

Bolsterstone plc  
36 Bridge Business Centre  
Beresford Way  
CHESTERFIELD S41 9FG

Your Ref:

Ref: PJL/418040let26

Date: 21 July 2014

For the attention of Mr I. Limb

Dear Ian,

**Groundwater and 'V' Notch Monitoring at Moneystone Quarry, Oakamoor,  
Staffordshire.**

Further to our previous monitoring letter (ABEC:418040Let 25 dated 6 February 2014), we carried out our twenty second groundwater / 'V' notch monitoring visit on 8 July 2014. The results are provided below. Whilst on site we continued to monitor the pH of surface water bodies and any groundwater seepages encountered.

**Weather:**

Since our last monitoring visit in April 2014, the temperatures have generally increased with the approaching summer. Although there have been periods of heavy rain, overall precipitation has been low.

**Earthworks**

As part of the quarry restoration plans, the areas of the processing plant (Area E) and Q2E (Area D) are to be re-graded. The earthworks and regrading of the site are currently ongoing with crushed demolition material and granular quarry waste being used to fill voids and re-grade the processing area.

### Q3 Lake Level

The Q3 lake level has been monitored by ABEC on previous visits. See Table 3. Our most recent visit on 8 July 2014 recorded a water level of approximately 158.3m AOD, around 700mm below the level of the spillway. It is noted that following the January 2014 visit, which appeared to show an equilibrium level had been reached around 156.91m AOD, lake levels have again begun to rise at a seemingly increasing rate. The lake level rise has obscured the former beach line that was observed on previous visits (ABEC Ref: 418040Let24) and has now overtopped BH95013. The small water course previously recorded on the north face of the quarry was noted to be dry during the latest visit. The lake level had now reached the boundary between the sandstone and the overlying coal measures strata on the southern face of Q3. The slopes on the southern edge of Q3 above the water line showed large desiccation cracks between 20mm to 40mm wide suggesting that the water level rise is not due to precipitation. Currently the bench surrounding Q3 is completely submerged with the exception of the western end which stands a maximum of 1.5m above the lake level. See Fig 4. The slopes within Q3 continue to be monitored for signs of instability.

Current restoration plans at the quarry have involved the excavation of a trench from L4 to drain water through L5 and eventually into Q3. Therefore it is considered likely that further water level rises should be expected and will result in the overtopping of the Q3 spillway. Consequently consideration should be given to the effect this may have on the surrounding areas and chemical testing of the water within both Q3 and Stream A may be beneficial.

### Q2 Water Level

During the course of the previous monitoring visits it has become apparent that the flow over the surface of L7 is heavily influenced by the preceding weather conditions. It was noted in the previous monitoring visit that water was flowing over the surface of L7 and ponding at the sinkhole in the southeastern corner. On this visit the



volume and rate of flow was greatly reduced. Water was seen to be predominately ponding in the centre of L7 with the surrounding areas becoming increasingly greened.

#### Water in Q1E

As previously mentioned, as part of the restoration plans, a trench has been excavated through the western edge of Q1E (L4) with a shallow trench draining water to Q1W (L5). At the time of the monitoring visit the water ponding on the surface of L4 was noted to be draining freely from the tailings. It is anticipated that as the water continues to drain the tailings will consolidate further. The stability of the lagoon has previously been of concern. It is considered that the draining of the lagoon will lead to a gradual increase in stability as the tailings dry out and become firmer.

#### Groundwater

The boreholes have shown varying rates of change throughout the monitoring period. During the July 2014 visit, all boreholes have shown slight decreases in groundwater levels of between 2.3m to 0.3m from the April 2014 visit. The exception of which is BH 122 and BH 92029, which record increases. See Table 1 and Fig 6. Over the course of the monitoring period an overall steady rise in water level has been recorded in BH 92029 with BH 122 remaining relatively constant. It is considered that the decreases in groundwater levels will be due in part to the reduced rainfall and infiltration from increased evaporation. The increased levels of Q3 would therefore not be expected. The Q3 level rise may be due to delayed draining out of groundwater in the sandstone, accumulated last winter.

Alternatively, it has been noted that on weathering the sandstone surface becomes hardened and less permeable due to iron oxidation. Consequently, this weathering effect may be responsible for a reduction in permeability and hence closing of seepage pathways to the south of Q3.

It was noted that the lake level rise has resulted in BH 95013 becoming submerged. During the previous monitoring visit (April 2014), groundwater in BH 95013 was noted to be around 0.7m below the level of the lake. It is further considered that as the groundwater in this area continues to rise, seepages through the rock of the land bridge will cause an increase in flows down Stream A. In previous months the ground to the headwaters of Stream A has become increasingly saturated, suggesting a rising water table. This raises concerns regarding the stability of the southern corner, adjacent to the overflow which will need to be considered further in subsequent monitoring visits.

During the current visit although the water level had risen, no immediate signs of instability were noted. The possibility of slips within Q3 however has increased as a result of rising lake levels. It should be recorded that the rising lake level along with increasing summer vegetation has made access to many areas of Q3 difficult.

No seepages were noted from the eastern edge of the L3 dam, along the railway access road although the material forming the dam continues to be noted to be waterlogged. We reaffirm our previous statement that whilst Stream D continues to discharge over the surface of L3, on its current course, percolation will prevent the reduction of pore pressures and consolidation of the L3 tailings. From previous monitoring visits it is clear that the water levels within the L3 lagoon are influenced by the preceeding weather conditions.

#### Stream 'V' Notch Measurements

During previous visits it has become apparent that streams A, B and C are influenced by the preceeding weather conditions. Stream A and B appear to be influenced to a greater degree than Stream C. During the

latest monitoring visit the flow in Stream B had decreased whilst it had increased in Streams A and C.

As previously mentioned, in previous months the ground at the head of Stream A has become waterlogged. It is anticipated that this remains due to seepage from the Q3 lake to the north and rising groundwater. The flows were reduced at the time of the most recent visit but the waterlogged ground remains. An additional flow from the fields to the south of Q3 and Stream A has been noted to be increasing in recent months, again likely due to increasing groundwater observed in BH 92029.

Previous monitoring visits have suggested that the woodland area adjacent to Stream C has been subject to periodic maintenance. This has been confirmed during the July 2014 visit with the area between Stream B and Stream C having been partially cleared for re-use as a nature trail.

#### Quarry and Surrounding Area pH Readings

Where accessible, the pH of surface water bodies and seepages were recorded (including lagoons and the River Churnet). The pH values are noted from previous visits to be highly variable. See Table 2 and Fig 3. The average pH across the site has remained relatively constant around pH 6.5 although small scale variations have been introduced by sampling regimes.

During the July 2014 monitoring visit the variability had reduced with the range of values recorded being between 5.2 and 5.8. It might be suggested that the variability in pH is influenced in part by the preceding weather conditions. As the warmer drier weather approaches, reduced precipitation could cause a reduction in pH due to decreased dilution.

Areas of elevated pH have been recorded previously, particularly in Q2 adjacent to the former flume. It is considered that as earthworks commence at the quarry, additional areas of extreme pH material may be exposed. This area will be closely monitored as part of the earthworks and future monitoring visits.

The River Churnet has shown considerable variation in pH values and would appear to be influenced by the weather. The River Churnet recorded pH values of between 5.8 to 5.4 and indicated a decrease in pH downstream. Although the acidic discharge was not monitored during the latest visit it remains clear that the pH of the River Churnet is still being influenced by the quarry.

Although there is no processing at the site, there will likely be legacy sources of extreme pH as a result of former processing operations.

#### Water in Q3 Lake

The pH of the water in Q3 was recorded to be between 5.1 and 5.3, currently below the EU bathing water limits and again may be in part linked to the preceeding weather conditions. It was anticipated that as lake volumes increased the variability in pH would decrease from greater mixing and dilution however, the variation again suggests a degree of influence from the weather. The current lake levels continue to restrict access to areas of Q3 with the majority of the bench now submerged.

#### Inspection of quarry faces

As part of this monitoring visit an inspection of the quarry faces was undertaken. No further movement associated with the previous rock fall to the west of Q2 was noted. However, adjacent to the access road of

Q2 the large face at the south-east corner of L7 showed the potential for several loose blocks which may present a future risk.

The stockpile to the north of L7 has continued to be monitored with no further movements observed. Currently the development proposals for Q2E involve the excavation and regrading of some material at the toe of this stockpile. It is understood that the earthworks should not include this stockpile and consequently the slope angle will not be changed. This will be further monitored during the earthworks for any signs of movement.

The south face of Q3, adjacent to BH 95013 showed many large desiccation cracks during the latest visit. Along with the reported lake level rises this raises other potential issues regarding stability. The desiccation cracks represent pathways for the rapid infiltration of water into the existing slope.

Concerns have been previously raised regarding the stability of the slopes within Q3 in relation to ground and surface water levels. Although water pressures in the surrounding slopes have the potential to be high, the continued presence of the lake offers a measure of confinement to the slopes. However, there is a need to remain vigilant until stability issues have been resolved.

### Conclusions

The borehole measurements appear to have shown a general decrease in water levels across the site, with the exception of BH 122 and BH 92029. It is anticipated this may be due in part to the warmer weather reducing infiltration to the ground. Interestingly however, it has been noted that the Q3 lake level has risen at a seemingly increasing rate.

It is considered that further water level rises may occur in the coming months and consequently consideration should be given to the consequences of overtopping of the spillway at the southern edge. The water reaching this point would be drained down Stream A and will likely need some chemical testing to assess the quality and effect on surrounding areas.

The quarry's historic activities appear to continue to influence the pH of the surface water in the area although it is anticipated there may also be an influence from the preceeding weather conditions. Currently the pH of Q3 is below the EU bathing water limits.

The extreme highs and lows of pH were not recorded during the latest visit although it is anticipated that localised areas may still exist. The currently ongoing earthworks will be monitoring for the presence of any potentially high pH material that may be disturbed.

The groundwater levels in BH121 continue to show significant fluctuations and may be exerting considerable pressures on the L3 dam. We reaffirm that consideration should be given to diverting the flow of Stream D from the surface of the tailings to an alternative outfall. Further consideration could also be given to draining Q1E.

#### Next Visit

Our next monitoring visits are scheduled for early October 2014, after which we will produce our monitoring report. We will continue to monitor groundwater and 'V' notch levels as well as groundwater and surface water pH levels. Further pH monitoring of the River Churnet and any inflows will also be carried out to better determine how the inflows are affecting the main channel. Inspections of the quarry faces, dams and lagoons will also be carried out to check for signs of further instability, deterioration or change. The progress of the earthworks will be monitored as they progress on site and will be reported separately.

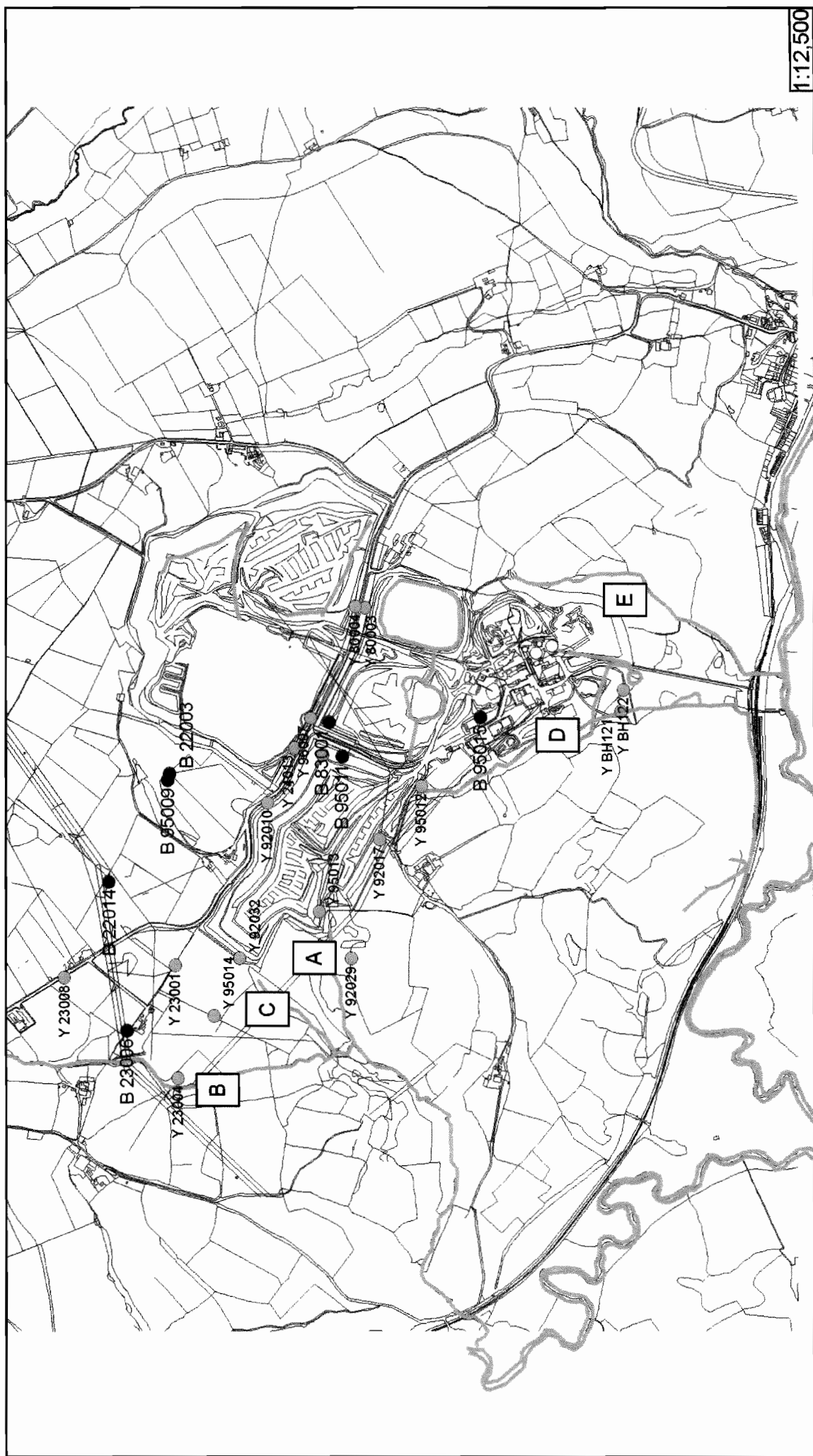


If you have any queries regarding the above, please do not hesitate to contact me on 01924 376622.

Yours sincerely

A handwritten signature in black ink, appearing to be 'Peter Lloyd', with a long, sweeping horizontal line extending to the right.

Peter Lloyd



# Site Plan

**Project: Monestown Park**  
**Job No: 418040**  
**Client: Laver Leisure**

**Fig 1**

### Legend

- Not monitored / blocked  
● Available

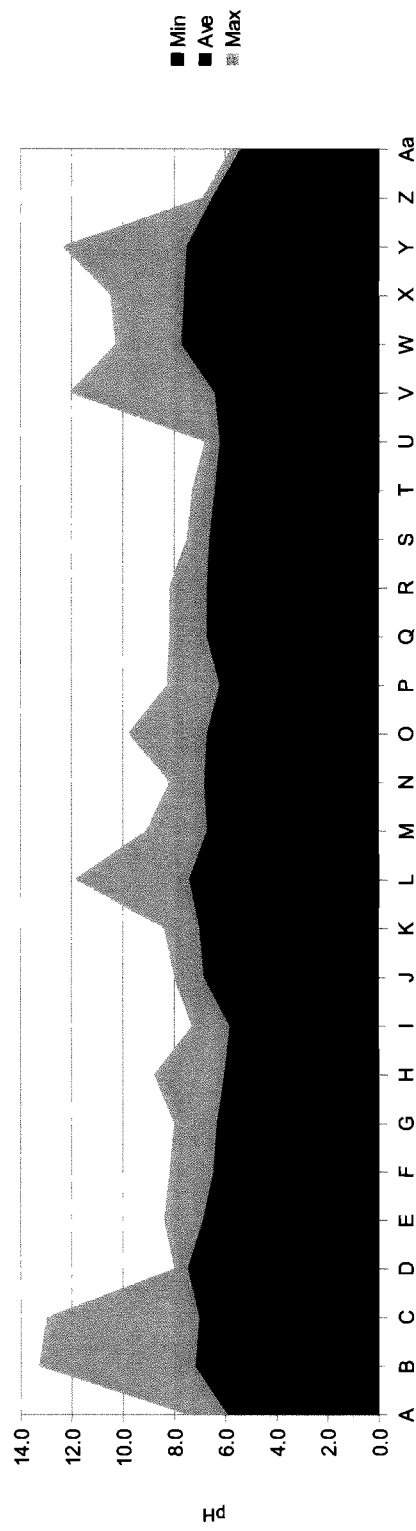
**Abbeydale**  
Building Environment Consultants

4 Neville Street WF1 5EF Tel: 01924 376622  
www.abbeydalebec.com



**Moneystone Park**  
**Monthly pH readings from December 2010**

**Fig 3**



Visit	A	B	C	D	E	F	G	H	I	J	K	L	M
Min	2.0	2.8	3.1	5.6	4.7	4.1	4.1	4.2	4.0	4.2	4.8	4.8	4.5
Ave	5.9	7.2	7.0	7.5	6.9	6.5	6.3	6.0	5.8	6.8	7.0	7.4	6.7
Max	7.5	13.3	13.0	8.0	8.4	8.2	8.0	8.8	7.3	8.0	8.4	11.9	9.1
STDEV	1.6	1.9	1.4	0.7	1.1	1.3	1.1	1.3	1.0	0.9	1.3	1.6	1.0
No.	13.0	39.0	52.0	12.0	25.0	27.0	24.0	25.0	28.0	47.0	13.0	29.0	33.0

Visit	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Min	4.8	4.5	5.0	5.1	4.9	5.0	5.0	5.3	4.8	6.2	4.6	4.8	6.0
Ave	6.8	6.8	6.5	6.7	6.7	6.6	6.4	6.2	6.4	7.7	7.6	7.5	6.5
Max	8.2	9.8	8.3	8.2	8.2	7.5	7.3	6.8	12.1	10.3	10.5	12.4	6.9
STDEV	1.1	1.8	1.1	1.1	0.9	0.9	0.6	0.4	1.4	0.8	1.2	1.7	0.2
No.	21.0	34.0	19.0	29.0	52.0	27.0	39.0	22.0	26.0	28.0	37.0	44.0	19.0

Visit	Aa
Min	5.1
Ave	5.4
Max	5.8
STDEV	0.3
No.	15.0



# Legend

- Not monitored / blocked
- Available
- July 2014

## Area of Q3 water coverage

Project: Moneystone Park  
 Job No: 418040  
 Client: Laver Leisure  
 July 2014

4 Neville Street WF1 5EF Tel: 01924 376622  
[www.abbeydalebec.com](http://www.abbeydalebec.com)

**Abbeydale**  
 Building Environment Consultants

**Fig 4**



## WATER MONITORING BOREHOLES

**Water Levels are m.AOD**

\* = location quarantined

2003 (23) series holes were drilled during December/January 2004.

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**Moneystone Park**  
**pH Readings**

**Table 2**

Date	Visit	Number	Location	pH on site	Material type	Comment
26/10/13	X	29	surface ponding	7.8	W	Track south of Q3
26/10/13	X	30	Ponding	8.1	W	East bench of Q3
26/10/13	X	31	Q3 N shore	7.6	W	Surface ponding
26/10/13	X	32	Q3 N shore	7.7	W	
26/10/13	X	33	Q3 N shore	7.7	W	Approx mid-point
26/10/13	X	34	Q3 W end	7.6	W	
26/10/13	X	35	Q3 N shore	7.6	W	
26/10/13	X	36	Q3 W end	8.1	W	
26/10/13	X	37	Q3 W end, S side	7.6	W	
08/01/14	Y	1	L3	5.8	W	Ponding on surface
08/01/14	Y	2	Stream D	5.9	W	
08/01/14	Y	3	Surface flow on access road	6	W	
08/01/14	Y	4	SP1	6.3	W	
08/01/14	Y	5	Pump house	6.3	W	Surface ponding
08/01/14	Y	6	Pump house	6.3	W	Surface ponding
08/01/14	Y	7	River Churnet	6.3	W	Pump house
08/01/14	Y	8	EA monitoring station	6.4	W	
08/01/14	Y	9	River Churnet	6.4	W	EA Monitoring Station
08/01/14	Y	10	Acidic Discharge	4.9	W	
08/01/14	Y	11	River Churnet	5.1	W	Downstream of Acidic Discharge
08/01/14	Y	12	Acidic Discharge	4.8	W	Near Tracks
08/01/14	Y	13	Drain by railway	5.2	W	
08/01/14	Y	14	Groundwater flow	5.3	W	Base of T2
08/01/14	Y	15	Ponded water	5.5	W	
08/01/14	Y	16	Silo	5.8	W	
08/01/14	Y	17	Surface Water	6.3	W	
08/01/14	Y	18	Surface Water	6.3	W	
08/01/14	Y	19	Q1 surface water	6.4	W	
08/01/14	Y	20	Q2 access track	6.5	W	Surface ponding
08/01/14	Y	21	Surface ponding	12.4	W	Q2 Eaccess track
08/01/14	Y	22	Q2E surface water	9.1	W	Gully
08/01/14	Y	23	Q2E surface water	8.9	W	Gully
08/01/14	Y	24	Q2E surface water	8.9	W	Gully
08/01/14	Y	25	Q2E surface water	8.8	W	Gully
08/01/14	Y	26	Q2E surface water	8.8	W	Gully
08/01/14	Y	27	Surface ponding	8.8	W	Q2 E
08/01/14	Y	28	Surface ponding	8.5	W	
08/01/14	Y	29	Surface flow	8.4	W	North of Q2 tip
08/01/14	Y	30	Surface ponding	11.4	W	Q2 Flume north
08/01/14	Y	31	Stream C	8.9	W	
08/01/14	Y	32	Stream B	8.6	W	
08/01/14	Y	33	Stream A	8.6	W	
08/01/14	Y	34	Groundwater flow	8.6	W	S of Q3
08/01/14	Y	35	Surface flow	8.5	W	Head of stream A?
08/01/14	Y	36	Q3	8.2	W	Below 95013
08/01/14	Y	37	Q3 Access track	8.1	W	
08/01/14	Y	38	Q3	8.2	W	South bank
08/01/14	Y	39	Q3	8.5	W	L8 causeway
08/01/14	Y	40	Q3	8.1	W	East end
08/01/14	Y	41	Q3	8.1	W	West end north side
08/01/14	Y	42	Q3	8.1	W	Q3 stream C inflow
08/01/14	Y	43	Q3	8	W	West end
08/01/14	Y	44	Q3	8	W	West end
15/04/14	Z	1	Q3	6.4	W	access to L8
15/04/14	Z	2	Q3	6.2	W	East end of L8
15/04/14	Z	3	Surface ponding	6	W	Top of Q3 access road
15/04/14	Z	4	Q3	6.4	W	Below 95013
15/04/14	Z	5	South of Q3 overflow	6.4	W	
15/04/14	Z	6	South of Q3	6.6	W	Head of stream A?
15/04/14	Z	7	Stream A	6.6	W	Upstream
15/04/14	Z	8	Stream A	6.5	W	Upstream
15/04/14	Z	9	Surface Water	6.5	W	
15/04/14	Z	10	Stream A	6.5	W	
15/04/14	Z	11	Stream A	6.5	W	V notch
15/04/14	Z	12	Stream C	6.4	W	V notch
15/04/14	Z	13	Stream B	6.5	W	V notch
15/04/14	Z	14	Q2E ditch	6.9	W	
15/04/14	Z	15	Q2E ditch	6.8	W	Upstream of crossing point
15/04/14	Z	16	Q2E surface water	6.8	W	
15/04/14	Z	17	Surface Ponding	6.4	W	North of Q2E
15/04/14	Z	18	Surface Ponding	6.6	W	Next to BH121
15/04/14	Z	19	Stream D	6.4	W	
09/07/14	Aa	1	Q3 east end	5.1	W	L8 access track
09/07/14	Aa	2	Stream C	5.7	W	
09/07/14	Aa	3	Stream B	5.3	W	Upstream of C
09/07/14	Aa	4	Stream B	5.2	W	Downstream of C
09/07/14	Aa	5	Stream A	5.3	W	
09/07/14	Aa	6	Stream A	5.2	W	Upstream
09/07/14	Aa	7	Q3 overflow	5.3	W	
09/07/14	Aa	8	Q3 W end, S side	5.2	W	
09/07/14	Aa	9	Q3 W end, N side	5.3	W	
09/07/14	Aa	10	Q1E	5.7	W	New outflow
09/07/14	Aa	11	Q1W	5.8	W	Gully ponding
09/07/14	Aa	12	Q1W	5.8	W	
09/07/14	Aa	13	River Churnet	5.8	W	Upstream
09/07/14	Aa	14	EA monitoring station	5.4	W	
09/07/14	Aa	15	River Churnet	5.6	W	Downstream

# Moneystone Park

## pH Readings

Table 2

Date	Visit	Number	Location	pH on site	Material type	Comment
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Visit A – 20/12/10 – Weather was cold (-5°C) and overcast. Thick ice (>5cm) present on many of the lagoons meaning sample not possible. Wet (acidic) process was in operation.

Visit B – 7/1/11 – Weather was cold (-1 to 1°C), snowing am, raining pm. Thick ice (~5cm) present on many of the lagoons meaning sample not possible. Wet (acidic) process not in operation, consequently there was no flow of water into any of the lagoons.

Visit C – 9/2/11 – Weather was over cast, damp about 5 – 8°C. Wet process in operation, water flowing into L7 and L8, but limited flow down Stream D into SP1, SP2 & SP3.

Visit D – 4/5/11 – Weather was warm and dry about 15°C. Only L7 receiving any water, flows reduced down Stream A, B, C & D. Q3 filling with water.

Visit E – 1/6/11 – Weather was warm and dry about 18°C. Only L7 receiving any water, flows reduced down Stream A, B, C & D. Q3 filling with water.

Visit F – 14/7/11 – Weather was warm and dry about 20°C. No lagoons receiving water from production. Flows down all streams low. Q3 and L8 filling with groundwater.

Visit G – 9/8/11 – Weather was overcast about 17°C with occasional light showers. No lagoons receiving water from production. Flows down streams A, B & C low. Q3 and L8 filling with groundwater. Stream D flows increased.

Visit H – 8/9/11 – Weather was overcast about 15°C. No lagoons receiving water from production L7 20% water remaining. Flows down streams A, B & C low. Q3 and L8 filling with groundwater.

Visit I – 3/10/11 – Weather was warm about 23°C. Quarry no longer active. All flows down stream D are natural. Flows down Streams A, B and C low. Q3 and L8 filling with groundwater.

Visit J – 22/11/11 – Weather was foggy about 10°C. Quarry no longer active. All flows down stream D are natural. Flows down Streams A, B and C low. Q3 and L8 filling with groundwater.

Visit K – 19/12/11 – Weather was cold, raining south or Eaves lane, Snowing north of Eaves lane. About 4°C. Quarry no longer active. All flows down stream D are natural. Flows down Streams A, B and C are raised. Q3 and L8 filling with groundwater.

Visit L – 9/1/12 – Weather was cold and damp, about 4°C. Quarry no longer active. All flows down stream D are natural. Flows down Streams A, B and C are raised. Q3 and L8 filling with groundwater.

Notas:

Visit M – 6/2/12 – Weather was cold and snow covered by ~40mm, 2°C. Quarry no longer active. All flows down stream D are natural. Flow down stream B are raised. Streams A and C had low flow. Q3 and L8 filling with groundwater.

Visit N – 20/3/12 – Weather was cool and sunny, 11°C. Quarry no longer active. All flows down stream D are natural. Flows down stream A, B and C are low. Q3 and L 8 filling with groundwater. Surface flow in Q2W into sinkhole in SE corner. Surface water absent from L3.

Visit O – 12/4/12 – Weather was highly changeable, sun and hail, 11°C. Quarry no Longer active. All flows down stream D are natural. Flows down stream A and C are low, stream B flow raised. Q3 and L 8 filling with groundwater. Surface flow in Q2W and ponding above sinkhole in SE corner. Surface water absent from L3.

Visit P – 22/5/12 – Weather was hot and sunny, 24°C. Quarry no longer active. Demolition nearly completed. All flows down stream D are natural. Flows down stream A, B and C are low. Q3 and L8 are filling with groundwater. Surface water absent from L3, surface firmer underfoot than previous visits.

Visit Q – 3/7/12 – Weather was cool and damp about 15°C. Quarry no longer active. All flows down stream D are natural. Flows down stream A, B and C are raised. Q3 and L8 filling with groundwater, water has overtopped the V notch and is flowing (~100mm deep) into L8. Vegetation around boreholes is very thick. Water ponding on Q2W surface around sinkhole. Surface water absent from L3.

Visit R – 17/9/12 – Weather was mild, sunny and breezy about 15°C. Quarry no longer active. All flows down stream D are natural. Flows down stream B are raised. Stream A and B were blocked. Stream C V-notch displaced. Vegetation around boreholes very thick. Q3 and L8 filling with water. Q3 bund notch overtopped, water at same level in Q3 and L8. Q2 SE sinkhole approximately 4m deep.

Visit S – 31/10/12 – Weather cool and breezy around 8°C. Quarry no longer active. Demolition ongoing. Q3 Bund overtopped at edges. Stream C V-notch repaired. Vegetation around boreholes reduced. Majority of standpipes uncovered.

Visit T – 6/12/12 – Weather cold and breezy approx 2°C. Quarry no longer active. Demolition ongoing. Q3 dam fully submerged. Vegetation around boreholes reduced. Level loggers removed from monitoring standpipes.

Visit U – 12/2/13 – Weather was cold and still approximately 1°C. Quarry no longer active. Demolition ongoing. Vegetation die back around boreholes. Stream B flow very high. Water in L3 dam and tailings at high level.

Visit V – 26/4/13 – Warm, sunny, very windy, approximately 11°C. Demolition completed. Water level in Q3 has reached level of bench in places. Vegetation is reduced around boreholes.

Visit W – 30/7/13 – Warm, sunny, occasional showers and breezes, approximately 22°C. Demolition completed. Water level in Q3 risen, no tide marks evident. Vegetation very dense around boreholes.

Visit X – 26/10/13 – Cool, breezy, showers in morning, approximately 13°C. Water level in Q3 has reduced. Vegetation dense. Standpipes in Q2E removed. White precipitate in acidic discharge has gone.

Visit Y – 8/01/14 – Cool, still, occasional showers, approximately 7°C. Water level in Q3 appears stable. Standpipes in Q2E removed. High pH noted in Q2. Ground very saturated.

Visit Z – 15/4/14 – Warm, breezy, scattered showers.

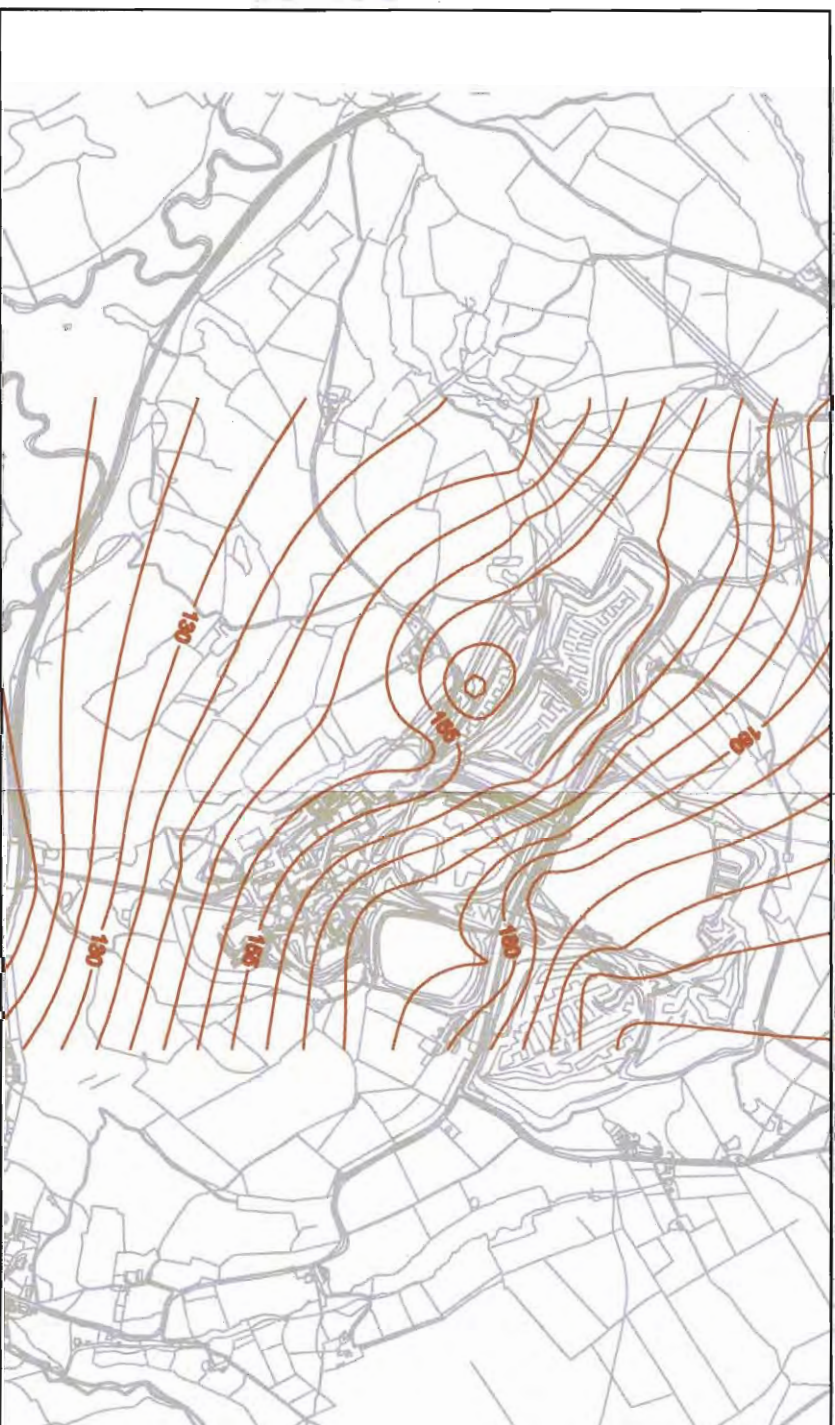
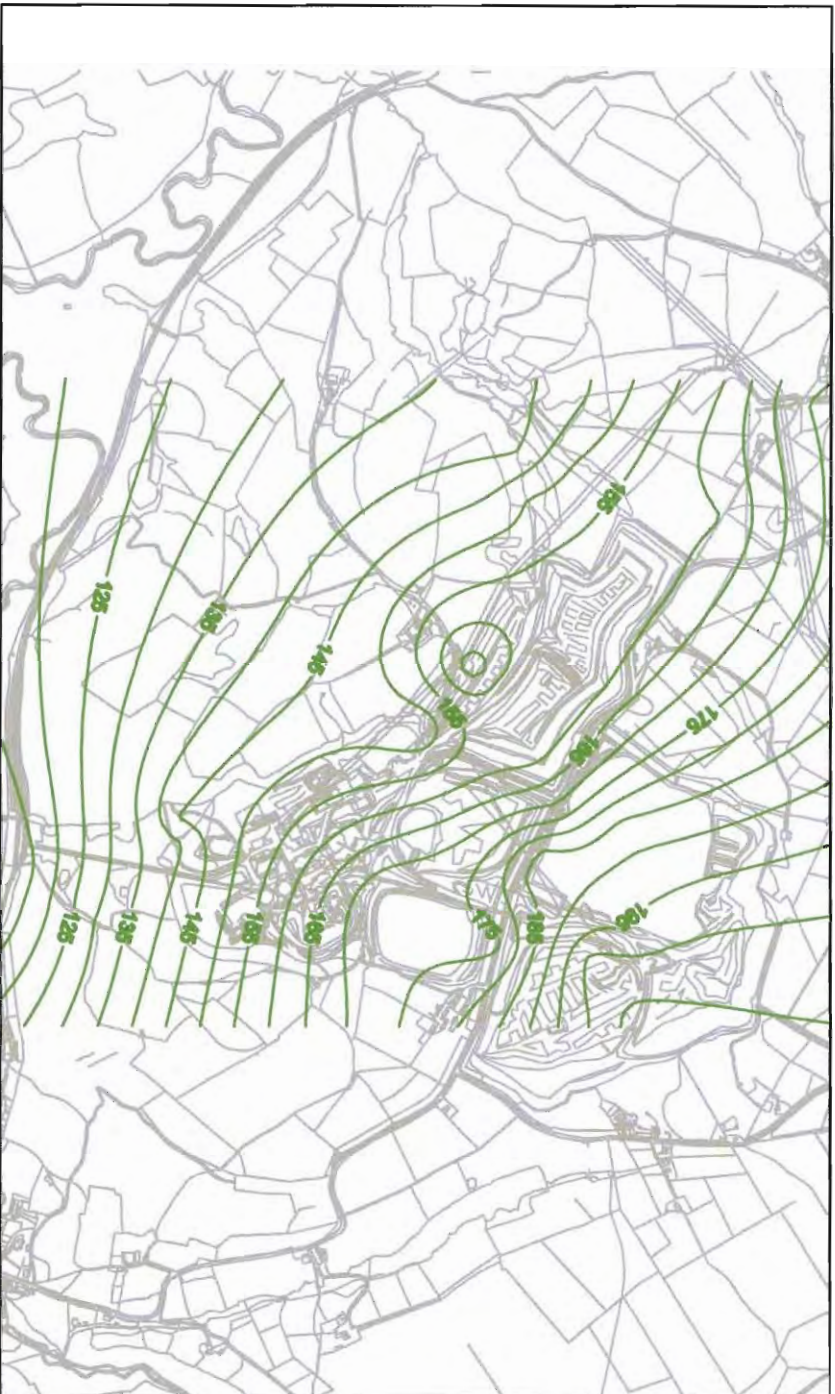
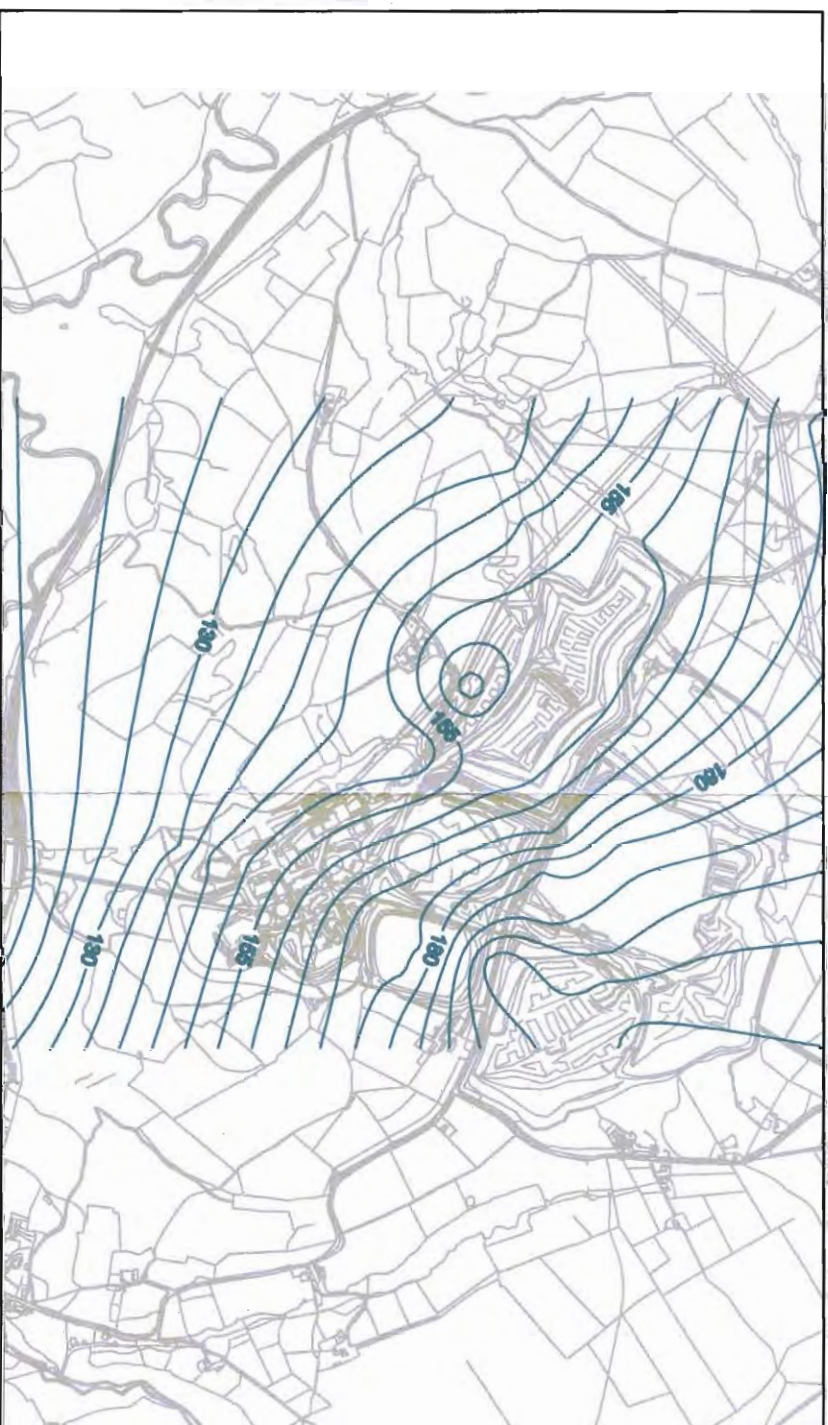
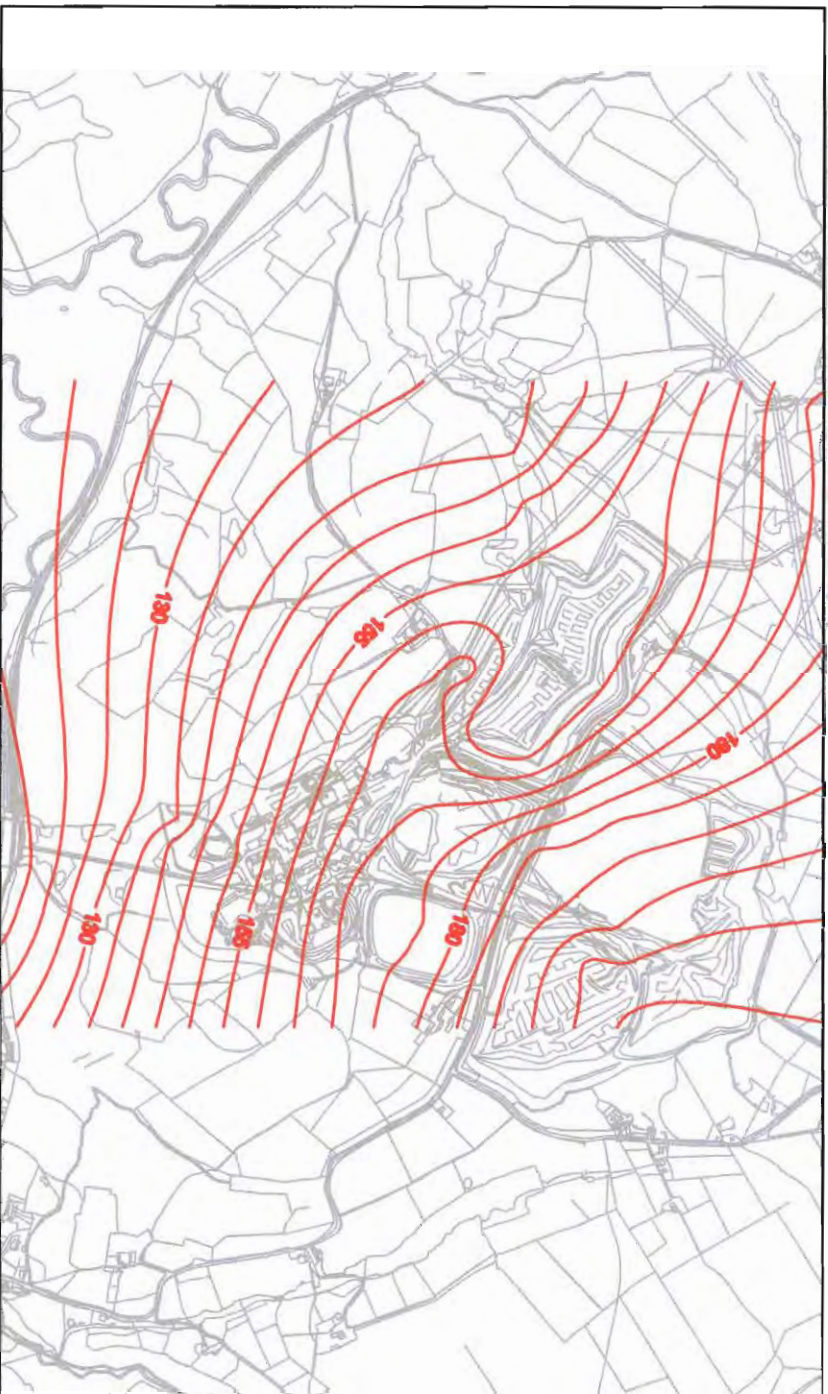
Visit Aa – 9/07/14 – Hot, breezy, approximately 25°C, heavy rain at 4pm. Water level in Q3 risen. Most of bench submerged. Vegetation very dense.

Table 3: Observed Q3 Water Levels						Inflow(m3/day)		River Flows (m3/day)		
Date	Days	Q3 Level	L8 Level	Level Rise (mm/day)	Volume	Avg	Period	A	B	C
16/12/2010	0	131.00			0					
20/12/2010	4	135.50	140.50	1125	2438	610	610			
07/01/2011	22	141.00		306	26301	1196	1326	382	1043	55
09/02/2011	55	144.00		91	68194	1240	1269	159	731	<50
04/05/2011	139	147.00	149.14	36	147528	1061	944	<100	109	<50
01/06/2011	167	148.25	149.64	45	169145	1013	772	<100	159	<50
14/07/2011	210	149.50	149.56	29	200000	952	718	<100	109	<50
09/08/2011	236	149.70	149.66	8	207567	880	291	<100	<100	<50
08/09/2011	266	150.00	149.96	10	218917	823	378	<100	109	<50
03/10/2011	291	150.16	150.47	6	224970	773	242	<100	159	<50
19/10/2011	307	150.74	150.81	36	246913	804	1371	<100	159	<50
22/11/2011	341	151.05	150.87	9	258490	758	340	159	256	<50
19/12/2011	368	151.39	150.85	13	271504	738	482	382	1224	81
09/01/2012	389	151.72	151.13	16	283876	730	589	220	483	112
06/02/2012	417	152.02	151.12	11	295226	708	405	159	1043	<50
20/03/2012	460	152.24	151.37	5	303662	660	196	295	431	<50
12/04/2012	483	152.38	151.46	6	308770	639	222	382	1224	81
22/05/2012	523	152.63	151.76	6	318417	609	241	295	337	<50
03/07/2012	565	152.90	152.10	6	328632	582	243	382	483	<50
17/09/2012	641	153.17		4	340246	531	153	295	1043	<50
31/10/2012	685	153.30		3	345623	505	122	295	1043	<50
06/12/2012	721	153.71		12	363474	504	496	663	1424	95
12/02/2013	789	154.95		18	423700	537	886	1131	3729	112
26/04/2013	862	156.75		25	520697	604	1329	539	731	<50
18/06/2013	915	157.25		9	547709	599	510	295	382	55
30/07/2013	957	157.29		1	549866	575	51	159	220	<50
26/10/2013	1045	156.88		-5	527760	505	-251	1224	3027	150
08/01/2014	1119	156.91		0	529108	473	18	483	1879	81
15/04/2014	1216	157.66		8	569654	468	418	188	878	<50
09/07/2014	1301	158.30		8	604322	465	408	382	483	150

**Table 4: Stream A, B and C flow rate.**

	A	B		C	A	B	C	
			Head (mm)				Flow (m3/d)	
09/08/2011		40	55	15				
08/09/2011		50	60	20			109	
03/10/2011		40	70	20			159	
22/11/2011		70	85	30	159		256	
19/12/2011		100	160	70	382		1224	81
09/01/2012		80	110	80	220		483	112
06/02/2012		70	150	30	159		1043	
20/03/2012		90	105	30	295		431	
12/04/2012		100	160	70	382		1224	81
22/05/2012		90	95	30	295		337	
03/07/2012		100	110	35	382		483	
17/09/2012		90	150	50	295		1043	
31/10/2012		90	150	55	295		1043	
06/12/2012		125	170	75	663		1424	95
12/02/2013		155	250	80	1131		3729	112
26/04/2013		115	130	45	539		731	
01/06/2013		90	100	60	295		382	55
30/07/2013		70	80	40	159		220	
26/10/2013		160	230	90	1224		3027	150
08/01/2014		110	190	70	483		1879	81
15/04/2014		75	140	50	188		878	
09/07/2014		100	110	90	382		483	150





# Legend

- Jul 13 GW Plot
- Oct 13 GW Plot
- Jan 14 GW Plot
- Apr 14 GW Plot



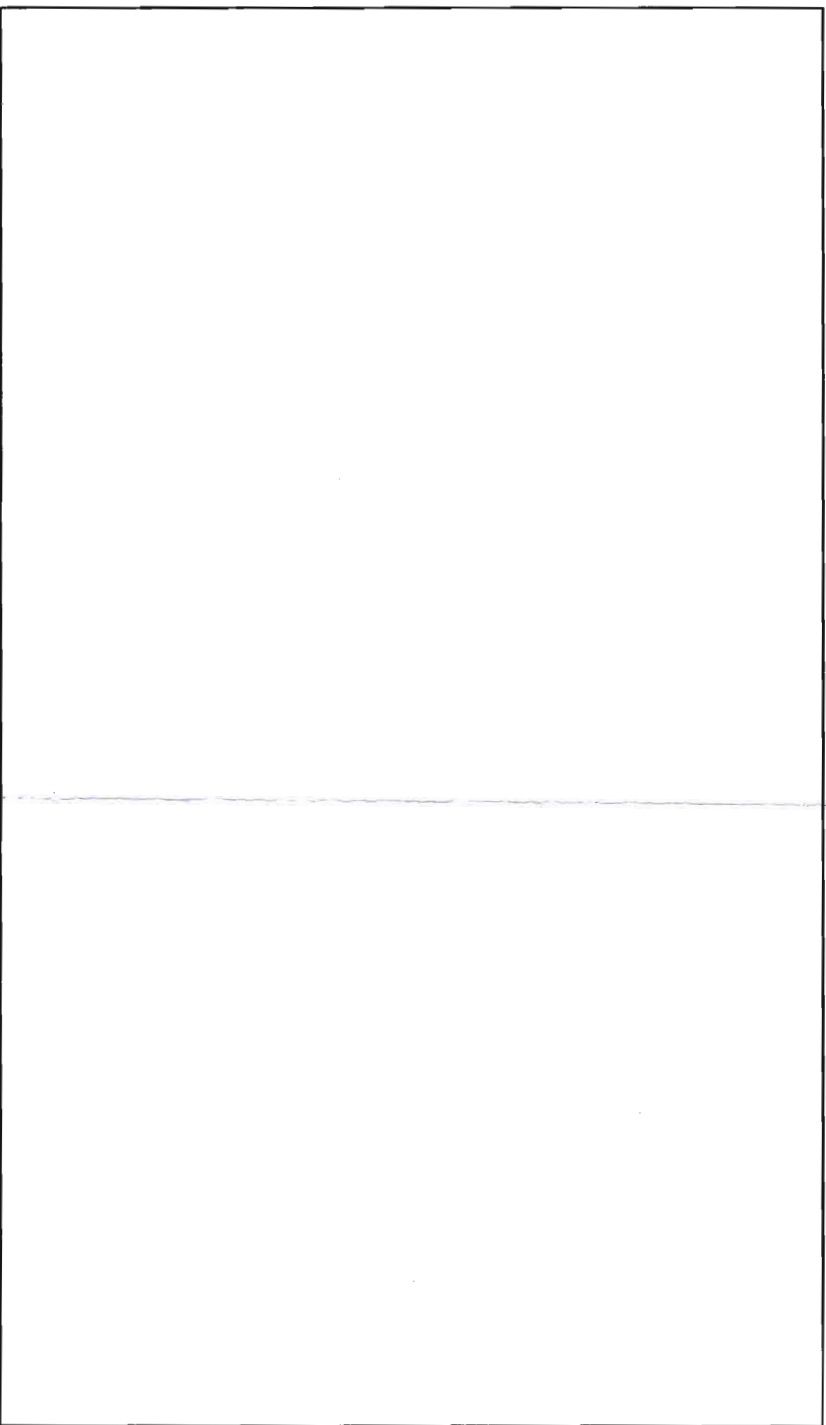
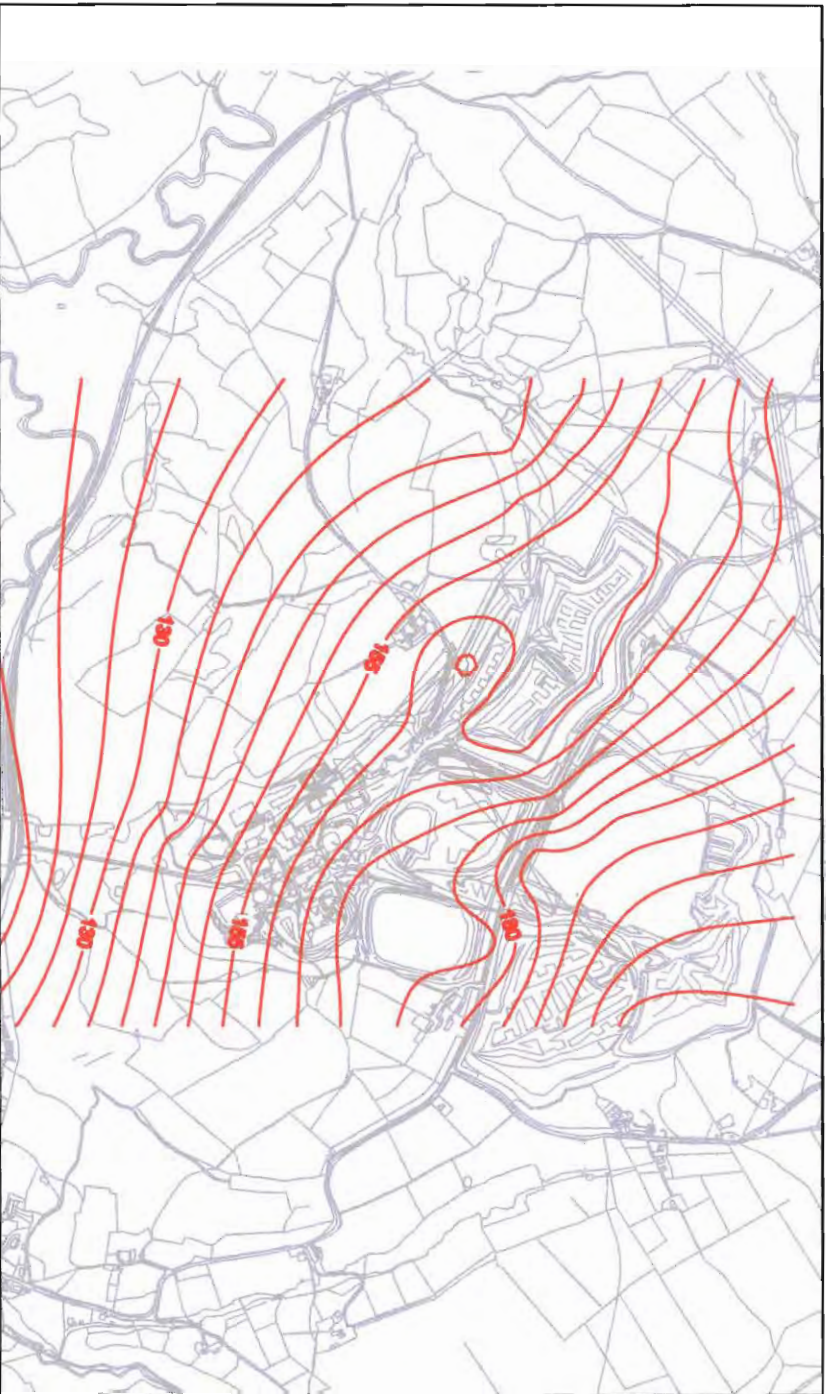
# Groundwater July 2013 to Apr 2014

Project: Moneystone Park  
Job No: 418040  
Client: Laver Leisure

1:15,000 at A3

Fig. 5g





**Legend**

— Jul 14 GW Plot



**Groundwater July 2014**

Project: Moneystone Park  
Job No: 418040  
Client: Laver Leisure



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1:15,000 at A3

**Fig. 5h**