same as the unit before the dyke. The pillows are up to 1 m in length. See previous description. There are aphyric and aphanitic dykes with chilled margins at: 337.95 - 338.15, 338.40 - 338.46 and 339.32 - 339.46 m.			HEB 04 - 10 353.2 - 353.45
355.42 - 365.72	Diorite dyke		The rock is massive and homogenous. The rock is a green to grey colour. There is chlorite replacement of mafic minerals, or they could be replaced phenocrysts. The rock is medium grained, although aphanitic at the margins. The rock is not magnetic. The rock has sharp intrusive contacts, and both are orientated at 40 - 50°		There is carbonate alteration throughout the rock, strong reaction with acid. There is patchy sericite and chlorite alteration and 1 % quartz veins.	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
365.72 - 367.06	Rhyolite ?dyke?		C/A. The rock is a medium green colour. The rock has 5 - 7 % feldspar phenocrysts. The rock is massive and homogenous. There are traces of quartz phenocrysts. The previous logger suggested dykes, but the contacts are not convincingly intrusive.		The rock is silicified.	
367.06 - 375.3	Pillow Lavas		The rock is medium grey to green in colour. The pillow margins are typified by hyaloclastite, that has chloritised fragments with angular shapes and quartz cement. The clasts are 1 - 5 mm in size. The massive intervals are aphyric and have traces of chlorite vesicles. This is different to the pillows seen before the dyke, and this may be basaltic andesite.	There is Pyroxene associated with the hyaloclastite intervals	There are 3 - 5 % sericite veins	HEB 04 - 11 374.08 - 374.77
375.3 - 376	Exhalite		The first 15 cm are interbedded pyrite and fine tuff, possibly with black argillite. The laminations are up to 7 mm thick. The tuff has a greenish colour. Some laminae are sericitised and there is a quartz vein in the centre. Then for 25 cm there is massive tuff with normal then reverse grading, but there is no other internal structure. There is disseminated pyrite within the tuff. The tuff also contains calcite. Then for 18 cm there is interbedded pyrite, tuff and argillite, with the lamina slightly thicker than before, 7 - 8 mm. Then for 6 cm there is disturbed sediments with some evidence for previous laminations. Then for 8 cm there is interbedded tuff, pyrite and argillite with beds up to 7 mm thick.			Exhalite 374 - 375.7
376 - 380.69	Rhyodacite??? (basaltic andesite)		The first 35 cm is a tuff, that becomes more angular and jigsaw fit and then massive and spherulitic. The clasts are up to 30 cm and are both angular and rounded. The spherulites range from 1 - 2 mm at the upper end to 2 cm lower down. There is no internal structure of the spherulites. The spherulites coalesce in places. Some of the spherulites are cut by hairline chlorite veins. In places the rock has a false fragmental texture as a result of alteration. The spherulites are white in colour and highlighted by chlorite alteration. The rock is fine grained and a medium grey colour. It is aphyric. The texture is very similar to the texture seen in basaltic andesite seen in previous holes.		The rock is altered with 10 - 15 % sericite, chlorite and quartz veins	HEB 04 - 12 376.7 - 377
380.69 - 385.4	Diorite dyke		The rock is massive and homogenous and contains chlorite replacement of mafic minerals. There is 2 - 3 % feldspar phenocrysts and traces of quartz filled amygdaloids. The rock is fine grained to aphanitic at the margins and is a medium to dark grey colour. The contacts are sharp and intrusive and are orientated at 40		The rock is cut by 1 - 2 % calcite veins	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
385.4 - 388.72	Rhyodacite?? Spherules (bas and)		- 50° C/A The rock is massive and a medium grey colour. There are 10 - 90 % spherules that are up to 3 cm across and coalesce locally. The spheroids are white and are highlighted by chlorite alteration. The rock is aphyric and fine grained, see the description of spheroidal unit above. There is a gradational contact with the unit below.			
388.72 - 401	Rhyodacite ?? Tuff/hyalaclastite (bas and)		The fragments are rounded and angular. The fragments are 2 - 3 mm across. The rock is clast supported. There is no matrix and the clasts do not have chilled margins. The rock has white and green fragments, but both types look altered. Some of the fragments may have been spherules. The origin of the rock is unclear, there are three possible mechanisms for forming this rock: Resedimented hyalaclastite; Genetic tuff and false fragmental texture as a result of alteration. There are aphanitic and aphyric mafic dykes, with sharp contacts at: 389.88 - 390.09 m; 390.19 - 390.90 m and 398.85 - 398.99 m.		There are silicified patches within the rock.	
401 - 403.1	Rhyodacite ?? Tuff/hyalaclastite (bas and)		See description of interval 385.4 - 388.72 m. From 401.7 - 402.37 m there is an aphanitic to fine grained, aphyric mafic dyke, there are sharp contacts and chilled margins. The upper contact is orientated at 20° C/A and the lower contact is at 20 - 30° C/A.			
403.1 - 411.3	Rhyo?? Tuff		See description of interval 388.72 - 401 m. Except between 404.21 - 404.41 m where it looks like real hyalaclastite with angular fragments that have a jigsaw fit aspect. There are possibly chilled margins on the clasts and the clasts are 2 mm - 1 cm across. There is a mafic dyke at 404.95 - 405.99 m, the rock is aphyric and aphanitic to fine grained. The contacts of the dyke are sharp and there is chilled margins.	There may be some mineralisation associated with the tuff, 1 - 2 % Pyrrhotite and pyrite, disseminated.	There is 1 - 2 % calcite veins and there is some pyrite associated with the veins.	
411.3 - 413.1	Rhyo?? Spher		For general description see interval 385.4 - 388.72 m. There are spherules that range from 5 mm - 2 cm, there is no internal structure of the spherules.		There are traces of sericite veins.	
413.1 - 424	Rhyo?? Massive		The rock is medium grey in colour and massive. It is homogenous with traces of calcite vesicles, that are 2 - 3 mm across. Locally there are ghosts of spherules that have coalesced. The rock is fine grained.	There are traces of pyrite veins	There is 1 - 2 % calcite veins.	HEB 04 - 13 422 - 422.25
424 - 424.80	Hyalaclastite dyke?		The rock is very chloritised and clast supported and the clasts are completely chloritised, and they are less than 1 mm across, there is no matrix. There is quartz cement. The clasts may have chilled			

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			margins. There is no grading. The origin of this rock is unclear. There is a sharp contact with the lower unit and a sharp contact with the upper unit. There is a suspicion of a chilled margin. The hyaloclastite is only at the lower margin. There are feldspar laths in the rest of the rock.			
424.80 - 429.89	Rhyolite		The rock is generally massive, although there are areas that have a suspicion of a fragmental texture. The rock is aphyric and is medium to pale grey. There are 5 - 10 % spherules. The spherulite texture is different to that seen previously. The spherules, which are less than 1 cm across, are more irregularly shaped and are more widely dispersed than seen previously seen, and there is no concentration. The rock is much harder than has been previously seen, this may be the first real rhyolite. The spherules do not coalesce. At 427.26 - 427.66 m there is a mafic, aphanitic and aphyric medium grey rock with sharp contacts orientated at 20° C/A.		There are traces of quartz veins.	HEB 04 - 14 425.7 - 426
429.89 - 443.59	Rhyolite		This is probably the same rhyolite as the previous unit. There is extensive shear until 441.20 m that is orientated at 30 - 40° C/A. The shear is accompanied by sericite and chlorite alteration. The rock is massive but there are areas with a suspicion of a fragmental texture, although it is most likely a result of the alteration. The rock is aphyric and there are traces of quartz filled vesicles. The rock has the same devitrification texture as previously seen, with irregular shapes up to 1 cm, and they do not coalesce. From 438.8 - 440.5 m the rock is definitely brecciated, the clasts are angular and large, up to 3 cm. There is a matrix of fine particles and the rock is clast supported. The clasts do not have chilled margins, and this is probably a tectonic breccia.		There are traces to 2 % locally of pyrite and pyrrhotite. There are large 5 cm thick quartz veins at the same angle as the shear.	
443.59 - 450.49	Gabbro		The upper and lower contacts are sharp. The upper contact is perpendicular to C/A and the lower contact is orientated at 70 - 90° C/A. The rock is a dark grey colour and is aphanitic at the margins. It is fine grained at the centre. The rock is aphyric and contains mafic minerals. At 446 - 446.08 m there is an injection of rhyolite or a xenolith, it is pale grey in colour and has traces of quartz filled vesicles and is aphyric.		Overall the rock is cut by 2 - 3 % calcite veins and there are traces of pyrrhotite associated with the veins. The rock reacts with acid everywhere and there is one calcite-heatmatite vein 1 cm thick.	
450.49 - 462.66	Rhyolite		The rock is dark grey in colour and massive. It is aphyric. There are traces of quartz and calcite filled vesicles at the upper margin. This is probably the same unit as before the gabbro. There is a		The rock has patchy silicification.	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			devitrification texture that have irregular to rounded shapes and do not coalesce. At 453.6 - 454.39 m the rock is sheared at 30 - 40° C/A and there is a tectonic breccia at the upper margin. The rock is faulted at 454.39 m. At 455.63 - 456.60 m there is an intermediate to mafic dyke with good chilled margins, there is 1 very large clast in the dyke, 30 cm across, the clast is composed of the rhyodacite that surrounds it. The lower contact is irregular and the upper contact is orientated at 35° C/A.			
462.66 - 465.63	Diorite dyke		The rock here is aphanitic at the margins and fine grained at the centre. The rock is a dark grey colour. The rock is aphyric. There are traces of quartz filled vesicles, that are irregular shapes. It has sharp contacts with chilled margins.			
465.63 - 475.72	Rhyodacite		The rock is massive, fine grained and aphyric. For the first metre there is vein controlled silicification then the rock is massive and relatively fresh. There are traces of quartz filled vesicles. At 469.75 - 470.13 m there is a mafic to intermediate dyke that is aphyric and aphanitic and has sharp contacts and chilled margins, the upper contact is at 70° C/A, the lower contact is irregular and wavy.		Overall there is patchy sericite alteration and 1 - 2 % quartz veins. There is sericite veins with salvages.	HEB 04 - 15 467 - 467.3
475.72 - 516.03	Diorite dyke		The rock is aphanitic and aphyric until 477.21 m. The rock is a medium green colour. After this there is replacement of mafic minerals by chlorite. There are traces of chlorite and feldspar phenocrysts. The whole rock reacts with acid. The rock is medium grained, 1 - 2 mm in the centre. The upper contact is at 40 - 50° C/A. and has a chilled margin, and also includes a fragment of the overlying rock. At 481.3 m there is a very strange feature. There is intense chlorite and carbonate veins/alteration around a circular area of the dyke, the origin is unclear. The dyke becomes a lighter green colour towards the bottom. The dyke also becomes silicified further down. There are two aphanitic and aphyric felsic dykes : 507.32 - 509.42 m and 510.75 - 513.51 m. The felsic dykes are a beige colour and are cut by 2 % chlorite veins. The contacts are sharp and are orientated at 60 - 70° C/A/		The diorite is cut by 3 - 4 % calcite veins.	HEB 04 - 16 501.9 - 502.2
516.03 - 525.47	Rhyolite		The rock is massive and a red colour, which is probably a result of haematite alteration and silicification. The rock is aphyric, although it looks similar to the QFP seen in previous holes. There is a possible devitrification texture locally although it is difficult to see through the alteration. The rock is cut by 2 - 3 % sericite and quartz veins. There are also traces of calcite veins and there is pyrite			

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			associated with the veins. This unit is probably different to the one before the dyke.			
525.47 - 529.07	Mafic dyke		The rock is dark grey with a greenish hue. The rock is aphanitic at the margins and fine to medium grained in the centre. There are traces of quartz filled vesicles that are less than 2 mm across. The whole rock reacts with acid. The rock is homogenous and massive. The contacts are at 40 - 50° C/A. There are chilled margins at the contacts.		The rock is cut by 1 % calcite veins	
529.07 - 536.48	Rhyolite		The rock is dark grey in colour for the first 1.5 m with chlorite and quartz filled vesicles that are elongated at 30° C/A. The rock is aphyric and mafic after the first 1.5 m. The last 25 cm are different, for 5 cm there is a possible devitrification texture, formed of white silicified spheres with sometimes a quartz fragment/vesicle/phenocryst inside and sericite around the rims. After this there is hyaloclastite with white angular irregularly shaped fragments with a sericite quartz cement and no matrix. The origin of this rock is unclear.		The rock is white and silicified after the first 1.5 m with almost no primary texture observed. There is also sericite alteration in this part.	
536.48 - 537.47	Mafic - intermediate dyke		The rock is green coloured with sharp contacts and chilled margins. The rock is fine grained all the way through and contains mafic minerals that are altered to chlorite. The upper contact is orientated at 45° C/A and the lower contact is orientated at 20 - 30° C/A. The rock is aphyric.		The rock is cut by traces of calcite veins.	
537.47 - 538.13	Rhyolite		This is the same as the unit before the dyke. The rock here may be a breccia, but is more likely to be a massive unit with a false fragmental texture as a result of alteration, but it is difficult to tell. Most of the clasts are composed of sericite.		The rock is highly silicified and sericitised.	
538.13 - 540.26	Mafic to intermediate dyke		This is very similar to the previous dyke except that it is aphanitic at the margins. There is locally a very weak fabric almost parallel to the core axis. There is also a xenolith of rhyolite within the dyke, the dyke as a chilled margin around it.		The rock is highly sericitised and contains a large quartz and carbonate vein that is 5 - 6 cm across.	
540.26 - 543.64	Rhyolite		The rock is very similar to the interval above the dyke. The rock is pale to whitish in colour and has a fragmental aspect so may be a breccia. The rock is massive after the first metre. There are traces of carbonate filled vesicles and traces of quartz filled vesicles. The rock is aphyric.		The rock is very altered, silicified. There is hematite alteration in places.	HEB 04 - 17 542.5 - 542.8
543.64 - 545.56	Dyke		There is 1 - 2 % quartz and carbonate vesicles. The rock is homogenous and very similar to previous dykes. The rock has chlorite replacement of the mafic minerals. The rock is massive and		The rock here is very sericite altered and there is hematite alteration in places.	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
545.56 - 546.85	Rhyolite		fine grained although aphanitic at the margins. The rock is massive and aphyric. It is medium to dark grey and fine grained. There are traces of quartz filled vesicles. The last 10 cm has a devitrification texture where the spherules are 1 mm to 2 cm and appear to coalesce. The spherules are a grey colour rather than white or beige as seen previously surrounded by a very chloritised rock.	There is haematite weathered pyrite in places, 1 %.	The rock is silicified. There is 1 % quartz veinlets.	
546.85 - 562.05	Gabbro		The rock is fine grained at the margins. The rock is coarse grained in the centre. The upper contact is sharp and at 45° C/A. The rock is homogenous and massive. There is 10 % chlorite replacement of mafic minerals, they are up to 4 mm in diameter on average but can be up to 1 cm. There are large glomerophenocrysts of feldspar up to 2 cm across, but average 7 - 10 mm. There are 20 - 30 % of the glomerophenocrysts. The rock is a light to dark green colour. There are small aphanitic dykes with chilled margins and a green colour at: 553.2 - 553.35 m; 555.55 - 555.77 m and 557.4 - 557.5 m.	There are traces of pyrite associated with the chlorite.	There is 1 - 2 % calcite veins and there is chlorite often associated with the calcite veins. The lower contact is occupied by a quartz and calcite vein.	
562.05 - 575.66	Diorite dyke		The rock is massive and homogenous and is medium grained. The rock is fine grained at the upper margin. The rock is weakly magnetic. There is chlorite replacement of 1 - 2 % mafic minerals. The rock is aphyric. The upper contact is at 40 - 50° C/A and the lower contact is at 50° C/A.		The rock is cut by 1 % chlorite veins and 1 - 2 % calcite veins. There are traces of sericite veins.	
575.66 - 603.2	Gabbro dyke		The rock is aphanitic at the margins and has traces of chlorite filled vesicles at the margin. The rock is non-vesicular elsewhere. There is 2 - 3 % chlorite replacement of mafic minerals. The rock is aphyric and fine grained in the centre. From 586.1 - 586.35 m the rock is broken up into chips that are 2 - 3 cm across, and this is likely a fracture zone. There is a contact at 593.62 m with a chilled margin on the lower side, but the gabbro is the same on either side. At 592.8 - 593.1 m there is an aphanitic mini dyke that has chilled margins.		The rock is cut by 1 - 2 % calcite veins and there is chlorite sometimes associated with the veins.	HEB 04 - 18 581.15 - 581.40
603.2 - 603.95	Dyke		The rock is aphyric and aphanitic. It has sharp contacts that are orientated at 40 - 50° C/A. This is probably an intermediate to mafic dyke. There are good chilled margins. There are traces of chlorite filled amygdaloids at the margins.		The rock is cut by 1 % calcite veins.	
603.95 - 606.25	Diorite dyke		The rock is medium grained all the way through and there is chlorite replacement of the mafic minerals. There is a weak fabric orientated at 40 - 50° C/A. The rock is homogenous and massive and is a grey to green colour.		The rock is cut by 1 % calcite veins.	

Depth	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
606.25 - 606.60	Intermediate to mafic dyke		This is the same as the intermediate-mafic dyke above. The rock has chilled margins, the upper contact is orientated at 90° C/A and the lower contact is irregular			
606.60 - 608.78	Diorite dyke		Same as diorite dyke above, but there are traces of leucoxene present. The whole rock reacts with acid.			
608.78 - 615	Rhyolite		The rock here is extensively sheared at 30 - 40° C/A and is a pale grey colour. The rock is fine grained to aphanitic. The rock is aphyric.	There are traces of pyrite	There is 2 - 3 % quartz, carbonate and sericite. There is intense silicification which makes the rock hard to see and describe. There is sericite alteration.	
615 - 628.42	Diorite dyke		This is the same as the diorite described at 603.95 m. The rock is extensively sheared at 30° C/A. The upper contact is difficult to see because it is in a shear zone. The lower contact is 20° C/A. The rock has chilled margin.			
628.42 - 635.44	Rhyolite		The rock is dark grey, massive and aphyric. It is homogenous and there is traces to 1 % of calcite filled vesicles. It was difficult to see the spherules that were noticed by the previous logger. There are brecciated regions at 630.80 - 630.95 m and 634.25 m until the end of the interval, but becomes hyaloclastite with 2 mm - 1 cm angular shards and the cement is quartz.	There is pyrite associated with the quartz cement in the hyaloclastite. There are also traces of pyrite veins.	There is 1 % calcite veinlets.	HEB 04 - 19 632.1 - 632.5
End of Hole						

Log of Hole HEB 05. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 615539/5374051, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0- 9.9	Overburden					
9.9 - 11.1	Rhyolite		Medium grey. Fine grained. Massive. Variable alteration. Previous logger had a mafic unit in here, but there is no contact and the "feldspar phenocrysts" are alteration flecks. Non vesicular. Aphyric. Some silicification			
11.1 - 14.8	Gabbro		Medium grained, fines slightly toward the margin. Upper contact is in broken core, lower contact is difficult to see. Not magnetic. Up to 1 % disseminated pyrite. Traces of quartz filled amygdaloids.			
14.8 - 15.8	Granodiorite		Medium to coarse grained felsic rock. Many pale grains - feldspar. Upper contact is difficult to see, lower contact is sharp, and orientated at 50 degrees to C/A. No chilled margin visible.			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
15.8 - 33	Rhyolite		Fine grained. Massive medium grey. Patchy silicification giving the impression of fragments locally. Also patchy epidote? Sericite? Alteration. Porphyritic: less than 1 % very small quartz phenocrysts, less than 0.5 mm. Locally there is the presence of flow banding. No consistent orientation of flow banding, ranges between 30 degrees and perpendicular to C/A. There is 1 - 2 % disseminated pyrite in the last 30 cm. See exhalite descriptions.		Patchy silicification giving the impression of fragments locally. Also patchy epidote? Sericite? Alteration.	HEB 05 - 01 25.4 - 25.65
33 - 33.2	Exhalite					
33.2 - 52.6	Mafic intrusion? Massive		Dark grey in colour. Fine to medium grained. Upper contact is sharp, no chilled margins. Massive, Homogenous. Contains leucoxene. Have seen 1 quartz phenocryst, but there is 1 - 2 % quartz filled vesicles, up to 2 mm in size. The rock is cut by 1 - 2 % quartz carbonate veins.			
52.6 - 69	Gabbro	50.8 - 51.8	Gabbro. Medium grained, dark/medium grey. Rock is very broken up contact is in broken core. Medium to coarse grained at centre. Lower contact is occupied by a vein of quartz 40 degrees C/A. Finer at the margins. In the centre there is up to 10 % feldspar phenocrysts, 1 mm across. Massive. Cut by 1 - 2 % quartz carbonate veins. Sharp contacts. From 54 - 60 there is probably a fault or fracture zone. Rock is a broken into small chips average size 3 cm across. Also a lot of gouge present.			
69 - 71.35	Rhyolite		Fine grained. Medium grey colour. Massive. Coherent. 1 - 2 % quartz phenocrysts. Patchy epidote alteration. Some possible orange alteration - Hematite? Carbonate?		Patchy epidote alteration. Some possible orange alteration - Hematite? Carbonate?	HEB 05 - 02 72.1 - 72.4
71.35 - 71.62	Tuff		Very fine grained, may not be a tuff. Possible vesicles, quartz and carbonate filled - may be an alteration effect. Possible bedding alternating between light and dark green, often truncated by "other" beds. Some veins have fragments of the tuff in, angular and jigsaw fit - hydrothermal brecciation.		Cut by 1 % carbonate and quartz veins.	
71.62 - 95.9	Resumption of the QP rhyo		Massive coherent medium grey rock. Patchy epidote alteration throughout, which gives rock a mottled look. Possible carbonate or hematite alteration. Locally there is intense sericite and chlorite alteration. The chlorite is mostly associated with veins. There is 2 - 3 % quartz phenocrysts throughout, although locally there is up to 10 % 1 - 2 mm across. From 86 - 93 the rock has a sheared look 30 - 40 degrees C/A, that is displayed by alignments of the alteration patches. This is probably the unit as the previous interval but here the rock is darker coloured and the patchy alteration is absent. There is no evidence of shear.		Patchy epidote alteration throughout, which gives rock a mottled look. Possible carbonate or hematite alteration. Locally there is intense sericite and chlorite alteration. The chlorite is mostly associated with veins.	
95.9 - 99.3	Rhyolite					

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			Massive coherent rock. 1 - 2 % quartz phenocrysts. 1 % small vesicles, quartz filled 1 mm across. Towards the end of the interval the patchy alteration resumes but less intense, for the last 80 cm.			
99.3 - 101.25	Dyke		Upper contact is irregular, with a good chilled margin. The lower contact is in broken core, difficult to see anything. The rock is a beige colour. Fine to medium grained, traces of quartz phenocrysts. Cut by 1 - 2 % quartz carbonate veins, also associated with the orange alteration seen previously.		orange alteration seen previously.	
101.25 - 105.6	Rhyolite		Same as rhyolite seen previously			
105.6 - 107.7	Dyke		Same as previously dyke. Upper contact sharp at 55 degrees C/A. Lower contact is occupied by a 60 cm quartz and rose quartz vein.			
107.7 - 129.85	Gabbro		Dark grey, medium to coarse grained. Fines slightly toward margins. Massive. Homogenous. Contains leucoxene. Upper contact is occupied by a quartz vein. Magnetic throughout. 1 - 2 % carbonate veinlets. Lower contact is at 75 degrees C/A. Rock gets lighter in colour last 70 cm but is still the same.			
129.85 - 148.35	Rhyolite		This is very similar to the previous rhyolite intervals. Dark grey in colour. Fine grained, patches of epidote and silica alteration giving a mottled appearance. Locally the alteration is comprehensive. In places alteration defines "flow banding". 2 - 3 % quartz phenocrysts, 1 - 2 mm across. Locally weak chlorite alteration. At 132.35 for 10 cm there is a fragmental look. Rounded to subrounded, silicified fragments 3 - 5 cm across. No internal structure. Possibly just an effect of alteration.		Patches of epidote and silica alteration giving a mottled appearance. Locally the alteration is comprehensive. In places alteration defines "flow banding". Locally weak chlorite alteration.	HEB 05 - 03 130.25 - 130.5
148.35 - 161.25	Gabbro		Medium to coarse grained intrusion. Upper contact is relatively sharp 45 degrees C/A no real chilled margin. Lower contact is sharp 45 degrees C/A. Possible chilled margin although there is sericite alteration obscuring. Medium to dark grey, fines toward margins. Homogenous. 2 - 3 % quartz carbonate veins			
161.25 - 175.6	Rhyolite		Similar to previous rhyolites. Mottled look. In places there is intense chlorite alteration. The rock is quartz phyric 2 - 3 %, 1 mm in size. The rock is cut by three veins of pink quartz 5 - 7 cm long. In places the rock contains a "microspherulitic" texture with the spherules up to 1 mm in size, 90 % locally. Alteration gives an appearance of fragments locally. There is 1 % disseminated pyrite from 173.6 to 174.6, 4 - 5 %.		In places there is intense chlorite alteration.	
175.6 - 178.9	Diorite		Fine grained. Dark grey in colour. Locally sericite altered but predominantly "fresh". 1 % disseminated pyrite cut by quartz carbonate veins. Fines towards margins, upper contact is in broken core. Lower contact shows a good chilled margin, but irregular.		Locally sericite altered but predominantly "fresh".	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
178.9 - 205.7	Rhyolite		This is the same as previously seen. Mottled etc. There is moderate chlorite alteration, also some of the orange alteration is locally present. There are 1 - 2 % quartz phenocrysts that are less than 1 mm across. There is local sericite veining giving intense alteration in the area of the vein.		There is moderate chlorite alteration, also some of the orange alteration is locally present. There is local sericite veining giving intense alteration in the area of the vein.	HEB 05 - 04 180.06 - 180.34
205.7 - 220.6	Rhyolite		This is the same as the previous unit, no obvious contacts, although it is less altered here. Locally the alteration returns giving a false fragmental texture. Locally there is a microspheulitic texture, with spherules less than 1 mm up to 90 %, they do not coalesce. There is silica alteration blebs throughout. Massive, medium grey. 206.8 - 206.5 m there is local fracturing/shearing, the rock is almost friable, at 30 degree to C/A.		There is silica alteration blebs throughout	HEB 05 - 05 219.1 - 219.4
220.6 - 220.96	Rhyolite		This is the same unit as seen previously. But here the rock may be fragmental with clasts 3 - 4 cm and angular, however they could just be silicification patches, there are a lot of quartz veins.			
220.96 - 240	Fault zone		The rock here is extremely altered. Red, orange and green colours. Very friable nearly throughout and in many places all that is left is fault gouge. Possibly a water flow route. Where rock is more coherent there is evidence of shear at 40 - 50 degrees to C/A.		Red, orange and green colours.	
240 - 244.3	Bas and		Possibly fragmental, although more likely just alteration. Green colour overall with white fragments, 3 - 4 cm in size, subrounded to subangular. 2 - 3 % sericite veinlets. Locally intense chlorite alteration.		Locally intense chlorite alteration.	
244.3 - 249	Bas and		Massive, greenish colour, 2 - 3 % sericite veining. Fine grained. Locally 2 - 3 % chlorite vesicles 1 - 2 mm across. Possibly a microspheulitic texture locally, but may just be an alteration effect.		Locally 2 - 3 % chlorite vesicles 1 - 2 mm across.	
249 - 250.8	Gabbro		Dark grey. Medium to fine grained. Fines towards margins, upper contact is irregular with a chilled margin. The lower contact is sharp at 30 degrees C/A. No chilled margin.			
250.8 - 261	Bas And		Same as previous bas and interval.			HEB 05 - 06 259.3 - 259.57
End of hole						

Log of Hole HEB 06. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 616777/5374148, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
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Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 6.4	Overburden					
6.4 - 34.1	Massive		Massive and medium grey in colour. Fine grained. Non-vesicular and aphyric. There are three small fracture zones less than 30 cm long, where the rock is broken up into small chips. Locally there is a variolitic texture, varivols less than 1 mm across, up to 30 % of them. Locally there is 1 - 2 % quartz filled vesicles 3 - 4 mm, with irregular shapes.		The rock is epidote altered, weakly to moderate, locally forming spots. There is 1 - 2 % chlorite veins, up to 10 % locally sometimes giving a false fragmental texture.	HEB 06 - 01 18.8 - 19.1
34.1 - 45	Pillows?		There is no real contact with the unit above, but here there are regularly spaced hyalaclastite intervals 5 - 10 cm long with the massive regions on either side being spherulitic. The spherules range in size from 5 mm to 2 cm and they coalesce. In places they seem to form "flow banding" similar to that seen in other mafic intervals. The hyalaclastite is very fine grained, 2 - 3 mm shards that are angular and in situ. The margins are 70 cm to 1 m apart. The massive region are fine grained medium grey, often formed of fully coalesced varioles. Aphyric. There are 1 - 2 % chlorite filled vesicles towards the bottom.			
45 - 52.5	Pillows		This is most likely the same as the unit above, but much darker in colour. There are 2 - 3 % chlorite filled vesicles. There is not always hyalaclastite visible in the pillow margins, they are just chlorite and epidote altered, they are 1 m apart.	There is 1 % disseminated pyrite.	There are patches of intense chlorite alteration away from the pillow margins.	
52.5 - 85.1	Gabbro		The upper contact is relatively arbitrary. Fines towards upper margin. Medium grained in centre, 1 - 2 % quartz carbonate veinlets. Medium grey in colour, massive, homogenous. Epidote, silica and chlorite alteration, weak to moderate, locally intense. From 77.7 to 78.6 there is a fracture zone, where the rock is broken up into small chips. There is 2 - 3 % disseminated pyrite.			
85.1 - 104.95	Gabbro		The previous logger said that there was andesite here, but there are no contacts and the rock has the same texture as the gabbro to either side. The rock is vesicular until 87.2, 3 - 5 % chlorite filled vesicles for the first 20 cm, then 1 - 2 % calcite filled vesicles and traces of quartz filled vesicles. Other than this it is the same as the gabbro. The gabbro below the vesicular interval is more epidote altered, moderate throughout and fines towards the lower margin, which is sharp and chilled at 70 degrees C/A. From 99.5 to 99.95 the rock is red and friable, fault plus water flow oxidising the rock.			
104.95 - 110.6	Massive Mafic		The rock is medium grey in colour, contains 2 - 3 % quartz filled vesicles locally. There is possibly 1 - 30 cm breccia interval, although this is maybe a false fragmental texture. "clasts" are 2 - 3 cm.		There is moderate sericite alteration. The rock is cut by 1 - 2 % carbonate veinlets.	
110.6 - 132.5	Massive mafic		The upper contact is relatively arbitrary. The rock here is a darker colour more greenish brown. There is 1 - 2 % quartz vesicles up to 2 mm across,	There is also disseminated	There is 1 - 2 % epidote alteration spots that occasionally become	HEB 06 - 02

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			there are also silicification patches, sometimes pink. There are 2 - 3 30 - 40 cm breccia intervals, very epidote altered, maybe false fragmental texture, clasts are 3 - 4 cm in a clast supported rock	pyrotite, up to 1 %.	domains. There are traces of sericite veinlets, 1 - 2 % quartz and carbonate veinlets. Epidote often associated with quartz veinlets.	123 - 123.3
132.5 - 133.5	Dyke		Upper contact is sharp, with a good chilled margin, at 30 degree C/A. The lower is sharp with a good chilled margin, at 40 degree C/A. The rock is fine grained, dark grey, massive and homogenous.			
133.5 - 134.3	Massive Mafic		Similar to the previous mafic interval			
134.3 - 134.8	Dyke		Same as previous dyke. UC sharp at 40 degrees C/A. LC sharp, chilled at 20 degree C/A.			
134.8 - 142.8	Mafic		This interval is predominantly massive and similar to the previous mafic interval, although here there is less epidote alteration, less to none. Here there are real breccia intervals possibly up to 1 m long. The clasts look fluidal and may have chilled margins. The clasts are 4 - 5 cm average, and the breccias are monomictic. The matrix is fine grained and the clasts are made of the same material as forms the massive intervals.			
142.8 - 154.35	Gabbro		The upper contact is sharp, but not chilled and there are 1 - 3 % chlorite filled vesicles. The rock is fine grained at the margin but rapidly becomes coarse grained, within 30 cm. Can see good feldspar crystals in the central part. Fine grained at the lower contact, sharp, chilled and irregular.			
154.35 - 163.45	Massive mafic		Medium grey, fine grained. After this the rock is relatively fresh 1 - 2 % quartz veins. 2 - 3 % chlorite filled vesicles, 1 - 2 mm. 1 - 2 % quartz filled vesicles, 2 - 3 mm across. There is 1 % disseminated pyrite.		The first 1.5 m is very altered, sericite, chlorite, silica and lots of epidote, cut by 2 - 3 % epidote and quartz veins.	HEB 06 - 03 163 - 163.3
163.45 - 170	Gabbro		Same as previous gabbro. Upper contact is occupied by a quartz vein. Lower contact is sharp and chilled, approximately 30 degrees C/A, although irregular			
170 - 195	Pillows?		Predominantly massive, medium grey, fine grained. Traces of quartz vesicles less than 1 mm in size. Possibly pillows. There is no real hyaloclastite, but chloritised angular clasts are sometimes visible. The pillow margins are 60 cm to 1 m apart. The last 7 m of this interval is massive and the last 35 cm are epidotised		There are epidotised intervals less than 5 cm thick, that may represent pillow margins.	HEB 06 - 04 190.2 - 190.5
195 - 237.8	Gabbro		The upper contact is relatively arbitrary, it is in an intensely epidotised region. This is the same as the previous gabbro. There is a twelve cm interval of breccia, with rounded clasts, 3 - 4 cm in size in a fine grained		Cut by 1 - 2 % quartz and carbonate veins, sometimes pink. There are traces of epidote veinlets.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
237.8 - 260.6	Gabbro		matrix - gabbro clasts - tectonic? Hydrothermal? The upper contact is sharp and chilled, approx. 30 degrees C/A and is immediately followed by a 30 cm quartz vein. This massive homogenous coarse grained. Fines toward margin. Can see good feldspar crystals, lower contact is occupied by numerous veins.			
260.6 - 273.6	Massive Mafic		The rock is medium to dark grey colour. Fine grained. Massive. Epidote alteration patches locally. 1 % chlorite filled vesicles. The last 2 m has possible pillow margins. Two are very likely, can almost see hyaloclastite, black angular clasts amid the epidote alteration, but the rest are just epidote regions less than 1 cm thick. If pillows there are 30 - 90 cm thick.	1 % disseminated pyrite.	Cut by 5 - 6 % hairline veinlets of epidote and/or sericite.	HEB 06 - 05 269.65 - 269.95
273.6 - 274.7	Exhalite		See exhalite descriptions			
274.7 - 293.1	Rhyolite		Medium grey. Very fine grained and massive. The rock contains 70 - 80 % spherules although they are different to spherules generally seen in this unit. The spherules are up to 5 mm across and do not coalesce. Most of the spherules have quartz centres and white rims. The quartz centres are rounded - vesicles? part of spherules? Different. The rock is cut by two mafic dykes which have good chilled margins, they are 10 and 15 cm thick. There are 2 spherule free regions in the last 9 m, each one is less than 1 m in length. From 285 - 288 m the core is completely broken up into small chips less than 3 cm. Most of the chips have the spherulitic texture, but some don't - dykes? massive spherule free regions?			HEB 06 - 06 291.3 - 291.6
293.1 - 303.3	Massive Mafic		Same as previous massive mafic. Traces of quartz veinlets. No pillow margins.			
303.3 - 304.9	Rhyolite		This unit is spherulitic in the same way as the previous rhyolite. It is massive, homogenous, medium to coarse grained. It has pinkish colour. 1 - 2 % chlorite filled vesicles 1 - 2 mm across.		Traces of carbonate quartz veins.	
304.9 - 313.9	Gabbro		Upper contact is sharp and intrusive, orientated at 30 degrees C/A. Lower contact is difficult to see, irregular, but chilled. Rock is fine grained at the margins. Medium to coarse grained at the centre.		Cut by 1 - 2 % epidote veinlets and 1 epidote vein.	
313.9 - 325.4	Rhyolite		Similar to previous spherulitic rhyolite, although there are only 20 - 30 % spherules and they are only present locally. This rock is much more altered than the previous interval. Massive. Fine grained		Quartz and chlorite alteration locally intense epidote.	
325.4 - 336	Massive Mafic		The first 15 cm are hyaloclastite, the shards are chloritised and epidotised, angular and in situ up to 1 cm in size. The rest of the rock is massive but with moderate to intense epidote alteration. Locally there is 1 - 2 % glomerophenos of feldspar although they are frequently not present. They			HEB 06 - 07 328.1 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			are sometimes epidote altered. The rock is cut by 1 - 2 % quartz veinlets and 1 30 cm quartz carbonate vein.			328.4
End of hole						

Log of Hole HEB 07. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 616794/5374106, Intended Azimuth: 160

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 14.6	Overburden					
14.6 - 51.00	Leu Dio		Coarse grained black and white rock. Massive. Homogenous (Monotonous) White feldspar is dominant, 90 %, there is also some possible quartz. The black colour is given by biotite		The rock is cut by 1 % chlorite veins. There is 1 - 2 % Quartz carbonate veins, locally 3 - 4 %.	
51 - 54.5	Shear zone		The rock is strongly sheared at 30 - 40 degrees C/A. It is difficult to see original texture. There is also orange carbonate alteration present, and the rock is cut by 3 - 4 % quartz veins, which follow the foliation.			
54.5 - 56.6	Dyke		The upper contact is most likely in the shear zone, but it is difficult to see. The lower contact is sharp and chilled against the unit below. The rock is fine grained and medium grey in colour. It is cut by 1 - 2 % epidote veinlets. The rock is aphanitic at the margins. There are traces of epidote alteration spots. In the centre there are several contacts sub-parallel to the core axis. This may be several dykes, or the edge of one			
56.6 - 64.9	Leu Dio					
64.9 - 66.1	Dyke		Same as the previous dyke			
66.1 - 91.6	Leu Dio					
91.6 - 92.15	Fault		This is a fault zone, with extensive shear orientated at 30 degrees C/A. There is fine friable gouge present			
92.15 - 94.7	Leu Dio					
94.7 - 100.5	Dyke		Same as previous dyke, although a slightly paler colour. Cut by traces of epidote veinlets. The upper contact is in broken core. The lower contact is sharp and chilled at 30 degrees to C/A.			
100.5 - 107.5	Leu Dio					
107.5 -	Gabbro		Fine grained, dark grey massive. The upper contact is occupied by a quartz vein. The lower			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
108.3 - 110.2	Leu Dio		contact is very irregular, over 30 - 40 cm, and undulose.			
110.2 - 110.9	Gabbro		Same as above, upper contact is sharp, chilled 20 - 30 degrees to C/A. The lower contact is sharp, chilled 20 - 30 degrees C/A			
110.9 - 111.7	Leu Dio					
111.7 - 114.5	Diorite		Same as previous dyke. UC Sharp, chilled 40 degrees C/A. Lower contact sharp, chilled 20 - 30 degrees C/A			
114.5 - 137.3	Leu Dio					
137.3 - 149.3	Shear zone		Weak shear. Orientated at 40 - 50 degrees C/A, contains several fault zones with gouge and the surrounding rock has been intensely epidote altered.			
149.3 - 193.05	Leu Dio					
193.05 - 193.5	Dyke		Previous logger called this volcanic rock, but margins are clearly chilled against the surrounding rock. The rock is intensely epidote altered			
193.5 - 224.7	Leu Dio					
224.7 - 255.1	Dyke Gabbro		Same as previous gabbro. LC Sharp chilled, perpendicular C/A. UC sharp chilled 40 - 50 degrees C/A			
255.1 - 226.1	Breccia		This is most likely hydrothermal. The clasts are angular to subrounded in situ 2 - 3 cm, although some are less than 0.5 cm. There are no fines, no matrix, quartz cement supported			
226.1 - 233.5	Leu Dio					
233.5 - 234.45	Diorite		Same as previous dios.			
		233.5 - 234.45	LC: sharp chilled 30 C/A. UC 45 C/A			
		234.6 - 235.9	LC: 70 C/A. UC: 50 - 60			
		240 - 240.3	LC: 45 C/A UC: Broken core			
234.45 - 261	Leu Dio					
End of hole						

Log of Hole HEB 08. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 613967/5372526, Intended Azimuth: 350

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 2.3	Overburden					
2.3 - 4.9	Mafic		Relatively massive medium grey rock. 3 - 4 % quartz filled amygdalae, locally up to 10 %, they are up to 4 mm across but average 1 - 2 mm. There are patches of light coloured material, probably alteration.			HEB 08 - 01
4.9 - 6.5	Mafic fragmental		The fragments are rounded and most display chilled margins. The fragments are irregular in shape and have a greenish colour. There are vesicles concentrated at the margins of some of the fragments. The vesicles are 1 - 2 mm in size and are both quartz and chlorite filled. Fragments range in size from 1 - 2 cm to 5 or 6 cm, the maximum size is 8 cm. Between the fragments there is a fine gray material, possibly cement? Hyaloclastite?. The vesicles do not intrude into the matrix. Pillow breccia?		epidote altered patchily.	3.4 - 3.7
6.5 - 8	Massive Andesite. Silicified?		Coherent rock, white colour, epidote altered patchily. This is similar to the interval before the fragmental interval. The vesicles are smaller than that interval, but still quartz and chlorite filled. The chlorite filled vesicles are 1 - 5 mm across, while the quartz filled vesicles are 3 - 4 mm, but much rarer than the quartz.		epidote altered patchily.	
8.0 - 14.0	Resumption of the fragmental interval		Fragmental interval, same as the previous one. From 12 - 12.25 m the fragments are more angular and slightly smaller, 3 - 4 cm average. Here there is hyaloclastite visible between the fragments, whereas before it was only a possibility.			
14 - 14.4	Gabbro		Coarser grained coherent rock. Abundant mafic minerals, sharp contacts with good chilled margin at the upper contact, which is orientated at 50 degrees C/A. The rock is cut by 1 - 2 % quartz and chlorite veins. Lower contact does not show good chilled margin because it was not observed, arbitrarily placed.			
14.4 - 37	Mafic		Similar to the coherent intervals described above. There is variable epidote alteration, that locally gives rock a beige colour. The rock is mostly a green colour where not altered. Amygdale content varies from < 1 % to locally 3 % and 5 % in upper 30 cm. The vesicles are mostly chlorite filled throughout the rock and 1 - 2 mm, however in the first 30 cm they are mostly quartz filled. There is occasionally chalcopyrite associated with the quartz filled vesicles. The rock is cut by < 1 % quartz veinlets.		There is variable epidote alteration, that locally gives rock a beige colour.	
		28 - 29.7	Dyke. Intrusive upper contact, good chilled margin, orientated at 15 - 20 degrees C/A. The centre of the intrusion is coarse grained and more epidote altered than the margins.			HEB 08 - 02

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
37 - 65.85	Mafic pillows		This is a continuation of the unit above, no obvious contacts. There are pillow margins here. There is up to 2 m between the pillow margins. They are very irregularly shaped, often running along the core axis. There is hyalaclastite visible in some of the margins, very fine grained angular clasts. Some of the margins are epidote altered, an example at 58.2 m.			42.75 - 43
65.85 - 74	Dyke	52.7 - 53.8	Gabbro. Upper contact not seen, lower contact sharp with a good chilled margin orientated at 30 degrees C/A. Medium grained in the centre, finer at margins. Weakly magnetic in the centre.			
74 - 82.9	Pillows		Mafic medium to dark grey. Fine grained to medium grained. Contains pyroxene in the first 60 cm and last 90 cm. <0.5 mm feldspar phenocrysts, 2 - 3 %. The upper contact has a good chilled margin and is sharp, orientated at 40 degrees c/A. The lower contact is sharp, but without a chilled margin, orientated at 40 degrees C/A.			
82.9 - 95.2	Massive mafic		Similar to previous pillow intervals. The pillow margins are an average of 30 to 80 cm apart. This is closer together than in the previous pillow interval. Hyalaclastite can be seen in the pillow margins and a microspherulitic texture in the massive regions to either side. The spherules are less than 0.5 mm across. They coalesce away from the margin and within 4 cm they are fully coalesced. The last pillow margin is at 82.9 m, after this the rock is massive.			
95.2 - 108.9	pillows		Similar interval to previous massive interval. There is variable epidote alteration, which gives the rock a patchy look, beige and green. Contains quartz and chlorite filled vesicles. The quartz filled vesicles are larger here, the chlorite filled are 3 - 4 mm, while the quartz filled are 1 - 2 mm. There is up to 3 % of them locally, but typically < 1 %		There is variable epidote alteration, which gives the rock a patchy look, beige and green.	HEB 08 - 03 93.4 - 93.65
108.9 - 110.26	Breccia		Very similar to pillowed intervals seen previously. There is lots of chlorite and epidote infilling of the hyalaclastite between the hyalaclastite. The margins are 60 - 90 cm apart on average. There is quite often pyroxene associated with the pillow margins. There is the same pattern with the spherules as seen in previous intervals, but here the pattern is observed away from the pillow margins as well.		There is lots of chlorite and epidote infilling of the hyalaclastite between the hyalaclastite.	
			Large rounded fragments that are green in colour and 3 - 4 cm across average, with a maximum of 20 cm, although only 1 clast is this big. There are also much finer clasts in the matrix, both black and white in colour. These smaller fragments are less than 1 cm across, but normally less. The matrix is harder than the clasts, silicified?? maybe. The rock is mostly clast supported with the matrix infilling, locally the rock is matrix supported.			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
110.26 - 111			The last 20 cm of the interval is all clast, with "veins" of the matrix within it.			
111 - 113.7	Massive mafic		Variable areas of brecciation after 110.7 m, similar to breccia seen previously. From the end of the last interval to the end of this there is variable amygdale content, these are what mark the interval. Massive coherent fine grained medium grey rock. The first 140 cm have large 4 - 5 mm quartz filled vesicles, that are irregularly shaped. There are also chlorite filled vesicles in this interval but they are smaller and less abundant. 2 - 3 % quartz vesicles and 1 - 2 % chlorite filled vesicles. This interval also has variable epidote alteration and locally 5 % very small chlorite filled vesicles, less than 1 mm across. The epidote alteration is only developed in one place, over 15 cm. There is also a large quartz vein that is 15 cm across. Until the end of the interval there are 2-3 % chlorite filled vesicles, that are 2 - 3 mm across and no quartz filled vesicle for last metre. There is no epidote alteration. There is a suspicion of a pillow margin, although there is no obvious hyaloclastite and this may be a vein. The breccia has green coloured clasts, 0.5 - 4 - 5 cm, many of the larger clasts contain chlorite filled vesicles. The matrix is harder than the fragments and there is pyroxene associated with the matrix. In places the smaller fragments have and in situ look. Elsewhere these fragments look sheared.		This interval also has variable epidote alteration. The epidote alteration is only developed in one place, over 15 cm.	
113.7 - 116	Breccia		Coherent rock, medium grey-green in colour, with 2 - 3 % amygdalae, which are both quartz and chlorite and calcite filled. The chlorite fills the smaller vesicles, the calcite the more irregularly shaped ones and the quartz everything else. There is pyroxene associated with calcite quartz veins and also with some vesicles. The last 13 cm is dominated by chlorite filled vesicles			
116 - 120	Mafic		The first 12 cm consist of fine grained to medium tuff. With pyroxene both disseminated and in zones that are not quite veins. The rock is a green colour with some black clasts and some white clasts. Then for 5.5 cm there is a continuation of the tuff and the pyroxene zones become thicker and more of a connected system. the last 3 cm are diffusely laminated, although not really laminated, consisting of grey, yellow, white and green material, likely fine grained tuff. The grey laminations may be "cherty", as cherty as seen in the analysed exhalites. There is diffuse pyroxene/pyroxene in the lamination, but it does not form the laminations.			
120 - 120.2	Exhalite (Not LA-ICP-MSed)		The rock has a lot of similarities to a coarse - medium grained intrusion. On closer inspection, it is full of white fragments that are less than 1 mm to			
120.2 - 124.6	Tuff					HEB 08 - 04

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			very rarely 2 mm. The clasts are angular to subrounded and sometimes contain what looks like very small vesicles. The matrix is very fine grained and it is a greenish colour. For the first 42 cm, the fragments look stretched or sheared at 20 - 25 degrees C/A. The rock is coarser downwards, showing normal grading, but even the largest fragments are less than 3 mm.			120.2 - 120.3
124.6 - 135	Gabbro		The upper contact is sharp and contains veins, if there is a chilled margin it is very difficult to see. The contact is orientated at 50 degrees C/A. The lower contact is not observed and has been placed arbitrarily. The intrusion is fine grained at the margins and medium to coarse grained at the centre. Leucoxene is visible and the intrusion is not magnetic. There is 1 - 2 % quartz veins.			
135 - 161.7	Pillows		The pillow margins are chloritised and often irregular. Hyaloclastite can only be seen occasionally. The margins are often associated with pyroxite mineralisation, particularly where the chlorite is less intense. Previous logger noted carbonates in the pillow margins, but there is no reaction with HCl. Pillow margins are 40 - 60 cm apart. In the massive interiors there is both vein controlled and patchy sericitic alteration but not in the inter-pillows. There are no varioles/spherules around the margins or in the interior. Pillow interiors are medium grey, fine grained and with 1 - 2 % quartz veinlets. There are occasional vesicles but they do not cluster at the margins. Quartz filled, 1 - 2 mm across, chlorite filled less than 1 mm across.			HEB 08 - 05 146.8 - 147
161.7 - 164.75	Dio Dyke		Coherent. Dark grey, coarsens slightly toward the margins, but generally fine grained. 2 - 3 % phenocrysts, quartz, possibly glomero in places. The distribution of the phenocrysts is relatively even throughout. From 162.7 for 60 cm, there is intense alteration, giving the rock a uniform beige colour but allowing the original texture to still be seen in places. Rock is hard, possibly silicified in places.			
164.75 - 186	pillows		This is the same as the one before the dyke. The pillow margins are closer together in this interval, with an average of 30 cm between them, and they are less often associated with pyroxite. Pink quartz is occasionally visible in the margins, very hard, no reaction with HCl. Vesicles are rarer here, although locally there is 2 - 3 % vesicles (184.3 m), they are quartz filled and calcite filled and 2 - 3 mm across. there are also smaller vesicles here which are chlorite and occasionally quartz filled, these are 1 - 2 mm.			
186 - 195	Gabbro		Intrusive rock. The upper contact is in broken core so a chilled margin cannot be seen, the lower contact is occupied by a vein and is at 70 degrees C/A, again a chilled margin is not visible. The rock is medium to coarse			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
195 - 195.68	Pillows		grained and does not fine or coarsen towards the margins. There is variable silicification. There is up to 1 % disseminated sulphide. This interval displays only 1 pillow margin. The rock is lighter in colour than previous pillow intervals and has 4 - 5 % amygdaloids. They are quartz and chlorite filled and are 1 - 2 mm across. There is less than 1 % disseminated pyrite.			
195.68 - 196.2	Fragmental		he rock here is "fragmental" although the clasts make up most of the core. The clasts are green in colour and are angular with a jigsaw fit aspect. The "matrix" looks like the "coalesced" pillow margins, containing 5 mm hyaloclastite fragments and quartz/sericite cement. There is disseminated sulphide in the matrix, 1 %. The last 25 cm looks more massive, with 1 pillow margin.			
196.2 - 197.2	Dyke		Fine grained dark grey rock, upper contact displays good chilled margin at 60 degrees C/A, lower contact also has a good chilled margin, orientated at 50 degrees C/A.			
197.2 - 199	Pillow Breccia		Similar to the interval before the dyke. The clasts are 5 - 10 cm, in a matrix of finer clasts 5 mm to 1 cm and cement. Again angular, in situ look.		There is patchy silicification in the clasts. Some clasts are chloritised.	
199 - 201	pillow		Occasional pillow margins visible in the clasts. The rock here is a lighter grey than previous intervals. May be silicified. There is 2 - 3 % quartz filled vesicles that are a mm across, although occasionally up to 4 mm. The pillow margins are not as chloritised as seen previously and hyaloclastite is easily visible, in situ, character, 5 mm across. Margins are 60 cm - 1 m apart, although there are only 3 visible.			
201 - 218.4	Massive, Mafic?		There are no pillow margins visible and the rock has different colours due to alteration. Overall there is 2 - 3 % quartz and carbonate veins, mostly carbonate, and traces of chlorite veins. At 216.1 - 216.48 the core is broken up.		different colours due to alteration	HEB 08 06
		201 - 204.2	The rock is a beige colour and harder than the surrounding rocks - possibly silicified. There is locally 3 - 4 % vesicles that are 1 mm across and quartz filled, occasionally up to 2 mm. There is up to 1 % disseminated pyrite and pyrotite.			205.85 - 206.2
		204.2 - 210	Medium grey - green colour and has 2 - 3 % vesicles. Most are quartz and calcite filled and are 1 mm across, there are some <1 % that are chlorite filled vesicles, up to 4 mm across.			
		210 - 218.4	Beige colour, with 2 - 3 % quartz and chlorite filled vesicles 1 - 2 mm across			
		213.15 -			An orange colour is present	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
		213.28			here, likely due to oxidation. It reacts with acid, so is carbonate or a combination of carbonate and Fe oxide.	
		213.28 - 213.48	False? Fragmental texture as a result of the oxidation.			
218.4 - 225.7	Fragmental		Fragments have a large variation in size, angularity and vesicle content. Towards the top the fragments are less than 1 cm in the matrix and consist of angular shards, sometimes displaying and in situ character. There is cement in the matrix, occasionally displaying replacement of the margin of the larger clasts. The cement is likely sericite or epidote. The larger fragments are 10 - 25 cm across. Some display chilled margins unbroken. The vesicles are filled with quartz and sometimes chlorite, they are 1 - 2 mm. Sometimes there is a zonation of vesicles towards the margins of the clasts, from larger vesicles in centre to smaller at the clast margins. Sometimes the vesicles are only present at the margin of the clasts. There is 1 - 2 % veinlets of calcite and quartz, mostly calcite. The veinlets cut the fragments and the matrix, sometimes with minor offsets.		The cement is likely sericite or epidote	
225.7 - 229.4	Pillows ?		The "pillow" margins are irregular in shape, up to 15 cm long. Fragments within the margins are hard to see, and the margins may just be the result of alteration. The most likely candidate for a pillow margin is subparallel to the C/A. The pillow material is similar to the fragments in the previous breccia, with 2 - 3 % quartz filled vesicles. The lower "contact" is occupied by a quartz vein 15 cm thick			
229.4 - 233.7	Massive mafic?		Fine grained, beige-ish colour. 2 - 3 % vesicles, mostly quartz filled, in places they seem to be elongate, orientated at 10 - 30 degrees C/A. 1 % disseminated sulphides. 1 - 2 % quartz veins.			
233.7 - 239.5	Dyke		Contains Leucocene. There are also 1 % calcite spots, which may be vesicles. Medium to coarse grained, medium to dark grey. There is an alignment of crystals, weak, at 20 degrees C/A. Upper and lower contacts are deformed. Chilled margins are possible but difficult to see. 1 - 2 % quartz veins, without foliation, therefore later. Plagioclase crystals size is finer at the margins, but also varies in the centre from less than 1 mm to 2 mm, almost at random - layering?			
239.5 - 243.8	Massive mafic		The first 140 cm are fine grained medium grey massive rock. Homogenous, with 1 % chlorite filled vesicles that are 1 - 2 mm across. There are traces of disseminated pyrite. There are 1 - 2 % quartz carbonate veins. After this for 14 cm there is a quartz carbonate sericite/epidote vein. The massive			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			interval resumes with 1 - 2 % chlorite and quartz filled vesicles that are 3 - 4 mm across in places. There is a reasonable foliation that stretches the vesicles and shears the rock, at 30 degrees C/A.			
243.8 - 245.5	Diorite		Same as previous dyke. Sharp contacts. Upper 30 degrees C/A. Lower is irregular.			
245.5 - 246.7	Massive mafic		Probably the same unit as before the dyke. Variable alteration giving colour changes from beige to medium grey-green. Quite vesicular 2 - 3 %, higher locally, most are 1 - 2 mm across, occasionally much bigger 5 - 6 mm. Most of the smaller vesicles are chlorite filled, some of the larger are calcite or quartz filled. There is a possible pillow margin at 245.8. It is sub-parallel to C/A, and has been sheared and chlorite altered, there are remnants of clasts possibly visible. There is less than 1 % disseminated pyrite. 1 % quartz carbonate veins		Variable alteration giving colour changes from beige to medium grey-green.	
246.7 - 248.9	Gabbro		Dark grey, fine to medium grained. 1 - 2 % disseminated sulphides. 1 - 2 % quartz carbonate veins. There are traces of epidote veins. Very little change in grain size and intrusive contact has been seen sub-parallel to C/A. There is 1 - 2 % sulphide associated with some of the veins. Possible quartz phenocrysts, poorly formed, many are vesicle like, but some have straight edges, 1%. Feldspar phenocrysts locally. Dark grey to green colour. Upper contact is sharp. 20 - 30 degree C/A, lower contact is sharp and wavy.			HEB 08 - 07 248 - 248.1
248.9 - 251.78	Massive		Massive, coherent rock. Medium grey light grey in colour. The first 50 cm of this rock has patchy alteration, almost camouflage pattern. The first 10 cm has abundant chlorite vesicles, 3 - 4 %. 2 - 3 mm across, well formed and rounded. The rest of the rock has vesicles less than 1 mm, quartz and chlorite filled. 1 - 2 % veinlets calcite and quartz.		The first 50 cm of this rock has patchy alteration, almost camouflage pattern.	HEB 08 - 08 250.3 - 250.5
251.78 - 257	Fragmental		Similar to the fragmental rocks seen in previous intervals. Black chlorite filled vesicles are less than 1 mm across and 2 - 3 % of them. The clasts vary in size from 5 cm to 20 cm. The matrix is very altered by epidote, but hyaloclastite is clearly visible in places. Some of the clasts have fluidal shapes and chilled margins. Some of the matrix looks like a pillow margin in 1 place. The last 25 cm is clearly sheared, with what looks like fault gouge, and there are elongated clasts in this area. The lower contact is sharp at 20 - 30 degrees to C/A.			
257 - 262.2	Dyke/Sill mafic		Massive, Coherent rock. Grey in colour. The first 33 cm is sheared and epidote altered. The shear is at 70 degrees C/A. It is fine grained to medium grained further down. There are traces of carbonate filled vesicles and 1 - 2 % quartz carbonate veins. There are also patches of shear and epidote alteration. The contact is possibly chilled against the unit below		epidote altered.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
262.2 - 262.8	"Felsic" Dyke. More likely Mafic Tuff		Contains quartz and feldspar crystals. There are some chloritised mafic minerals. The cogitore chemistry in this unit indicates that it is definitely mafic. The grain size varies abruptly, mostly medium to coarse grained to bands of very fine grained material. These are most likely bedding. The bands are consistently orientated at 30 - 60 degrees C/A, the same as the contact. The margins of the surrounding dykes are chilled against this unit.			
262.8 - 264.6	Mafic dyke		Probably the same intrusion as before the previous dyke. Here there is locally 2 - 3 % chlorite filled vesicles locally, but 1 % overall. They are up to 1 mm across. There are rare calcite filled vesicles, cut by 1 - 2 % quartz-calcite veins. Progressively finer grained towards lower contact and chilled against at 30 - 40 degrees C/A.			
264.6 - 267.9	"Felsic" dyke rhyod? Mafic Tuff?		Medium grained, with abrupt grain size changes, defining bands. Contains quartz crystals. There are zones of shear, not always associated with the finer grained units. The upper and lower contacts of the surrounding intrusions are chilled against this unit. Same as in the unit before the dyke, the fine bands may be bedding.			HEB 08 - 09
267.9 - 269.2	Dyke		Fine grained to very fine grained at the margins. Lower contact has good chilled margin orientated at 20 - 30 degrees C/A. The upper contact is occupied by a vein. There is 1 % chlorite filled vesicles. There is 1 % quartz and carbonate veinlets. There are traces of quartz filled vesicles.			266.2 - 266.8
269.2 - 271.1	Tuff		Very fine grained at the upper margin but coarsens downwards. The fragments are 1 - 2 mm. Some are of quartz and others are mafic. There are traces of disseminated pyrite and the rock is cut by 1 - 2 % quartz carbonate veins. The last 30 cm of this interval are pepperitic. Laminations can clearly be seen being truncated by the dyke below, while that dyke also has a chilled margin. Fragments of the dyke can be seen in the tuff.			
271.1 - 274.5	Mafic dyke		Medium to fine grained, same as previous dyke. Between 271.4 and 272.9 there is a large proportion of amygdalae, 3 - 4 % average of 1 - 2 mm across. Most of the vesicles are chlorite filled, occasionally quartz/calcite filled, rounded in shape.			
274.5 - 298.2	Mafic		Predominantly massive, with brecciated/possible inter-pillow regions. The massive regions are medium grey and fine grained with 1 - 6 % vesicles locally. Vesicles are 2 - 3 mm across and chlorite - quartz or epidote filled. There are 1 - 2 % quartz veins. The breccia are from the start of the interval until 282.2 m. It consists of relatively large fragments often with chilled margins. There are quartz filled vesicles within the large fragments that are 1 - 2 mm across between the larger fragments there is hyaloclastite and often cement. The hyaloclastite is not always visible. There is often pyrorite			HEB 08 - 10 293.35 - 293.5

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			and other sulphides associated with matrix. Other breccia intervals are at: 283.5 - 284.3; 285 - 285.4; 286.2 - 286.4.			
298.2 - 299.25	Gabbro		Sharp contacts, upper contact 30 - 40 degrees C/A. The rock is very fine grained at the margins but coarsens towards the centre. There is no leucoxene. No vesicles, homogenous. Lower contact is sharp and chilled, at 60 - 70 degrees C/A.			
299.25 - 306.44	Massive mafic		Medium grained, fine grained variably vesicular. The first 50 cm has 10 % vesicles, mostly chlorite filled and less than 1 mm across. There are some that are quartz or calcite filled. From 301.8 the vesicles are dominantly calcite filled and 3 mm across. There is variable alteration throughout, possibly silicification or epidote. 1 - 2 % quartz carbonate veins throughout.		There is variable alteration throughout, possibly silicification or epidote	
306.44 - 319.1	Gabbro		Homogenous. Medium grained, dark grey rock. There is 1 - 2 % disseminated sulphide (pyrite and pyrotite). There is 1 - 2 % chlorite filled vesicles locally, 1 - 2 mm across, rounded shapes and the occasional calcite filled vesicles. Cut by 1 - 2 % quartz calcite veins. The rock has chilled margins.			
319.1 - 319.3	Tuff		Very fine grained laminated unit. Numerous veinlets, often offsetting the laminations. The lamina are in varying shades of grey and some show normal grading. The last 2 m seem more stretched. The grading indicates younging up hole. Photos taken.			
319.3 - 320.1	Gabbro		Same as previous gabbro, slightly higher vesicle content.			
320.1 - 320.6	Exhalite		See description of exhalite in Exhalite Description folder			
320.6 - 322.75	Gabbro		See previous description. Although here there are patches of epidote alteration associated with quartz veins. From 321.15 - 321.33 m.			
322.75 - 323.18	Rhyodacite		This is a coherent rock. The overall colour is grey, but lighter and darker patches - alteration? Does contain quartz phenocrysts, 1 - 2 mm across, but there is also 1 - 2 % quartz filled amygdaloids. There is also 1 - 2 % disseminated pyrite. Patches may be the remnants of the spherulite texture seen further down.			
323.18 - 326.7	Gabbro		See previous description.			
326.7 - 335.75	Rhyodacite		The rock is felsic and medium grey. The rock contains quartz phenocrysts, 1 %. There is also 1 % disseminated pyrite. The first 155 cm is very messy. Maybe a false fragmental texture but may also be real breccia. In places		Many of the "fragments" are defined by epidote alteration, chlorite alteration	HEB 08 - 11

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			there are possible remnants of the spherulitic texture seen lower down. Many of the "fragments" are defined by epidote alteration, and where the "clasts" are the most angular, there are epidote veins separating them. There is patchy alteration throughout the rock. Then for 110 cm there are clearly visible spherules. They do not obviously coalesce here and there is no chlorite alteration highlighting them, which is seen later. The spherules here are 4 - 5 mm across. Then for 100 cm there is a spherulite texture, these are up to 2 cm across and do coalesce, these are highlighted by chlorite alteration of the surrounding rocks. Then for 220 cm, there is a return to the "messy rock" although parts of this section are massive with no spherules at all, which is what continues to the end of the interval.			329.8 - 330
335.75 - 336.1	Diorite		Medium grey, medium grained. Homogenous. 1 % chlorite filled vesicles, 1 mm across. Both contacts are sharp. 70 - 90 degrees C/A.			
336.1 - 336.9	Rhyodacite		Similar to rhyodacite above. Coalescing spheroids, up to 3 cm across. The spherules are highlighted by chlorite alteration.		The spherules are highlighted by chlorite alteration.	
336.9 - 337.08	Diorite		Same as previous diorite. Slightly finer grained.			
337.08 - 341.2	Rhyodacite massive		Coalescing spherules 2 - 3 cm across, highlighted by chlorite alteration. After 60 cm they are fully coalesced leaving a medium grey rock with a "ghost" spherulitic texture. For 70 cm when they begin to "un"-coalesce into discrete, amorphous spherules 1 - 2 cm across for 30 cm. There is then a relatively sharp transition into less spherulitic rocks, 30 - 40 % where the spherules do not coalesce which continues until the end of the interval. Possible brecciation in the last 10 cm.		highlighted by chlorite alteration	
341.2 - 353.7	Fragmental		May be the same as the rhyodacite above. Large clast has been sampled to determine if the same. The first 30 cm contains 2 - 3 % epidote filled vesicles, 2 - 3 mm across. The first 10 cm in clearly fragmental, and a green colour similar to the rest of the interval. The clasts are predominantly angular, however in places they appear rounded, but this may be a result of alteration. Locally the fragments have a jigsaw-fit aspect. The vast majority of the clasts are green and less than 1 cm in size, probably hyalaclastite. There are other larger clasts which have small spherules at the margins, and some clasts show chilled margins, others show flow banding defined by spherules at the margins. There are no quartz phenocrysts, in the clasts or the matrix. These fragments range in size from 2 cm - 50 cm. There is often chlorite alteration in the matrix.		There is often chlorite alteration in the matrix.	HEB 08 - 12 349 - 349.25
353.7 - 363.27	Intrusive Mafic		Dark grey in colour fine grained. Massive. Homogenous. Both contacts are sharp with chilled margins. The lower contact is at 10 degrees C/A, the			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			upper contact is at 10 - 30 degrees C/A. The rock contains 5 - 10 % feldspar phenocrysts, sometimes glomero, with an average size of 2 - 3 mm across. Not magnetic.			
363.27 - 366.77	Massive mafic???		This rock is extremely altered for the first 40 cm, false fragmental texture? maybe, there is no clear fragmentation. Then there are two possible contacts, the second one 30 cm after, however these may just be alteration fronts formed of epidote and chlorite alteration. Difficult to see anything in this rock. Then for the rest of the interval the rock is massive, medium grey and has spherules locally 2 - 3 %. These are 2 - 3 mm across and do not coalesce and are a greenish colour. These are very different to the spherules seen in the Rhyodacite (H4). There may be a coarse grained tuff, but no fragments are clearly visible.		however these may just be alteration fronts formed of epidote and chlorite alteration.	
366.77 - 367.37	Breccia		Clasts are angular, average 5 cm. Most have chilled margins, some clasts have spherules, 1 - 2 mm. There may be one flow banded clast, but it may be alteration. The matrix is completely chloritised.		The matrix is completely chloritised.	
367.37 - 381	Gabbro		The upper contact is sharp and orientated at 60 degree C/A. The lower contact is sharp and orientated at 40 - 50 degrees C/A. Both contacts display good chilled margins. It is medium grained in the centre, to very fine grained at the margins. Mostly aphyric, with locally 1 % chloritised mafic mineral phenocrysts. No vesicles. Not magnetic.			
381 - 388.6	Breccia		This is very similar to the interval where a large clast was sampled green coloured matrix. Fragments are beige in colour up to 20 cm across with an average of 5 cm. Some clasts show chilled margins although it is not common. Most clasts are spherulitic, and the smaller clasts, 1 - 2 cm in the matrix are chloritised. In places the matrix is completely chloritised. The rock is cut by 1 - 2 % quartz veins. There is some disseminated sulphide in the matrix.		In places the matrix is completely chloritised.	
388.6 - 389.56	Dyke		Dark grey fine grained. The upper contact is very irregular, the lower contact is 30 - 40 degrees to C/A. Both contacts display chilled margins. There is 1 - 2 % feldspar phenocrysts.			
389.56 - 395.14	Lapilli Tuff		Green in colour. Fragments, 0.5 - 1 cm in size, angular to mostly sub-rounded, with 1 - 2 % disseminated pyrite. White coloured clasts are more angular and harder, 2 - 3 % of them. There is no grading, but generally poorly sorted, cut by 1 % veins of quartz and calcite. There are 3 or 4 larger clasts, which are associated with traces of chalcopyrite. The larger clasts have no chilled margins but are fluidal in shape. Non-vesicular and 5 - 6 cm across. Generally sub-rounded. Some of the clasts have chlorite veins, some clasts have veins that do not cut the matrix.		Some of the clasts have chlorite veins, some clasts have veins that do not cut the matrix.	HEB 08 - 13 390.1 - 390.4

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
395.14 - 399.17	Dyke		The first 20 cm has large amounts of pyrite. Then after 32 cm there is a fault, with well rounded friable. The rest of the rock is massive, medium grey, the upper contact is intrusive, at 20 - 30 degrees C/A.			
399.19 - 406.6	Gabbro		Fine grained, dark grey colour, cut by 2 - 3 % quartz and calcite veinlets. Weakly magnetic. Massive homogenous, contains leucoxene.			
406.6 - 408.75	Tuff		The previous logger called this an intrusive breccia. The margin of the gabbro above is chilled against this. The rock is a coarse tuff, with fragments less than 1 mm. Most fragments are white in colour and are angular. There are some abrupt changes to very fine grained material - possibly bedding. Fine grained domains are less than 2 cm across. Rock generally coarsens downwards. The lower contact has many veins and is difficult to see any chilled margin. But this is most likely a tuff rather than an "intrusive breccia"!			
408.75 - 409.81	Intrusion		Upper contact is occupied by numerous veins of quartz and carbonate, so it is difficult to see a chilled margin. The lower contact is relatively diffuse, no clear chilled margin. Contact is mainly marked by a change in colour from greenish grey to brownish grey and the termination of the vesicles in the unit below. The rock is a massive homogenous and fine grained, non vesicular. It is aphyric and does fine toward the margin, being aphanitic. There are 1 - 2 % quartz veinlets.			
409.81 - 412.9	Massive mafic		This unit has 2 - 3 % chlorite filled vesicles, locally up to 5 % The rock is a brownish grey colour fine grained and aphyric. There is 1 - 2 % quartz veinlets and possibly traces of sericite veinlets.			
412.9 - 413.42	Diorite		Upper contact is sharp orientated at 55 degrees C/A. There is no clear chilled margin and the rock does not fine towards the margin. The upper contact is sharp at 60 degrees C/A and again there is no chilled margin. The rock is fine-grained contains abundant mafic minerals. the rock is grey green in colour.			
413.42 - 413.8	Exhalite ?		The first 3 cm is marked by black. Hard material with elongated clasts, likely fault gouge. There is disseminated, undeformed pyrite crystals in the gouge. Below this there is a 1 mm thick pyrite lamination. After the vein is a chaotic interval for 4 cm occupied by a quartz vein and with a generally siliceous look. Then for the rest of the interval there is bedding and the remains of bedding, in green, black and white intervals.			
413.8 - 418.21	Massive mafic		This is similar to massive interval described 409.8 - 412.9. This rock also has some quartz filled vesicles in addition to the chlorite. There are traces of disseminated pyrite. Cut by 1 - 2 % quartz veinlets, in some places the veinlets are truncated by this rock, probably not a contact - minor fault		There is a patchy silica, sericite and maybe epidote alteration throughout this interval varying in intensity from not present to	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
418.21 - 419	Diorite		shifts? Sharp contacts, although upper contact is occupied by a vein so cannot be see a chilled margin. The lower contact is irregular but does show a chilled margin in places. There is a clast of the dyke in the rock beneath, lower rock still plastic? Clast is still barely attached. The rock is medium grey green aphyric and nonvesicular. Patches of chlorite alteration. Fines slightly toward the margins. Up to 1 % quartz veins.		intense.	
419 - 423.85	Mafic massive		Similar to other massive mafic units described before the diorite. There is more mineralisation here, 1 - 2 % but in blebs, not disseminated, mostly pyrite. There are 1 - 2 % quartz filled vesicles in addition to chlorite filled vesicles. Medium to fine grained. Locally amygdaloid disappear. Rock is more altered here.			HEB 08 - 15 421.9 - 421.6
423.85 - 424.5	Mafic massive		This is very similar to the unit above, but the unit here is finer grained and non-vesicular. Some brownish grey colour.			
424.5 - 425.56	Diorite		Upper contact is sharp and shows a good chilled margin, orientated at 40 degrees C/A. Lower contact is sharp and does show some chilled aspects but it is occupied by a calcite vein. Rock medium grey from fine grained to aphanitic at margin, shows 1 % chlorite filled veins, less than 1 mm at the margins. Rock is aphyric. see exhalite descriptions			
425.56 - 426	Exhalite					
426 - 427.06	Massive mafic		Fine grained massive rock. Medium grey green. Not brown, so different from interval above. Traces of quartz filled vesicles 1 - 2 mm across. Possibly there is a spherulitic texture, spherules less than 1 mm across and do not coalesce. The last 30 cm is faulted, displaying fault gouge and elongated clasts 1 - 3 cm across. Some disseminated pyrite in gouge.			
427.06 - 434.7	Gabbro		Rock is dark grey with abundant mafic minerals. Medium grained in the centre to fine grained at the margins. Homogenous, medium grey colour, weakly magnetic, locally, traces of chlorite filled vesicles, less than 1 mm across. Cut by 2 - 3 % quartz and calcite veins.			
434.7 - 435.57	Massive mafic		The first 40 cm consist of black fault gouge, containing elongate clasts, orientated at 50 degrees C/A. There is a lot of silica alteration in there and 3 - 4 % disseminated pyrite. After this the rock is massive homogenous and fine grained. Traces of quartz filled vesicles. medium grey colour and cut by traces to 1% of quartz veinlets.		here is a lot of silica alteration in there	
435.57 - 437.7	Massive mafic		This is the same as the previous interval except here the rock contains epidote alteration. Spots 2 - 3 %, 3 - 5 mm across. Previously interpreted as		the rock contains epidote alteration. Spots 2 - 3 %, 3 - 5	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
437.7 - 438.05	Mafic massive		a glomeroporphyritic texture, this is not so. Rock is a brownish colour similar to earlier intervals of same colour. Only traces of the chlorite vesicles. Fine grained.		mm across.	
438.05 - 438.62	Intrusion		Mafic intrusion. Sharp contacts, possibly chilled margins. Rock fines towards contacts. Medium grey colour, homogenous, aphyric, non-vesicular. Upper contact: 50 - 60 degrees C/A, lower contact: 50 - 60 degrees C/A.			
438.62 - 438.74	Fragmental unit		Brownish colour, angular fragments, 1 - 2 mm across. Monomictic. First 3 cm, fine tuff, then 1 cm coarse tuff, then 3.5 cm fine tuff, then 1 cm coarse tuff then fine grained until the end of the interval.			
438.74 - 438.85	Dyke		Similar to previous dyke. Good chilled margins 40 - 50 degrees C/A.			
438.85 - 439.85	Tuff		Fine grained clastic unit. Brownish colour, some chloritised clasts but mostly monomictic. Average grain size, is much less than 1 mm, the rock coarsens down hole to 1 - 2 mm. At very bottom the rock has more chloritised clasts and an in situ aspect. Patches of chlorite alteration - mostly vein associated. Lower contact is very irregular. 1 - 2 % quartz veinlets.		patches of chlorite alteration - mostly vein associated.	
439.85 - 446.5	Messy rock, as described above the rhyodacite		This is very similar to the messy rock seen in the rhyodacite up hole. Very altered. Possibly fragmental throughout, but definitely fragmental in places. "Fragments" range in size from 1 cm to 10 cm. Possibly spherulitic in places but may just be epidote alteration spots. There are traces of pyrite in blebs. The first 20 cm has hyaloclastite look - in situ angular fragments, but no contact visible, strongly chloritised in places strongly epidote altered in others. Possible quartz phenocrysts, less than 1 %. No real contacts with the unit below. Gradational. Cogitore chemistry says rhyolite/Rhyodacite		Very altered. Possibly spherulitic in places but may just be epidote alteration spots.	
446.5 - 451.4	Rhyodacite		Spherulite texture, same as seen rhyodacite above. 90 % spherules that are completely coalesced after 70 cm leaving ghosts of spherulitic texture. Completely coalesced for 200 cm then un-coalesce again. White hard amorphous spherulitic. No internal structure, up to 2 cm across. The matrix is chloritised.		The matrix is chloritised.	HEB 08 - 14 447.8 - 448.1
451.4 - 459.7	Messy rock		This is the same as the previous messy interval. There are less "fragmental" zones. The rock is mostly massive, but altered. There is patchy epidote alteration. Non-vesicular. Traces of disseminated pyrite. Possible quartz phenocrysts.		There is patchy epidote alteration.	
459.7 -	Rhyodacite		Same spherulitic texture as before. Spherules are epidote altered. No			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
460.3 - 470.2	Messy rock breccia		contacts with units above or below. Spherules are 2 - 3 cm across. Clearly brecciated. Although lots of alteration. The fragments are an average of 3 - 4 cm across and heavily chloritised. It is difficult to see anything within the clasts. Some of the larger clasts have chilled margins. The matrix is epidote altered. The clasts are angular to sub-rounded. This was called autoclastic by the previous logger although there is no in situ look, there is patchy silicification. Some clasts may contain quartz filled vesicles, 1 - 2 mm across.		The matrix is epidote altered.	
470.2 - 472.8	Messy rock		Again, similar to previous interval, but less obviously brecciated probably massive. Dark grey in colour lots of alteration. Patches of quartz. Possibly traces of quartz filled vesicles. Possible quartz phenocrysts. There are possible fragments completely epidote altered 1 - 2 % quartz veinlets. No obvious contacts with units above or below. Sericite, epidote and silica alteration.		Sericite, epidote and silica alteration.	
472.8 - 478.18	Spherulitic Rhyodacite		Again similar to other spherulitic intervals. Smaller spherules here, average 5 mm coalesce and un-coalesce. In one place there is a chloritised fragment within the coalesced spherules. There is also some flow banding although it may just be shear, orientated 40 degrees C/A.			
478.18 - 482.2	Gabbro		Fine grained, slightly finer at the margins. Upper margin has 1 - 2 % quartz and calcite filled vesicles 1 - 2 mm across. Not magnetic. Medium grey colour. Sharp contacts, with good chilled margins. Upper contact is orientated at 30 - 40 degrees C/A, lower is irregular.			
482.2 - 483.3	Rhyolite		Medium grey in colour. Weakly spherulitic 10 - 20 % spherules are less than 1 mm across and do not coalesce. Quartz phenocrysts, less than 1 %. Traces of disseminated pyrite, spherules become epidote altered toward lower margin.		spherules become epidote altered toward lower margin.	
483.3 - 491.5	Gabbro		Medium grey homogenous massive. Medium grained in core, fine grained at margins. Contains leucoxene. 1 - 2 % chloritised mafic phenocrysts last metre. The rock is cut by 1 - 2 % quartz veinlets and traces of sericite veinlets. Not magnetic, although may be pyrotyte in some vesicles.			
491.5 - 492.3	Massive Dyke?		Possible chilled margins, not really clear. Fines toward margins. Sharp contacts. No chilled margins of intrusions above and below this area. 1 - 2 % feldspar phenocrysts also chloritised phenocrysts. Medium grey in colour.			
492.3 - 492.87	Gabbro		Upper contact sharp but irregular and not chilled. Lower contact sharp, irregular and with good chilled margin. Fine grained, medium grey green, aphyric. Non-vesicular.			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
492.87 - 505.8	Messy rock/massive rhyodacite		The rock is predominantly massive, with brief intervals of the messy rock seen before the dyke. The massive intervals are medium grey, fine grained with faint spherulitic texture, much less than 1 mm across. Looks a little like flow banding. In other areas the spherulite are more clear and larger, up to 1 cm across and they do coalesce. No easily visible quartz phenos. From 500.6 - 501 there is a lot of mineralisation, stringer like, mostly pyroclite.			
505.8 - 510.1	Rhyodacite		Massive. The first 80 cm show the spherulitic texture, the spherules are 0.5 - 1 cm across, and they do coalesce. The rock has a chloritised matrix. There are traces of quartz phenocrysts. The spherulite texture disappears after this, although traces of it remain locally. The rock does have epidote alteration spots. There are traces of quartz filled vesicles less than 1 cm across. There are possible quartz phenocrysts. There are also silica alteration spots.		The rock does have epidote alteration spots. There are also silica alteration spots.	
510.1 - 510.35	Intrusion		The rock is dark grey and fine grained. There is no obvious chilled margins. The contacts are sharp, the upper contact is 30 degrees C/A, the lower in nearly perpendicular.			
510.35 - 518.5	Massive rhyodacite		The rock is massive, medium grey and fine grained. Spherules are mostly absent, although locally they appear and coalesce. In one place the spherules define flow banding. There are traces to 1 % of quartz phenocrysts, which are less than 1 mm across. The rock is cut by 1 - 2 % quartz veinlets.			HEB 08 - 16
518.5 - 520.6	Mafic rhyodacite		Looks more altered than the previous interval but is generally the same.			517.3 - 517.6
520.6 - 531.26	Andesite Pillows		Upper contact is placed at the upper limit of the hyalacite which forms the upper 20 cm of this interval, the clasts are chloritised with an in situ look. After this the rock is pillowed. The massive regions have a spherulitic texture, that is the same as that observed in rhyodacite above. In places the spherules form "flow banding", which must just be a concentration of spherules along a specific line which gives the appearance of flow banding. In between the pillows there is hyalacite that is up to 10 cm thick the clasts are either green or completely chloritised, they are angular, less than 1 cm and have a jigsaw fit aspect. The pillow margins are less than 1 m apart. Massive region are aphyric and non vesicular.			
531.26 - 548.1	Gabbro		Dark grey rock medium grained. Finer at the margins. The upper contact is at 30 degree C/A, it is sharp and chilled. The lower contact is at 30 - 40 degrees to C/A. It is sharp with a very good chilled margin. Not magnetic. There are traces of disseminated sulphide, patchy epidote alteration.		Maybe some pinkish carbonate? alteration associated with some of the veins.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
548.1 - 551.95	Andesite Pillows?		Contains leucoxene. Maybe some pinkish carbonate? alteration associated with some of the veins. The rock is cut by 1 - 2 % quartz carbonate veins. The first 70 cm are massive and show a very poor spherulitic texture, medium green in colour. At the top and bottom of this first 70 cm are a few angular fragments that are not quite in situ. There is 1 - 2 % chlorite veining in this region. This is followed by 30 cm of real hyalacastite, fragments are green in colour, some are zoned with chlorite in the centre, between the fragments is a matrix of silica, although the fragments have an in situ aspect, they are and average of 0.5 cm. This is followed by 40 cm of breccia, the fragments are 4 - 5 cm and sub-rounded, some display chilled margins. There are varioles in the fragments, that are less than 1 mm across. This is followed again by hyalacastite for 30 cm. There is then a massive region - pillow? - which has coalescing green spherules towards the margin. Medium grey colour overall. then hyalacastite until end of interval.			
551.95 - 558.6	Dyke		Upper contact is sharp, with a good chilled margin orientated at 45 degrees to C/A. Lower contact is sharp, chilled margin at 50 degrees C/A. The rock is medium grained in the centre, aphanatic at margins. The rock is patch epidote alteration, traces of chlorite and silica alteration. Not magnetic.			
558.6 - 564	Andesite		Massive and medium grey in colour. Fine grained. Aphyric. Traces of quartz vesicles less than 1 mm. There is a spherulitic texture periodically, that coalesces. The average spherule size is 5 mm. At 559.7 there is 8 cm of hyalacastite. The clasts are completely chloritised and 2 - 3 mm across. They are angular with an in situ look, there is a spherulitic texture that has increasing spherules coalescing away from the hyalacastite in both directions			
564 - 565.8	Andesite		This is mostly hyalacastite with some massive regions. The massive regions are up to 20 cm long and are spherulitic. The hyalacastite fragments are 3 - 4 mm, There us 2 - 3 % disseminated sulphides in this area, and the whole interval has been affected by sericite and intense epidote alteration.		the whole interval has been affected by sericite and intense epidote alteration	
565.8 - 572.2	Andesite		This is the same as interval 588.6 - 564. In addition there is moderate epidote alteration locally.		In addition there is moderate epidote alteration locally.	HEB 08 - 17
572.2 - 574.5	Andesite breccia		There are two types of clasts. The larger clasts have an average size of 3 - 4 cm although they can be as big as 10 cm. These clasts are a greenish colour and often display chilled margins, they are angular to subrounded, and			569.4 - 569.7

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			sometimes spherulitic. The smaller clasts are less than 1 cm, angular and often completely chloritised, in places they have an in situ aspect.			
574.5 - 576.9	Massive Dyke?		This is either a very large fragment of the unit above or a dyke. It is massive, the upper contact is irregular but has a good chilled margin. The lower contact does not have a chilled margin and is not particularly sharp. The rock is a medium grey green colour, fine grained and has a "microspherulitic" texture locally, spherules are much less than 1 mm and do not coalesce.			
576.9 - 587.7	Breccia andesite		Overall the rock is a grey green colour. Varies from clast supported to matrix supported, apparently at random. Where it is clast supported it is hyaloclastite and the fragments are angular and in situ, they are up to 5 mm in size and completely chloritised. Where it is matrix supported the matrix is a green colour and the clasts are sub-angular to sub-rounded. The clasts average 1 - 2 cm in size and are completely chloritised. The clasts look to be in the process of in situ fragmentation in some cases although it may be veins that do not cut the matrix.			
587.7 - 594.4	Breccia		This is a continuation of the previous interval. There are more massive intervals here and they are up to 30 cm long. They may be large clasts. They all show a non-coalescing spherulite to micro-spherulite texture. Sometimes seems to define flow banding???. There is 2 - 3 % disseminated sulphide, locally 4 - 5 % in blebs.			
594.4 - 597	Dyke		Upper contact is sharp with a good chilled margin orientated at 55 degrees C/A. The lower contact is irregular and hard to see. The rock is irregular and medium grained, medium grey in colour. There is 5 - 10 feldspar phenocrysts, sometimes glomero. There is 1 - 2 % chlorite filled vesicles at the margin, irregular shapes and less than 1 mm across.			
597 - 624.7	Pillows		There are two intervals of the clast supported breccia see above at the start of this unit, but then it is predominantly massive with pillow margins less than 10 cm thick. The pillows are a medium grey colour, fine grained and aphyric. Traces of chlorite filled vesicles less than 1 mm in size. The pillow margins are defined by chlorite and epidote alteration, with epidote in centre and chlorite on the margins. There are some spherules on the margins, less than 2 mm across and also epidote altered. Most pillow margins do not show hyaloclastite, but it is present in some of the larger margins. Clasts less than 5 mm and completely chloritised. The pillow margins are about 2 m apart, but sometimes 40 - 60 cm.			HEB 08 - 18 621.7 - 621.9
624.7 - 636.4	Breccia		The rock is matrix supported. The matrix is chloritised. There are 70 - 80 % fragments, which are green in colour. At the top, for the first 3 m the		The matrix is chloritised.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			average clast size is 2 - 3 cm and the clasts are angular with a few fluidal larger clasts. The fluidal clasts sometimes have quartz filled vesicles. They also display chilled margins. None of the clasts have flow banding. After the first 3 m the fluidal clasts dominate and small, less than 5 mm clasts, which are angular and chloritised can be seen, 3 - 4 % of them. There is 1 - 2 % disseminated pyrite. In places the black small clasts have an in situ look.			
636.4 - 661.1	Massive		Predominantly massive, with small brecciated intervals 10 - 40 cm long. The breccias may just be the result of alteration they are very chlorite altered and the fragments are 5 - 6 cm angular and pretty much jigsaw fit. The rock has a spherulitic textures in places although may be epidote alteration spots. The rock is pretty messed up, epidote, chlorite and silicification. Fine grained aphyric, 2 - 3 % quartz and carbonate filled vesicles 2 - 3 mm across, irregularly shaped. 1 - 2 % quartz carbonate veins.		The breccias may just be the result of alteration they are very chlorite altered. epidote alteration spots. The rock is pretty messed up, epidote, chlorite and silicification.	
661.1 - 666.2	Rhyo		Massive. Medium grey colour. 1 % quartz phenocrysts. Fine grained, patchy epidote alteration. Traces of epidote veins. 1 % quartz veins, carbonate veins. 2 - 3 % disseminated sulphides and some vein associated.			
666.2 - 674.5	Gabbro.		Not magnetic. Homogenous. Medium grey. Medium grained to fine grained at the margins. Sharp contacts, good chilled margins. Lower contact s at 30 degrees C/A. Upper contact is at 70 degrees C/A			
674.5 - 680.7	Breccia		Matrix is chlorite altered. Clasts are irregular and either pure white or white with black/green spots (Alteration?). Both clast types are very hard. The rock is matrix supported and the matrix is very fine grained or the alteration hides any detail. Clasts are not jigsaw fit. Average clast size is 3 - 4 cm. Very poorly sorted. The previous logger noted two mafic dykes, the first one is 70 cm long and the one after is 30 cm. The "dykes" have very irregular contacts with no chilled margins. The dykes are green in colour. There is an increase in green clasts towards the dykes, up to 5 %. No chilled margins. May be a peperitic texture but there is no concentration of the green clasts towards the "dyke" margins, only in the region. More likely that the "dykes" are large fragments in the breccia.		Matrix is chlorite altered.	
680.7 - 722	Rhyolite		Fine grained medium dark grey 1 % quartz phenocrysts. 2 - 3 % feldspar phenocrysts, both types are up to 1 mm in size. There are 2 - 3 % quartz and carbonate vesicles 2 - 3 mm rounded to irregular shapes. Massive. Cut by 1 - 2 % quartz and carbonate veins. Traces of chlorite filled vesicles. There are gabbroic dykes at 685.95 - 686.3; 685.95; 687.4 - 687.8. Locally there are spherules present within the rhyolite. Less than 2 cm across and a			HEB 08 - 19 682.5 - 682.75 HEB

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			greenish colour, may be epidote alteration. There is a small breccia 15 cm long, that has monomictic almost in situ fragments of the rhyolite and voluminous quartz cement.			08 - 20 720.2 - 720.45
End of hole						

Log of Hole HEB 09. Russell Rogers, Project Hebecourt, 2009, Coordinates of collar: 611884/5371791, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 18.6	Overburden					
18.6 - 28.7	Gabbro		The lower contact is sharp and chilled, orientated at 30 degrees C/A. The rock is massive and homogenous. Medium grey in colour. The rock is fine grained towards the lower margin, but medium grained in the centre. The rock is cut by 1 - 2 % quartz-carbonate veins.			
28.7 - 34.4	Mafic		Massive, medium grey. Fine grained. Locally 1 - 2 quartz vesicles and traces of carbonate vesicles, both types are 1 - 2 mm. The rock is homogenous.			HEB 09 - 01 31.2 - 31.6
34.4 - 46.1	Pillow breccia		At 34.4 there is a pillow margin, but beneath this the rock consists of numerous chilled margins. The rock is clast supported, and there is a concentration of chlorite filled vesicles, that are up to 1 mm, and these are concentrated towards the margins of the clasts. The rock is a green in colour. The clasts are fluidal in shape, and 5 - 10 cm across, although it is difficult to tell because of the way that the clasts run into each other. Some of the clasts are epidote altered. There is a patch of hydrothermal breccia at 40.9, with angular clasts 1 - 2 cm across and lots of quartz cement. From 45 m until the end of the interval the rock is a matrix supported breccia. The matrix is white in colour and very fine grained, the clasts are 1 - 2 cm subangular to subrounded, and they do not have chilled margins.		Some of the clasts are epidote altered.	
46.1 - 57.28	Massive Mafic		The rock is massive medium grey and fine grained. There are 1 - 2 % quartz filled amygdalae, up to 1 mm across. From 50.9 - 54.3 the rock is feldspar phytic, 3 - 5 %, up to 1 mm, angular crystals. At 54 m the rock is briefly spherulitic, spherules 1 - 2 cm and devoid of internal structure, they are white and fully coalesced within 3 cm either side of this point. There are traces of chlorite veinlets and 1 - 2 % quartz carbonate veinlets.			
57.28 -	Exhalite		See exhalite descriptions			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
58.8 - 72.5	Massive Mafic		Massive, medium grey. 1 - 2 % chlorite filled vesicles that are 2 - 3 mm across. 1 - 2 % Quartz filled vesicles 2 - 3 mm across. The rock is cut by 1 - 2 % quartz veins. The rock is homogenous, massive.			HEB 09 - 02 71.2 - 71.5
72.5 - 115.9	Gabbro		The upper contact is sharp but there is no real chilled margin, it is orientated at 30 degree C/A, although it is quite irregular. There are traces of chlorite and quartz filled vesicles in the first 30 cm. The rock is medium grey. Homogenous. Fine grained at the upper margin, medium to coarse grained in the centre.			
115.9 - 119	Dyke		This is a dyke within the gabbro. The upper contact is sharp and chilled against the gabbro, approximately perpendicular to C/A. The rock is sparsely variolitic at the upper contact, varioles approximately 1 mm, they are a greenish white colour. Then the same varioles are present for the last 10 cm. The lower contact is sharp and chilled against the gabbro, orientated at 30 degrees C/A. The rock is homogenous fine grained and massive and medium grey in colour			
119 - 150.4	Gabbro		This is a continuation of the previous gabbro. The lower contact is sharp and chilled at approximately 25 degree C/A. The rock fines towards the lower margin.			
150.4 - 157.3	Mafic massive		Massive medium grey. Homogenous. Fine grained. There is patchy epidote alteration, sometimes forming spots up to 2 mm. There is 1 possible pillow margin. The rock is chilled on either side then 0.6 cm of epidote. There are traces of chlorite filled vesicles that are up to 1 mm in size.		There is patchy epidote alteration, sometimes forming spots up to 2 mm	HEB 09 - 03 155.1 - 155.35
157.3 - 163.7	Pillow Breccia		The clasts are fluidal in shape with good chilled margins. They are 5 - 6 cm in size and very often contains quartz and chlorite filled vesicles. There are other angular clasts up to 2 cm in size and these often display broken chilled margins. The rock is predominantly matrix supported. The matrix is epidote altered and often contains up to 0.5 cm angular clasts, sometimes chloritised, more often green. Both the upper and lower contacts are gradational.		The matrix is epidote altered	
163.7 - 174	Mafic massive		The rock is massive and a medium grey colour. There is 1 - 2 % quartz filled vesicles and 1 - 2 % chlorite filled vesicles, both up to 2 mm in size. The rock is homogenous, monotonous. The rock is cut by 1 - 2 % quartz veinlets. There is variable epidote alteration, from intense to spots to absent. At 172.6 there is a 3 cm fault, characterised by black gouge, that is friable.		There is variable epidote alteration, from intense to spots to absent.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
174 - 208.8	Rhy?		The rock is massive, medium grey and fine grained. There is local epidote alteration, vein associated. The rock is variably spherulitic. There is locally 80 - 90 %, but absent elsewhere. The spherules are from 1 mm to 2 - 3 cm in size, they are white and devoid of internal structure and they coalesce. There are traces of quartz filled vesicles up to 1 mm, but the rock is aphyric. Locally the spherules appear to define flow banding. Sometimes spherules are highlighted by chlorite alteration.		. Sometimes spherules are highlighted by chlorite alteration.	
208.8 - 211	Dyke		The upper contact is sharp and chilled at 30 degrees to C/A. The lower contact is sharp and chilled at 20 - 30 degrees to C/A. The rock is fine grained, medium grey, massive and homogenous. There are traces of chlorite filled vesicles at the upper margin, which are gone within 20 cm. The rock is cut by 1 - 2 % quartz carbonate veinlets. Same as previous rhyodacite.			
211 - 220	Rhyo					HEB 09 - 04 219 - 219.25
220 - 221.2	Dyke		The upper contact is sharp and irregular. There is no chilled margin. The lower contact is sharp at approximately 20 degrees to C/A. There is no chilled margin. The rock is fine grained to aphanitic at the margins. The rock is grey green in colour, it is aphyric and homogenous			
221.2 - 224.1	Rhyo		Same as previous rhyodacite.			
224.1 - 231.36	Mafic		The rock is massive and medium grey for the first metre, cut by 1 % quartz veins. Then until the end of the interval it is breccia. The first 2 m are coarse grained tuff, green and white subangular fragments up to 0.5 cm in size. There is no grading and no bedding. Then for 140 cm the coarse tuff acts as a matrix for a matrix supported breccia which has grey fluidal clasts with chilled margins, which are 5 - 15 cm across, the clasts are non-vesicular. After this fluidal clasts are still present, but are often broken into angular clasts showing broken chilled margins. The matrix is locally chloritised.		The matrix is locally chloritised.	
231.36 - 236.3	Mafic		This is a continuation of the previous interval. Here it returns to the large fluidal clasts which have chilled margins, and are 7 - 8 cm in size. The matrix is hard to see and very chloritised but does contain subrounded grey fragments of the same material as the fluidal clasts. Locally the fluidal fragments are broken into angular fragments with			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
236.3 - 244.3	Mafic		broken chilled margins. Same unit as above. The first metre is massive, medium grey etc. This is followed by coarse grained tuff. The fragments are green and white, subangular to subrounded and 0.5 to 1 cm across. There is no grading and no bedding. It does contain 1 % large fluidal clasts with chilled margins, which are 5 - 7 cm across, although 1 is 30 cm across. Locally the matrix is chloritised.		Locally the matrix is chloritised.	
244.3 - 249.45	Mafic		Massive medium grey fined grained homogenous. There are traces of quartz filled vesicles, 2 - 3 mm. This is cut by 1 - 2 % quartz carbonate veinlets.			
249.45 - 254.6	Gabbro		The upper contact is occupied by a quartz vein. The rock is massive and homogenous. It is medium grey in colour. There are 3 - 4 % quartz veins and the rock is very fractured. The lower contact is sharp and chilled 30 - 40 degrees C/A.			
254.6 - 281.2	Pillows		The rock is medium grey, homogenous and fine grained. There are traces of varioles less than 1 mm across. Locally there are 1 % chlorite filled vesicles. The pillow margins are defined by chilled margins and epidote alteration. They are usually less than 1 cm across, but where they are wider there is hyalacastite visible, angular shards with an in situ aspect, they are chloritised. The pillows are cut by 1 % quartz veinlets. Occasionally there are traces of sulphide associated with the hyalacastite. The margins are 60 - 70 cm apart. This is a fine grained mafic dyke, with sharp chilled contacts.		epidote alteration.	HEB 09 - 05 262 - 262.25
281.2 - 300.7	Massive Mafic	268.8 - 269.3	There are no real contacts between this unit and the unit above. Massive medium grey. Fine grained. Homogenous. There are traces of chlorite filled vesicles less than 1 mm across. The rock is cut by 1 - 2 % quartz carbonate veins. There are traces of chlorite veinlets.			
300.7 - 323.5	Pillows		Very similar to the previous pillow unit. There is more often hyalacastite visible here. The margins are 90 - 130 cm apart. From 309.6 - 322.9 there is a texture that was called glomero by the previous logger, but it is just epidote alteration patches. The rock is cut by 1 - 2 % quartz veins. From 308.1 - 308.7 there is a fracture zone. There are spherules in the pillows (not on margins), they are up to 1 mm across and do not coalesce. There are traces of chlorite filled vesicles		epidote alteration patches	HEB 09 - 06 310 - 310.3
323.5 - 369.5	Gabbro		The upper contact is sharp and chilled and orientate at 30 degrees C/A. The rock is medium grey in colour and fine grained at the upper		There is variable epidote alteration, absent to moderate.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
369.5 - 388.3	Pillows		margin and medium to coarse grained at the centre. The rock is homogenous and has chloritised mafic minerals and traces of chlorite filled vesicles. There is also 1 - 2 % blebby pyrite. There is variable epidote alteration, absent to moderate. The lower contact is very irregular but does display a chilled margin. The rock is very fine grained at the lower contact. This is similar to the previous interval of pillows. The pillow margins are indicated by two chilled margins and a region of epidote alteration that is generally less than 1 cm thick. There is occasionally hyaloclastite visible in the thicker margins. The clasts are less than 0.5 cm across and are completely chloritised. The pillow margins are greater than 1 m apart. The rock contains 1 - 2 % chlorite filled vesicles, locally 3 - 5 %. 1 - 2 mm across. There is 1 - 2 % quartz filled vesicles up to 2 mm in size. There is no concentration of vesicles towards the pillow margins. There is variable epidote alteration outside of the margins, weak to moderate.		a region of epidote alteration that is generally less than 1 cm thick. There is variable epidote alteration outside of the margins, weak to moderate.	HEB 09 - 07 374.2 - 374.5
388.3 - 389	Dyke		The rock is fine grained, the upper contact is sharp and intrusive orientated at 70 degrees to C/A. The rock is massive and a grey green colour. It is homogenous. The lower contact is sharp, with no chilled margin, it is orientated at 40 - 50 degrees C/A.			
389 - 426.3	Pillows		This is the same as the previous pillow interval, pillow margins are an average 60 cm apart. There are no quartz filled vesicles, there are traces of chlorite filled vesicles less than 1 mm apart. The epidote alteration is more intense in the centre of this interval.		The epidote alteration is more intense in the centre of this interval.	HEB 09 - 08 423 - 423.3
426.3 - 427.1	Dyke		Same as previous dyke. Fine grained, the contacts are sharp and chilled, at 50 degrees C/A.			
427.1 - 436.1	Pillows		Same as previous pillow interval. Margins are 80 - 90 cm apart.			
436.1 - 437.2	Dyke		Dark grey, medium to coarse grained. The upper contact is sharp and with no chilled margins. The lower contact is in broken core. The rock is homogenous.			
437.2 - 457.2	Pillows		Margins are 60 - 70 cm apart. Same as the previous pillow interval.			
457.2 - 463.9	Gabbro		The rock is a medium grey in colour and massive. The rock is homogenous. The rock is fine grained at the margins, medium to coarse grained in the centre. There are chlorite alteration patches, up to 2 mm in size. The upper contact is sharp but with no chilled margin and very irregular. The lower contact is sharp with a good		here are chlorite alteration patches, up to 2 mm in size.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
463.9 - 471.5	Pillows		chilled margin, 30 - 40 degree C/A. This is different to the previous pillow intervals. The margins are the same with hyaloclastite in every one. They are 90 cm apart. There are spherules? Alteration spots? They are white and diffuse, they do not react with acid, epidote?. They are up to 1 mm in size and there is 10 % locally. The rock is also more altered here, there are chlorite alteration flecks.		The rock is also more altered here, there are chlorite alteration flecks.	
471.5 - 475.3	Shear zone		The shear is orientated at 45 degrees to C/A. It is difficult to see what the original rock was, all textures are obscured. The rock is very heterogeneous, with shear bands of different colours. This may have been a breccia.			
475.3 - 476.1	Rhyolite?		This is an extremely silicic interval, very silicified. There is 1 % quartz phenocrysts and traces of disseminated pyrite. The rock is massive and homogenous, white in colour and the upper and lower contacts are gradational.			
476.1 - 477.45	Breccia (False?)		Clasts, rounded and angular, black and green , Chlorite and epidote altered. The clasts are 1 - 2 cm in size. The rock is matrix supported and the matrix is completely chloritised. This may be a false fragmental texture.		he rock is matrix supported and the matrix is completely chloritised.	
477.45 - 479.35	Rhy??		Same as interval before breccia			
479.35 - 483.5	Gabbro		Same as the previous gabbro. The upper contact is in broken core, the lower contact is occupied by a vein of carbonate.			
483.5 - 489.85	Massive Mafic		The rock is a medium grey greenish colour. There are traces of quartz filled vesicles, 1 - 2 mm across. There are traces of chlorite filled vesicles. There are chlorite alteration patches. The rock is cut by 1 - 2 % quartz carbonate veins. The rock is massive and homogenous.		There are chlorite alteration patches.	HEB 09 - 09 485.65 - 485.85
489.85 - 492.5	Breccia		The first 50 cm is matrix supported with the matrix being completely chloritised. The fragments are angular and black 1 - 2 cm. There is no in situ look. The last 10 cm of this first 50 cm has white fragments also, they are still angular. After this the rock is still matrix supported but the clasts and the matrix are green. The clasts are rounded to subangular and up to 1 cm in size. This continues with no grading until the end of the interval.			
492.5 -	Massive Mafic		This is a grey colour. The rock is massive. This rock has a texture that		The last 1.5 m is also heavily	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
497			looks a bit like the coalescing spherules, but here the spherules are 5 - 10 cm in size, more like domains with chlorite alteration in between. The "domains" fully coalesce. Elsewhere the spherulitic texture is similar to that seen in other holes, 2 - 3 cm spherules. The last 1.5 m is cut by so many quartz veinlets, 15 - 20 % that is looks in situ fragmented and is also heavily chlorite altered here. There are also discrete white spherules that are devoid of internal structure, these are usually alone and well spaced out		chlorite altered here	
497 - 497.7	Breccia		This looks like hyalacastite, with chloritised shards, angular and in situ and less than 5 mm. The matrix is chloritised and epidote altered.		The matrix is chloritised and epidote altered.	
497.7 - 498.4	Rhy??		Same as the rhyolite seen previously, silicified and containing traces of quartz phenocrysts and traces of disseminated sulphide.			
498.4 - 500	Gabbro		Medium grey in colour. Fine grained, there are patches of chlorite alteration. The upper contact is sharp with a chilled margin, orientated at 70 degrees C/A. The lower contact is in broken core		there are patches of chlorite alteration.	
500 - 503.2	Massive Mafic		Medium grey in colour, greenish and silicified. The rock is massive for the first 1.5 m then there are patches of hyalacastite 10 - 20 cm long in a predominantly massive interval. The hyalacastite has chloritised clasts that are 0.5 to 1 cm across angular and in situ.		chloritised clasts	
503.2 - 504.8	Dyke		The upper contact is relatively arbitrary. The rock is massive, homogenous and fine grained. It is a greenish colour. There are traces of chlorite alteration patches. The rock is cut by 2 - 3 % epidote veinlets. The lower contact has a good chilled margin and is sharp at 30 degrees C/A. There are traces of chlorite filled vesicles at the lower margin, they are 1 - 2 mm across.			
504.8 - 508.2	Massive Mafic?		Massive and homogenous. Dark grey in colour and fine grained. There are traces of quartz filled vesicles 1 - 2 mm in size. The rock is cut by 1 - 2 % quartz carbonate veinlets. There is epidote alteration veins throughout, from absent to weak. There are traces of chlorite veinlets.		There is epidote alteration veins throughout, from absent to weak.	
508.2 - 510.8	Gabbro		The rock is a medium grey green in colour. The rock is massive and homogenous. The rock is fine grained at the upper margin and medium-coarse grained in the centre. There are 1 - 2 % chlorite filled vesicles locally, up to 1 mm. The upper contact is sharp and irregular, with no chilled margin. The lower contact is in broken core.			
510.8 - 511.4	Massive mafic??		Rock is fine grained and very altered. There is epidote and sericite and silica veining, 30 - 40 %. The rock also looks silicified. This may be part of the unit before the gabbro or part of the following one. It is		There is epidote and sericite and silica veining, 30 - 40 %. The rock also looks silicified. The matrix is	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			very hard to say. The last 5 cm is a breccia. The matrix is chlorite and the fragments are up to 1 mm and appear to be predominantly crystals of feldspar and quartz. I have no explanation for this.		chlorite	
511.4 - 515	Massive Rhyodacite		This unit is fine grained to aphanitic. The rock is medium grey in colour. The rock has a sugary texture. It is massive. There are traces of quartz filled vesicles, and traces to locally 1 - 2 % quartz phenocrysts. The rock is cut by 1 - 2 % carbonate veins. See exhalite descriptions			
515 - 517.25	Exhalite					
517.25 - 518	Tuff/Hyalacastite		This is a fine to medium grained tuff, green in colour. There is no grading and it is massive. There is occasionally larger, 0.5 cm chloritised angular shards and within the last 10 cm all the shards have an in situ look, with quartz cement			
518 - 518.14	Tuff		Very fine grained laminated tuff, with some laminations of argillite and possibly chert in the first 5 cm. There is some evidence of syn sed faulting. The average lamination thickness is 1 - 2 cm. There is 1 5 cm lamination of tuff.			
518.14 - 572.2	Pillow? Massive?		The rock is predominantly massive. The rock is medium grey in colour and fine grained. It has two types of spherules, large 2 - 3 cm spherules which coalesce locally, and also smaller, < 2 mm spherules. The rock also contains 10 cm maximum patches of hyalacastite which may represent pillow margins. The small spherules are often present in the hyalacastite as well as the massive regions. In the hyalacastite they appear to cross fragments - alteration feature? The large spherules are a greenish colour - epidote altered? These larger spherules are never present in the hyalacastite, but are present in the massive rock adjacent to the hyalacastite, and coalesce away from it. The hyalacastite intervals are either black or green, sometimes both and average clast size is 0.5 - 1 cm, sometimes smaller rarely larger. The hyalacastite intervals are an average of 1.5 - 2 m apart. The rock is affected variably moderate to absent chlorite and epidote alteration. There are 1 - 2 % quartz carbonate veinlets. The chlorite most often affects the hyalacastite, although it sometimes highlights the spherules. There is often traces of disseminated pyrite associated with the hyalacastite. From 552 until the end of the interval the hyalacastite are more closely spaced, up to 1 m and they are longer, 60 - 70 cm average. They also have an average clast size of 1 - 2 cm. The massive intervals occasionally have traces of a glomero feldspar		The rock is affected variably moderate to absent chlorite and epidote alteration. There are 1 - 2 % quartz carbonate veinlets. The chlorite most often affects the hyalacastite, although it sometimes highlights the spherules.	HEB 09 - 10 and HEB 09 - 11 526.3 - 526.6 and 570.3 - 570.6 respectively

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			texture, up to 1 cm. From 568 until the end of the interval the rock is massive.			
572.2 - 598.75	Dyke		The upper contact is sharp and intrusive, with a good chilled margin. The rock is aphanitic at the upper margin and fine grained in the centre. The rock is medium grey greenish colour. Locally there is 1 - 2 % feldspar phenocrysts (although they may be vesicles, kind of rounded shapes, but unusual to have feldspar filled vesicles) They are less than 1 mm apart. The rock is cut by 1 - 2 % quartz carbonate veinlets. Locally the rock has a brownish colour - ???. The lower contact is occupied by a quartz vein.			
598.75 - 600.5	Tuff/Breccia		The first 12 cm of this interval consists of fine-grained laminated tuff, 1 lamination of argillite and "chert" the laminations are 1 - 2 mm thick. After this until the end of the interval the rock is a coarse grained tuff. The matrix is a brownish colour and very fine grained, there are clasts less than 2 mm across of angular chloritised material that is not in situ. There are also grey siliceous clasts, angular to subangular that are also < 2 mm. The rock is matrix supported. There are three or 4 clasts at the top of the breccia that are much larger, average 5 cm. These are grey and siliceous and are rounded, they display chilled margins.			
600.5 - 602.22	Rhyodacite		The rock is medium grey, fine grained to aphanitic and massive. There is up to 1 % quartz phenocrysts, that are less than 1 mm. The rock is cut by 1 - 2 % quartz veins. There is local silicification.		There is local silicification.	
602.22 - 604	Exhalite		See exhalite descriptions			
604 - 616.9	Messy rock "Rhyodacite		Same as messy rock seen in previous holes. There is 1 - 2 % vesicles locally filled with an orange carbonate. Locally 2 - 3 % quartz filled vesicles. Traces of disseminated and blebby pyrite.		Extremely altered silica, epidote and chlorite, giving the rock a mottled, false fragmental look.	HEB 09 - 12 610 - 610.3
616.9 - 621	Breccia		The rock is brecciated, the fragments are subangular to subrounded, 1 - 2 cm average, although some are 5 cm. The clasts are white and silicified and the matrix is very fine grained, often completely chloritised. Matrix supported breccia. Some fragments contain quartz filled vesicles.			
621 - 624.8	Massive Rhyodacite		Massive, medium grey and fine grained. There are traces of quartz phenos < 1 mm. There are 2 - 3 % quartz carbonate filled vesicles. Locally there is silica and epidote alteration give the rock a mottled look but it is nothing compared to seen above,		Locally there is silica and epidote alteration give the rock a mottled look but it is nothing compared to seen above,	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
624.8 - 626.7	Breccia		Same as the previous breccia			
626.7 - 641.7	Massive rhyodacite		Same as previous Rhyolite. Mottled patches are rarer. There is 1 - 2 % sericite veins in addition			
641.7 - 676.8	Massive Rhyolite		This is the same unit as previously. There are no mottled patches. Locally there is a microspherulitic texture, formed of very small spherules, < 1 mm. They are a whitish green colour and they do not coalesce. In the last 12 cm there are larger "spherules" although i think they are more to do with alteration; they are a greenish colour, no internal structure, do not coalesce or cluster together, there is 2 - 3 % of them, and they have very diffuse edges, not at all like the spherulitic texture seen in the rhyodacite in previous holes.			HEB 09 - 13 651.8 - 652.1
End of hole						

Log of Hole MD 01. Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 609095/5371306, Intended Azimuth: 160

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 33.6	Overburden					
33.6 - 58.4	Rhyolite		The rock contains mafic minerals that are replaced by chlorite. The mafic minerals are needle shaped. Quartz and feldspar make up the rest of the identifiable minerals. There are no identifiable quartz phenocrysts. The rock is massive and contains veinlets that have been dissolved, but were probably originally filled with calcite, and sometimes have chlorite margins. The rock also contains fractured intervals at 36.2 - 36.25m and 48.8 - 58.4 m. The rock is coherent and a medium grey colour. The fragments mentioned in the original log are spots of alteration as the mafic needled cross the boundaries.			MD 01 - 1 40.75 - 41.05
58.4 - 58.6	Protolith uncertain		Poorly preserved rock in broken up core. The rock contains rhyolite fragments that are up to 1 cm across and 5 % dissolved carbonate veins. The origin of this rock is unclear.			
58.6 - 58.9	Mud		The core recovered here is actual mud (not mudstone) with quartz fragments.			
58.9 -	Rhyolite		The rock is a dark green colour and fine grained. There are		There is 1 % carbonate veinlets	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
59.15			darker patches which may be patchy chlorite alteration. The rock contains 10 % rhyolite clasts that are a whitish colour. Some of the clasts contain spheroids and others contain quartz phenocrysts that are less than 1 mm across. The fragments have irregular to round shapes. There is material in some veins that is very soft and could be gypsum. There are traces of quartz crystals in the green parts of the rock, although these parts have a fragmental aspect.			
59.15 - 60	CNR		Core is not recovered here			
60 - 63.58	Rhyolite		The rock is dark grey to dark green and contains 10 % rhyolite fragments that are up to 2 cm across. The rhyolite fragments often contain spheroids and are a white colour with an irregular to rounded shape. The rock also contains 0 - 15 % dark green spots that are soft and easy to scratch, they are most likely chlorite alteration spots. Some of the clasts show evidence of plastic deformation and photos have been taken of this.	There is disseminated pyrite locally, associated with the bleached interval	From 61.9 - 62.9 m the rock is a medium grey with a beige hue and looks bleached as a result of silica and to a lesser extent sericite. The rock contains overall 2 % carbonate veins	
63.58 - 64.62	Rhyolite		The rock is the same as the preceding interval but contains less fragments, 1 %. The fragments are a white colour and are rounded, they are < 7 mm across. The rock looks dark grey which is probably as a result of alteration. The rock has patches of silicification locally.		The rock contains overall 1 % quartz veins and 1 - 2 % dissolved carbonate veins.	
64.62 - 67.6	Rhyolite		The first 25 cm of this interval contains 60 - 90 % rhyolite fragments. Some of the fragments are white and some are greenish. There are quartz phenocrysts in some of the fragments. There are spheroids in some of the fragments. The matrix contains some haematite. After the first 25 cm there is 5 % clasts that are a whitish colour, in a green rock. Some of these clasts also contain spheroids. From 66 m the core is broken up but one patch of silicification is visible.			
67.6 - 68.4	Uncertain		The rock looks very bleached which may be a result of silicification. There are a few clasts in this interval but they are sporadic and may be hidden by the alteration.		The rock contains 2 % dissolved veinlets of calcite and something unidentified.	
68.4 - 69.2	Fracture zone		The core recovered here is small rock chips and gravel			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
69.2 - 73.65	Rhyolite		The rock is dark grey and fine grained. The rock contains 10 % easily visible clasts and probably many more that are hard to see in the first 30 cm. Then from 70.1 - 70.85 m the rock is bleached and primary texture is hard to see. The clearly visible fragments are variable in texture and shape. Most are rounded and some have quartz phenocrysts that are < 7 mm across. There is some similarity between this rock and the possible rheomorphic ignimbrite in MD 02, except that the fragments are smaller and the rock is more altered. There are traces of chloritised fragments with angular shapes.		The rock contains 2 % carbonate and chlorite veinlets. The carbonate veinlets are dissolved. There is also some weak sericitic alteration locally.	
73.65 - 80.3	Rhyolite		The rock is dark grey with 0 - 5 % rhyolite clasts, but locally up to 15 %. The clasts often contain spheroids that are up to 3 cm across. The clasts are white and irregularly shaped. Some of the largest clasts show evidence of plastic deformation. The rock also contains 0 - 5 % circles and ellipses that are a pale grey to purple colour and have concentric patterns. They may be vesicles or fragments with reaction rims. There origin is uncertain and photo's have been taken.	There are traces of pyrite locally	There is 1 % carbonate veinlets that have not been dissolved. There is also 5 cm of bleaching at 76 m and 76.3 m.	MD 01 - 2 79 - 79.3
80.3 - 80.5	Uncertain protolith		The rock here is strange and complicated with various fragment types in a siliceous/silicified matrix. The rock has > 50 % fragments that are up to several centimetres across. The fragments are elongated at 35° C/A. Some of the fragments are zoned in a similar way to the rhyolite fragments described above. The rock is hard to describe and of uncertain origin.			
80.5 - 85.5	Rhyolite		The core is broken into pieces less than 30 cm long. The rock contains 3 % rhyolite fragments, some of which contain spheroids that are up to 2 cm across. There is a small interval that looks as though it is a tectonic breccia. Core is not recovered from the region of 84 m. The last 5 cm contain 15 % completely dissolved calcite veinlets.		There is local moderate to intense silicification giving the rock a pale grey, bleached look.	
85.5 - 94.4	Rhyolite		In general this rock is similar to the interval 73.85 - 80.3 m. The rock is dark grey to dark green and contains 10 % fragments that are pale coloured with irregular to elliptical shapes. The fragments are rhyolite and some contain spheroids. Many of the fragments have a rim that is fine		There is local weak bleaching in this interval. There is also 2 % dissolved calcite veins.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			grained and medium grey in colour. The rims may coalesce locally. The maximum clast size is 4 cm, but the average is less than 1 cm. The rock also contains 0 - 5 % of circular shaped quartz filled features that may be amygdaloid but it is not clear.			
94.4 - 102.55	Rhyolite		The rock is dark grey to dark green and contains very few fragments, except locally. There are traces of quartz phenocrysts. Within 65 cm of the lower contact there is a concentration of fragments and 1 - 2 % quartz filled vesicles.		The rock contains 0 - 15 % calcite veinlets, most of which are completely dissolved. From 96.8 - 97.3 m there is 30 % chlorite quartz veins that are up to 2 cm thick.	MD 01 - 3 102.55 - 102.8
102.55 - 122.50	Gabbro		The upper contact of this rock is sharp and is at 35° C/A. The average grain size is 1 - 2 mm but the unit fines towards the margins. The rock contains more plagioclase feldspar than mafic mineral. The rock has locally up to 5 % chlorite spots, that are probably a feature of alteration, that are 1 - 3 mm across. There is 1 % quartz carbonate that are not dissolved and there is no dissolution below this interval. The original log states that this unit is magnetic, but the magnet does not respond. The lower contact is at 38° C/A and is sharp.			MD 01 - 4 110.7 - 111
122.50 - 132.4	Rhyolite		The rock is dark green and generally fine grained. The rock contains traces of quartz phenocrysts and rhyolite fragments, but the fragments are difficult to see. There is a possible false fragmentation texture over the last 30 cm. There is a weak foliation at 40° C/A. The porphyritic character of this rock is not obvious, the crystals are more easily seen in the first 40 cm where the rock is bleached by alteration.		The rock contains 1 % carbonate veins. See the original log for metreage of quartz veining that is associated with patchy and fracture controlled sericite alteration.	
132.4 - 133.4	Rhyolite		The rock is chloritised. The rock contains a texture that could be quartz filled amygdaloid or silicified spherules, the features are spheroidal and are up to 2 mm across. The rock also contains up to 3 % rhyolite fragments that have folded shapes and are white in colour. The maximum size of the fragments is 1.5 cm. The rock also contains darker clast that are difficult to see and are similar to the false fragmentation texture seen previously. The dark clasts contain pale clasts			MD 01 - 05 127.15 - 127.55 MD 01 - 06 132.66 - 132.76

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
133.4 - 146.7	Rhyolite		The rock is a dark grey to dark green colour. The rock is fine grained. In the bleached areas there can be seen 2 - 3 % quartz crystals. There is an unusual texture at the margins of the bleached areas consisting of pale coloured spots, up to 5 mm across, that coalesce. This could be a devitrification texture or it could be the result of alteration. At 140.3 to 140.5 m there is a large concentration of circular to elliptic features that are up to 2.6 cm across. The origin of these features is unknown, but some contain quartz phenocrysts in and around them. They are definitely not clasts. Photos of these features have been taken. The rock also contains 5 - 12 % rhyolite fragments that are up to 3 cm across but are typically less than 1 cm. The fragments range from aphanitic to spheroidal. All of the fragments that are larger than 1 cm have been plastically deformed. The fragments are a pale grey to white colour and some contain quartz phenocrysts. The groundmass or matrix between the clasts has a coherent aspect in most places. The fragments are randomly orientated. The rock contains a weak foliation that is not visible everywhere, the foliation is orientated at 30 - 40° C/A.	There is traces of pyrite at 141.6 m	The rock is bleached from 141.85 m to 142.25 m. There is moderate, fracture controlled bleaching at 139.4 to 139.9 m and this is likely to be silicification. The rock is cut by 2 % carbonate veinlet overall and there is traces of quartz veins and veinlets.	MD 01 - 07 142.85 - 142.75
146.7 - 150	Rhyolite		The rock is a medium to dark grey colour. This rock is similar to the preceding unit, but contains fewer fragments. There is 1 big clast every metre. The maximum size of the clasts is 4 cm. The quartz crystals of the previous unit have become more abundant and increase toward the bottom of the interval, there is 2 % at the top but 5 % at the bottom. The crystals are all less than 1 mm. There is a variable abundance of feldspar phenocrysts locally up to 14 % e.g. 148.6 m but the average for the rock is 2 %. The crystals are up to 2 mm in size.	Between 147 m and 148 m there is 1 - 2 % pyrite that is disseminated and is also present by replacement in some rhyolite clasts.	The alteration of this rock is variable. From 147.5 to 147.8 m there is bleaching, probably as a result of silicification. The rock is cut by 1 % carbonate veins that are not dissolved.	
150 - 154.4	QFP		The rock is dark grey and is quartz and feldspar phyrlic. There is 3 - 4 % Quartz phenocrysts that are less than 2 mm. The feldspar phenocrysts are euhedral to subhedral crystals that are 2 mm across, there is 5 % feldspar phenocrysts. This is the only real QFP seen so far in this hole. The rock contains very few rhyolite fragments, less than 1 per metre. In the last 20 cm of this interval there is a	There is 5 cm of bleaching between 150.03 m and 150.08. This may be silicification. There are also traces of carbonate veinlets.	There are traces of pyrite in the last 15 cm	MD 01 - 08 152.15 - 152.4

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			weak foliation orientated at 35° C/A. The rock here is also weakly silicified. The lower contact of this rock is knife sharp and is orientated at 55° C/A. The unit beneath has a chilled margin against this unit.			
154.4 - 164.80	Diorite dyke		The lower contact of this unit is not clear, but is orientated at approximately 70° C/A. The first 2 m of this interval are very fine grained, as is the bottom 2 m. The central portion of this unit contains plagioclase laths that are up to 5 mm long and are randomly orientated. The plagioclase crystals have a greenish aspect which is probably as a result of epidote alteration.		The rock contains 2 - 3 % epidote veinlets locally. The rock also contains 1 % quartz and carbonate veinlets. There are traces of hematite epidote alteration that is fracture controlled.	MD 01 - 09 158.75 - 159
164.8	QFP		This is the same unit as before the dyke. There are no clear rhyolite fragments in this interval. The rock has a good porphyritic texture with up to 5 % quartz phenocrysts that are up to 2 mm across and up to 10 % plagioclase phenocrysts that are up to 2 mm across. Some of the crystals may be glomerophenocrysts. The feldspar crystals are generally subhedral. The groundmass is a dark grey colour and is very fine grained.	There are traces of hairline carbonate veinlets		
169.2 - 170.1	Dyke		This rock is a very fine grained mafic rock with a green colour. The contacts are sharp and intrusive and are orientated at 45° C/A for the upper contact and 42° C/A for the lower contact.			
170.1 - 170.55	QFP		This is similar to the QFP interval before the dyke. See that description			
170.55 - 171.2	Dyke		The rock is a fine grained, dark green mafic intrusion. The contacts are sharp and intrusive and are orientated at 55° C/A for the upper contact and 55° C/A		The rock is cut by 3 - 5 % carbonate veinlets	
171.2 - 212.6	QFP		This is probably the same unit as before the dykes and has a good porphyritic texture. There is 3 - 5 % quartz phenocrysts that are up to 2 mm in diameter. The abundance of feldspar phenocrysts is variable on a decimetre scale, for example at 187.5 m there is 10 % crystals, while at 181.5 m there is only 2 %. The average size for the feldspar phenocrysts is 2 mm, but the maximum is 3 mm. The feldspar and quartz crystals are all euhedral to subhedral. The groundmass of the rock is a dark greenish grey colour and is fine grained to aphanitic.		The rock is bleached at 181.35 - 181.95 m and at 171.2 - 174 m. There is weak sericite alteration at 180.7 m with the veinlets orientated at 50° C/A. There are traces of carbonate alteration throughout the rock. From 191 m to the end of the interval there is variable alteration, see the original log for details.	MD 01 - 10 174.57 - 174.87 MD 01 - 11 209.6 - 209.9

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			At 178.9 - 178.98 m there is brecciation, the fragments are dark grey and are angular to subangular. The fragments are up to 1 cm in size. The intrafragmental material appears to be hydrothermal cement. Some of the fragments contain quartz phenocrysts. This is most likely an in situ breccia. Nowhere else in the interval is brecciated.			
212.6 - 217.9	Gabbro		The rock is strongly deformed and altered, see the original log for details. From 213.2 - 213.9 m there is a strong schistose texture that is orientated at 30° C/A. There is also an orange carbonate/haematite visible in this area. From 214.78 - 215 the rock is fragmental and friable, with moderate to strong epidote alteration. At 214.5 there is a low angle contact with an internal dyke, but it is not very clear.		There is strong to intense chlorite and epidote alteration throughout the rock.	
217.9 - 307	QFP		This rock is all QFP and is most likely to be the same interval as before the dyke. At 228.91 - 229 m there is a concentration of phenocrysts, some of which have rounded edges and could be amygdaloids. There is a possibility that this is a lobe margin. Feldspar phenocrysts are more visible in the haematite altered regions. From 275 - 293 there is a false fragmentation texture, there is an even distribution of phenocrysts in the clasts and the matrix. Then there is intermittent false fragmental texture until the end of the interval.	There are traces of pyrite	See the original log for details of the alteration	MD 01 - 12 253.44 - 253.75 MD 01 - 13 289.3 - 289.6
307 - 317.4	Rhyolite		This rocks contains fragments and there is some evidence of flow banding near the upper margin, at 307.3 - 307.45 m. The flow banding is orientated at 55° C/A. Between the flow banding and the upper boundary of the interval there have been several generations of alteration, including chlorite and sericite. There is a weak foliation orientated at 45° C/A in this region and the protolith is uncertain. From 307.45 m the rock is messy and things are difficult to see. This is possibly a rhyolite breccia protolith, with clasts an average size of 1 cm, but a maximum of 5 cm. There is a QFP clast at 309 m which is accompanied by aphyric, aphanitic, white rhyolite fragments. At 309.5 - 312 m the rock has a marbled aspect as a result of multiple generations of alteration, the protolith is probably a		There is moderate sericite alteration, which is veinlet controlled. There are also patches of chlorite which may be clasts or islands of chloritised rock in a bleached sea.	MD 01 - 14 311.45 - 311.65

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
317.4 - 322.05	Rhyolite		<p>rhyolite breccia. Below this subinterval the dominant alteration is silicification. At 315.15 - 315.28 m there is a fine grained to aphanitic mafic dyke that has 5 % quartz filled vesicles that occasionally have calcite as well. The vesicles are elongated and orientated at 60° C/A. The contacts are sharp and intrusive, the upper contact is orientated at 55° C/A, the lower contact is at 65° C/A. Below the dyke the rock is the same as above the dyke.</p> <p>The protolith of this rock is most likely a rhyolite breccia. There have been several stages of intense alteration, including chlorite, silica and sericite, and occasionally pyrite. The origin of this breccia is unclear. Hydrothermal?, volcanic?. Most of the fragments have been altered and are replaced by alteration minerals. There are several intermediate to mafic dykes cutting this unit. An example is at 319.7 - 320.4 m. There is a sharp contact at 40° C/A with a chilled margin, for the upper contact. The grain size of this dyke is 1 mm in the centre, and there are trace amounts of calcite filled vesicles that are up to 4 mm across. There is 5 % chlorite alteration. There is 1 % carbonate veinlets cutting this dyke and it is coherent throughout. The rock is dominated by altered plagioclase and the lower contact is unclear. At 321.2 - 321.5 m there is a change in the rock but the contacts of this dyke are very irregular and the rock seems to be composed of basaltic hyaloclastite, that may or may not contain rhyolite fragments. At 321.37 - 322.05 m there is another dyke and this one also has irregular contacts. The last 8 cm of this dyke are coherent, but elsewhere there is hyaloclastite with traces of rhyolite fragments. The favoured interpretation for the hyaloclastite dykes is peperite. All the dykes are beige to medium green and are probably sericitised. The clasts in the last dyke have a preferred orientation of 65° C/A, which is probably tectonic.</p> <p>The rock is a coherent rhyolite with trace amounts of quartz and feldspar phenocrysts that are up to 1 - 2 mm. There are no obvious fragments in this rock, except where false fragmental textures are developed by chlorite</p>			<p>MD 01 - 15 319.9 - 320.08 MD 01 - 16 321.7 - 321.78</p>
322.05 - 339	Rhyolite				There is variable alteration. For example at 323.6 - 324.6 m there is weak bleaching with 5 % massive quartz - chlorite veins and veinlets overprinting bleached rock. The	MD 01 - 17 337.9 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
339 - 344.45	Protolith uncertain	339 - 340.2	veinlets. Overall the rock has a medium grey colour and has a fine grained to aphanitic groundmass.		veins are cut by traces of carbonate veinlets. At 329 - 334.4 there is variable quartz haematite alteration with up to 5 % chlorite veins cutting the rock and locally forming a false fragmental texture. The chlorite veins sometimes contain pyrite. The chlorite veins are cut by traces of quartz carbonate veinlets.	338.15
			The rock is a pale yellowish green and contains yellowish grey fragments. The fragments are mostly angular and less than 1 mm across, but they can be a few mm in places. Many of the fragments appear to be sericitised. The matrix is also altered to sericite and other minerals. There is some similarity with the mafic pepperite seen in a previous interval, but there is no obvious massive part or intrusive contact here. At 339.56 to 339.72 m there is normal grading in a lapilli tuff/coarse tuff. The last 4 cm of this is laminated tuff that is possibly re-sedimented hyalacastite.			
		340.2 - 340.6	The rock here is highly altered by sericite, silica, chlorite and late carbonate. The protolith is uncertain			
		340.6 - 342.2	The rock here is dark grey and ranges from aphanitic to coarse grained. There are traces of quartz phenocrysts. The rock is coherent but the chemistry and origin are unknown		There is 2 % sericite veinlets that are orientated at 25 - 30° C/A. The sericite veins are cut by traces of carbonate veins that are at random angles.	
		342.2 - 344.45	This is probably the same rock as in the previous interval but with more intense alteration. There are 3 % carbonate veinlets. There are traces of chlorite veinlets with traces of pyrite		There is silica and sericite alteration.	
344.45 - 350.3	Protolith uncertain		This rock is generally a dark green colour with fragments of variable size and character. It is possible that some of the fragmentation is volcanoclastic and some is alteration. Some of the fragmented regions have a vague resemblance to what has previously been referred to as hyalacastite, for example the first 45 cm of the interval and the last 20 cm of the interval.		There is moderate to strong alteration including chlorite and sericite.	
		346.4 - 347.4	The rock is fragmental and many of the fragments are white and very hard. The clasts are aligned at 55° C/A. The clasts are often elliptical in shape and almost look like vesicles. The matrix of this rock is chlorite rich and very			MD 01 - 18 346.53 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			soft. At 346.3 m until 346.4 m the rock has dark green to black intensely chloritised fragments. The boundaries are defined by sericite veins. This is hydrothermal brecciation. The origin of the rest of the sub-interval is unknown. This has been reinterpreted as a spheroidal texture that has been invaded and partially altered by chlorite.			346.54
		348 - 350	The rock here contains small fragments with a lot of sericite alteration. There are domains up to 5 cm across that are the remains of a fresher rock. The fragments are formed preferentially in the sericite altered parts, and are most likely formed by tectonics. The fragments have very irregular shapes. This is re-interpretation as a result of evidence seen lower.			
		349.5 - 349.65	This rock contains 5 % calcite filled vesicles up to 2 mm across. The vesicles are found mostly in the dark, soft elongate fragments. The vesicles are not elongate. A possible interpretation is that the fragmentation is a result of sericite alteration. The origin is not clear and the rock is very confusing!			MD 01 - 19 349.04 - 349.17
350.3 - 366	Protolith uncertain	350.3 - 350.9	Grey rock with partial to total sericite alteration that creates a fragmental texture at its most intense.			
		350.9 - 351.4	Grey rock with weak sericite alteration that is vein and veinlet controlled			
		351.4 - 351.8	Strong sericite alteration in a grey rock.			
		351.8 - 352.2	This is a fine grained medium grey rock with no sericite alteration			
		352.2 - 352.75	Locally the remains of the fresh grey rock can be seen.		This rock contains strong to intense sericite alteration. The rock contains fragments of sericite locally.	
		352.75 - 353.65	The rock here is possibly a hydrothermal breccia. There are chlorite altered darker fragments surrounded by sericite alteration that may also be silicified.			
		353.65 - 354	This is a fine grained medium green rock. The protolith is uncertain as it has probably been altered to sericite.			
		354 - 355.9	The rock here is very strange. The protolith is unknown. The rock contains nodules and/or fragments that can be up		The rock is cut by 1 % carbonate veinlets.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			to 4 mm across. They have shapes that are elongate to circular. They are a greyish beige colour. The most circular fragment has a vague radial pattern that may be present in the other features. Overall there is 5 % of these features. The matrix of the last 80 cm of this interval contains strange radiating fibres. The favoured interpretation is that the fibrous pattern is a result of the alteration of spherules, as there is some evidence of alteration impinging on the spherules			
		355.9 - 356.4	The rock here does not contain any evidence of nodules and the rock looks a coherent grey colour, but with an invasion of sericite. The rock is cut by less than 1 % calcite veins, some of which are an orange colour.			
		356.4 - 357.25	The rock here is messy and has a marbled appearance that is the result of variable silica and sericite alteration. The rock has a brecciated appearance. The protolith is unknown.		The rock is locally replaced by 90 % silica that may or may not be associated with hematite	
		357.25 - 358.75	The rock here was formerly coherent and it contains some patterns that suggest that there were spherules as a result of devitrification. The rock is a beige colour but there is an invasion of chlorite and silica that creates a brecciated aspect locally			
		358.75 - 366	The rock here is also messy. The rock has a brecciated aspect. The nodules in this rock are much smaller than previously seen, they average 0.5 cm across. There is up to 50 % of the nodules. There is a slight elongation of the nodules orientated at 35° C/A. This area is the best evidence to support the interpretation that the nodules are altered spherules.		The alteration here is probably chlorite, quartz and some hematite, although it is much weaker than previously seen. There are also 2 - 3 % sericite veinlets that are orientated at 65° C/A. There is also 1 % late carbonate veins that cut everything	MD 01 - 20 359.5 - 359.75
366 - 366.7			This is the same unit as in the above interval but here there 10 - 15 % nodules that are up to 1 cm across and coalesce locally. Some of the nodules seen here have radial fibres			
366.7 - 376			This interval is still in the same rock as the above intervals, the Variolite/spherulite/nodular rock. The nodules here are various sizes concentrations and states of preservation as a result of the chlorite, silica and sericite replacement. At 371.5 m the nodules are dark grey and up to 1.2 cm across, some of them are partly digested by			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
376 - 382.2	Mafic		<p>alteration. Elsewhere in the interval the nodules are smaller, except locally. The nodules are siliceous to very siliceous, this applies to many of the intervals, not just this one. Overall the rock is a medium green to beige colour. At 374.2 - 374.7 m the core is broken up into rock chips less than 2 cm big, which is evidence for a fracture zone.</p> <p>This rock has a gradational contact with the rocks to either side. The rock is a medium grey to greenish colour and the first 20 cm has weak evidence coalescing of nodules. The rock is generally fine grained and homogenous. There is no alteration except locally. At 380.65 - 381 m there are spherules visible and they average 0.7 cm across, but at 380.2 - 380.43 m they are also visible and average only 2 - 3 mm across.</p>			MD 01 - 21 377.75 - 378
382.2 - 388			<p>This unit also contains nodules, they range from 1 mm to 1.5 cm in size but the average is 2 mm. The rock is a medium green colour to dark green locally. The rock contains traces of quartz filled vesicles that are an average of 2 mm across. The rock has a brecciated aspect locally and the fragments are defined by silica veins with chlorite. From 385.10 - 385.65 m the rock is hyalacastite, and is probably a real feature. Although there is a lot of sericite alteration many of the clasts are not made of sericite. The clasts are angular and have a jigsaw fit aspect. The clasts are an average of 2 - 5 mm across, but can be up to 2 cm. The cement of the hyalacastite is sericite</p>		There is moderate sericite alteration throughout this rock. There is also patchy chlorite alteration. The rock is cut by traces of quartz and carbonate veinlets.	MD 01 - 22 382.1 - 382.17
388 - 388.65	Hyalacastite		<p>The rock here has a spectacular fragmental texture. The average clast size is 5 - 6 mm, but can be up to 3 cm. The fragmental texture is enhanced by sericite cement. There are small round features that are 1 - 2 mm across and they appear everywhere at the upper margin independent of the clast or cement. The round features are silicified. There are also zoned fragments that have chlorite at the centre. In the last 25 cm of the interval the clasts are larger, an average of 5 - 20 mm in size</p>			
388.65 - 388.90			<p>The rock here contains elliptic to amaeoboid shapes that are up to 3 cm across. The features have a sericite rim that is 2 mm thick. The interior is chlorite with a sericite overprint.</p>			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			The cement is siliceous but greenish. There are none on the concretions in this interval. This interval is the same unit as the previous 2 intervals			
388.9 - 389.2			This is the same unit as in the previous interval. It is fine grained, and the spherules and chlorite are overprinted by sericite veinlets.			
389.2 - 397.3	Diorite or Gabbro intrusion		The lower contact of this unit is sharp and has a good chilled margin, the contact is orientated at 50° C/A. The first 1.5 m and last 1.5 m are fine grained to aphanitic. There are plagioclase crystals that are up to 2 mm, they are not lath shaped and are probably altered to epidote. The rock contains up to 3 % disseminated leucoxene crystals that are less than 1 mm across. The first 50 cm has a strange slightly heterogeneous look, that is probably a result of alteration. The upper contact is unclear. Overall the rock has a clear igneous texture and a chilled margin making it very likely that the rock is intrusive			
397.3 - 405.45	Intermediate lava		This is a massive intermediate to mafic lava. The rock contains 0 - 10 % chlorite and/or calcite amygdalites that are up to 2 mm across. The rock is homogenous apart from the first 30 cm, which contains poorly preserved ?devitrification nodules. The rock is a medium grey to greenish colour.		There are traces of sericite, carbonate and chlorite veinlets	MD 01 - 23 404.55 - 404.85
405.45 - 407	Gabbro		There is a sharp upper contact that has a chilled margin, the contact is orientated at 65° C/A. The lower contact is not observed because it is located in broken core. The grain size coarsens downward and reaches 1 mm from within 20 cm of the upper contact. The grain size stays at 1 mm until 20 cm from the lower contact. The rock has an overall dark greenish grey colour. The rock also contains euhedral to subhedral plagioclase crystals	There are trace amounts of pyrite.	There are trace amounts of sericite and carbonate veinlets.	
407 - 407.4	Mafic or intermediate		The rock contains clasts that are up to 1 cm across. The clasts have angular shapes and a jigsaw fit aspect. The rock is clast supported with 1 - 2 % calcite cement. Some of the clasts are chlorite altered at the core but have silicified margins similar to what has been seen before. There is locally up to 2 % circular spots that are less than 1 mm across, they have concentric zoning that contains			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
407.4 - 409.8	Basalt or andesite		quartz, chlorite and other unknown minerals. These could be vesicles, this is likely as they occur mainly in the clasts. The overall colour of this rock is medium grey. The rock looks coherent, but there are 0 - 5 % white nodules that locally have radial fibres, they are up to 1 cm across. At 408.2 - 408.95 m there are large concentric patterns defining zones up to 4 cm across with elliptical to irregular shapes. The core is chlorite rich with some silica. The outer 1 - 1.5 cm contains 1 mm thick concentric lamina within a silica rich rim. The lamina look like growth rings. Some of the nodules have coalesced. The coherent nature of the rock is not firmly established. At 409.5 - 409.6 m the rock looks fragmented and is largely devoid of nodules. This could be the protolith for the rock earlier in the interval. It is largely devoid of chlorite alteration. In the first 45 cm of the interval the banded features appear to invade pre-existing severely sericite altered fragments. The bands also invade the matrix. The bands here are not really concentric, they are more symmetric about a centre line. They are darker than the other nodules and are less silica rich		The rock is cut by 1 % carbonate veins	
409.8 - 409.95	Andesite/Basalt		The rock is medium grey and coherent. The rock is fine grained.			
409.95 - 410.1			The rock is broken and the core is mixed up			
410.1 - 410.35			The rock here contains 0 - 15 % white nodules, but the rock is generally similar to the interval 408.2 - 408.95 m but the concentric lamina is incomplete or partially destroyed by the subsequent alteration			
410.35 - 411.05	Hyaloclastite		The hyaloclastite texture of this rock may be false. Some of the fragments contain nodules that are probably vesicles and they are silicified, they are up to 5 mm across and they have 1 mm thick sericite rims. There are radial fibres in the core of the nodules, there is chlorite alteration and another type of alteration that is unidentified. There is chlorite in the core of the nodules. Some of the fragments have a spherulitic aspect, the spherules are silicified. The cement is siliceous and the clasts are grey to green.			MD 01 - 24 410.8 - 411

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
411.05 - 413.9			The rock here is a mixture of hyalaclastite and massive rock with spheroids. There is an overprint of the big nodules with concentric banding. There is alteration on the pre-existing "hyalaclastite". The last alteration phase gives the rock a greyish beige colour and removes the fragmental aspect when the process is complete. The "hyalaclastite" unaffected by this is a greenish colour and there is some remains of this in the replaced region. The final result of the replacement is nodules that are up to 4 cm with darker cores and concentric rims, as seen in the interval encompassing 408.6 m. Locally there are a few white to pale beige nodules that are very silicic and some show radial fibres, preserved in the "hyalaclastite" and the grey nodular alteration. This texture is definitely older than the last phase of alteration and seems to survive it, probably because of the silicious nature. They appear partially digested locally			
413.9 - 414.35			This is the same unit as seen above. This is a hyalaclastite interval, but there is no later overprinting of the big nodular alteration			
414.35 - 414.80			This is still the same, but the hyalaclastite here has moderate to strong "big nodular alteration". There are trace amounts of silicification that partly destroy the silicic radial nodules			
414.80 - 416			The hyalaclastite here has more moderate replacement and locally preserved silicic nodules that are up to 2 cm across. They are partly destroyed locally			
416 - 416.15			The rock here is coherent and pale to medium grey rock, with a possible devitrification texture. The spheroids of the devitrification features are up to 2 mm across. The upper contact of this coherent section with the surrounding hyalaclastite is gradational, the lower contact is sharp but irregular with a high angle to C/A.			
416.15 - 417.1			The rock is a moderately replaced hyalaclastite. It may not have been a clastic rock, it could have been a chloritised coherent rock prior to alteration			
417.1 - 422	Mafic/intermediate		The rock is generally massive, and was probably a lava or intrusion. The rock is medium grey and generally fine		There are traces of quartz and carbonate veinlets	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			grained. From 420.25 - 421.1 m the rock is coarser grained and has randomly orientated plagioclase laths. The contacts are gradational, the first and last 30 cm of the interval show a brecciated texture, spherules and pieces of nodules.			
422 - 422.3			The rock here is a mixture of spherules and in situ breccia. There is a large quartz - carbonate vein.			
422.3 - 428.53	Hyalacラスト		The clasts are angular and are up to 2 cm in size. The rock has an in situ breccia aspect. There is silicification or silica cement of the hyalacラスト. The largest clasts have chlorite cores and siliceous rims. The big nodular alteration is observed at 424 - 424.7 m and 425.15 - 426.2 m. In these sub-intervals preservation of the hyalacラスト ranges from zero to partial, only the largest fragments are still visible. At 427 - 427.7 m there is a fine grained to aphanitic dyke with chilled margins and sharp contacts. The lower contact is at 25° C/A and the upper contact is at 30° C/A		There are traces of quartz and carbonate veins throughout, there are also traces of a yellowish vein - possibly quartz and sericite?. The veins are later than everything else.	MD 01 - 25 426.58 - 426.78
428.53 - 429			There is 9 cm of pale grey, fine grained to aphanitic coherent rock. This is either a large clast or a dyke. There is no chilled margin observed. There are sharp contacts. This is probably a fragment. There are traces of other fragments. There is hyalacラスト with fragments an average size of 1 - 5 mm and a maximum size of 1 cm. The fragments are angular, with a preferred orientation of 35° C/A, some of the clasts have thin yellow rims. This looks like the sericite altered clasts seen higher. The rock is a dark green colour overall. There are 2 large fragments, up to 8 cm across of fine grained to aphanitic medium grey coherent rock similar to the fragment seen at the start of the interval, but these have chlorite cores.		There are traces of quartz veinlets	
429 - 429.78	Intermediate/mafic		The rock is a medium to beige grey, fine grained to aphanitic. There is the presence of siliceous nodules locally, they are up to 1 cm across and they have radial fibres. This is possibly a dyke or a clast. The upper contact is at 70° C/A and is sharp. The lower contact is orientated at 68° C/A and is unclear. The lowest 3 m of this interval consists of partly coalesced siliceous nodules.			
429.78			There is 13 cm of hyalacラスト with fragments that are up			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
- 429.91			to 1 cm in size. The fragments have white to yellow rims. This is comparable to the interval encompassing 228 m. There is an invasion of silica and sericite that destroys the hyaloclastite texture, the alteration is vein controlled.			
429.91 - 430.03	Exhalite?		The rock here consists of laminated chert. The laminations are orientated at 55° C/A. The lamination are 0.5 mm to 1 cm thick. The lamina range from pale grey to dark grey in colour. The dark grey laminations likely contain fine ash or other fine particles. The rock does not contain any sulphides			Exhalite 429.5 - 430.25
430.3 - 433.4			The rock is a medium grey to greenish colour. The rock is fragmental, the clasts are an average size of 5 mm, but the maximum is 1 cm. The rock is similar to the hyaloclastite at 428.7 m. The fragments are aligned at 40 - 45° C/A. The shape of the clasts are difficult to see. Some of the clasts have very thin white rims. In the last 50 cm of the interval the clasts are larger and clearly angular. Some of the clasts are very silicious. They can be up to 2 cm long but are an average of less than 0.8 cm. The matrix/cement contains chlorite.		There is a 2 cm thick quartz-calcite vein 1.15 m above the lower contact	
433.4 - 474.2	Rhyodacite		The rock is fine grained to almost aphanitic throughout. It does not contain quartz eyes, but is hard to scratch. The rock is massive and medium grey, it is coherent. This is most likely a massive intermediate to mafic lava. From 440 - 441.7 m the grain size reaches 1 mm. From 438.3 - 438.45 m the core is broken, possibly in part due to splitting. From 447 - 459 m the rock has a 1 mm grain size and there is slight bleaching from 451.75 - 451.90 m. From 454.5 - 455.5 m the core is broken into chips less than 2 cm across, probably a result of a fracture zone. From 472.06 - 472.71 m there is 3 % chlorite filled vesicles up to 1 cm across, with an average 2 mm.		There are trace amounts of carbonate veins and 1 % sericite veins.	MD 01 - 26 443.35 - 443.6
474.2 - 481	Transition zone		This is a box of split core in small pieces. There are possibly traces of spherulites at 477.4 m for 5 cm associated with chlorite and pyrite. The first 50 cm of this interval are more uniform. The rock is aphanitic and medium grey. The rest of the box is more visually homogenous possibly due to the alteration, which is		There is 1 % sericite veinlets similar to end of the last interval. There are trace amounts of quartz-carbonate veinlets	MD 01 -27 474.75 - 475

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
481 - 573.98	Pillow basalt or andesite		<p>patchy, and similar to what will be described below. The core below the first 50 cm contains quartz amygdaloes locally, that are up to 2 mm. They are easier to see in the bleached parts. Some of the amygdaloes are chlorite filled and are less than 1 mm across. It is suspected that the rhyodacite-basaltic andesite contact is in this box, but there is no evidence of chert, tuffs or laminated exhalative sediment. Every piece was examined.</p> <p>The rock has a variable colour from medium grey to bleached to dark grey, with chlorite spots, that concentrate locally. There are chlorite patches and/or hyalaclastite bands at regular intervals. There is a good example at 487.25 m and a photo was taken of this. The matrix of the hyalaclastite appears sericitised with chloritised clasts. From 501.1 - 502 m there is a hydrothermal breccia that has 90 % fragments and 10 % cement. There is a bad contrast between fragments and cement, toward the base of the breccia the fragments are preferentially aligned at 45° C/A. The rock is monomictic and clast supported and contains 0.1 % disseminated pyrite. At 491.5 m there is a 5 cm thick quartz and sericite vein that also has a pink mineral that is unidentified, it has no reaction to acid and is scratchable with the scratcher. There are traces of this mineral elsewhere. Some of the hyalaclastite bands are replaced by pyrite, a good example is at 520.8 m although this is not common. The inter-pillow margin distance can be as low as 10 cm, but the average is 30 - 100 cm. At 530.3 m there fragments are rounded fragments that are up to 10 cm in length, these fragments contain 1 - 2 % quartz veins. The clasts are surrounded by grey banded material that is silicious. There is no explanation for this. At 525.3 m there is a haematite fracture. At 536.6 m there is a pink mineral that does not react with acid and is harder than calcite. At 538.3 - 539.8 m the core is broken up into pieces less than 5 cm long, this is also the case at 540 - 540.5 m. Some of the spotty aspect could be as a result of devitrification, rather than alteration. An example is at 546.8 m.</p>			<p>MD 01 - 28 481.5 - 481.8 MD 01 - 29 517.35 - 517.65 MD 01 - 30 558.1 - 558.35</p>

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
573.98 - 580.2	Intermediate? Massive		The rock is massive, aphyric and likely intermediate. Between 575.5 and 579.3 m the grainsize is 0.5 - 1 mm. The margins are very fine grained. The colour is a medium grey uniform colour. The spotty alteration seen in the previous interval is not observed here. The upper contact is occupied by a vein, but the lower contact is sharp and orientated at 65° C/A, but the rocks either side are medium grey and there is no chilled margin.		There are traces of carbonate and sericite veinlets	MD 01 - 31 579.35 - 579.6
580.2 - 593.2			This is similar to the interval 481 - 573.98 m. There are not too many pillow margins but there are some, and they are irregularly shaped. The fragments are angular shapes and are chloritised. This interval is a medium grey colour			
593.2 - 594.65	Lapilli Tuff		The composition of this rock is uncertain, as is the origin. The clasts vary in shape and texture, but are generally a grey colour, and some contain 15 % amygdalites that are less than 1 mm across, but some are non-vesicular. There are no bedding planes and no clear grading. There are some angular fragments locally, and they have sericite rims. This resembles the hyaloclastite texture seen higher in the hole. The rock has an altered aspect, but the alteration mineralogy is not visible in hand specimen, but there is probably some chlorite. The maximum clast size is 2 cm but the average size is 5 mm. The upper contact is in split core and is not actually observed. The lower contact is occupied by a vein. This rock could be resedimented hyaloclastite or something else. There is nothing diagnostic.			
594.65 - 615.3	Breccia and massive regions		The rock has alternating brecciated and massive regions, some of the massive parts look slightly fractured - incipiently brecciated? The massive parts are up to 2.5 m thick and are probably pillows and/or pillow fragments an example is at 608.5 m to 610.8 m. The rock is aphanitic to very fine grained and is a medium grey colour. The brecciated parts are between 3 cm and 80 cm thick, and there is more than normal for a pillow lava sequence, making it likely to be a pillow breccia. The breccia is typified by sub-angular clasts and has an in situ appearance, an example is at 606.5 - 607 m where breccia		There is 1 % carbonate veins that are randomly orientated, for example at 597.5 m, there is hematite alteration making it likely that there is some form of hydrothermal brecciation as well, accompanied by quartz and calcite veins. The hydrothermal brecciation is in the massive intervals.	MD 01 - 32 608.5 - 608.75

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			is found between two tongues of lava with chilled margins and the fragments are clearly derived from similar lava bodies, and they have chilled margins. There is an undulating contact with the tongues and the breccia does not have a jigsaw fit. Other breccia intervals are more altered. See the original logs for faults and veins			
End of hole						

Log of Hole MD 02. Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 609051/5371444, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0.00 - 70.1	Overburden					
70.10 - 89.1	Felsic		The rock contains 2 - 3 % calcite or quartz filled vesicles, and traces that are quartz filled. Some of the amygdalae are elongate in the orientation 50 ° C/A. There are also traces of quartz and feldspar phenocrysts that are up to 1 mm across. The rock overall has a pinkish colour. The rock contains 1 - 2 % fragments of rhyolite in a coherent matrix. Are these fragments xenoliths? The fragments are paler than the rest of the rock and are angular to rounded. At least one of the fragments has a quartz phenocryst within it. The fragments are cut by chlorite and some quartz veins, so the alteration must be later than the inclusion of the fragments.		There is locally 5 % chlorite veins but the average is 1 - 2 %. There is 1 % sericite veins	MD 02 - 1 71.65 - 71.9 MD 02 - 2 87.7 - 88.0
89.1 - 127.2	Gabbro		Medium grained, 1 - 2 mm, medium grey rock that contains mafic minerals as well as plagioclase. There are no vesicles. There are traces of leucoxene, < 1 %. The centre of the intrusion is less mafic looking or more green, as a result of epidote alteration of plagioclase. Near the lower margin the rock contain chlorite and calcite vesicles, 1 %.	At 100.8 there is a chalcopyrite bleb associated with a 4 cm thick quartz vein.	Near the upper margin there is 1 - 2 % calcite veins, traces of epidote veinlets and a possibility of some haematite associated with the calcite veins. In the centre of the intrusion the haematite is clear and is associated with the calcite veins. There are epidote crystals in the centre of the intrusion.	MD 02 - 3 92.55 - 92.85 MD 02 - 4 124.24 - 124.70
		97.5 - 97.9	There is a dyke that is medium grey to green in colour and contain < 1 % veinlets of haematite, calcite and epidote. The rock is aphanatic to fine grained. The upper contact is clearly			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			intrusive with a good chilled margin, and is orientated at 42° C/A. The lower contact is broken			
127.2 - 144.9	Rhyolite		The rock contains flow banding perpendicular to the core axis. The rock contains rhyolite fragments, even within the flow banded intervals, an example of which is at 131 - 131.6 m. The fragments are angular to rounded in shape and are up to 1.5 cm across. There is 1 - 2 % fragments overall and some of the fragments contain traces of quartz phenocrysts. There are spheroids, possibly as a result of devitrification between 133 - 134 m, they are up to 1 mm across. Overall there is 1 - 2 % quartz filled vesicles			MD 02 - 5 133 - 133.3 MD 02 - 6 134 - 134.1
144.9 - 151.25	Gabbro		The upper contact of this rock is at 40° C/A. The lower contact is not clear. This is the same as the previous gabbro. There are quartz, calcite and epidote veinlets, 1 - 2 % overall. There is also traces of chlorite veinlets			
151.25 - 157.25	Rhyolite		This rock is possibly fragmental. The fragments range from white and spheroidal, with the spheroids < 1 mm, to black and chloritised. Some of the fragments appear microvesicular with elongate shapes, which may be evidence of plastic deformation. One of the largest clasts is 3.3 cm across with an elliptical shape and appeared to distort the flow banding around itself. There are photos of this clast as well as the clast itself taken as a sample. Overall the rock contains 1 % quartz amygdaloids and trace amounts of quartz crystals. There is also 1 % calcite veins, some of which contain quartz.		From 156 - 165.50 m there is weak epidote alteration	MD 02 - 7 153 - 153.3 MD 02 - 8 155.15 - 155.25
157.25 - 169	Rhyolite		The rock here is more homogenous than in the previous interval. There are fragments distributed at 1 in every 5 to 10 cm of core. The intra-fragmental material is dark grey, fine grained and has a coherent aspect. The maximum size of a fragment is 5 cm but the average is 2 cm. Many of the fragments are elongate and there are photos taken of this. Some of the fragments are spheroidal, but many are not and appear microvesicular? Some of the fragments contain quartz phenocrysts and these fragments are sub-rounded and sub-equant. The rhyolite fragments have a pale grey colour.		There is 1 - 2 % quartz or carbonate veins. There are epidote and chlorite veins locally.	MD 02 - 9 158.5 - 158.7
169 - 196	Rhyolite		The rock is a dark grey fine grained rock the same as the preceding intervals. However, now there are traces of quartz		Overall there is 1 - 2 % calcite veins that are 2 - 3 mm thick, some of which contain quartz	MD 02 - 10

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			crystals and the fragment spacing is 1 in every 20 cm of core. From 177.7 m to 188.1 m there is an increase in carbonate or calcite amygdaloids to 1 % with up to 5 % locally. The maximum size of an amygdale is 1 cm but the average is 2 mm. There are fragments throughout the vesicle rich interval but the spacing increases to 1 in 30 cm of core. Overall many of the larger fragments have a rounded aspect and the fragments have a homogenous grey colour			169.75 - 170
196 - 223.5	Rhyolite		The rock is dark grey, fine grained and homogenous. It looks mafic at first glance but there are traces of quartz crystal, that are < 1 across. There are still clasts in this interval, and they are spaced 1 every 20 - 30 cm of core. Most of the clasts contain spheruloids, and are an average size of 1 cm, although the maximum is 3 cm. From 215.2 - 218 there is a vesicular interval, with 1 - 2 % chlorite filled vesicles. From 217 - 223 there are a few large vesicles filled with calcite.			MD 02 - 11 209.7 - 210
223.5 - 239.7	Rhyolite		The rock is dark grey and is the same as the preceding unit. The fragments, which are medium grey in this interval, are now sparse with 1 in 50 cm of core until 237.3 m then there is 1 in every 20 cm of core. There may be traces of quartz phenocrysts, this will need to be verified in thin section. From 228.8 m to 233 m the core is broken up into small pieces, which is possibly evidence of a fracture zone.		There is 2 - 3 % quartz, calcite or epidote veinlets. There is also traces of haematite veins	MD 02 - 12 236.7 - 236.82 MD 02 - 13 237.3 - 237.5
239.7 - 250.3	Protolith uncertain		The rock has a fragmental matrix that is variably developed. The matrix is visible in association with altered clasts. If they are clasts, then they are > 3 cm and can have grey cores. There is no obvious matrix visible where the clasts are not orange. The orange colour of the clasts is most likely the result of alteration by a carbonate. There are no quartz crystals that could be seen		The rock is highly hydrothermally altered. There are several generations of veining, with the last generation being calcite, but quartz and haematite are among the last events. There are several intervals that are less than a metre in length where there is intense silicification to the extent that no primary structure is visible	
250.5 - 255.3	Rhyolite		The rock in this interval is highly altered and veined. There are quartz phenocrysts recognisable in some of the fragments. The fragments are rhyolite. The fragments include quartz and chlorite veins that do not cut the matrix, so they are a pre-fragmentation event. The matrix is of very fine particles in		Carbonate veinlets appear to be the latest event	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			some places, but in others there is only cement. The cement between the clasts is mostly quartz. In the last 10 cm the rhyolite fragments are mixed with soft black fragments that look to be derived from the underlying unit. There is up to 20 % matrix in the last 10 cm.			
255.5 - 255.55	Rhyolite?		The rock here is fragmental throughout and matrix supported. 90 % of the fragments are soft and black and probably had a gabbro protolith. 10 % of the fragments are rhyolite, they are irregularly dispersed through the rock. The rhyolite fragments are beige in colour and are sub-rounded. They appear to have been silicified prior to fragmentation			
255.55 - 257.5	Gabbro ?		The rock is black and fine grained. It is homogenous and has an altered aspect. The first 30 cm are even finer grained to aphanitic. There are traces of carbonate veinlets and possibly chlorite veinlets.			
275.5 - 325	Gabbro ?		The core is badly broken and unrecognisable, but some sections are very silicified so this may still be rhyolite. From 310 m to the end of the hole the core is less broken and is recognisable as a gabbro. The gabbro is medium grained but becomes coarser progressively to the end of the hole.			MD 02 - 14 324 - 324.3
End of hole						

Log of Hole MD 03. Russell Rogers, Project Hebecourt, 2008, Coordinates of collar: 608441/5370757, Intended Azimuth: 340

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
0 - 10	Overburden					
10.6 - 18.2	Andesite		The rock is massive containing some mafic minerals. Contains 1% vesicles that are < 3mm, there are trace amounts of quartz filled amygdaloids. It is a medium grey colour. Aphyric. Not magnetic	Trace amounts of pyrite	Patchy alteration, light coloured, may be albite. Local silicification	
18.2 - 23.1	Andesite		Fractured zone, becomes more coherent downward. Aphyric. Massive	Trace amounts of carbonate veinlets	Patchy alteration, light coloured, may be albite.	
23.1 - 27.55	Intermediate Intrusive		Leucoxene, triangles and squares. Massive. Medium grained in the centre, 1-2mm, with plagioclase and mafic minerals. The grain size fines towards the contacts and leucoxene is not present at the contacts			
27.55 -	Andesite		The rock is massive and homogenous. There are no		Traces amounts of hairline chlorite veins	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
29.22			vesicles and it is aphyric. The rock is very fine grained and is a medium grey colour. The rock is not magnetic		and 1% calcite veins	
29.22 - 42.22	Andesite		The rock is massive and vesicular. There is between 0 and 8 % vesicles, quartz filled and in some cases calcite around the margin of the fill. The vesicles are an average of < 2 mm but can be up to 5 mm, they are circular to elliptical in shape. In some cases there are Spheroids growing concentrically around the vesicles, but the distribution of each is unrelated, and irregular in both cases (photo taken, 35.7 m). There is 5 cm of hydrothermal brecciation per metre. The breccia's have a quartz cement that is white to grey and shows open space crystallisation (photo taken, 36.8 m). There is a possible pillow margin, where the Spheroids and the vesicles become more concentrated, and there is some brecciation with chloritised ash.	There are sulphides in the breccia's. < 5 % pyrite in the cement and on the clasts.	There is vein controlled hydrothermal alteration. Some vesicles are chlorite filled.	
42.2 - 55.5	Intermediate Intrusive		The rock has a chilled margin against the andesite of the previous interval. The rock contains 3 % leucoxene. The intrusion is magnetic. The margins of the intrusion are aphanitic, for the first and last 30 cm. The maximum grain size is 2 mm, but the average is 1 mm. The rock does not contain any vesicles. The rock is fresh until 52 m.		After 52 m there is epidote and quartz veining. There is a later stage of calcite associated with the quartz.	
55.5 - 55.94	Andesite		The rock contains 10 % quartz filled vesicles, there is sometimes a green mineral around the margins. The vesicles are up to 3 mm and are irregular to circular in shape.			
55.94 - 60.90	Diorite		The angle of the contact with the previous intrusive unit is 35° C/A and the lower contact is also 35° C/A. The rock is aphanitic at the margins to very fine grained in the centre.	There are pyrite veinlets that are < 1 mm in thickness. They are often within calcite veins that are up to 3.5 cm thick. The calcite veinlets are 1 - 2 % of the rock.		
		58.3 - 58.7	Fractured zone within the Diorite			
		60.39 - 60.55	There is an intrusion within this intrusion. It is aphanitic with chilled margins.			
60.90 - 71.7	Andesite		The rock contains between 0 and 10 % quartz filled vesicles with chlorite around the margins up to 44.5 m.			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			After 64.5 m, there are 0 - 10 % calcite and quartz filled vesicles. The vesicles are up to 3 mm in size.			
		65.2 - 65.5	Small intrusion within the andesite with irregular contacts. The upper contact is 30° C/A and the lower contact is 20° C/A. The intrusion is aphanitic at the margins and coarsens towards the centre, with a maximum grain size of 1 mm.			
		68.6 - 69.1	Small intrusion within the andesite. The contacts with the andesite are irregular, the upper contact is 55° C/A and the lower contact is 45° C/A. The intrusion is aphanitic			
71.7 - 72.5	Intermediate Intrusive		The rock is fine grained, 1 mm, and is a medium grey colour. The rock does not contain any vesicles. The upper contact is uncertain, the lower contact is 45° C/A.			
72.5 - 80.53	Andesite		Quartz filled vesicles, up to 2 mm, irregular to circular in shape. There is a spherulitic devitrification texture locally, the texture may be picked out by chlorite alteration		2 % epidote veins in the lower half	
80.53 - 83.07	Intermediate Intrusive		Contains feldspar laths in a random orientation, that can be up to 4 mm in the long axis. These are evidence for rapid cooling. This interval also contains mafic minerals that have been chloritised, these minerals can be up to 3 mm across. The upper contact of this interval is clearly intrusive and is at 45° C/A. The lower contact is at 45° C/A. This interval is not magnetic	Disseminated pyrite crystals	This interval is not as affected by epidote as the previous interval	
83.07 - 92.85	Andesite		This rock contains between 0 and 10 % vesicles, which are mostly filled with quartz or calcite, although some are chlorite filled.	There is pyrite mineralisation in the quartz and calcite veins that are between 4 mm and 1 cm thick		
		87.5 - 88.5	There is hydrothermal brecciation in this interval, the breccias are 2 - 5 cm thick and have black angular clasts with a jigsaw fit texture. The cement is quartz and calcite.			
92.85 - 102.62	Intermediate Intrusive		The rock is massive and homogenous. It is a medium grey to greenish colour. It does not contain any elongate crystals or feldspar laths. The average grain size in the centre is 1 - 2 mm. The rock is not magnetic		There is patchy epidote alteration, from subtle to weak	
102.62 - 127.63	Andesite		The rock contains quartz filled vesicles from 1 - 10 %. There are two definite pillow margins with hyaloclastite. The hyaloclastite fragments are small < 8 mm. There is a	There is pyrite mineralisation in the pillow margins and the calcite and quartz vein.	At 109.25 m there is hydrothermal brecciation with quartz cement that is milky and translucent. There is also pyrite in this	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			patchy devitrification texture that becomes better developed and less patchy after 116.5 m. At 104.4 m there is a 4 cm thick calcite and quartz vein.		interval. At 122.64 m there is a 9 cm thick quartz, calcite, chlorite and sericite vein.	
		108.6 - 109.1			Weak epidote alteration	
		114.37 - 115.2		2 % pyrite mineralisation	Moderate epidote alteration	
127.63 - 128.38	Diorite		This rock has no vesicles. It is not magnetic. It is aphanitic at the margins and has a grain size of up to 1 mm at the centre. It has 1 % quartz veins			
128.38 - 140.10	Andesite		This rock has 5 % vesicles. The vesicles are filled with chlorite and quartz. Below the intrusive there is a devitrification texture throughout. There are also chlorite and pyrite veins up to 3 mm thick. There is also 2 % chlorite veinlets, that are less than 1 mm. At 131.04 m there is a hydrothermal breccia/quartz and chlorite vein concentration. After the breccia there are quartz filled vesicles are up to 6 mm across, that are irregular to elliptical in shape. There is 1 % vesicles in this section. At 132.45 m the rock becomes patchily hydrothermally brecciated, with quartz and chlorite cement. There is also 10 % quartz filled vesicles in this section	At 132.01 m there is a 3 cm thick pyrite vein. At 132.33 m there is a 2 cm thick chlorite and pyrite vein. After 132.45 m there is pyrite associated with the hydrothermally brecciated patches.	At 135.59 m there is a 1 cm thick quartz vein	
		129.38 - 129.80	Sharp upper contact at 45° C/A. Flow texture along the contact and there are less vesicles, 1%.			
140.10 - 142.48	Intermediate Intrusive		The rock is aphanitic at the margins, up to 1 mm grain size at the centre. There is 1 % quartz and chlorite filled vesicles at the upper margin. Some of the vesicles are stretched to 1.5 cm at 30 - 40° C/A. The average vesicle size is 1 - 5 mm. The rock is not magnetic. The upper contact is 30° C/A and the lower contact is 35° C/A.		At 140.7 m and 140.89 m there are calcite veins between 1 - 1.5 cm thick. Overall there is < 1 % quartz and chlorite veins.	
142.48 - 173.45	Andesite	142.48 - 143.47	Homogenous andesite, with <1 % calcite filled vesicles that are up to 2 mm in size. The average grain size is < 1 mm.			
		143.47 - 146.39	The andesite here has a devitrification texture. There are 5 % calcite filled vesicles		There is a calcite and epidote vein 1 cm thick at 144.49 m	
		146.39 - 147.53	The devitrification texture becomes more intense/highlighted by chlorite alteration. There is <1 %		There is weak epidote alteration in this interval	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			epidote filled vesicles that are up to 2 mm across and circular in shape			
		147.53 - 173.45	The devitrification texture is less intense/less chlorite alteration here. The rock here also contains 1 % sericite veinlets. The rock becomes aphanitic after 170	There is 1 % disseminated pyrite	At 160.3 m there is a quartz vein with calcite in the centre. There is also pyrite mineralisation associated with the vein < 2 %. There is also a fractured quartz and calcite vein with sericite at the margins from 165.27 m to 165.52 m. There is a 14 cm thick quartz vein, that has suspicions of hydrothermal brecciation because of the presence of some clasts, at 172.08 m.	
173.45 - 189.77	Andesite ?		The rock is aphanitic and homogenous. It is a very dark grey colour and is homogenous		The rock is intensely altered by chlorite. It has 15 % calcite veins. There is also patchy moderate epidote alteration.	
		176.95 - 177.54	The rock is intrusive and homogenous. It is fine grained at the margins, and is 1 mm grainsize in the centre. The upper contact is intrusive and is at 70° C/A. The lower contact is at 50° C/A. The rock is very weakly magnetic.		There is chlorite replacement of minerals.	
189.77 - 197.26	Andesite		There is brecciation at the margin, which may be hydrothermal. There is a hyaloclastite clast within the breccia. The rock is hyaloclastite until 191.23 m, with angular clasts, the clasts are an average of 5 mm across, although the largest clast is 1 cm. The last 10 cm are very coarse and silicified and the average clast size is 7 mm. Then until 191.38 m the rock is massive with 10 % quartz filled vesicles, which are circular. The last 3 cm of the vesicular unit are moderately chlorite altered. Then until 191.50 m the rock has a devitrification texture, but no vesicles. Then the rock is massive.	Disseminated pyrite crystals, 1 %	At 190.4 m there is a quartz, chlorite and calcite vein 2.5 cm thick. At 190.87 m there is a quartz vein 9 cm thick. At 195.65 m there is a calcite veinlet 5 mm thick	
197.26 - 197.64	Intermediate Intrusive		Very fine grained at the margins coarsening to fine grained at the centre. The rock is not magnetic. There are 1 % quartz filled vesicles toward the lower margin. The upper contact is at 45° C/A and the lower contact is at 55° C/A		The rock is chlorite altered and has epidote alteration locally	
197.64 - 222.41	Andesite		This is the same unit as before the intrusive interval. The rock is aphanitic, with locally 10 % vesicles that are quartz and chlorite filled. Average 2 % vesicles. From 201.67 m there is a devitrification texture that is	There is 1 % disseminated pyrite		MD 03-01A 203.65 -

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			highlighted by chlorite alteration. From 203.8 m until 204 m there is a transition in the devitrification texture from Spheroids to coalesced Spheroids. From 204 m to 204.14 m there is hyalacastite, it is formed of some angular fragments but most are rounded. The fragments are chlorite altered, there are quartz filled vesicles within some of the larger clasts. The average clast size is 2 mm, but the clasts become larger toward the lower margin with an average clast size of 2 cm. A greater proportion of the clasts are angular in the centre of the hyalacastite interval. From 204.14 m until 214.95 m the rock becomes massive and homogenous, with less than 1 % quartz filled vesicles with chlorite rims. There is weak epidote alteration locally in this interval. From 214.95 m until 219.40 m, the sparse vesicles disappear and the rock has a devitrification texture, that becomes progressively more pervasive or highlighted by chlorite alteration, and even coalesce in places. For the last 30 cm the vesicles return, 1 %, filled with quartz. Then from 219.40 m until the end of the interval there is hyalacastite, with an average clast size of 2 mm. The clasts are all angular, and have a jigsaw fit character. The hyalacastite grades into massive andesite with 5 % quartz filled vesicles after 15 cm. There is also devitrification texture highlighted by chlorite alteration until the end of the interval.			203.95 MD 03-01B 203.65 - 203.96 MD 03-01C 203.65 - 203.97 MD 03-01D 203.65 - 203.98 MD 03-01E 203.65 - 203.99
222.41 - 228	Andesite Pillows??		This interval is probably still the same unit. The devitrification texture is still present, but the chlorite alteration is weaker so it is less obvious. From 224.85 m there is hyalacastite, with angular fragments and a jigsaw fit character. The average clast size is 2 mm. The hyalacastite ends at 225.36, where it grades into a massive rock with 2 - 3 % vesicles that are mostly filled with quartz, although some are calcite filled. There is also a devitrification texture that becomes progressively more highlighted by chlorite alteration. The contact is unclear. From 224.83 m the devitrification texture recedes and the rock becomes 3 % vesicular with quartz filling. From 224.9 m there is hyalacastite with angular clasts of an		There is a 6 cm thick quartz and calcite vein at 224.95 m to 224.99. There is a 1.2 cm thick quartz vein with calcite on the margins at 224.62 m.	MD 03 - 02

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
228 - 234.88	Andesite Pillows??		<p>average size of 1.5 mm. The hyalacラスト ends at 225.15 m. The rock then has a well developed devitrification texture until 225.31 where it becomes hyalacラスト with an average clast size of 2 mm and a maximum clast size of 1.3 cm. The fragments are chloritised. There is core missing either side of the hyalacラスト. At 223.87 m the hyalacラスト becomes epidote altered and the clasts are finer, with an average size of 1.5 mm. The rock then becomes strongly epidote and carbonate altered and fractured. From 226.55 m until 227.22 m the rock has a devitrification texture that is well highlighted by the chlorite alteration. The Spheroids are large, up to 5 cm, and are elongate at an orientation of 30° C/A. From 227.22 m until 228 m there is hyalacラスト with a chloritised matrix and fragments that are angular and 1 - 2 mm in size. However there is core missing. The hyalacラスト intervals are believed to represent inter-pillow material, and in some cases there is a concentration of amygdalae toward the hyalacラスト interval, supporting the theory.</p> <p>This is believed to still be the same unit, the interval was split for ease of description. The rock here is massive and a medium grey colour. There are no intrusive contacts, no vesicles and no Spheroids. The rock is fine grained to aphanitic. At 231.88 m the rock becomes chloritised with quartz filled vesicles for 2 cm, then there is hyalacラスト for 20 cm, with angular chloritised clasts with an average size of 5 mm. There is then massive rock with a chlorite highlighted devitrification texture for 54 cm, then the massive devitrified rock becomes epidote altered. Then from 233.60 m until 233.84 m there is hyalacラスト with angular clasts. The clasts have an average size of 5 mm and the maximum clast size is 2 cm. The matrix of the hyalacラスト is chlorite altered. From 233.84 m until 234.60 m there is a massive, medium grey, fine grained rock with no vesicles or Spheroids. For the last 28 cm there is strong chlorite alteration. The central 10 cm of this interval is hyalacラスト with chloritised clasts and matrix,</p>			
					There is 2 % calcite veinlets overall. At 228.53 there is a 2 cm thick calcite vein.	

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			with an average clast size of 2 mm. Either side of the hyalacastite is massive rock with a spherulitic texture. Overall the hyalacastite intervals are again believed to represent pillow margins, although a concentration of vesicles toward the margin is not observed as frequently as in the previous interval			
234.88 - 241.83	Andesite Pillows	234.88 - 235.49	The rock is massive, with 2 % chlorite amygdalae. There are no spheroids.		At 235.08 m there is a 7 cm thick quartz vein, with some evidence for hydrothermal as clasts of the massive interval are incorporated within the vein	
		235.49 - 235.65	The rock is hyalacastite with a chloritised matrix. The clasts are angular and have a jigsaw fit aspect. Near the margins the clasts are between 1 and 5 cm across, in the centre the average clast size is 1 mm. The lower margin has spheroids			
		235.65 - 236.63	The rock is massive and contains 2 % chlorite filled amygdalae. There are, again no spheroids			
		236.63 - 236.80	The rock is hyalacastite with a chloritised matrix. The clasts have been epidote altered. The clasts are an average of 5 mm across, they are angular with a jigsaw fit aspect.			
		236.80 - 237.89	The rock is massive with 3 % epidote veins and 1 % quartz veins. The rock does not have any amygdalae or vesicles			
		237.67 - 237.89	The rock is hyalacastite with fragments averaging 2 mm across. The clasts are chloritised. The lower margin contains spheroids that are an average of 1 - 2 cm across			
		237.89 - 241.86	The rock is massive and fine grained, with 0 - 2 % chlorite filled amygdalae		At 239.11 m there is a 4 cm thick quartz vein. At 239.87 m there is a 4.5 cm thick quartz vein that may be associated with carbonate. At 239.02 there is a 5 cm thick quartz vein that also contains a green mineral that does not scratch with a knife or react to HCl.	
241.83 - 250.3	Andesite		This is the same unit as the last massive unit in the previous interval. This interval has a well developed devitrification texture in the form of spheroids containing radial fibres, although the radial pattern is not uniform. The spheroids also coalesce locally, a good example at			MD 03 - 3

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
250.3 - 268	Andesite		<p>242.8 m. There is traces to 3 % of quartz, chlorite or both filling vesicles, that are a maximum of 2 mm in size. Where both minerals are filling the vesicle the chlorite forms a rim with the quartz in the centre</p> <p>The upper contact is gradational with the preceding unit. The rock is fine grained to aphanitic, but there is no evidence for an intrusive contact. The first 80 cm contains 1 - 2 % chlorite or quartz filled vesicles, which are an average of 2 mm across. There are no vesicles in the rest of the interval. This interval does not contain any spheroids. From 204 m until 255.5 m the rock is fine grained, so coarser than the rest of the interval. From 264 m until the end of the interval there are vesicles that are quartz filled, and there is also hydrothermal breccia locally but the rock here is aphanitic. There is also a pink mineral associated with the calcite in the veins.</p>	There is pyrite associated with the veins from 264 m onwards.	There is 1 % quartz veins overall that vary in size from veinlets to 3 cm thick. Some of the veins contain calcite. The percentage of veins increases to 2 - 3 % from 264 m onwards.	
268 - 278.4	Andesite		<p>The rock is massive. The rock contains 5 - 7 % chlorite or calcite filled vesicles. The rock develops devitrification spheroids from 270.5 m to 273.5, the spheroids are paler than the surrounding rock. The spheroids also coalesce locally. Below the spheroids is a massive medium grey unit, that is the same rock but with a different texture. This rock contains 1 - 2 % chlorite filled vesicles.</p>		Overall the rock contains 0 - 2 % calcite and epidote veins	
278.4 - 288.8	Diorite		<p>The rock is massive and fine grained, with 5 - 7 % needles of mafic minerals (amphiboles?) which can be up to 5 mm long. The rock is a greenish to medium grey colour with 1 - 2 % calcite veinlets. The last few cm are aphanitic and have a diffuse contact with the lower unit, the contact may be pepperitic.</p>			
288.8 - 288.96	Exhalite		<p>The exhalite is 12 cm long with a three cm long quartz vein. There is core missing. The upper contact is perpendicular to core axis and shows evidence of soft sediment deformation/invasion by hydrothermal fluids</p>			Exhalite
		288.8 - 288.82	Transition zone from base of overlying lava to fine ash/sediment.			
		288.82 - 288.83	Relatively undisturbed laminated fine ash/sediment. The laminations are perpendicular to the core axis. Then for 25 mm there is disturbed fine ash or sediment, there is			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
			evidence for former lamination which could include exhalative sediment because of its siliceous nature			
		288.83 - 288.85	Liquefied ash or fine sediment, which is also injected into the overlying material causing the disturbance.			
		288.85 - 288.88	Liquefaction by loading? Then there is core missing			
		288.88 - 288.96	Quartz and calcite vein			
			Tuff with a green colour invaded by chlorite and carbonate or interbedded with mudstone.	There is pyrite associated with the tuff and appears superimposed on it		
288.96 - 289.76	Tuff		The rock consists of 1 bed of coarse tuff 0 - 25 % lapilli that are 2 - 5 mm across. The overall colour of the rock is yellowish as a result of sericite alteration. The bed has been deformed and all clasts have a preferred orientation of 65° C/A. The rock is polymictic. There are traces of hairline veinlets of sericite orientated at 65° C/A. The rock may contain quartz crystals that are 2 mm across. There are traces of carbonate veinlets orientated at 65° C/A.		There are traces of disseminated pyrite crystals, 1 mm across	
289.76 - 290.14			This interval has pervasive silica alteration, and the protolith is unknown, but it is most likely the same tuff as the preceding interval			
290.14 - 290.89	Tuff		This is the same tuff as before the silicified interval. The rock contains 3 % sericite veinlets. There are a range of fine grained clast types. The overall colour of the rock is grey with darker patches. The majority of the fragments are chloritised. The rock also contains 2 % chlorite veinlets. There are quartz crystals in some fragments. There is a good fabric orientated at 55 - 60° C/A.			MD 03 - 4
290.89 - 294.75	Tuff		The first 30 cm of this interval consists of broken core, which is tuff with sericite and silica alteration. After the broken section there is coarse to fine tuff that is sericite altered and silicified. There is deformation at 60° C/A, there is also a pyrite nodule that is deformed in the same orientation, it is 2.5 cm in the axis of elongation and 1 cm across, the nodule is 55 cm below the start of the interval. The rest of the interval is variably chloritised and silicified, but in places tuff is recognisable with or without laminations. The lower contact is very wavy and irregular,			

Depth (m)	Type	Sub-intervals	Texture and Structure	Mineralisation	Alteration	Sample
294.75 - 295.4	Tuff		it also contains very irregularly shaped rip-up clasts. Medium grey to greenish tuff. Not laminated. There are traces of disseminated pyrite.			
295.4 - 316			See original log. Variable alteration of chlorite, sericite and silica, there is no primary texture preserved. The Cogitore sample was taken in a silicified interval, which explains there SiO2 value of 80+ %. Between 301 and 301.8 m there is a false fragmental texture formed by sericite overprinting chlorite alteration			
316 - 345			See original log. From 324 - 324.6 m there is an orange carbonate that may or may not be associated with quartz, it reacts with HCl.			
End of hole						