Attachment 3 – Effect of Fully Penetrating Wells

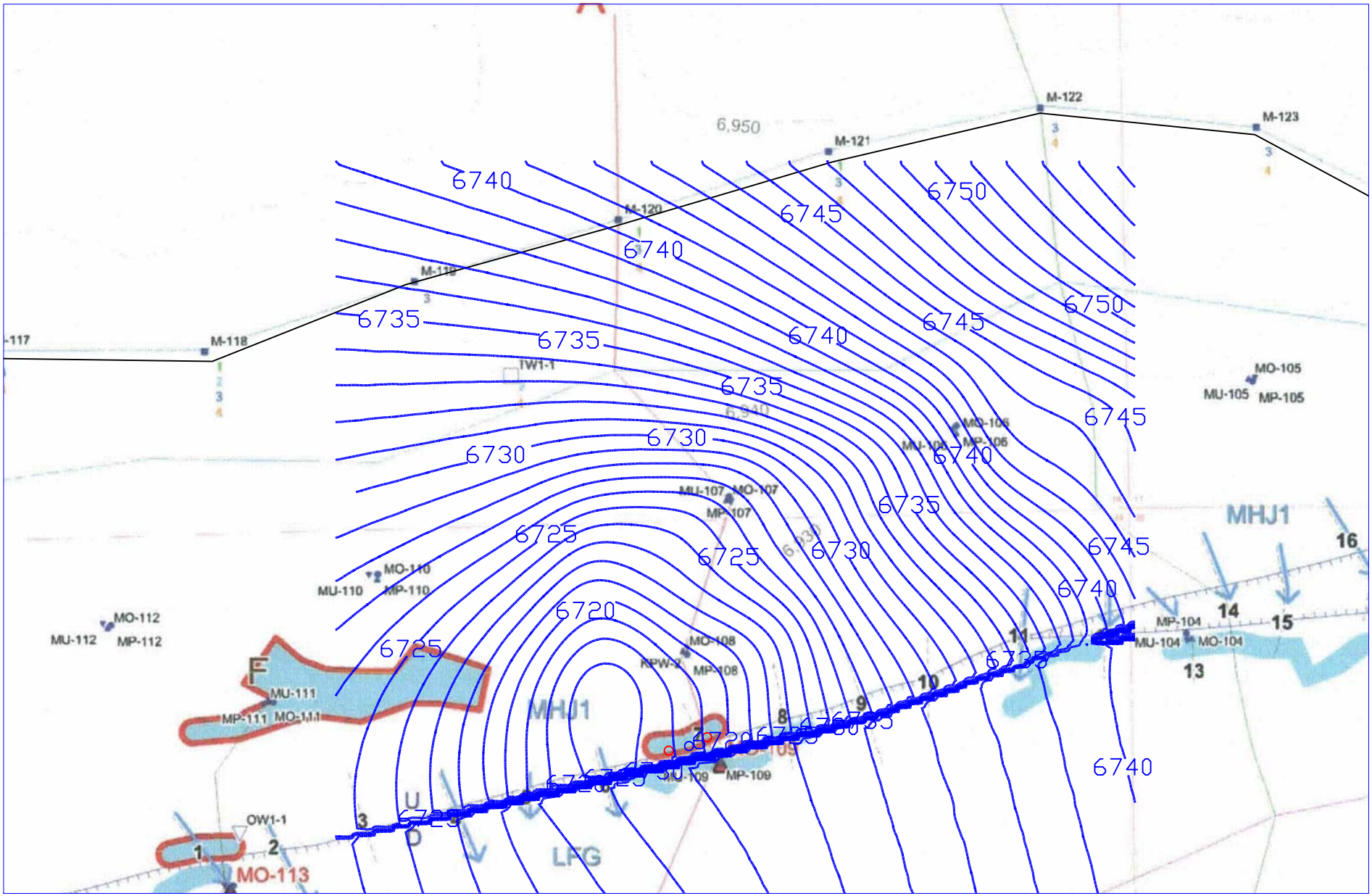
Lost Creek has made commitments to evaluate abandoned boreholes as potential conduits for lixiviant migration; however, staff is unaware of Lost Creek's plan for, or the extent of, all existing wells within the perimeter ring of MU1. Most wells appear to be screened in a single horizon. On the other hand, staff knows of at least four wells that are screened over multiple zones within the HJ horizon. Those wells are the pumping wells used to the regional and MU1 pumping tests (LC16M, LC19M, PW-101 and PW-102).

To verify the expected impact, staff used the AEM Model discussed in Attachment 2. A contour map of the model-predicted potentiometric surface in Zone 2 under normal long-term operations in Zones 3 and 4 is shown on Attachment Figure 3-1. The contour map shows that the potentiometric head is depressed in part from the operations in Zones 3 and 4; however, a west-southwestern gradient is maintained in Zone 2.

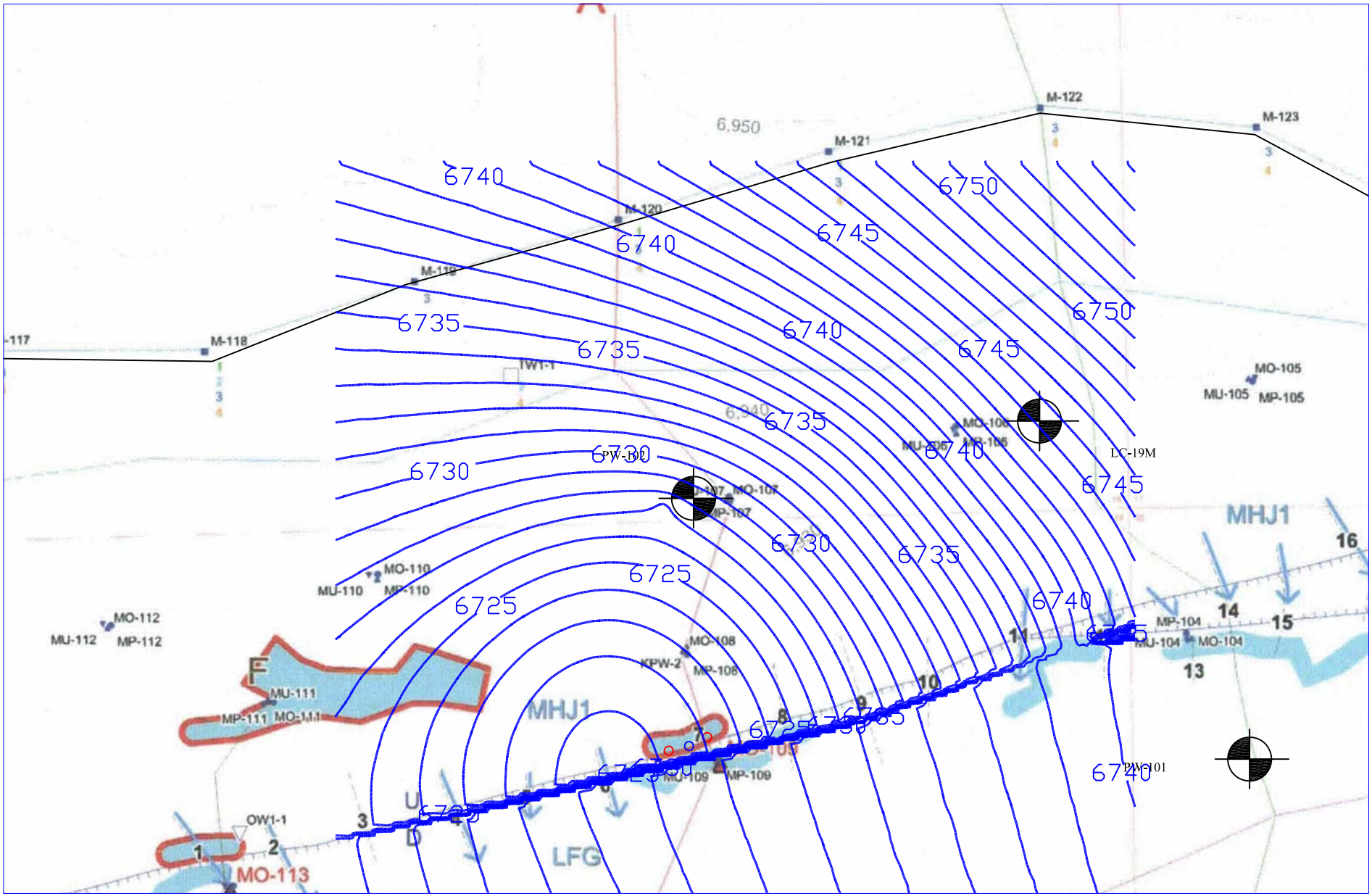
Non-operating wells were added to simulate wells PW-102 and LC19M (for the revised model input, see Appendix 3-A). A contour map of the model predicted potentiometric surface in Zone 2 under long-term operations in Zone 3 and 4 with the non-operating wells is shown on Attachment Figure 3-2.

A comparison between Attachment figures 3-1 and 3-2 show area of minor depression in the vicinity of non-operating well PW-102. The minor depression indicates increased communication with Zone 3 through well PW-102. If well PW-102 was located closer to an injection well, the connection may result in the migration of lixiviant from Zone 3 to Zone 2.

Lost Creek does not propose monitoring, does not specify corrective actions should such a scenario develop nor provide details on well abandonment.



Attachment 3 Figure 3-1 NRC model-predicted potentiometric surface in Zone 2 with long-term operations at Selected Modules in Zone 3 and Zone 4



Attachment 3 Figure 3-2 NRC model-predicted potentiometric surface in Zone 2 with long-term operations at Selected Modules in Zone 3 and Zone 4 and fully penetrating wells LC19M and PW-102

Attachment 3 Appendix 3-A

```
from TimML import *
from mlpylabutil import *
import csv

#  steady state
#  Coordinates based on NAD83 traslantion from (2208300,593600) to (0,0)



z = [6540,6535,6530,6525,6520,6515,6510,6505,6500,6495,6490,6485,6480,6475
,6420]
kh1 =  [1.07, 1.07, 1.07, 1.07,0.008, 1.07, 1.07, 1.07, 1.07, 1.07,0.008,0
07, 1.07, 1.07, 1.07, 1.07]
kz =  [0.02,0.02,0.02,0.02, 0.7, 0.02,0.02,0.02,0.02,0.02, 0.7, 0.7,0.02,0
.02]



ml=Model3D(z,kh1,kz)
rf= Constant(ml,0,10000,6780,[1])
uf=Uflow(ml,0.009,220)
#
# now for the hfb
LineDoubletImp(ml,3498.,1923.,4686.,2027.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,4686.,2027.,5443.,2199.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,7822.,3284.,6174.,2756.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,6174.,2756.,5189.,2435.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,5189.,2435.,4428.,2240.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,4428.,2240.,3868.,2049.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,3868.,2049.,3498.,1928.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,3498.,1928.,2981.,1745.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,2981.,1745.,2132.,1549.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,2132.,1549.,946.,1299.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,946.,1299.,805.,1272.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,805.,1272.,457.,1234.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
LineDoubletImp(ml,457.,1234.,-200.,989.,order=3,layers=
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])

#  for the wells
w7 = Well(ml ,2657,2401,-1620,0.25, [14,15,16])
w8 = Well(ml ,2623,2322,-3240,0.25, [14,15,16])
w9 = Well(ml ,2691,2275,-6480,0.25, [14,15,16])
w10 = Well(ml ,2757,2378,-4860,0.25, [14,15,16])
w11 = Well(ml ,2546,2244,-4860,0.25, [14,15,16])
w12 = Well(ml ,2656,2193,-4860,0.25, [14,15,16])
w13 = Well(ml ,2654,2144,-1620,0.25, [14,15,16])
w14 = Well(ml ,2529,2146,-3240,0.25, [14,15,16])
```

```
 44    w15 = Well(ml ,2433,2154,-4860,0.25, [14,15,16])
 45    w16 = Well(ml ,2418,2228,-3240,0.25, [14,15,16])
 46    w17 = Well(ml ,2314,2218,-1620,0.25, [14,15,16])
 47    w18 = Well(ml ,2308,2158,-3240,0.25, [14,15,16])
 48    w19 = Well(ml ,2324,2074,-3240,0.25, [14,15,16])
 49    w20 = Well(ml ,2425,2084,-3240,0.25, [14,15,16])
 50    w21 = Well(ml ,2443,1996,-4860,0.25, [14,15,16])
 51    w22 = Well(ml ,2319,1996,-3240,0.25, [14,15,16])
 52    w23 = Well(ml ,2333,1908,-3240,0.25, [14,15,16])
 53    w24 = Well(ml ,2416,1897,-6480,0.25, [14,15,16])
 54    w25 = Well(ml ,2519,1871,-4860,0.25, [14,15,16])
 55    w26 = Well(ml ,2542,1929,-1620,0.25, [14,15,16])
 56    w27 = Well(ml ,2404,1789,-3240,0.25, [14,15,16])
 57    w28 = Well(ml ,2326,1786,-3240,0.25, [14,15,16])
 58    w29 = Well(ml ,2310,1678,-1620,0.25, [14,15,16])
 59    w30 = Well(ml ,2418,1683,-1620,0.25, [14,15,16])
 60    w31 = Well(ml ,2506,1782,-3240,0.25, [14,15,16])
 61    w32 = Well(ml ,2616,1766,-3240,0.25, [14,15,16])
 62    w33 = Well(ml ,2726,1777,-1620,0.25, [14,15,16])
 63    w34 = Well(ml ,2618,1862,-4860,0.25, [14,15,16])
 64    w35 = Well(ml ,2724,1860,-4860,0.25, [14,15,16])
 65    w36 = Well(ml ,2715,1954,-3240,0.25, [14,15,16])
 66    w37 = Well(ml ,2614,1938,-1620,0.25, [14,15,16])
 67    w38 = Well(ml ,2759,1975,-3240,0.25, [14,15,16])
 68    w39 = Well(ml ,2837,1899,-3240,0.25, [14,15,16])
 69    w40 = Well(ml ,2890,1968,-1620,0.25, [14,15,16])
 70    w41 = Well(ml ,2821,2028,-1620,0.25, [14,15,16])
 71    w42 = Well(ml ,2771,2166,-1620,0.25, [14,15,16])
 72    w43 = Well(ml ,2784,2244,-3240,0.25, [14,15,16])
 73    w44 = Well(ml ,2825,2286,-4860,0.25, [14,15,16])
 74    w45 = Well(ml ,2888,2330,-6480,0.25, [14,15,16])
 75    w46 = Well(ml ,2843,2407,-3240,0.25, [14,15,16])
 76    w47 = Well(ml ,2960,2442,-3240,0.25, [14,15,16])
 77    w48 = Well(ml ,2976,2366,-6480,0.25, [14,15,16])
 78    w49 = Well(ml ,3009,2273,-3240,0.25, [14,15,16])
 79    w50 = Well(ml ,2949,2226,-4860,0.25, [14,15,16])
 80    w51 = Well(ml ,2859,2198,-3240,0.25, [14,15,16])
 81    w52 = Well(ml ,2944,2103,-3240,0.25, [14,15,16])
 82    w53 = Well(ml ,2983,2197,-4860,0.25, [14,15,16])
 83    w54 = Well(ml ,3060,2174,-1620,0.25, [14,15,16])
 84    w55 = Well(ml ,3004,2066,-1620,0.25, [14,15,16])
 85    w56 = Well(ml ,3072,2276,-3240,0.25, [14,15,16])
 86    w57 = Well(ml ,3089,2384,-6480,0.25, [14,15,16])
 87    w58 = Well(ml ,3062,2476,-3240,0.25, [14,15,16])
 88    w59 = Well(ml ,3164,2267,-3240,0.25, [14,15,16])
 89    w60 = Well(ml ,3156,2382,-6480,0.25, [14,15,16])
 90    w61 = Well(ml ,3165,2501,-4860,0.25, [14,15,16])
 91    w62 = Well(ml ,3221,2623,-3240,0.25, [14,15,16])
 92    w63 = Well(ml ,3233,2507,-6480,0.25, [14,15,16])
 93    w64 = Well(ml ,3247,2381,-4860,0.25, [14,15,16])
 94    w65 = Well(ml ,3264,2301,-1620,0.25, [14,15,16])
 95    w66 = Well(ml ,3298,2382,-3240,0.25, [14,15,16])
 96    w67 = Well(ml ,3358,2383,-3240,0.25, [14,15,16])
 97    w68 = Well(ml ,3374,2490,-6480,0.25, [14,15,16])
 98    w69 = Well(ml ,3301,2509,-6480,0.25, [14,15,16])
 99    w70 = Well(ml ,3320,2615,-3240,0.25, [14,15,16])
100    w71 = Well(ml ,3392,2612,-3240,0.25, [14,15,16])
101    w72 = Well(ml ,3485,2567,-3240,0.25, [14,15,16])
102    w73 = Well(ml ,3453,2483,-6480,0.25, [14,15,16])
103    w74 = Well(ml ,3466,2391,-3240,0.25, [14,15,16])
104    w75 = Well(ml ,3569,2396,-3240,0.25, [14,15,16])
```

```
105    w76 = Well(ml ,3579,2466,-6480,0.25, [14,15,16])
106    w77 = Well(ml ,3577,2537,-3240,0.25, [14,15,16])
107    w78 = Well(ml ,3681,2561,-3240,0.25, [14,15,16])
108    w79 = Well(ml ,3696,2461,-6480,0.25, [14,15,16])
109    w80 = Well(ml ,3683,2384,-3240,0.25, [14,15,16])
110    w81 = Well(ml ,3787,2471,-6480,0.25, [14,15,16])
111    w82 = Well(ml ,3813,2373,-3240,0.25, [14,15,16])
112    w83 = Well(ml ,3773,2569,-3240,0.25, [14,15,16])
113    w84 = Well(ml ,3893,2532,-3240,0.25, [14,15,16])
114    w85 = Well(ml ,3885,2495,-4860,0.25, [14,15,16])
115    w86 = Well(ml ,3870,2378,-3240,0.25, [14,15,16])
116    w87 = Well(ml ,3967,2476,-1620,0.25, [14,15,16])
117    w88 = Well(ml ,3955,2375,-1620,0.25, [14,15,16])
118    w89 = Well(ml ,3828,2520,6687.5,0.25, [14,15,16])
119    w90 = Well(ml ,3920,2430,6687.5,0.25, [14,15,16])
120    w91 = Well(ml ,3840,2439,6687.5,0.25, [14,15,16])
121    w92 = Well(ml ,3745,2421,6687.5,0.25, [14,15,16])
122    w93 = Well(ml ,3734,2513,6687.5,0.25, [14,15,16])
123    w94 = Well(ml ,3637,2505,6687.5,0.25, [14,15,16])
124    w95 = Well(ml ,3631,2423,6687.5,0.25, [14,15,16])
125    w96 = Well(ml ,3517,2433,6687.5,0.25, [14,15,16])
126    w97 = Well(ml ,3519,2506,6687.5,0.25, [14,15,16])
127    w98 = Well(ml ,3420,2550,6687.5,0.25, [14,15,16])
128    w99 = Well(ml ,3409,2431,6687.5,0.25, [14,15,16])
129    w100 = Well(ml ,3332,2441,6687.5,0.25, [14,15,16])
130    w101 = Well(ml ,3351,2559,6687.5,0.25, [14,15,16])
131    w102 = Well(ml ,3269,2567,6687.5,0.25, [14,15,16])
132    w103 = Well(ml ,3209,2549,6687.5,0.25, [14,15,16])
133    w104 = Well(ml ,3200,2442,6687.5,0.25, [14,15,16])
134    w105 = Well(ml ,3203,2326,6687.5,0.25, [14,15,16])
135    w106 = Well(ml ,3125,2319,6687.5,0.25, [14,15,16])
136    w107 = Well(ml ,3121,2443,6687.5,0.25, [14,15,16])
137    w108 = Well(ml ,3028,2415,6687.5,0.25, [14,15,16])
138    w109 = Well(ml ,3043,2330,6687.5,0.25, [14,15,16])
139    w110 = Well(ml ,2955,2301,6687.5,0.25, [14,15,16])
140    w111 = Well(ml ,2917,2393,6687.5,0.25, [14,15,16])
141    w112 = Well(ml ,2823,2351,6687.5,0.25, [14,15,16])
142    w113 = Well(ml ,2887,2253,6687.5,0.25, [14,15,16])
143    w114 = Well(ml ,2755,2305,6687.5,0.25, [14,15,16])
144    w115 = Well(ml ,2726,2217,6687.5,0.25, [14,15,16])
145    w116 = Well(ml ,2687,2344,6687.5,0.25, [14,15,16])
146    w117 = Well(ml ,2624,2256,6687.5,0.25, [14,15,16])
147    w118 = Well(ml ,2587,2185,6687.5,0.25, [14,15,16])
148    w119 = Well(ml ,2484,2201,6687.5,0.25, [14,15,16])
149    w120 = Well(ml ,2371,2189,6687.5,0.25, [14,15,16])
150    w121 = Well(ml ,2371,2115,6687.5,0.25, [14,15,16])
151    w122 = Well(ml ,2372,2035,6687.5,0.25, [14,15,16])
152    w123 = Well(ml ,2379,1949,6687.5,0.25, [14,15,16])
153    w124 = Well(ml ,2473,1924,6687.5,0.25, [14,15,16])
154    w125 = Well(ml ,2366,1842,6687.5,0.25, [14,15,16])
155    w126 = Well(ml ,2448,1835,6687.5,0.25, [14,15,16])
156    w127 = Well(ml ,2569,1820,6687.5,0.25, [14,15,16])
157    w128 = Well(ml ,2675,1820,6687.5,0.25, [14,15,16])
158    w129 = Well(ml ,2680,1906,6687.5,0.25, [14,15,16])
159    w130 = Well(ml ,2764,1921,6687.5,0.25, [14,15,16])
160    w131 = Well(ml ,2827,1967,6687.5,0.25, [14,15,16])
161    w132 = Well(ml ,2361,1731,6687.5,0.25, [14,15,16])
162    w133 = Well(ml ,3002,2138,6687.5,0.25, [14,15,16])
163    w134 = Well(ml ,2915,2185,6687.5,0.25, [14,15,16])
164    w135 = Well(ml ,2583,1684,-1620,0.25, [21,22,23])
165    w136 = Well(ml ,2684,1699,-1620,0.25, [21,22,23])
```

```
166    w137 = Well(ml ,2680,1785,-3240,0.25, [21,22,23])
167    w138 = Well(ml ,2577,1784,-4860,0.25, [21,22,23])
168    w139 = Well(ml ,2498,1790,-1620,0.25, [21,22,23])
169    w140 = Well(ml ,2502,1898,-1620,0.25, [21,22,23])
170    w141 = Well(ml ,2592,1895,-4860,0.25, [21,22,23])
171    w142 = Well(ml ,2690,1886,-3240,0.25, [21,22,23])
172    w143 = Well(ml ,2694,1992,-1620,0.25, [21,22,23])
173    w144 = Well(ml ,2593,1976,-1620,0.25, [21,22,23])
174    w145 = Well(ml ,2895,2074,-1620,0.25, [21,22,23])
175    w146 = Well(ml ,2908,2169,-4860,0.25, [21,22,23])
176    w147 = Well(ml ,3000,2167,-3240,0.25, [21,22,23])
177    w148 = Well(ml ,3016,2103,-3240,0.25, [21,22,23])
178    w149 = Well(ml ,3026,2241,-4860,0.25, [21,22,23])
179    w150 = Well(ml ,2941,2291,-3240,0.25, [21,22,23])
180    w151 = Well(ml ,2878,2233,-1620,0.25, [21,22,23])
181    w152 = Well(ml ,2968,2365,-1620,0.25, [21,22,23])
182    w153 = Well(ml ,3073,2343,-3240,0.25, [21,22,23])
183    w154 = Well(ml ,3145,2292,-4860,0.25, [21,22,23])
184    w155 = Well(ml ,3130,2241,-3240,0.25, [21,22,23])
185    w156 = Well(ml ,3238,2195,-1620,0.25, [21,22,23])
186    w157 = Well(ml ,3257,2278,-3240,0.25, [21,22,23])
187    w158 = Well(ml ,3244,2382,-3240,0.25, [21,22,23])
188    w159 = Well(ml ,3169,2387,-3240,0.25, [21,22,23])
189    w160 = Well(ml ,3264,2481,-3240,0.25, [21,22,23])
190    w161 = Well(ml ,3279,2415,-3240,0.25, [21,22,23])
191    w162 = Well(ml ,3340,2388,-3240,0.25, [21,22,23])
192    w163 = Well(ml ,3406,2343,-1620,0.25, [21,22,23])
193    w164 = Well(ml ,3472,2407,-3240,0.25, [21,22,23])
194    w165 = Well(ml ,3392,2490,-4860,0.25, [21,22,23])
195    w166 = Well(ml ,3462,2542,-1620,0.25, [21,22,23])
196    w167 = Well(ml ,3526,2468,-1620,0.25, [21,22,23])
197    w168 = Well(ml ,3156,2099,-1620,0.25, [21,22,23])
198    w169 = Well(ml ,3269,2090,-1620,0.25, [21,22,23])
199    w170 = Well(ml ,3390,2095,-1620,0.25, [21,22,23])
200    w171 = Well(ml ,2804,2163,-1620,0.25, [21,22,23])
201    w172 = Well(ml ,2736,2137,-1620,0.25, [21,22,23])
202    w173 = Well(ml ,2540,1848,5818.5,0.25, [21,22,23])
203    w174 = Well(ml ,2628,1735,5818.5,0.25, [21,22,23])
204    w175 = Well(ml ,2629,1836,5818.5,0.25, [21,22,23])
205    w176 = Well(ml ,2640,1937,5818.5,0.25, [21,22,23])
206    w177 = Well(ml ,2953,2128,5818.5,0.25, [21,22,23])
207    w178 = Well(ml ,2956,2225,5818.5,0.25, [21,22,23])
208    w179 = Well(ml ,3003,2312,5818.5,0.25, [21,22,23])
209    w180 = Well(ml ,3094,2277,5818.5,0.25, [21,22,23])
210    w181 = Well(ml ,3202,2250,5818.5,0.25, [21,22,23])
211    w182 = Well(ml ,3206,2335,5818.5,0.25, [21,22,23])
212    w183 = Well(ml ,3234,2422,5818.5,0.25, [21,22,23])
213    w184 = Well(ml ,3322,2448,5818.5,0.25, [21,22,23])
214    w185 = Well(ml ,3406,2411,5818.5,0.25, [21,22,23])
215    w186 = Well(ml ,3460,2479,5818.5,0.25, [21,22,23])
216    w187 = Well(ml ,3333,2070,5818.5,0.25, [21,22,23])
217    w188 = Well(ml ,3213,2133,5818.5,0.25, [21,22,23])
218    w189 = Well(ml ,3090,2097,5818.5,0.25, [21,22,23])
219    w190 = Well(ml ,2796,2098,5818.5,0.25, [21,22,23])
220
221    lc19M = Well(ml,3363,2359,0,0.25,
[8,9,10,11,12,13,14,15,16,17,18,19,20,21])
222    pw102 = Well(ml,2537,2224,0,0.25,
[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24])
223
224    ml.solve()
```

```
225
226    timvertcontour(ml,2394,2381,4102,2437,50,6420,6540,50,levels=50,labels=1)
227    show()
228
229
230
231
232    result=open('l8_3a.csv','wb')
233    writer =csv.writer(result,dialect='excel')
234
235    x1=linspace(1800.0,3600,201)
236    y1=linspace(1200.0,3000,201)
237    dd1  = 50*ones(len(x1))
238
239    writer.writerow(x1)
240    writer.writerow(y1)
241
242    for j in range(len(y1)):
243         print j
244         for i in range(len(x1)):
245            dd1[i]=ml.head3D(x1[i],y1[j],6527)
246         writer.writerow(dd1)
247
248    result.close()
249
250    result=open('l3_3a.csv','wb')
251    writer =csv.writer(result,dialect='excel')
252
253    x1=linspace(1800.0,3600,201)
254    y1=linspace(1200.0,3000,201)
255    dd1  = 50*ones(len(x1))
256
257    writer.writerow(x1)
258    writer.writerow(y1)
259
260    for j in range(len(y1)):
261         print j
262         for i in range(len(x1)):
263            dd1[i]=ml.head3D(x1[i],y1[j], 6502)
264         writer.writerow(dd1)
265
266
267    result.close()
268
269    result=open('l14_3a.csv','wb')
270    writer =csv.writer(result,dialect='excel')
271
272    writer.writerow(x1)
273    writer.writerow(y1)
274
275    for j in range(len(y1)):
276         print j
277         for i in range(len(x1)):
278            dd1[i]=ml.head3D(x1[i],y1[j],6472 )
279         writer.writerow(dd1)
280
281
282    result.close()
283
284    result=open('l21_3a.csv','wb')
```

```
285    writer =csv.writer(result,dialect='excel')
286
287    writer.writerow(x1)
288    writer.writerow(y1)
289
290    for j in range(len(y1)):
291         print j
292         for i in range(len(x1)):
293            dd1[i]=ml.head3D(x1[i],y1[j],6437)
294         writer.writerow(dd1)
295
296    result.close()
```