

POOL ETAF DOWNSTREAM MAPPING SUMMARY



ETAF-4 In boulder field Downstream of Pool ETAF looking Upstream



ETAF-5 In boulder field Downstream of Pool ETAF looking Downstream



ETAF-6 Downstream end of boulder field Downstream of Pool ETAF looking Upstream



ETAF-7 Downstream end of boulder field Downstream of Pool ETAF looking Downstream

Pool ETAF Downstream notes (as at 19 Dec 2008)

- Further downstream of the rockbar below Pool ETAF, water flows through a boulder field with boulders up to approximately 3m size.
- Water flows onto exposed sandstone downstream of the boulder field, before entering Pool ETAG.

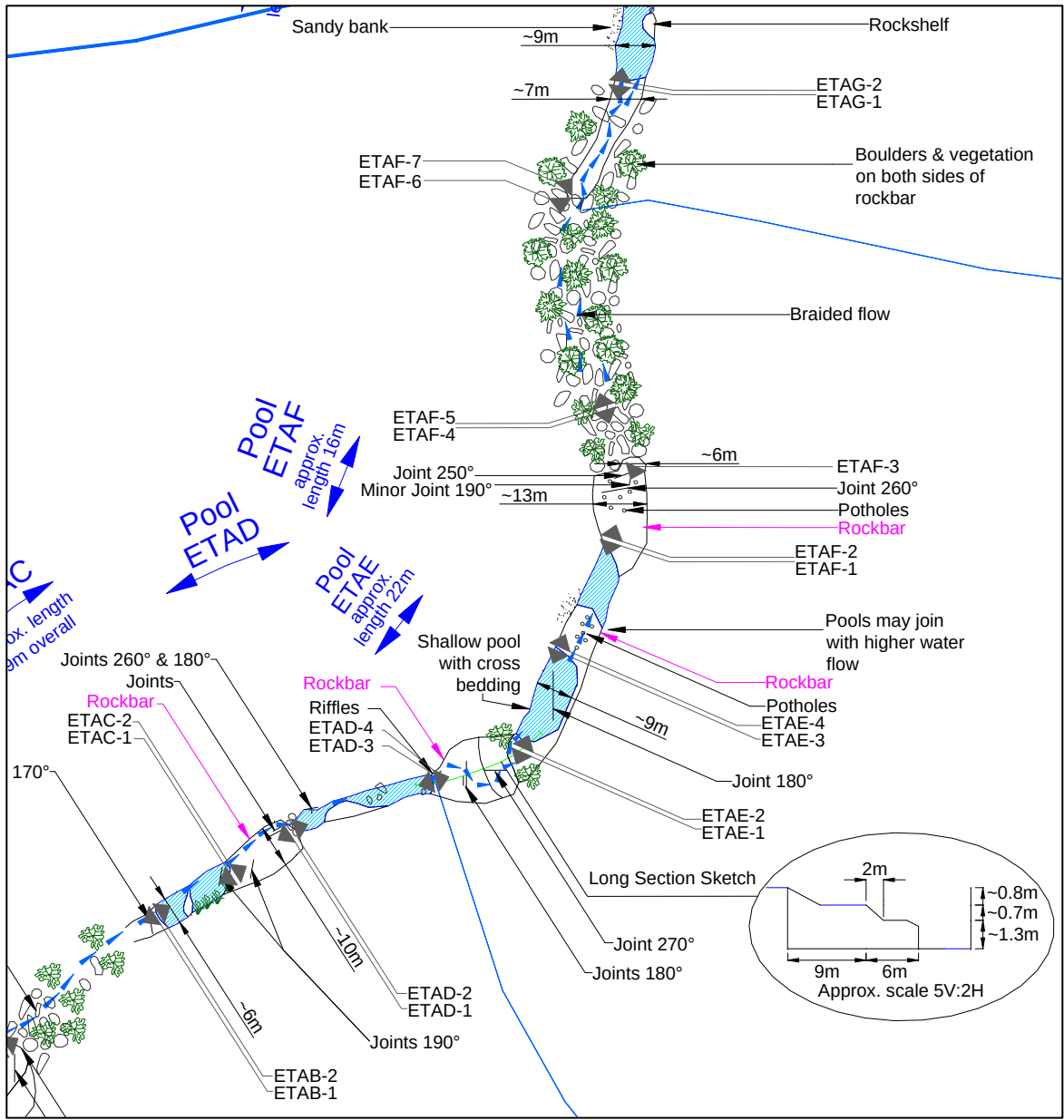


Photo Details

Photo ID	Easting	Northing	Bearing
ETAF-4	312214	6214693	162
ETAF-5	312214	6214693	342
ETAF-6	312204	6214742	180
ETAF-7	312204	6214742	40

POOL ETAG STREAM MAPPING SUMMARY



ETAG-1 Upstream end of Pool ETAG looking Upstream



ETAG-2 Upstream end of Pool ETAG looking Downstream



ETAG-3 Downstream end of Pool ETAG looking Upstream



ETAG-4 Downstream end of Pool ETAG looking Downstream

- Pool ETAG notes (as at 19 Dec 2008)
- Width varies from approximately 3m to 9m.
 - Water depth varies from approximately 0.1m to 1m.
 - Base of the pool is sandstone with alluvial deposits, mainly on the western side.
 - Boulders up to approximately 0.5m are present at the downstream eastern end of the pool.
 - Algae deposits present.
 - Water flows into a boulder field downstream of the pool. Boulders up to approximately 3m size.

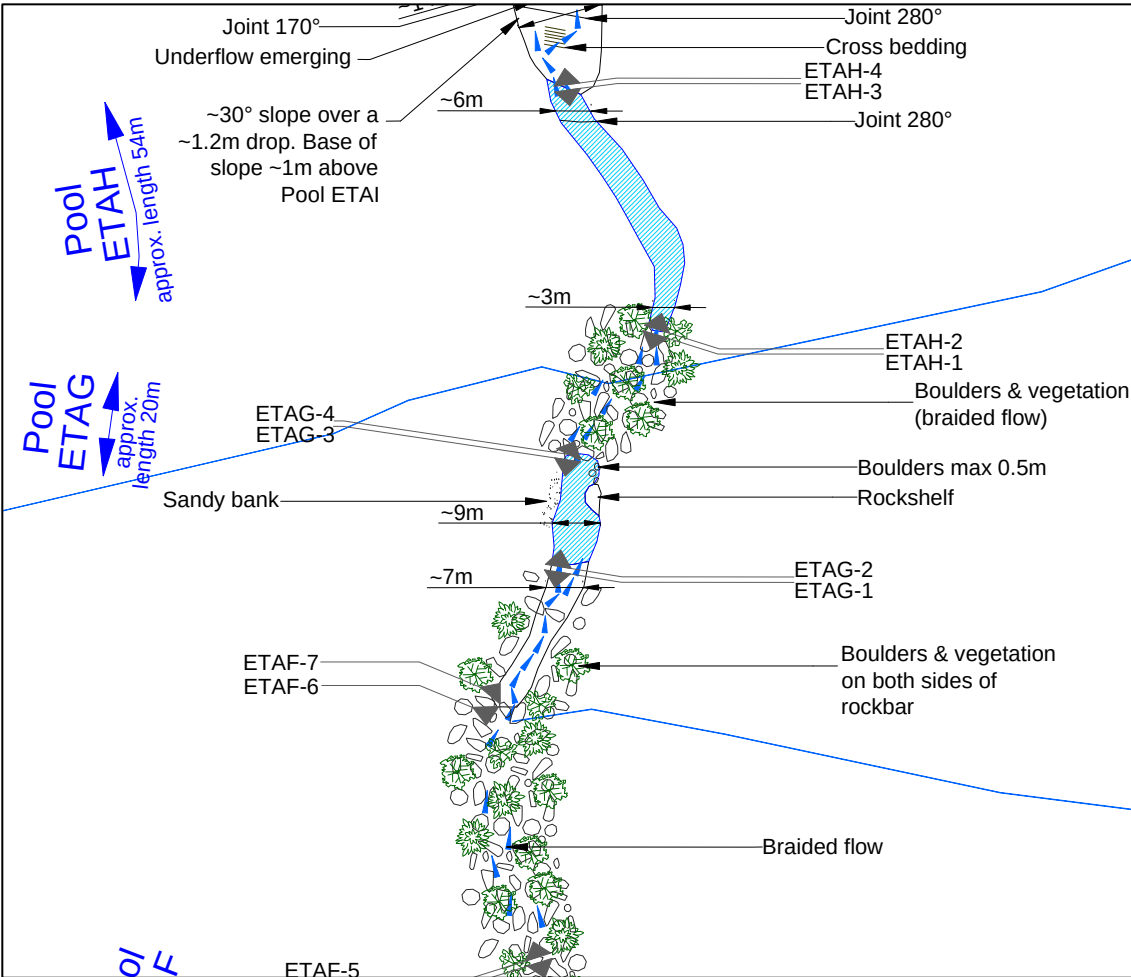


Photo Details			
Photo ID	Easting	Northing	Bearing
ETAG-1	312217	6214767	189
ETAG-2	312217	6214767	9
ETAG-3	312219	6214788	188
ETAG-4	312219	6214788	26

POOL ETAH STREAM MAPPING SUMMARY



ETAH-1 Upstream end of Pool ETAH looking Upstream



ETAH-2 Upstream end of Pool ETAH looking Downstream



ETAH-3 Downstream end of Pool ETAH looking Upstream



ETAH-4 Downstream end of Pool ETAH looking Downstream

Pool ETAH notes (as at 19 Dec 2008)

- Width varies from approximately 3m to 6m.
- Water depth varies from approximately 0.3m to 1.5m.
- Base of the pool is sandstone with alluvial deposits.
- Water depth is very shallow with some sandstone exposed over approximately 8m at the downstream end of the pool.
- Rockbar downstream of the pool is cross bedded.
- Water flows over most of the rockbar surface with some ponded areas and some underflow.
- Pool ETAI is more than 2m below Pool ETAH.

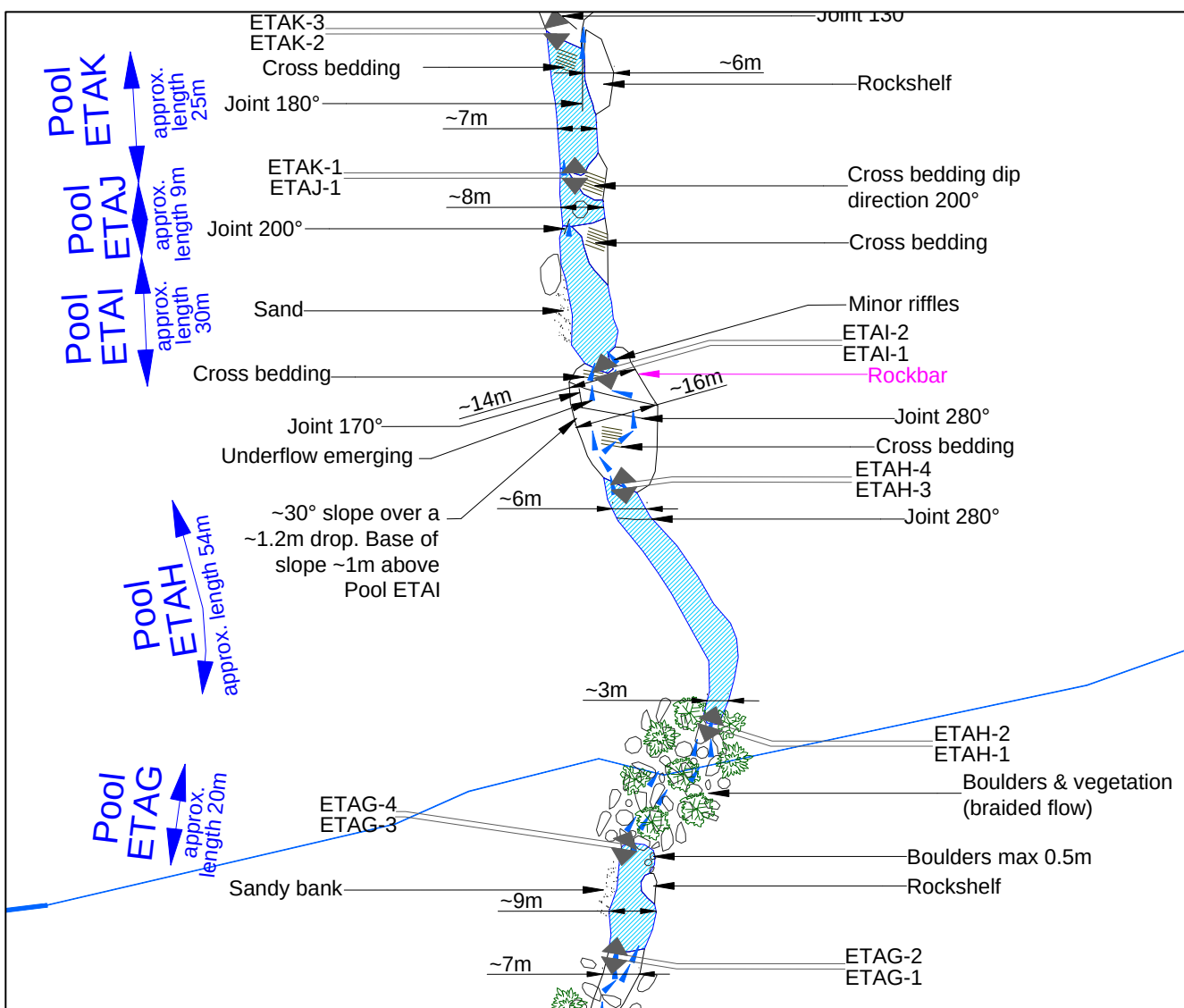


Photo Details

Photo ID	Easting	Northing	Bearing
ETAH-1	312236	6214812	197
ETAH-2	312236	6214812	17
ETAH-3	312220	6214859	172
ETAH-4	312220	6214859	352

POOLS ETAI & ETAJ STREAM MAPPING SUMMARY



ETAI-1 Upstream end of Pool ETAI looking Upstream



ETAI-2 Upstream end of Pool ETAI looking Downstream



ETAJ-1 Downstream end Pool ETAJ looking Upstream

Mine Subsidence Engineering Consultants
March 2009

Pools ETAI and ETAJ notes (as at 19 Dec 2008)

- Width varies from approximately 2m to 8m.
- Water depth varies from approximately 0.2m to 1m.
- Base of the pool is sandstone with alluvial deposits and scattered boulders.
- Large sand bank present on the western side of the pool.
- Sandstone is cross bedded.
- Only small rockbars separate Pools ETAI, AJ and AK. Pools may join to become one large pool with higher water levels.

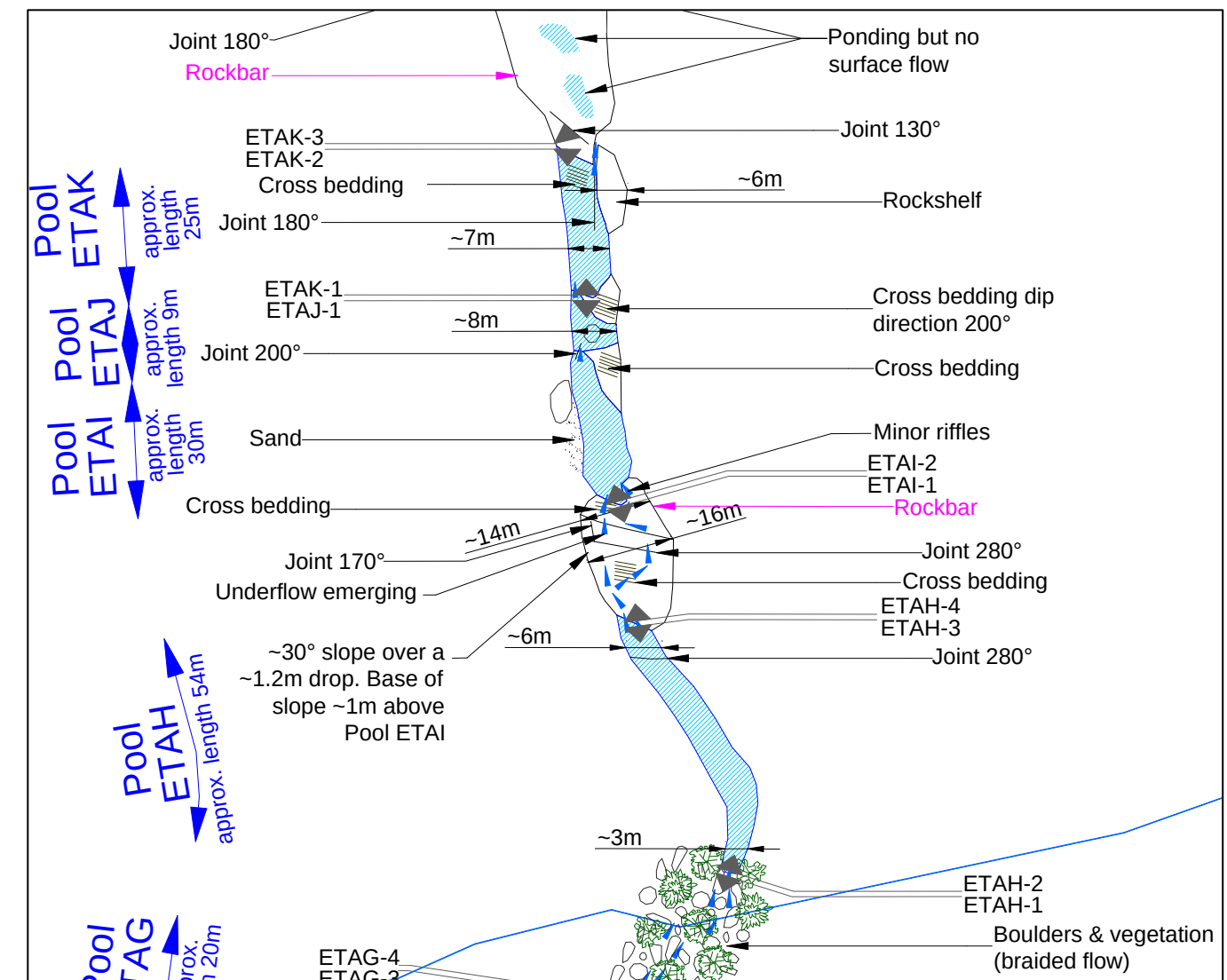


Photo Details

Photo ID	Easting	Northing	Bearing
ETAI-1	312216	621481	164
ETAI-2	312216	621481	344
ETAJ-1	312210	6214919	180

Metropolitan Colliery
Eastern Tributary Stream Mapping

POOL ETAK STREAM MAPPING SUMMARY



ETAK-1 Upstream end of Pool ETAK looking Downstream



ETAK-2 Downstream end of Pool ETAK looking Upstream



ETAK-3 Downstream end Pool ETAK looking Downstream

Mine Subsidence Engineering Consultants
March 2009

Pool ETAK notes (as at 19 Dec 2008)

- Width varies from approximately 4m to 7m.
- Water depth varies from approximately 0.2m to 0.5m.
- Base of the pool is sandstone with minor alluvial deposits.
- Sandstone is cross bedded and weathered.
- Rockbar downstream of Pool ETAK has several small pools/ponded areas but no surface flow observed.
- Maximum width of rockbar is approximately 21m.

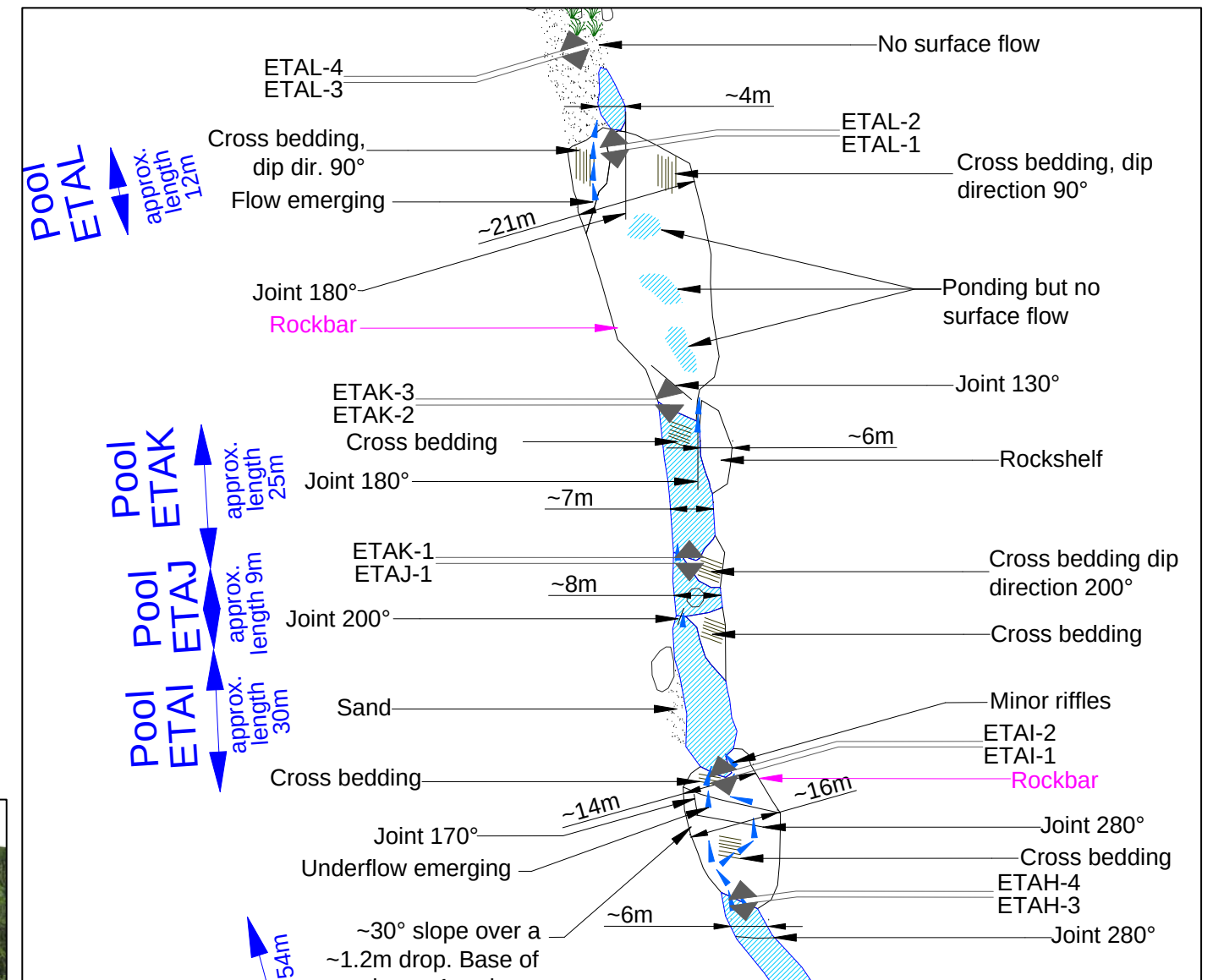


Photo Details

Photo ID	Easting	Northing	Bearing
ETAK-1	312210	6214919	0
ETAK-2	312207	6214948	180
ETAK-3	312207	6214948	347

Metropolitan Colliery
Eastern Tributary Stream Mapping

POOL ETAL STREAM MAPPING SUMMARY



ETAL-1 Upstream end of Pool ETAL looking Upstream



ETAL-2 Upstream end of Pool ETAL looking Downstream



ETAL-3 Downstream end of Pool ETAL looking Upstream



ETAL-4 Downstream end of Pool ETAL looking Downstream

Pool ETAL notes (as at 19 Dec 2008)

- Pool ETAL is approximately 1.5m below the upstream rockbar.
- Width varies from approximately 2m to 4m. Length is approximately 12m.
- Water depth varies from approximately 0.1m to 0.8m.
- Base of the pool is sandstone with alluvial deposits.
- Large alluvial deposits on the western and downstream sides of the pool.
- Algae present in the pool.
- No surface flow observed downstream of the pool.
- Flow emerges approximately 30m downstream of the pool from a small boulder field onto exposed sandstone.

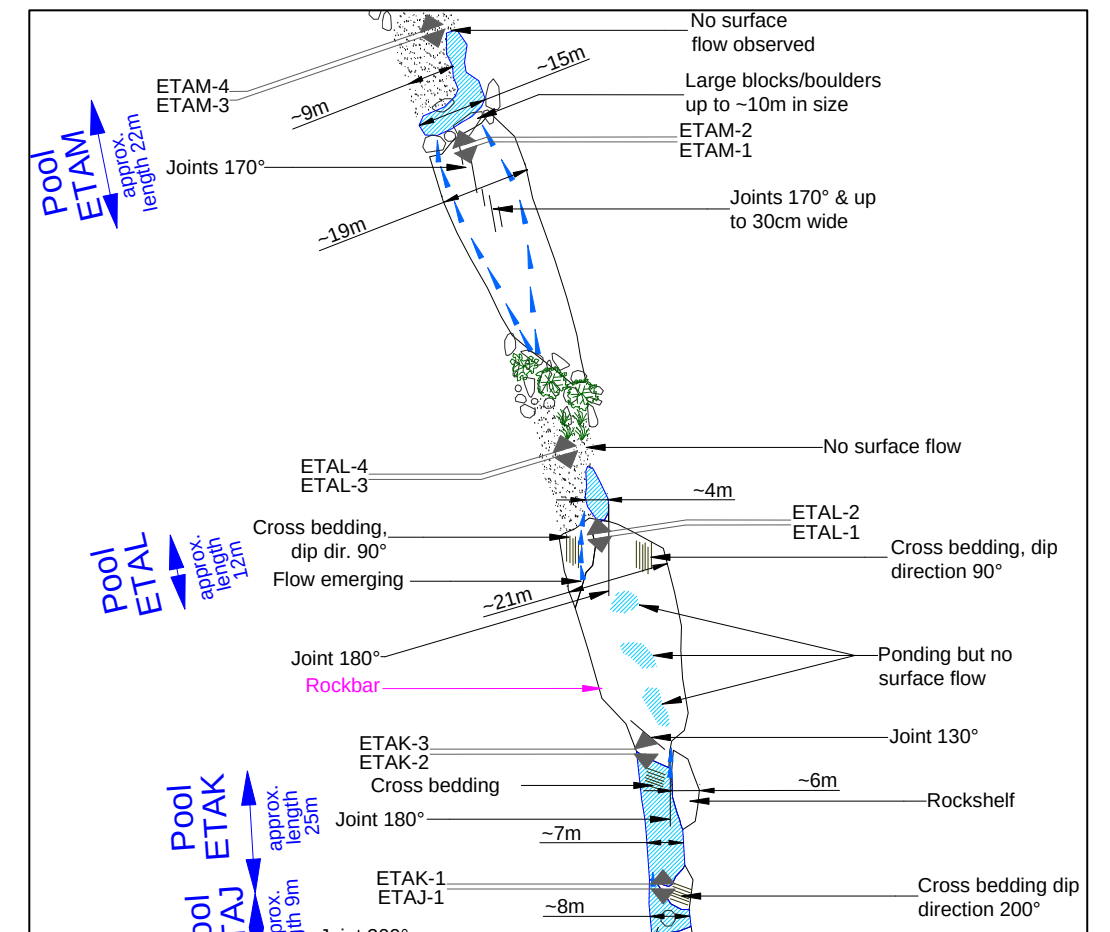


Photo Details

Photo ID	Easting	Northing	Bearing
ETAL-1	312197	6214992	171
ETAL-2	312197	6214992	351
ETAL-3	312190	6215010	163
ETAL-4	312190	6215010	343

POOL ETAM STREAM MAPPING SUMMARY



ETAM-1 Upstream end of Pool ETAM looking Upstream



ETAM-2 Upstream end of Pool ETAM looking Downstream



ETAM-3 Downstream end of Pool ETAM looking Upstream



ETAM-4 Downstream end of Pool ETAM looking Downstream

- Pool ETAM notes (as at 19 Dec 2008)
- Pool ETAM is approximately 3m below the upstream rockbar.
 - Width varies from approximately 15m at the upstream end to 2m at the downstream end.
 - Water depth varies up to approximately 0.8m
 - Base of the pool is alluvial deposit.
 - There is a large alluvial deposit on the west bank approximately 9m wide and 25m long.
 - Cross bedding present in exposed sandstone.
 - Large detached blocks/boulders are present at the upstream end of the pool.
 - No surface flow observed downstream of the pool.
 - Alluvial deposits present on the downstream side of the pool then boulder field.

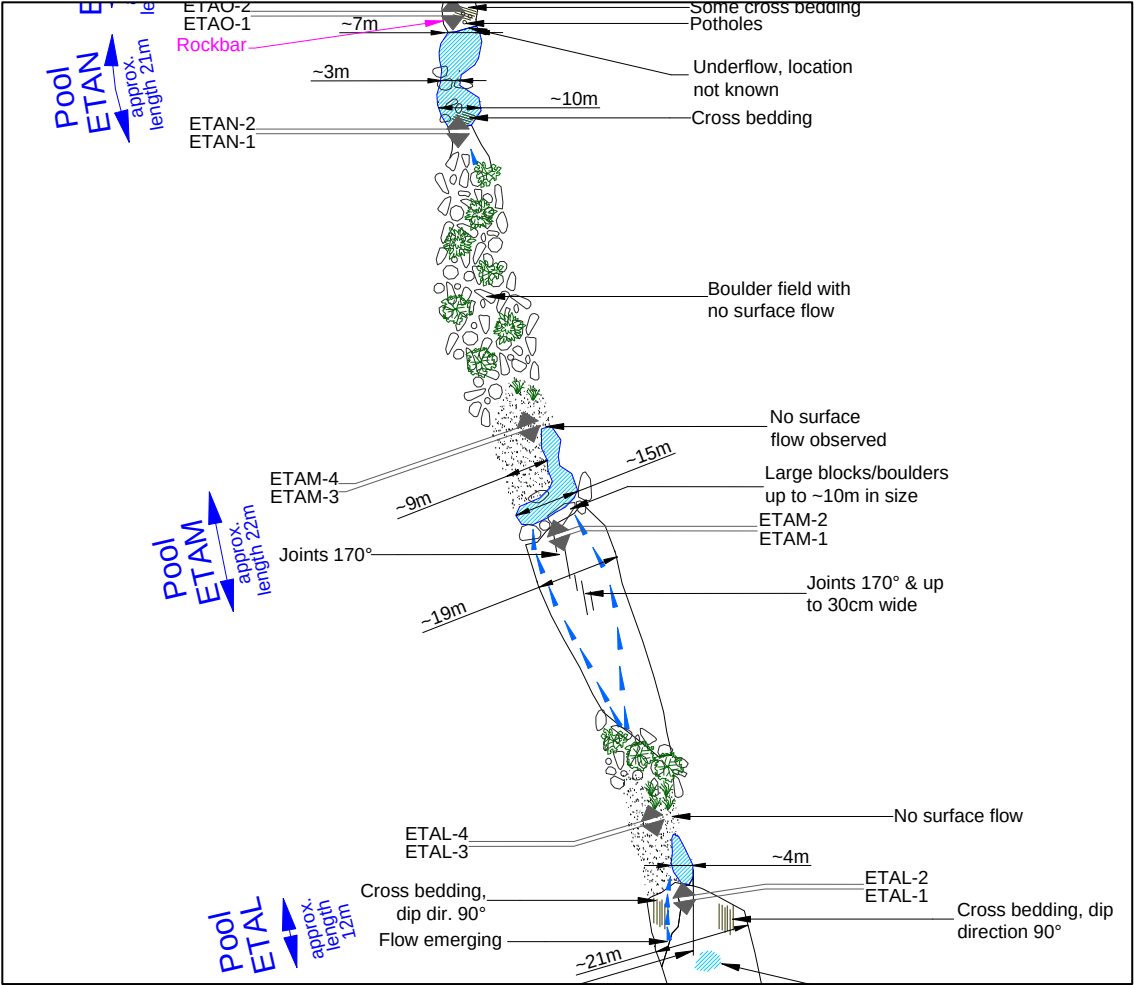


Photo Details

Photo ID	Easting	Northing	Bearing
ETAM-1	312169	6215073	161
ETAM-2	312169	6215073	341
ETAM-3	312162	6215098	161
ETAM-4	312162	6215098	341

POOLS ETAN & ETAO STREAM MAPPING SUMMARY



ETAN-1 Upstream end of Pool ETAN looking Upstream



ETAN-2 Upstream end of Pool ETAN looking Downstream



ETAO-1 Upstream end of Pool ETAO looking Upstream



ETAO-2 Upstream end of Pool ETAO looking Downstream

- Pools ETAN and ETAO notes (as at 19 Dec 2008)
- Widths vary from approximately 3m to 7m.
 - Water depth varies up to 0.9m.
 - Base of the pool is sandstone with alluvial deposits and scattered boulders up to approximately 4m size.
 - Rockbar separating Pool ETAN and ETAO is approximately 7m wide and 7m long. Some cross bedding and potholes are present in the rockbar.
 - Water flows around the eastern side of the rockbar downstream of Pool ETAO.

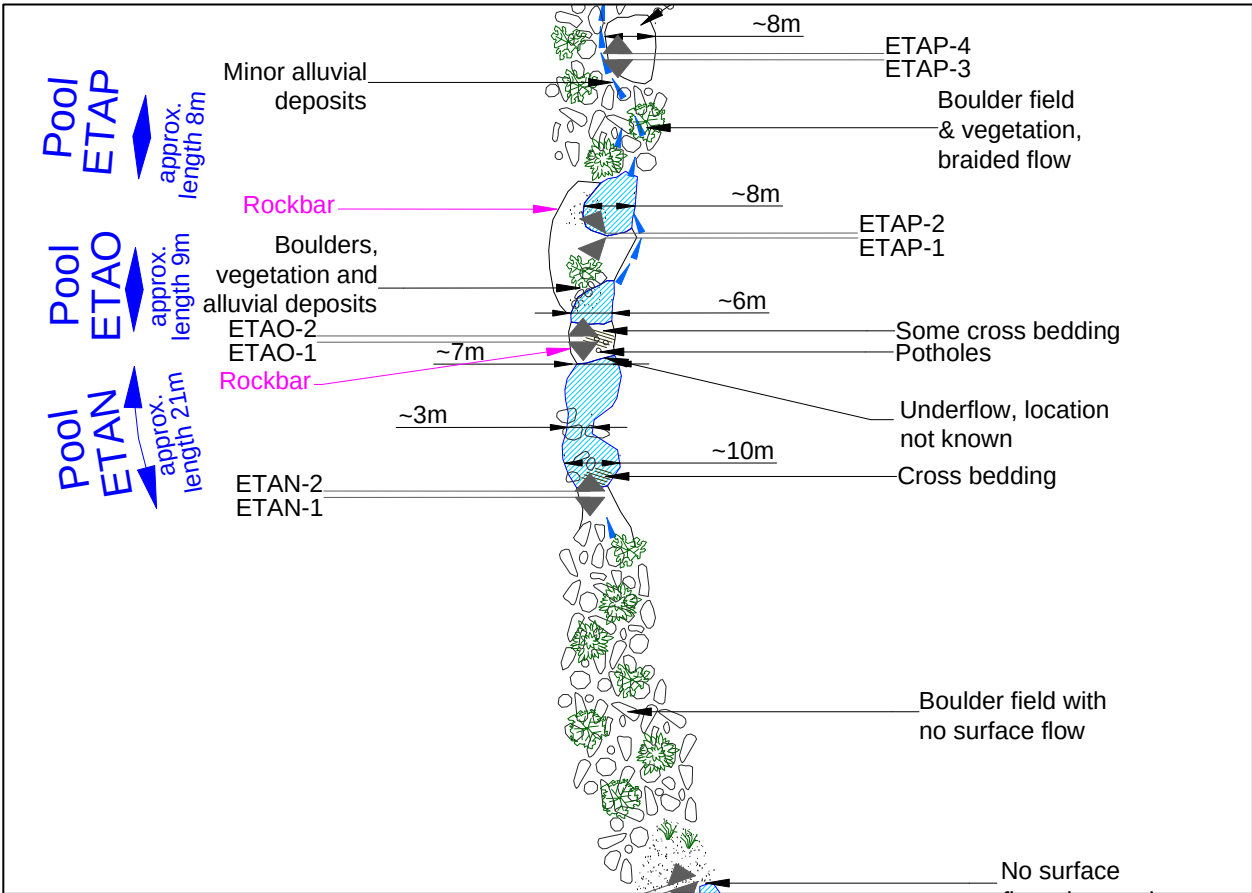


Photo Details			
Photo ID	Easting	Northing	Bearing
ETAN-1	312146	6215164	180
ETAN-2	312146	6215164	0
ETAO-1	312145	6215190	180
ETAO-2	312145	6215190	0

POOL ETAP STREAM MAPPING SUMMARY



ETAP-1 Upstream end of Pool ETAP looking Upstream



ETAP-3 Braided flow Downstream of Pool ETAP looking Upstream



ETAP-2 Upstream end of Pool ETAP looking Downstream



ETAP-4 Sandstone Downstream of Pool ETAP looking Downstream



ETAP-5 Sandstone Downstream of Pool ETAP looking Downstream



ETAP-6 Sandstone Downstream of Pool ETAP looking Upstream



ETAP-7 Sandstone Downstream of Pool ETAP looking downstream

Pool ETAP notes (as at 19 Dec 2008)

- Pool width is approximately 6m and length is approximately 8m.
- Average water depth is approximately 0.6m.
- Base of the pool is sandstone with alluvial deposits, mainly on the western half of the pool and scattered small boulders.
- Stream becomes braided flow through boulder field downstream of the pool. Some sandstone bedrock is exposed in the boulder field.
- End of the boulder field is approximately 60m downstream of the pool where flow continues along western side of exposed sandstone.

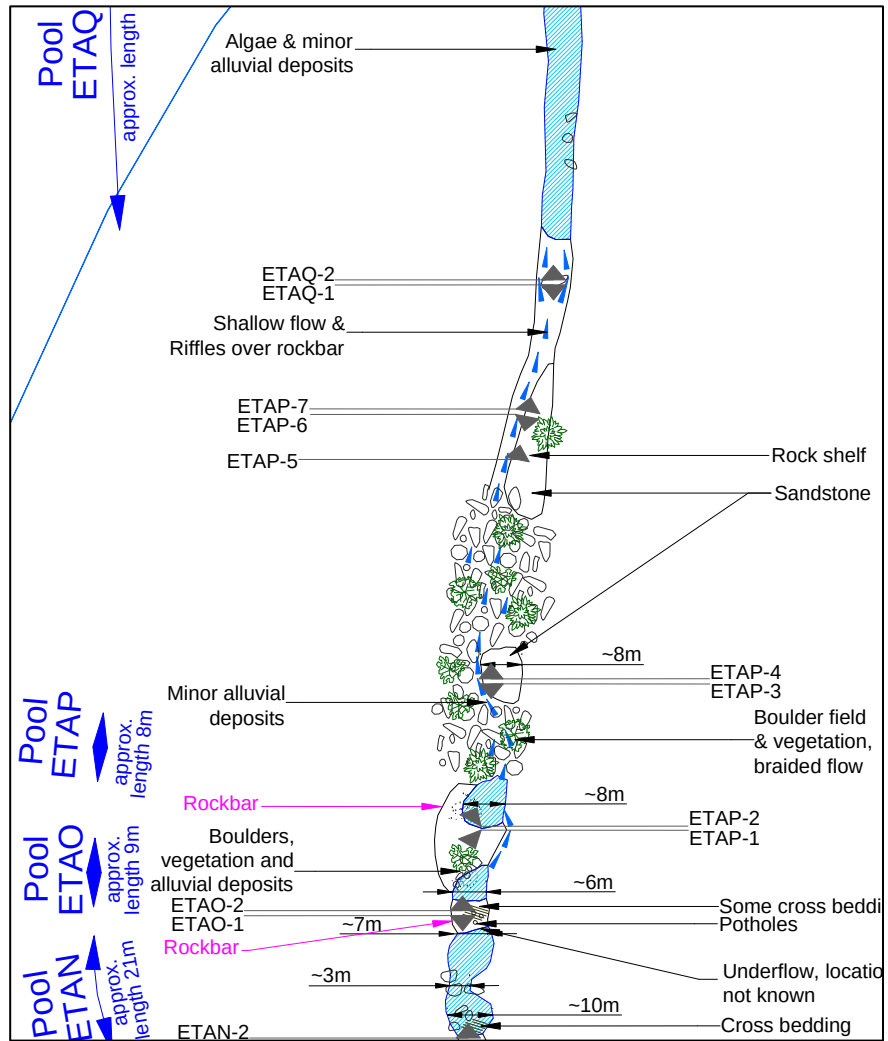


Photo Details

Photo ID	Easting	Northing	Bearing
ETAP-1	312148	6215208	159
ETAP-2	312148	6215208	29
ETAP-3	312151	6215238	180
ETAP-4	312151	6215238	0
ETAP-5	312156	6215283	11
ETAP-6	312158	6215293	191
ETAP-7	312158	6215293	11

POOL ETAQ STREAM MAPPING SUMMARY



ETAQ-1 Upstream end of Pool ETAQ looking Upstream



ETAQ-2 Upstream end of Pool ETAQ looking Downstream



ETAQ-5 Waterfall Downstream of Pool ETAQ

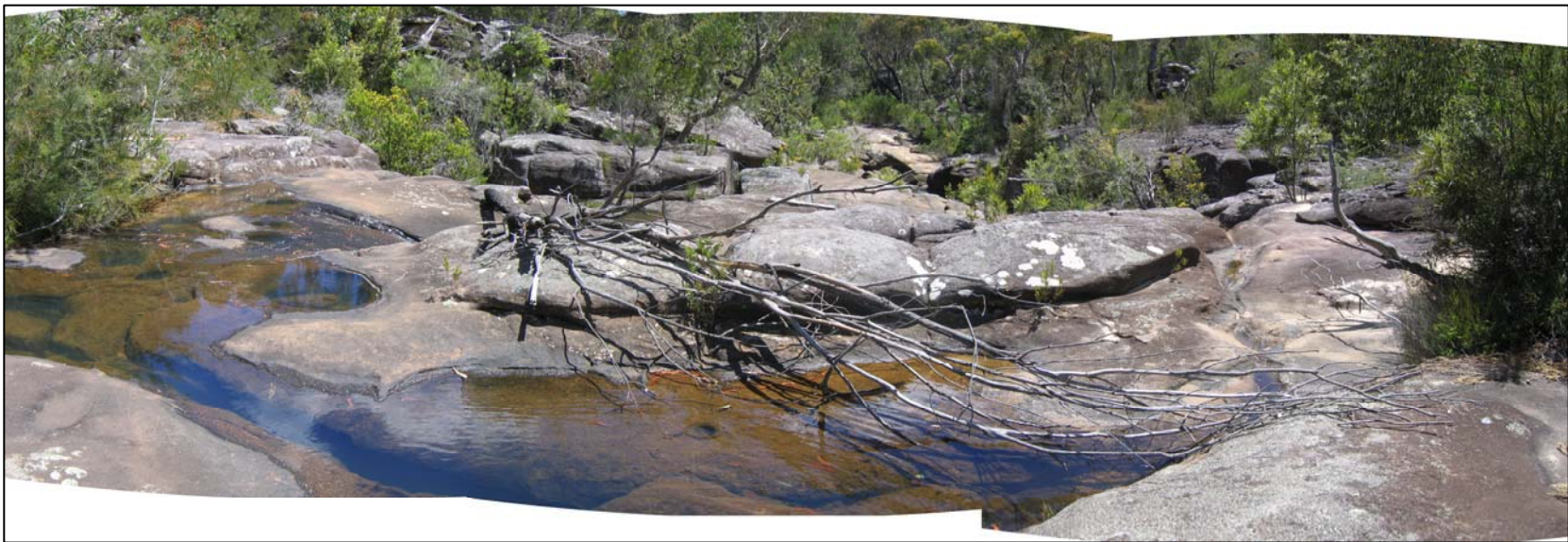
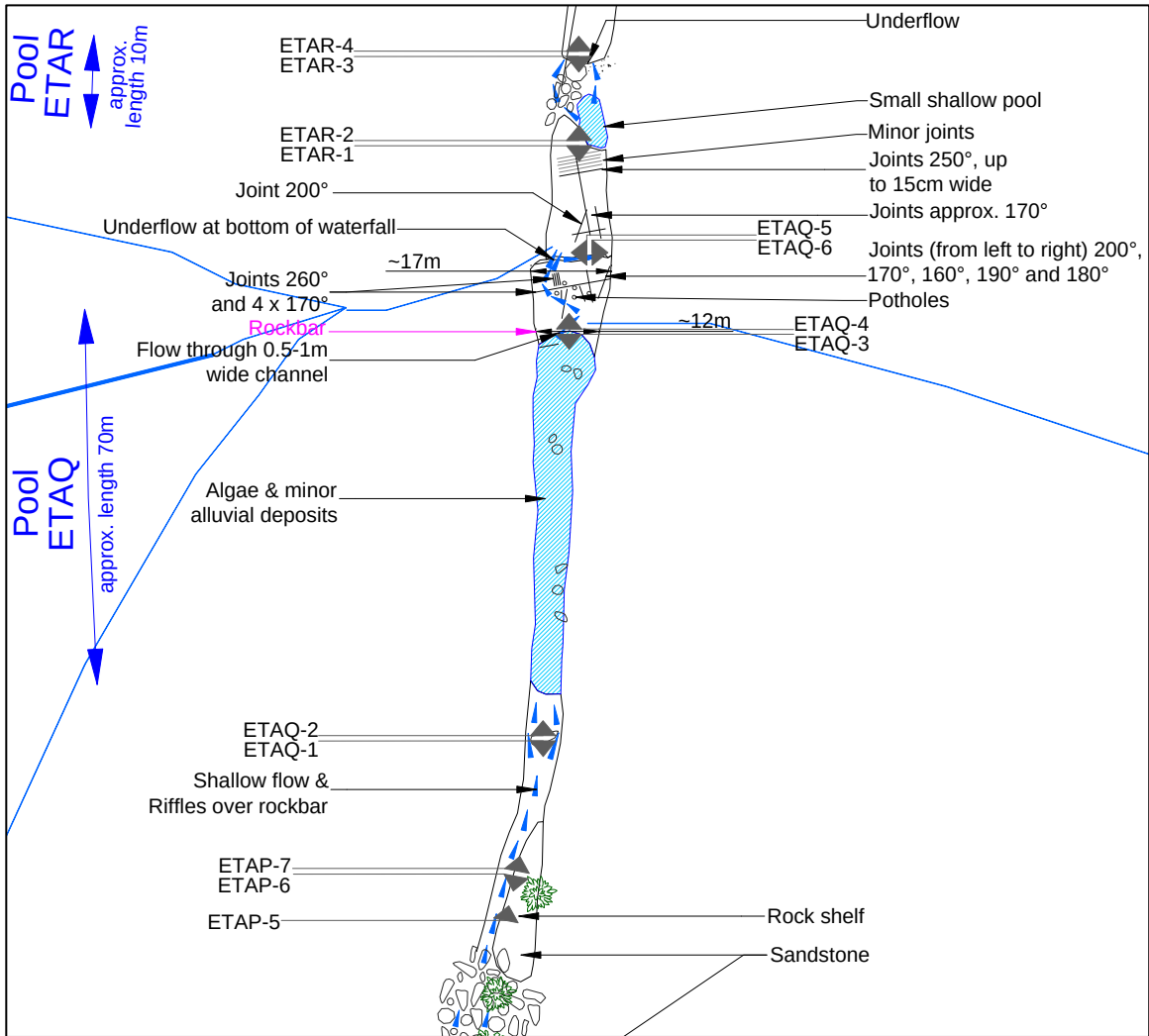
- Pool ETAQ notes (as at 19 Dec 2008)
- Width varies from approximately 6m to 12m.
 - Water depth varies from approximately 0.1m to 1m.
 - Base of the pool is sandstone with alluvial deposits and some boulders up to approximately 2m size.
 - Rockbar downstream of the pool varies from approximately 12m to 17m wide. Cross bedding present in the rockbar.
 - Water flows from the pool in a channel 0.5m to 1m wide and up to 1m deep. Potholes present around the channel. Water continues as underflow from the channel and emerges near a waterfall.
 - The top of the waterfall is approximately 15m downstream of Pool ETAQ and is approximately 1m below the pool level. The waterfall is approximately 3m high.
 - Water ponds at the base of the waterfall, then continues as underflow and some minor surface flow.



ETAQ-3 Downstream end of Pool ETAQ looking Upstream



ETAQ-6 Underflow toward Eastern bank at Waterfall



ETAQ-4 Downstream end of Pool ETAQ looking Downstream

Photo Details			
Photo ID	Easting	Northing	Bearing
ETAQ-1	312164	6215320	180
ETAQ-2	312164	6215320	0
ETAQ-3	312169	6215401	180
ETAQ-4	312169	6215401	0
ETAQ-5	312173	6215418	270
ETAQ-6	312173	6215418	90

POOL ETAR STREAM MAPPING SUMMARY



ETAR-1 Upstream end of Pool ETAR looking Upstream



ETAR-4 Downstream of Pool ETAR looking Downstream



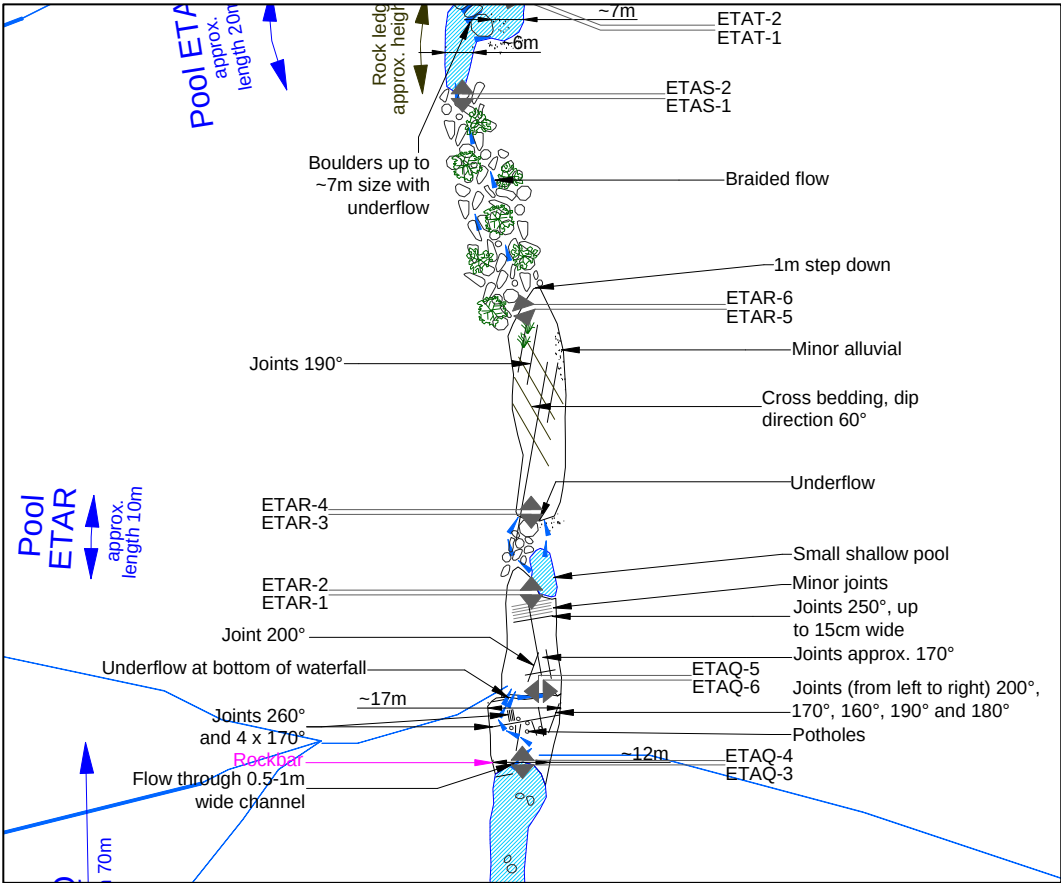
ETAR-2 Upstream end of Pool ETAR looking Downstream



ETAR-6 Downstream end of rockbar looking Downstream

Pool ETAR notes (as at 19 Dec 2008)

- Width is approximately 5m.
- Water depth varies up to approximately 0.4m.
- Base of the pool is sandstone with minor alluvial deposits and cobbles and boulders up to approximately 5m size.
- Rockbar downstream of the pool has cross bedding and joints.
- No surface flow observed over the rockbar.
- Water flow continues through boulder field which starts approximately midway between Pools ETAR and ETAS.



ETAR-3 Downstream end of Pool ETAR looking Upstream



ETAR-5 Downstream end of rockbar Downstream of Pool ETAR looking Upstream (camera error)

Photo Details

Photo ID	Easting	Northing	Bearing
ETAR-1	312171	6215439	180
ETAR-2	312171	6215439	0
ETAR-3	312171	6215457	180
ETAR-4	312171	6215457	0
ETAR-5	312169	6215502	160
ETAR-6	312169	6215502	342

POOLS ETAS & ETAT STREAM MAPPING SUMMARY



ETAS-1 Upstream end of Pool ETAS looking Upstream



ETAS-2 Upstream end of Pool ETAS looking Downstream



ETAT-1 Downstream end of Pool ETAT looking Upstream



ETAT-2 Downstream end of Pool ETAT looking Downstream



ETAT-3 On rockbar Downstream of Pool ETAT looking Upstream



ETAT-4 On rockbar Downstream of Pool ETAT looking Downstream

Pools ETAS and ETAT notes (as at 19 Dec 2008)

- Width varies from approximately 2m to 7m.
- Water depth varies from approximately 0.1m to 1.5m.
- Base of the pools is sandstone with alluvial deposits and boulders up to approximately 5m size.
- Separation between Pools ETAS and ETAT appears to be mainly detached block and boulders.
- Water level in both pools appears to be similar.
- Rockbar downstream of Pool ETAT is cross bedded and mostly covered with water.
- Pool ETAU approximately the same level as Pool ETAT.

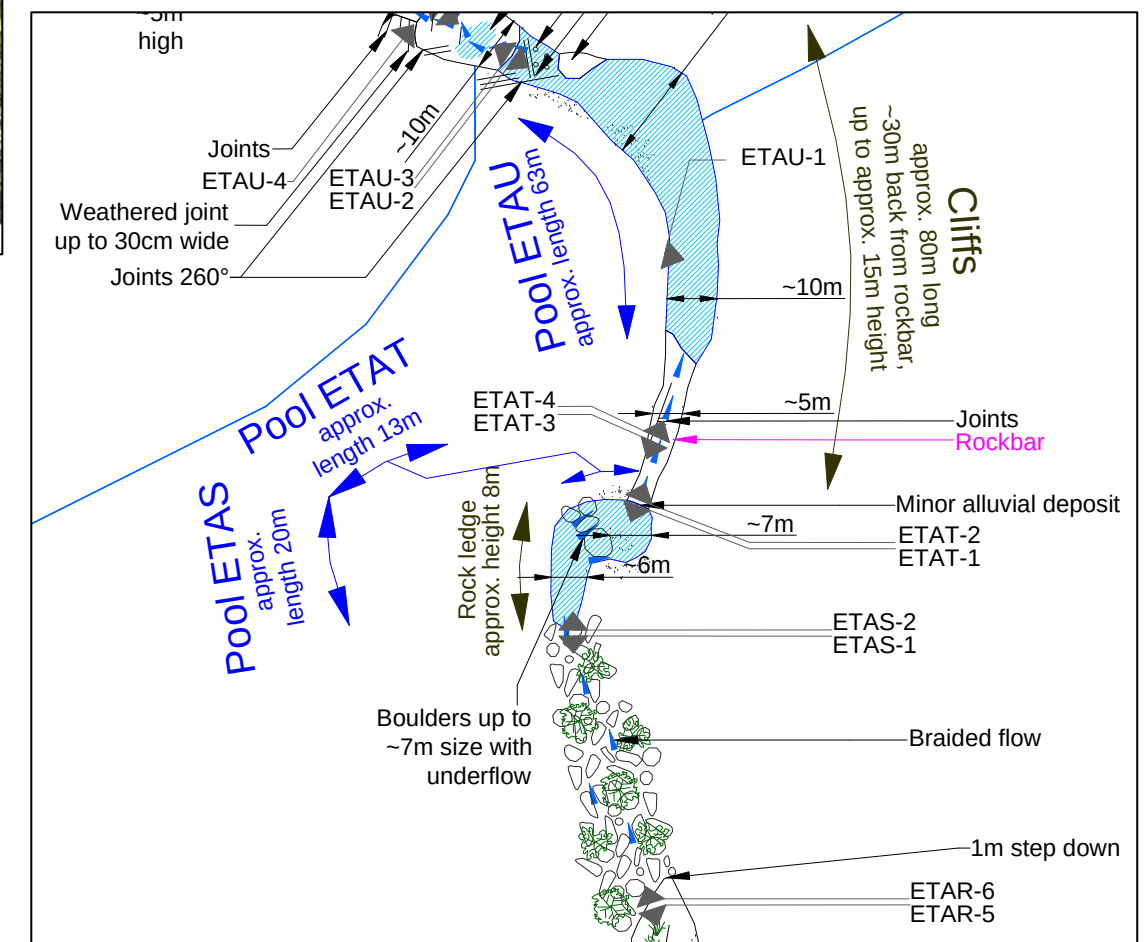


Photo Details

Photo ID	Easting	Northing	Bearing
ETAS-1	312156	6215549	180
ETAS-2	312156	6215549	0
ETAT-1	312166	6215572	201
ETAT-2	312166	6215572	21
ETAT-3	312170	6215583	204
ETAT-4	312170	6215583	24

POOL ETAU STREAM MAPPING SUMMARY



ETAU-1 Mid point of Pool ETAU looking toward the Eastern bank



ETAU-2 Downstream end of Pool ETAU looking Upstream



ETAU-3 Downstream end of Pool ETAU looking Downstream

Pool ETAU notes (as at 19 Dec 2008)

- Width varies from approximately 10m to 17m.
- Water depth varies from approximately 0.3m to 1.5m.
- Base of the pool is sandstone with alluvial deposits.
- Cross bedding present.
- Rockbar downstream of the pool has cross bedding and ponded water on surface.
- A waterfall approximately 5m high is located approximately 17m downstream of Pool ETAU.

(Notes continued on second sheet)

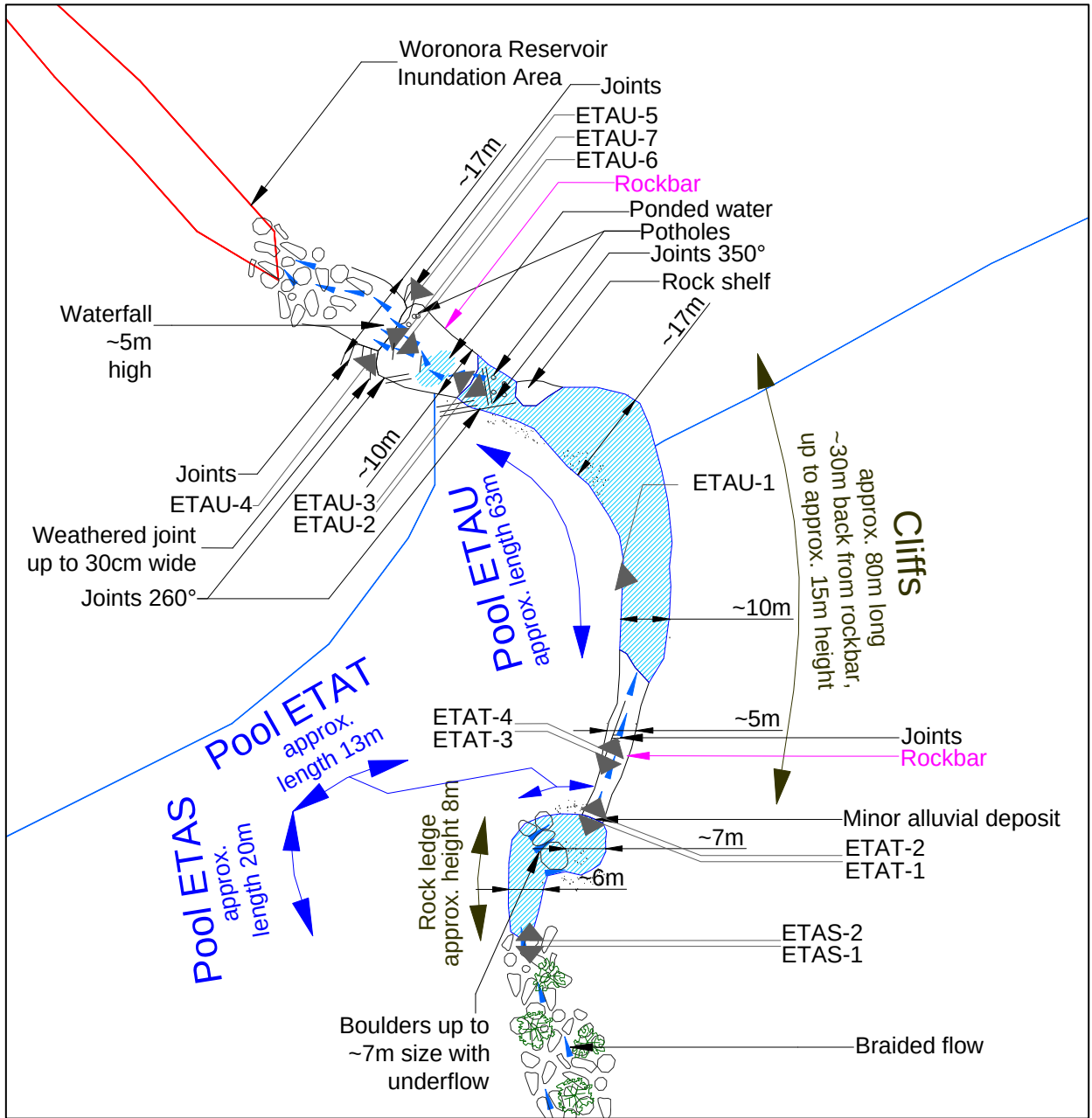


Photo Details

Photo ID	Easting	Northing	Bearing
ETAU-1	312174	6215615	104
ETAU-2	312145	6215650	123
ETAU-3	312145	6215650	303

POOL ETAU DOWNSTREAM MAPPING SUMMARY



Pool ETAU Downstream notes (as at 19 Dec 2008)

- Waterfall is approximately 5m high.
- Several large detached blocks present on both banks downstream of the waterfall.
- Flow continues along the eastern side from the base of the waterfall into the inundation area of Woronora Reservoir.

ETAU-4 Looking toward Eastern bank at waterfall Downstream of Pool ETAU

ETAU-5 Looking toward Western bank at waterfall Downstream of Pool ETAU



ETAU-6 On waterfall Downstream of Pool ETAU looking Upstream



ETAU-7 On waterfall Downstream of Pool ETAU looking Downstream

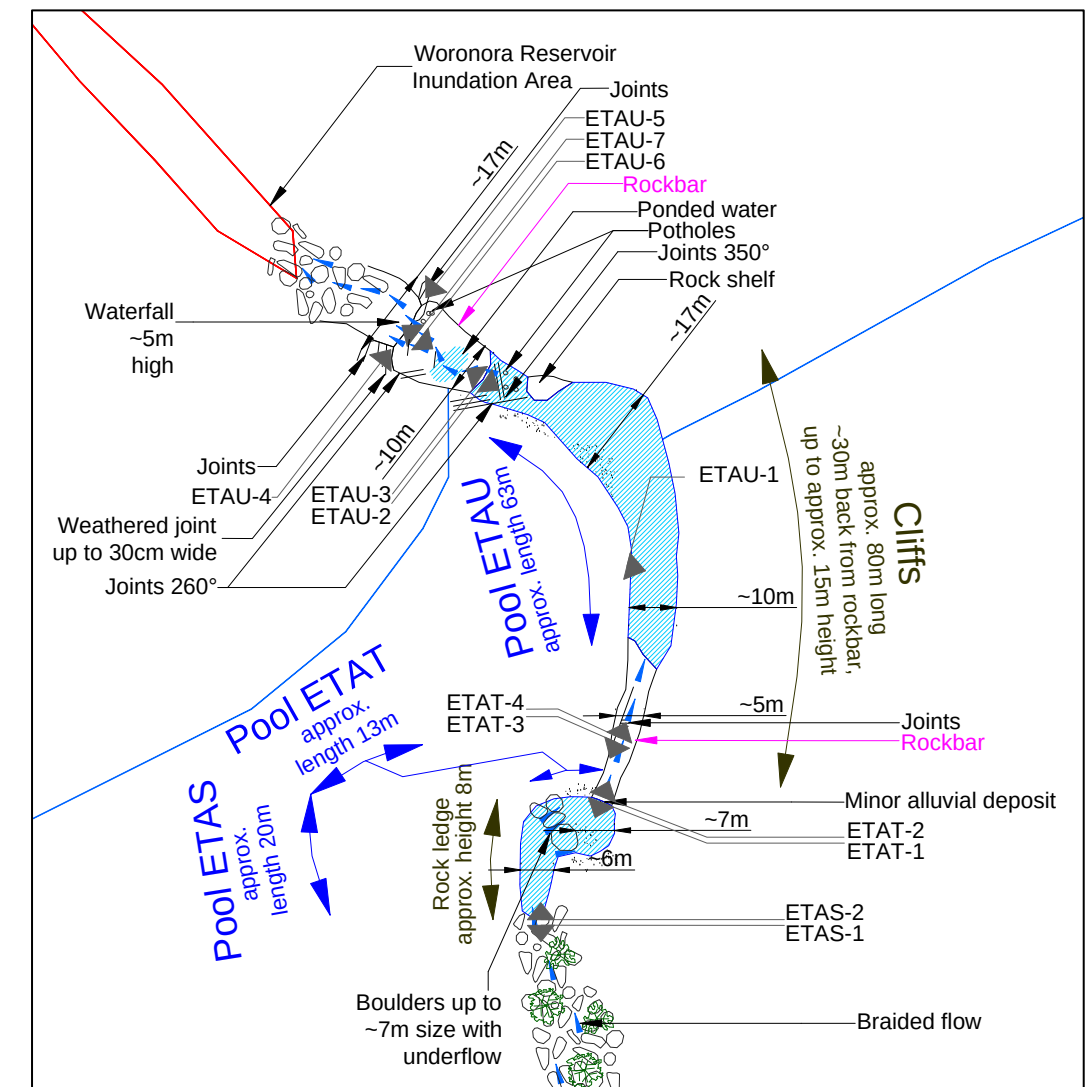


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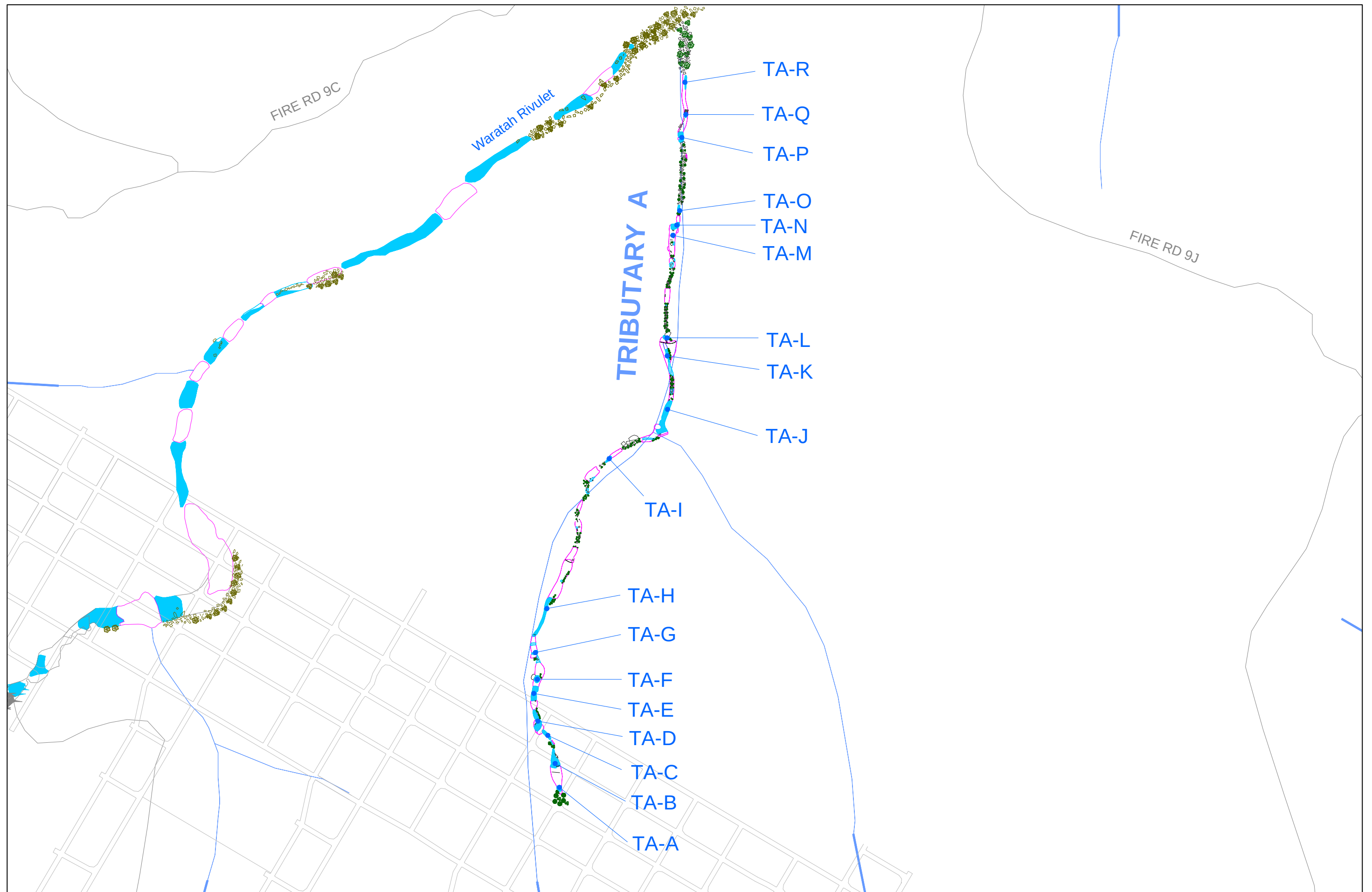
Photo ID	Easting	Northing	Bearing
ETAU-4	312128	6215655	18
ETAU-5	312134	6215665	218
ETAU-6	312133	6215658	127
ETAU-7	312133	6215658	307

APPENDIX 3

TRIBUTARY A STREAM MAPPING AND PHOTOGRAPHIC RECORD

Metropolitan Coal – Water Management Plan		
Revision No. WMP-R01-A		
Document ID: Water Management Plan		

TRIBUTARY A – GENERAL LAYOUT



TRIBUTARY A STREAM MAPPING SUMMARY



TA01-1 Downstream end of Pool TA-A looking Upstream



TA01-2 Downstream end of Pool TA-A looking Downstream

Notes (as at 5 January 2010)

- Pool TA-A approximately 5m long, 5m wide and 0.3m deep
- Base of the pool is sandstone
- Rockbar upstream of the pool is approximately 3m wide with scattered vegetation debris
- Rockbar downstream of the pool is approximately 10m wide and 17m long, with many joints and cross bedding at the downstream end
- Flow path along the eastern side of the rockbar toward Pool TA-B

- Pool TA-B approximately 15m long, 8m wide and 0.5m deep
- Base of the pool is sandstone with scattered boulders



TA02-1 Upstream end of Pool TA-B looking Upstream



TA02-2 Upstream end of Pool TA-B looking Downstream



TA02-3 Joint across rockbar between Pools TA-A and TA-B

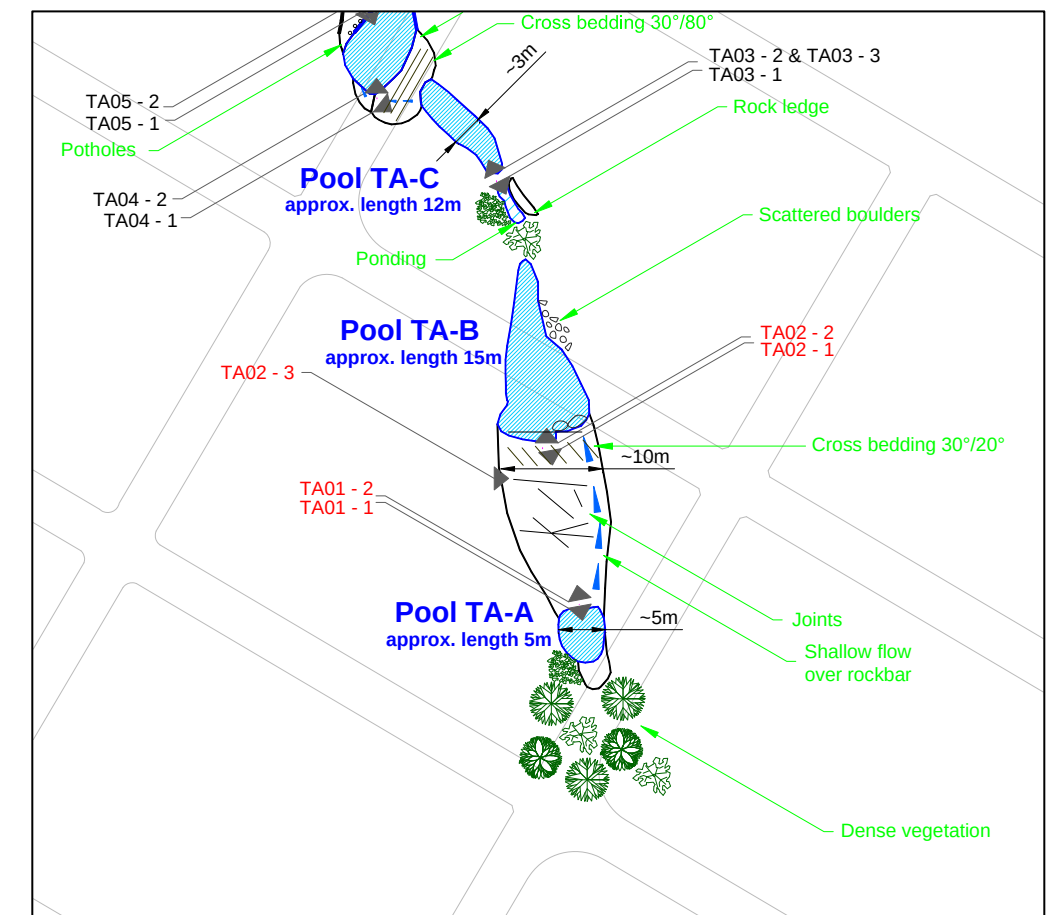


Photo Details

Photo ID	Easting	Northing	Bearing
TA01-1	310238	6214098	170
TA01-2	310238	6214098	350
TA02-1	310234	6214115	170
TA02-2	310234	6214115	0
TA02-3	310234	6214115	90

TRIBUTARY A STREAM MAPPING SUMMARY



TA03-1 Upstream end of Pool TA-C looking Upstream



TA03-2 and TA03-3 Upstream end of Pool TA-C looking Downstream



TA04-1 Upstream end of Pool TA-D looking Upstream



TA04-2 Upstream end of Pool TA-D looking Downstream

Notes (as at 5 January 2010)

- Pool TA-C approximately 12m long, 3m wide and 0.2m deep
- Base of the pool is sandstone
- Ponding and vegetation upstream of pool
- Flow path along western side of rockbar toward Pool TA-D

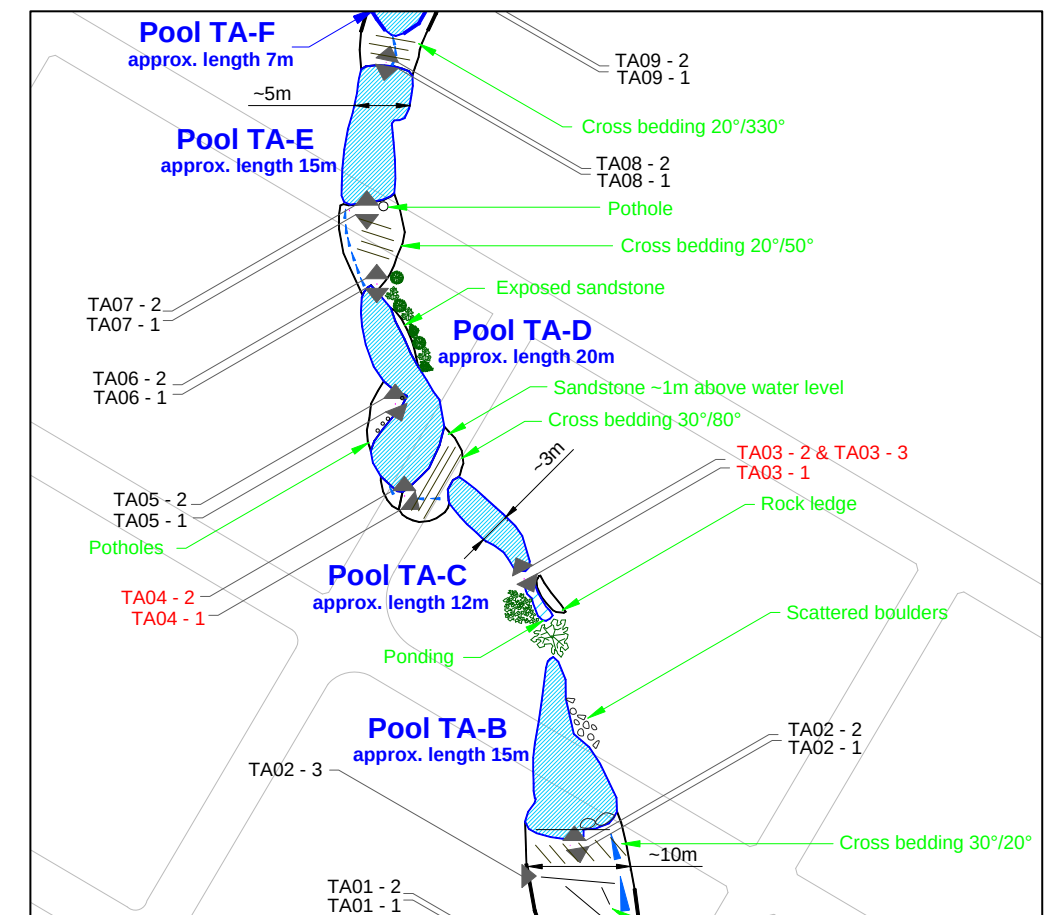


Photo Details

Photo ID	Easting	Northing	Bearing
TA03-1	310229	6214144	155
TA03-2	310229	6214144	335
TA03-3	310229	6214144	335
TA04-1	310216	6214153	130
TA04-2	310216	6214153	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA05-1 Midway along Pool TA-D looking Upstream



TA05-2 Midway along Pool TA-D looking Downstream



TA06-1 Downstream end of Pool TA-D looking Upstream



TA06-2 Downstream end of Pool TA-D looking Downstream

Notes (as at 5 January 2010)

- Pool TA-D approximately 20m long, up to 9m wide and up to 1m deep at the upstream end
- Base of the pool is sandstone
- Sandstone ledge upstream of pool is approximately 1m above water level

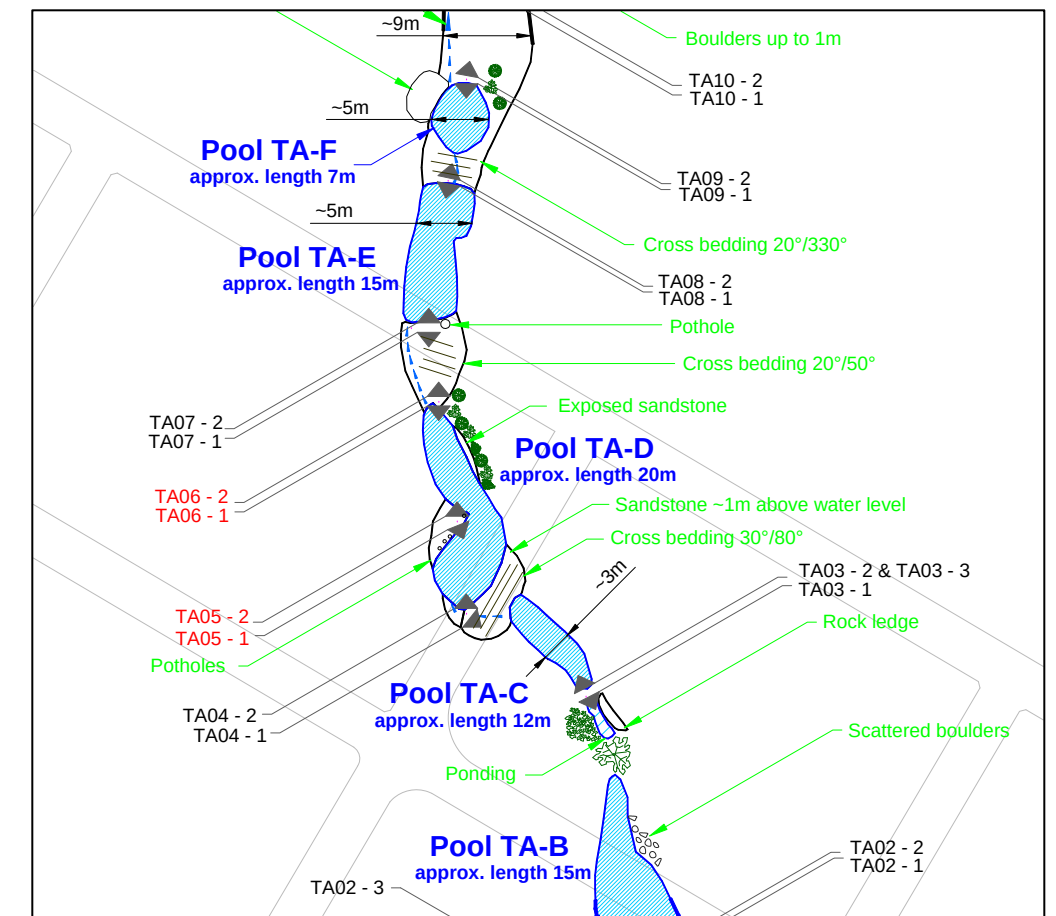


Photo Details

Photo ID	Easting	Northing	Bearing
TA05-1	310215	6214163	160
TA05-2	310215	6214163	0
TA06-1	310213	6214176	180
TA06-2	310213	6214176	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA07-1 Upstream end of Pool TA-E looking Upstream



TA07-2 Upstream end of Pool TA-E looking Downstream

Notes (as at 5 January 2010)

- Pool TA-E approximately 15m long, 3 to 5m wide and 0.6m deep
- Base of the pool is sandstone
- Rockbar upstream of the pool is approximately 7m wide with cross bedding
- Flow path along western side of rockbar toward Pool TA-E



TA08-1 Downstream end of Pool TA-E looking Upstream



TA08-2 Downstream end of Pool TA-E looking Downstream

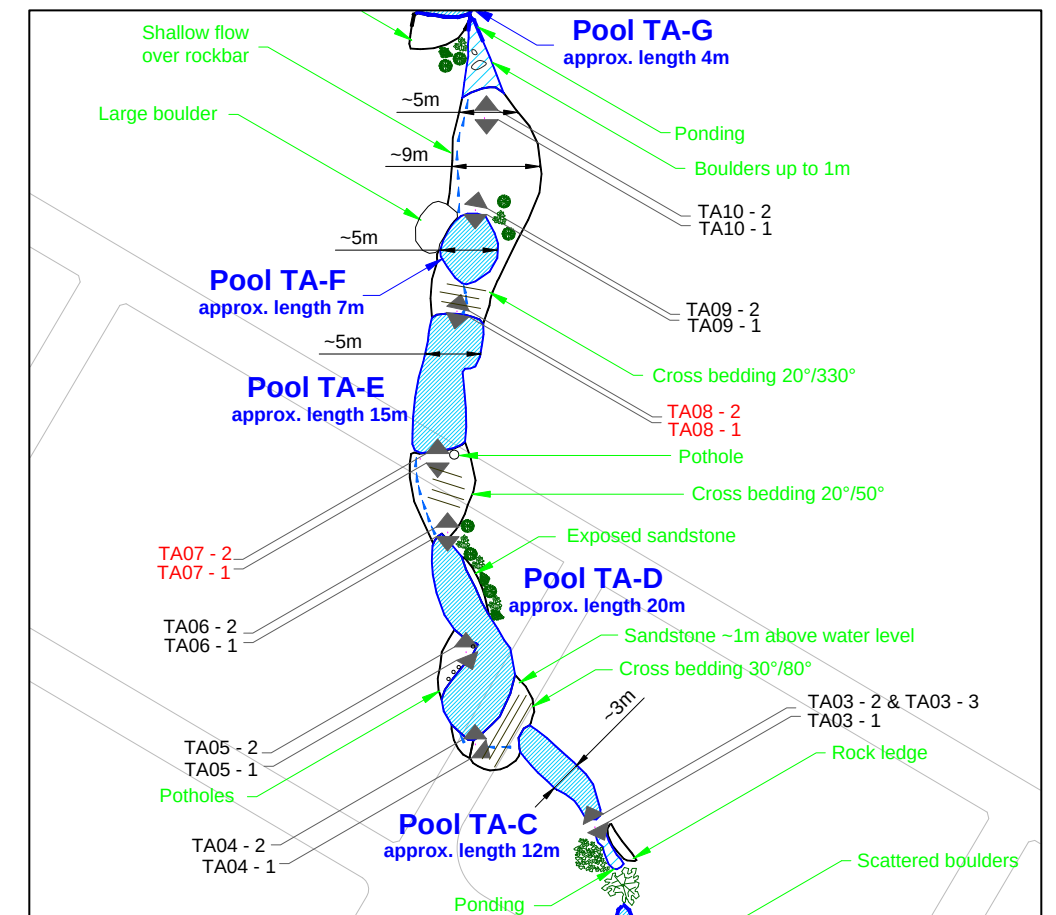


Photo Details

Photo ID	Easting	Northing	Bearing
TA07-1	310210	6214184	180
TA07-2	310210	6214184	0
TA08-1	310214	6214200	190
TA08-2	310214	6214200	10

TRIBUTARY A STREAM MAPPING SUMMARY



TA09-1 Downstream end of Pool TA-F looking Upstream



TA09-2 Downstream end of Pool TA-F looking Downstream



TA10-1 Rockbar downstream of Pool TA-F looking Upstream



TA10-2 Rockbar downstream of Pool TA-F looking Downstream

Notes (as at 5 January 2010)

- Pool TA-F approximately 7m long, 3 to 5m wide and 0.3m deep
- Base of the pool is sandstone with minor alluvial deposits and algae
- Rockbar upstream of the pool is approximately 5m wide and 3m long with cross bedding
- Rockbar downstream of the pool is approximately 9m wide at the upstream end and 5m wide at the downstream end
- Flow path along western side of rockbar

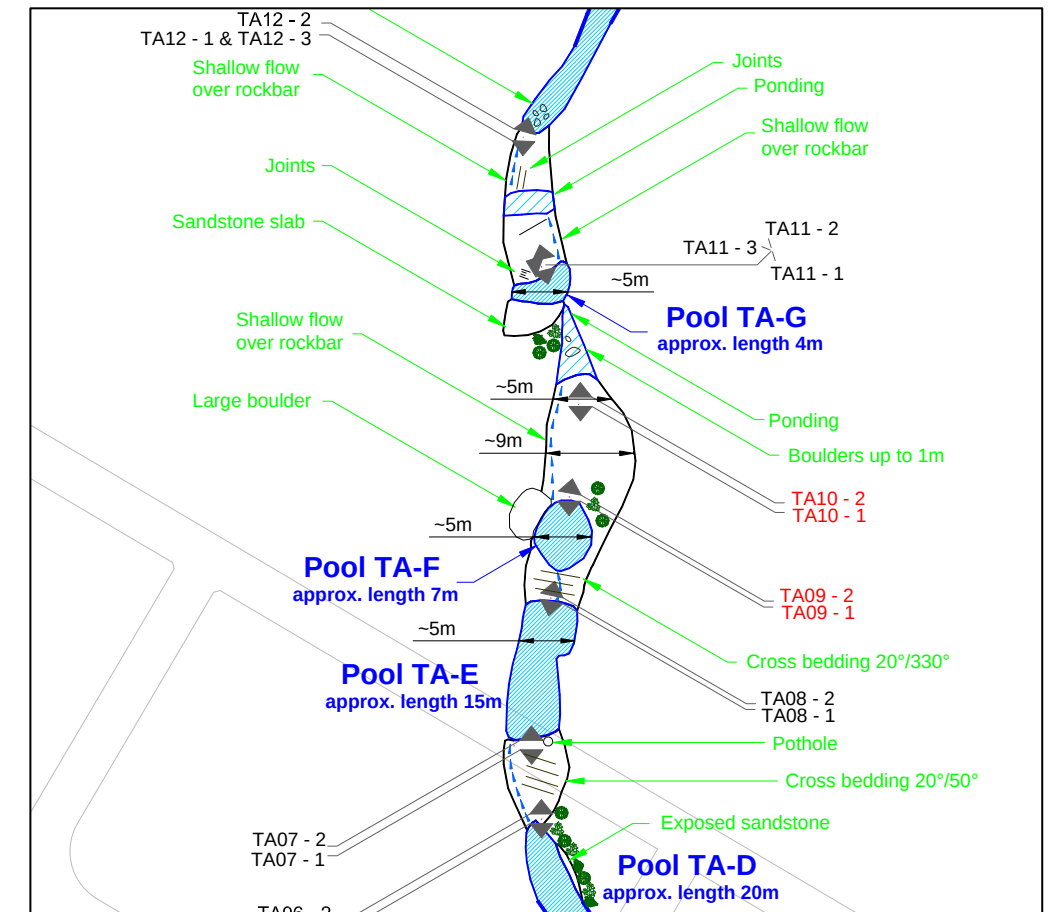


Photo Details

Photo ID	Easting	Northing	Bearing
TA09-1	310216	6214211	180
TA09-2	310216	6214211	10
TA10-1	310217	6214221	180
TA10-2	310217	6214221	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA11-1 Downstream end of Pool TA-G looking Upstream



TA11-2 Downstream end of Pool TA-G looking Downstream

Notes (as at 5 January 2010)

- Pool TA-G approximately 4m long, 5m wide and 0.2m deep
- Base of the pool is sandstone
- Sandstone ledge and ponding upstream of the pool
- Rockbar downstream of the pool is approximately 14m long with ponding in the centre and many joints
- Flow path along eastern side of rockbar toward ponding, then along western side toward Pool TA-H
- Pool TA-H approximately 43m long, 3m wide and up to 1m deep
- Base of the pool is sandstone with alluvial deposits, scattered boulders at the upstream end, and dead trees at the downstream end



TA11-3 Joints



TA12-1 Upstream end of Pool TA-H looking Upstream



TA12-2 Upstream end of Pool TA-H looking Downstream



TA12-3 Joints

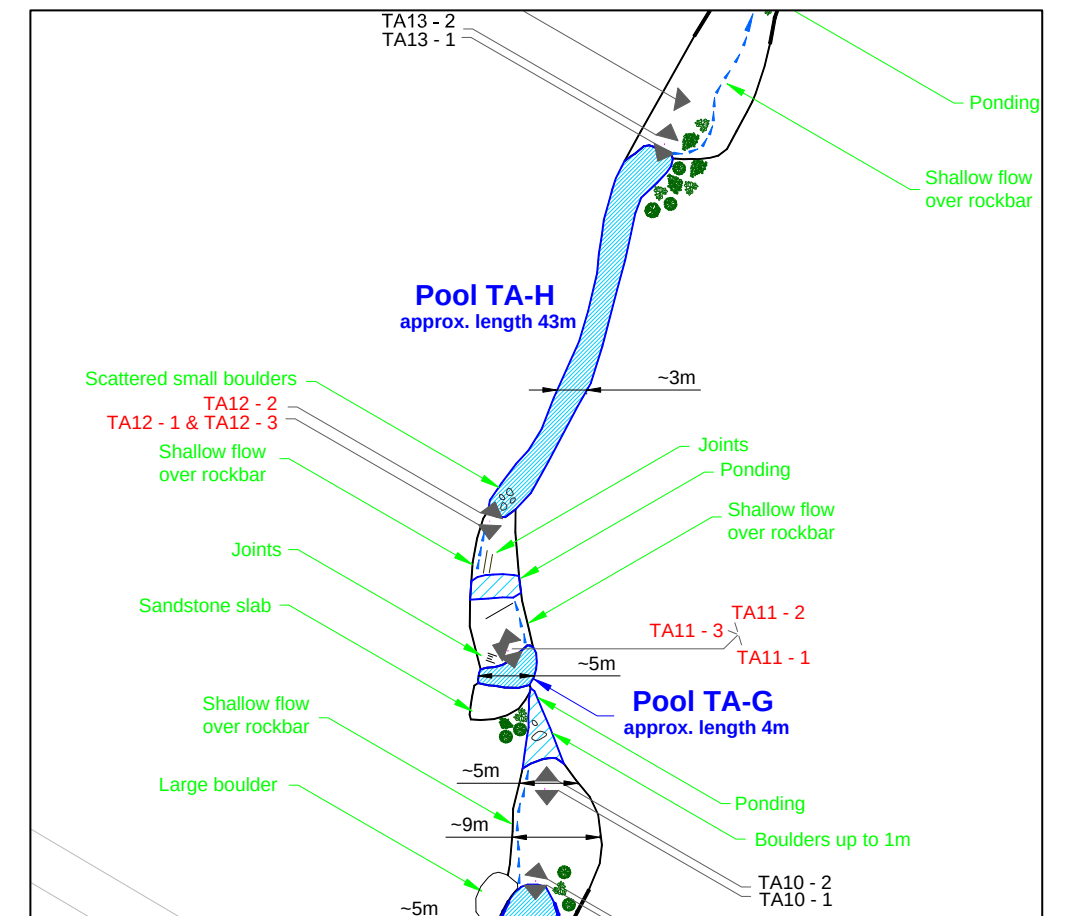


Photo Details

Photo ID	Easting	Northing	Bearing
TA11-1	310213	6214236	165
TA11-2	310213	6214236	345
TA11-3	310213	6214236	290
TA12-1	310211	6214250	180
TA12-2	310211	6214250	15
TA12-3	310211	6214250	180

TRIBUTARY A STREAM MAPPING SUMMARY



TA13-1 Downstream end of Pool TA-H looking Upstream



TA13-2 Downstream end of Pool TA-H looking Downstream

Notes (as at 5 January 2010)

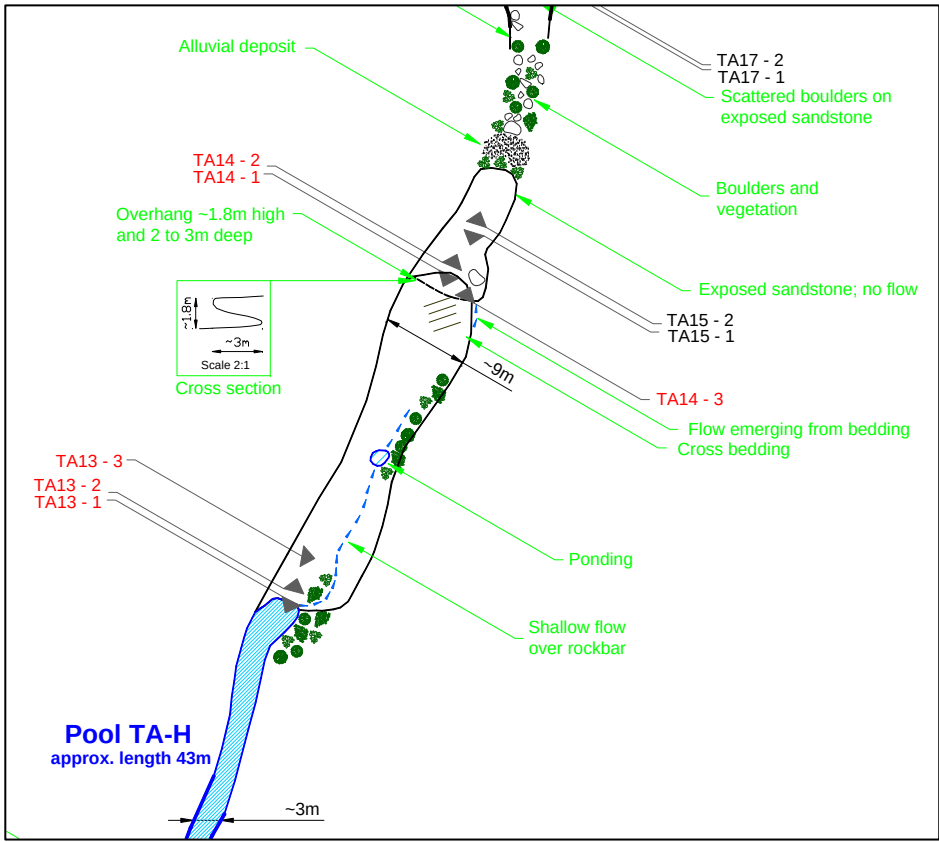
- Rockbar downstream of Pool TA-H is approximately 43m long and up to 9m wide
- Cross bedding is present at the downstream end
- Flow path part way along eastern side of the rockbar
- Flow emerges from bedding at overhang
- Overhang at the downstream end is approximately 1.8m high and 2 to 3m deep



TA13-3 East Bank at downstream end of Pool TA-H



TA14-1 Rockbar downstream of Pool TA-H looking Upstream



TA14-2 Overhang looking Downstream (western side)



TA14-3 Overhang looking Downstream (eastern side)

Photo Details

Photo ID	Easting	Northing	Bearing
TA13-1	310230	6214291	210
TA13-2	310230	6214291	15
TA13-3	310230	6214291	100
TA14-1	310249	6214330	25
TA14-2	310249	6214330	205
TA14-3	310249	6214330	25

TRIBUTARY A STREAM MAPPING SUMMARY



TA15-1 Rockbar downstream of overhang looking Upstream



TA15-2 Rockbar downstream of overhang looking Downstream



TA16-1 Rockbar looking Upstream



TA17-1 Rockbar looking Upstream



TA17-2 Rockbar looking Downstream

Notes (as at 5 January 2010)

- Rockbar approximately 13m long and up to 7m wide
- No visible flow across rockbar
- Alluvial deposit and vegetation at downstream end of rockbar leading into boulder field
- Boulder field opens up to rockbar 6 to 8m wide with scattered boulders and ponding
- Audible flow only
- Rockbar leads into boulder field at downstream end

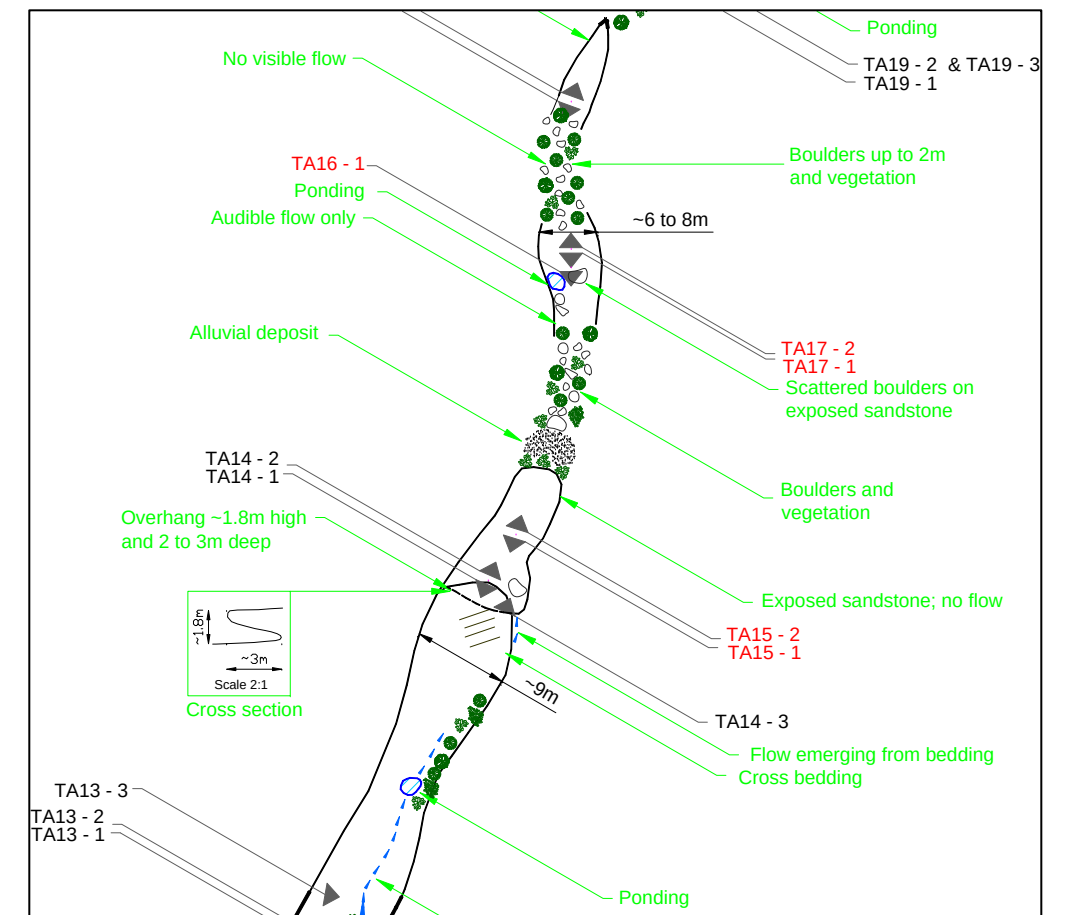


Photo Details

Photo ID	Easting	Northing	Bearing
TA15-1	310252	6214335	195
TA15-2	310252	6214335	15
TA16-1	310258	6214366	180
TA17-1	310258	6214364	180
TA17-2	310258	6214364	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA18-1 Upstream end of rockbar looking Upstream



TA18-2 Upstream end of rockbar looking Downstream

Notes (as at 5 January 2010)

- No visible flow through boulder field and vegetation
- Rockbar downstream of boulder field is approximately 9m long and 4m wide, with vegetation at the downstream end
- Vegetation opens to ponding with scattered boulders up to 2m



TA19-1 Downstream of vegetation looking Upstream



TA19-2 Downstream of vegetation looking Downstream



TA19-3 Downstream of vegetation looking Downstream

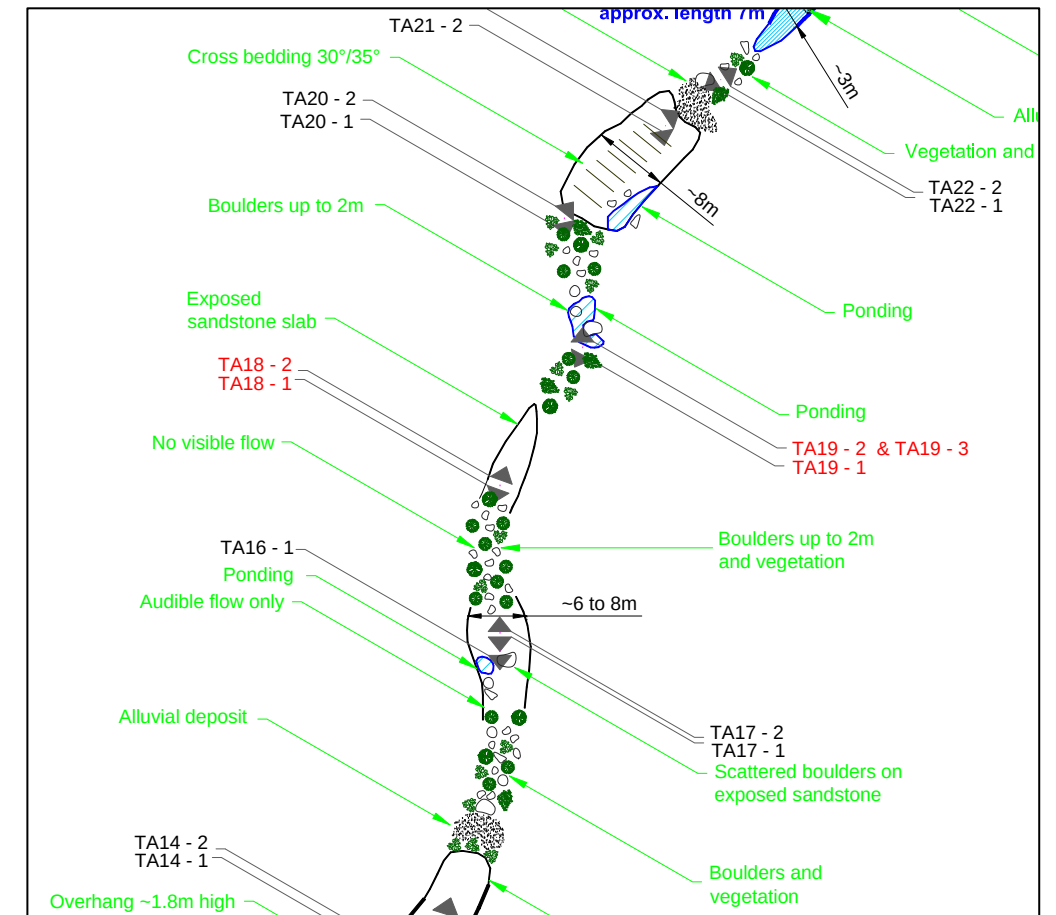


Photo Details

Photo ID	Easting	Northing	Bearing
TA18-1	310258	6214382	200
TA18-2	310258	6214382	20
TA19-1	310267	6214397	210
TA19-2	310267	6214397	0
TA19-3	310267	6214397	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA20-1 Upstream end of rockbar looking Upstream



TA20-2 Upstream end of rockbar looking Downstream



TA21-1 Downstream end of rockbar looking Downstream



TA21-2 Ponding at eastern side of rockbar

Notes (as at 5 January 2010)

- Rockbar is approximately 12m long and 8m wide with cross bedding and scattered vegetation debris
- Shallow ponding at eastern side of rockbar, with no visible flow downstream
- Alluvial deposit at downstream end of rockbar

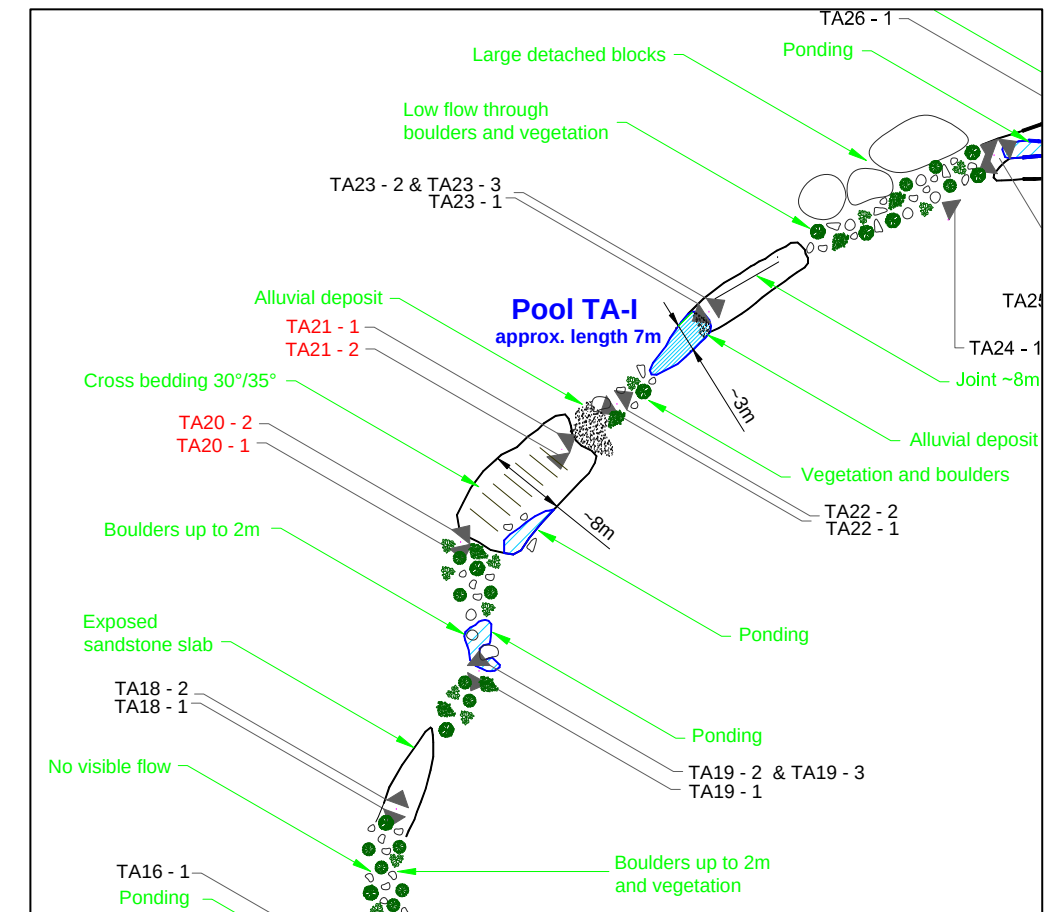


Photo Details

Photo ID	Easting	Northing	Bearing
TA20-1	310265	6214411	170
TA20-2	310265	6214411	40
TA21-1	310276	6214421	55
TA21-2	310276	6214421	170

TRIBUTARY A STREAM MAPPING SUMMARY



TA22-1 Near Upstream end of Pool TA-I looking Upstream



TA22-2 Near Upstream end of Pool TA-I looking Downstream

Notes (as at 5 January 2010)

- Pool TA-I is approximately 7m long, 3m wide and 0.3m deep
- Base of the pool is sandstone with minor alluvial deposits at the downstream end, leaf litter and boulders up to 1m
- Boulder field and vegetation upstream of pool
- Rockbar downstream of the pool is approximately 12m long
- 8m long joint runs along rockbar on western side



TA23-1 Downstream end of Pool TA-I looking Upstream



TA23-2 Downstream end of Pool TA-I looking Downstream



TA23-3 Joint downstream of Pool TA-I

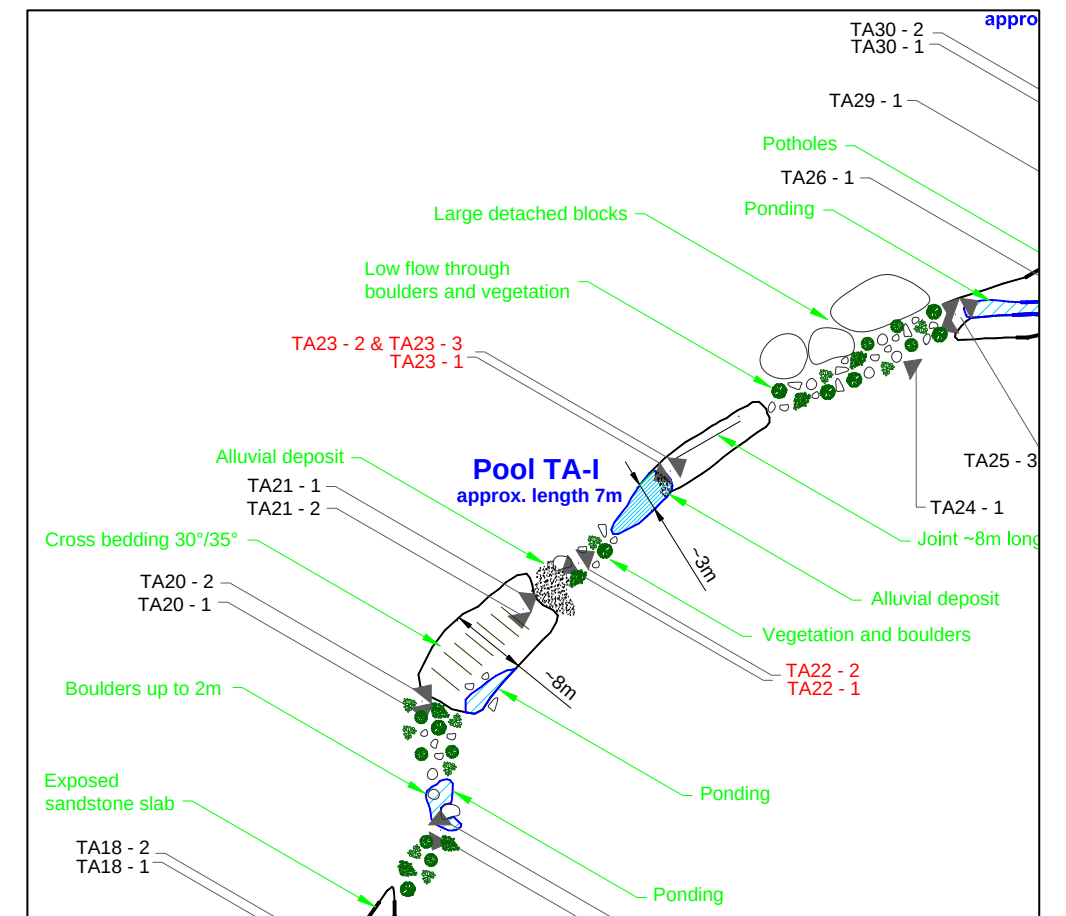


Photo Details

Photo ID	Easting	Northing	Bearing
TA22-1	310282	6214426	235
TA22-2	310282	6214426	55
TA23-1	310292	6214436	235
TA23-2	310292	6214436	55
TA23-3	310292	6214436	55

TRIBUTARY A STREAM MAPPING SUMMARY



TA24-1 Large detached blocks on western bank



TA25-1 Downstream end of boulder field looking Upstream



TA25-2 Downstream end of boulder field looking Downstream



TA25-3 Large detached blocks on western bank

Notes (as at 5 January 2010)

- Low flow through boulder field, with shallow ponding and potholes downstream
- Large detached blocks on western bank up to 10m in size
- Large sandstone outcrop on eastern bank approximately 2m high

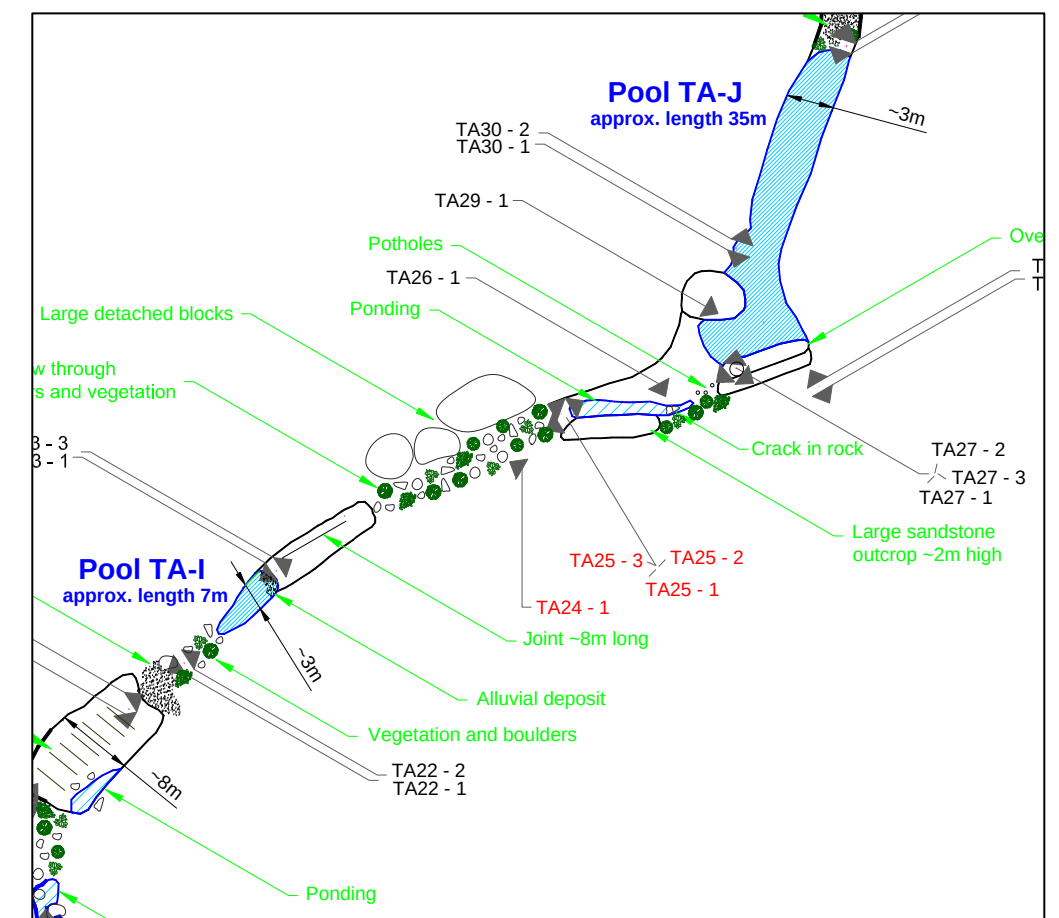


Photo Details

Photo ID	Easting	Northing	Bearing
TA24-1	310318	6214446	300
TA25-1	310323	6214453	240
TA25-2	310323	6214453	60
TA25-3	310323	6214453	290

TRIBUTARY A STREAM MAPPING SUMMARY



TA26-1 Cracking in rock



TA27-1 Upstream end of Pool TA-J looking Upstream

Notes (as at 5 January 2010)

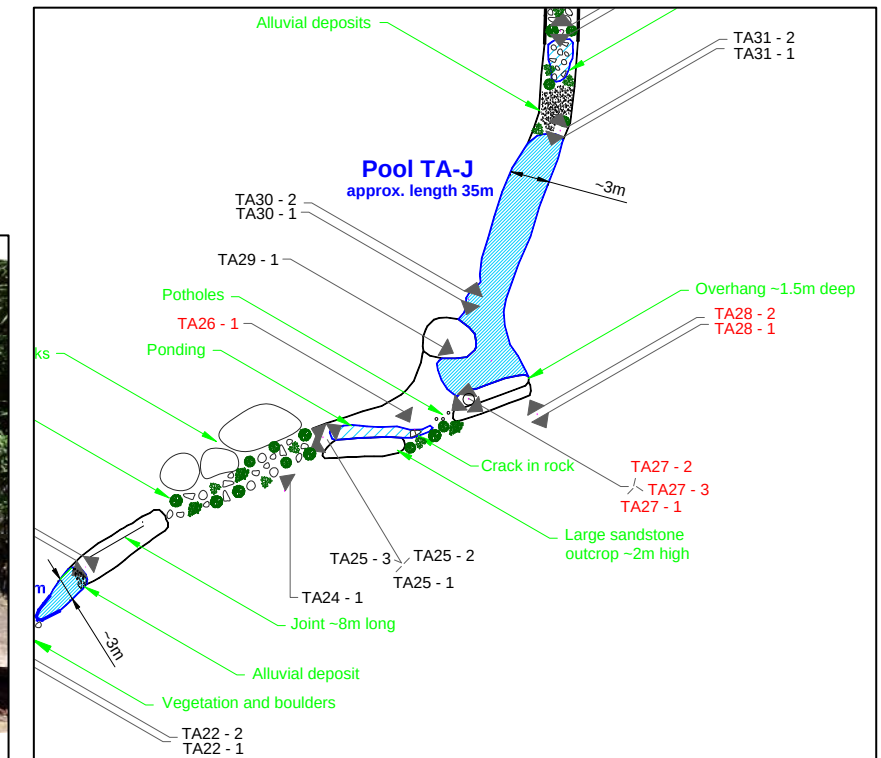
- Cracking through rock surface at downstream end of ponding
- Exposed sandstone upstream of Pool TA-J
- No visible flow from minor tributary into Tributary A at confluence, but minor flow visible further downstream
- Approximate 3m change in height from Pool TA-J to minor tributary



TA27-2 Upstream end of Pool TA-J looking Downstream



TA27-3 Confluence of Tributary A and minor tributary



TA28-1 Minor tributary looking Upstream



TA28-2 Minor tributary looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TA26-1	310335	6214454	150
TA27-1	310342	6214458	230
TA27-2	310342	6214458	5
TA27-3	310342	6214458	125
TA28-1	310351	6214456	150
TA28-2	310351	6214456	330

TRIBUTARY A STREAM MAPPING SUMMARY



TA29-1 Upstream end of Pool TA-J looking to minor tributary



TA30-1 Part way along Pool TA-J looking Upstream

Notes (as at 5 January 2010)

- Pool TA-J approximately 35m long, 2 to 3m wide and up to 0.2m deep
- Base of the pool is sandstone with some alluvial deposits, and vegetation debris at the downstream end
- Overhang at upstream end of pool is approximately 1.5m deep
- Alluvial deposits and vegetation at downstream end of pool



TA30-2 Part way along Pool TA-J looking Downstream



TA31-1 Downstream end of Pool TA-J looking Upstream



TA31-2 Downstream end of Pool TA-J looking Downstream

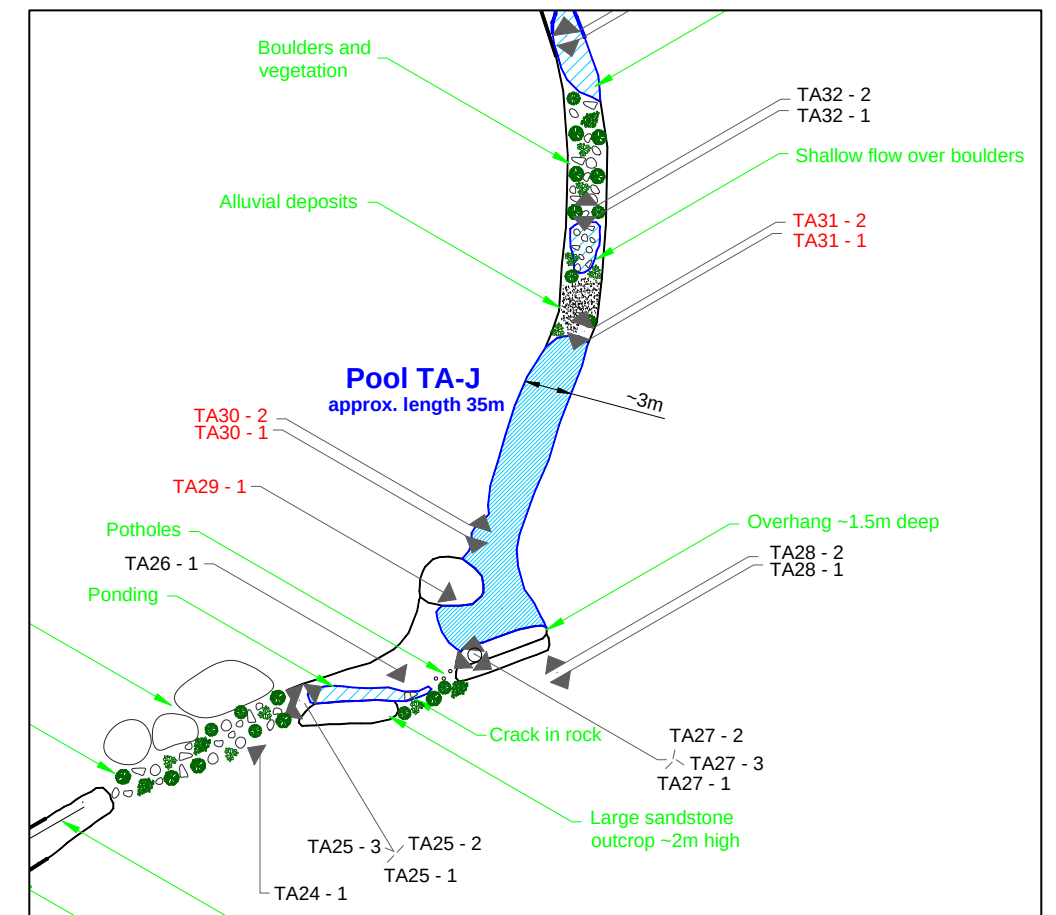


Photo Details

Photo ID	Easting	Northing	Bearing
TA29-1	310345	6214463	120
TA30-1	310342	6214471	200
TA30-2	310342	6214471	15
TA31-1	310354	6214493	200
TA31-2	310354	6214493	15

TRIBUTARY A STREAM MAPPING SUMMARY



TA32-1 Upstream end of boulder field looking Upstream



TA32-2 Upstream end of boulder field looking Downstream



TA33-1 Rockbar upstream of Pool TA-K looking Upstream



TA33-2 Rockbar upstream of Pool TA-K looking Downstream

Notes (as at 5 January 2010)

- Ponding and shallow flow through boulder field
- Ponding upstream of Pool TA-K up to 2m wide and 0.3m deep
- Pool TA-K approximately 12m long, 3m wide and 0.4m deep
- Base of pool is sandstone

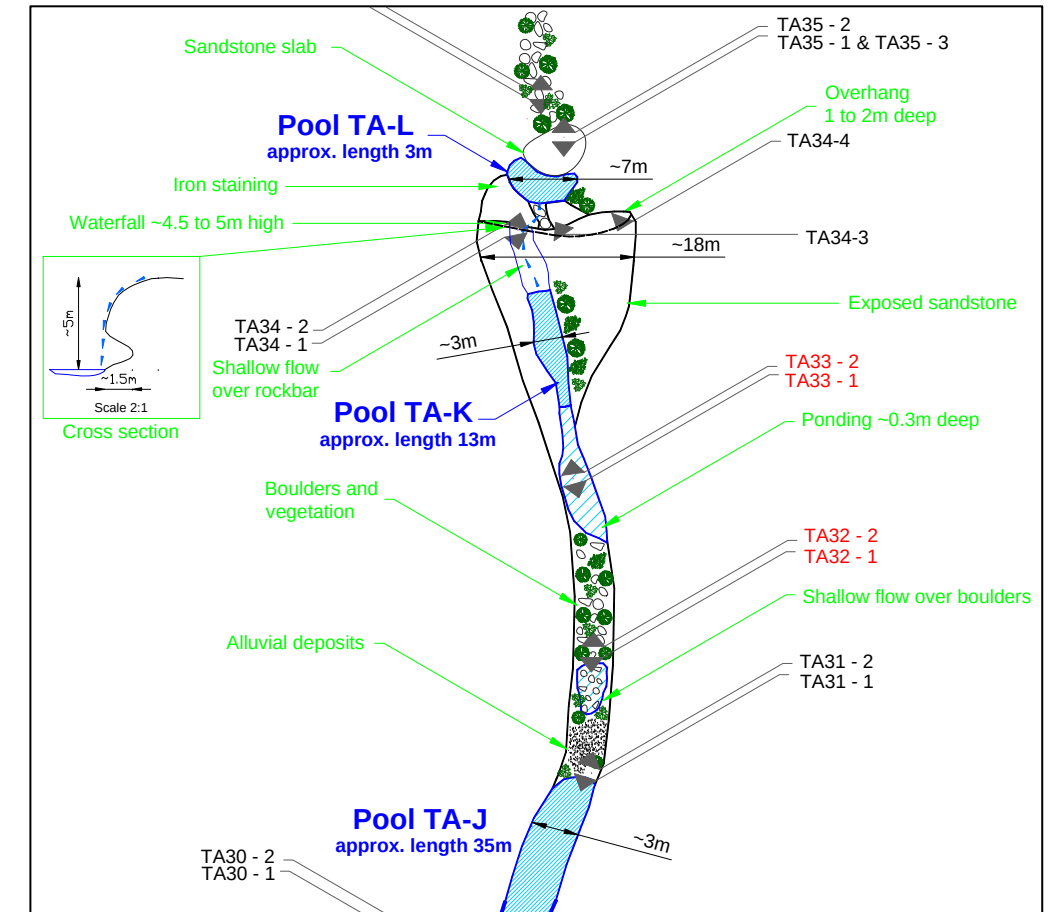


Photo Details

Photo ID	Easting	Northing	Bearing
TA32-1	310354	6214506	180
TA32-2	310354	6214506	0
TA33-1	310352	6214525	165
TA33-2	310352	6214525	350

TRIBUTARY A STREAM MAPPING SUMMARY



TA34-1 At top of waterfall looking upstream toward Pool TA-K



TA34-2 At top of waterfall looking Downstream



TA34-3 Pool TA-L below waterfall



TA34-4 At top of waterfall looking toward west bank

Notes (as at 5 January 2010)

- Waterfall drops approximately 4.5 to 5m
- Depth of overhang is approximately 1.5m
- Rockbar upstream of waterfall is approximately 18m wide
- Pool TA-L approximately 3m long, 7m wide and up to 0.7m deep at western side
- Base of the pool is sandstone with minor alluvial deposits
- Iron staining evident at western side and beneath waterfall

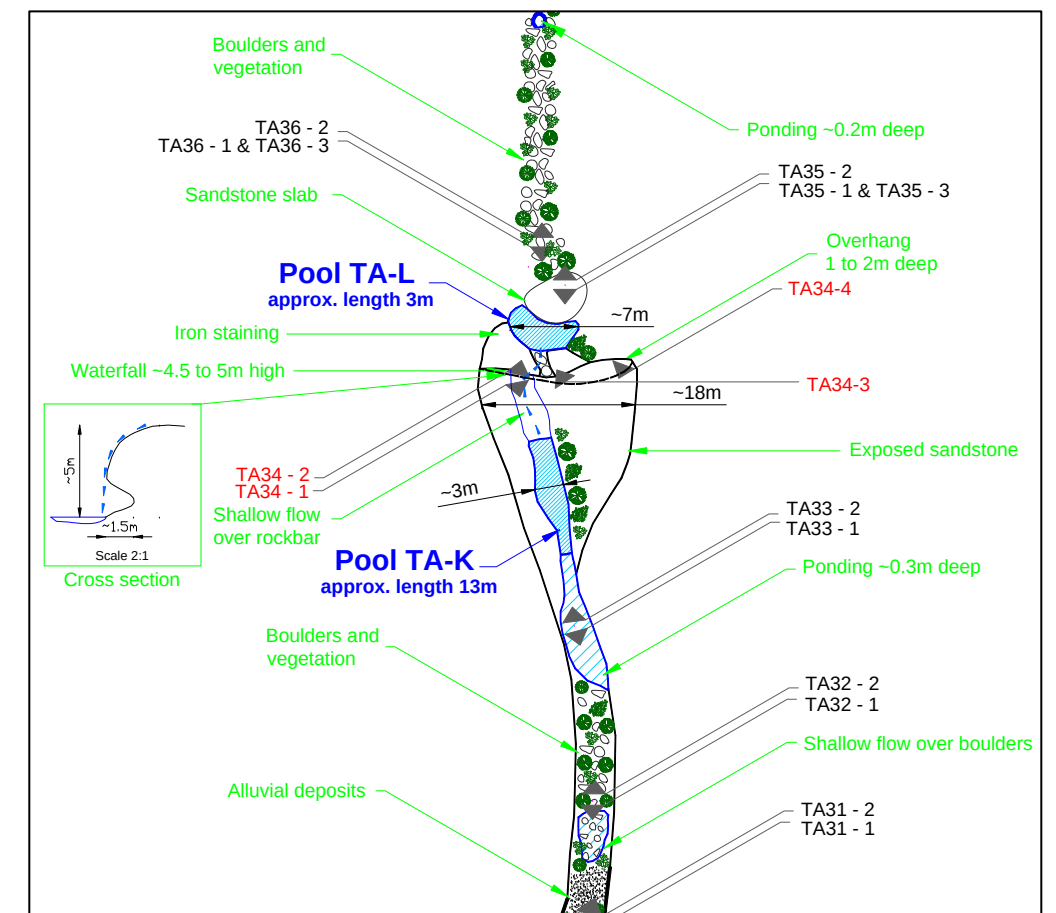


Photo Details

Photo ID	Easting	Northing	Bearing
TA34-1	310346	6214552	170
TA34-2	310346	6214552	15
TA34-3	310351	6214552	325
TA34-4	310357	6214553	200

TRIBUTARY A STREAM MAPPING SUMMARY



TA35-1 Downstream end of Pool TA-L looking Upstream



TA35-2 Downstream end of Pool TA-L looking Downstream

Notes (as at 5 January 2010)

- Waterfall drops approximately 4.5 to 5m
- Depth of overhang is approximately 1.5m
- Pool TA-L approximately 3m long, 7m wide and up to 0.7m deep at western side
- Base of the pool is sandstone with minor alluvial deposits
- Iron staining evident at western side and beneath waterfall
- Boulder field and vegetation downstream of pool



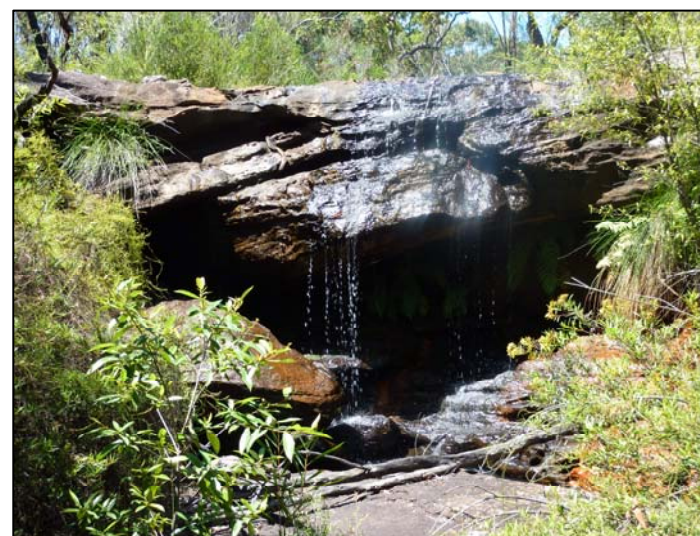
TA35-3 Overhang



TA36-1 Downstream of Pool TA-L looking Upstream



TA36-2 Downstream of Pool TA-L looking Downstream



TA36-3 Waterfall

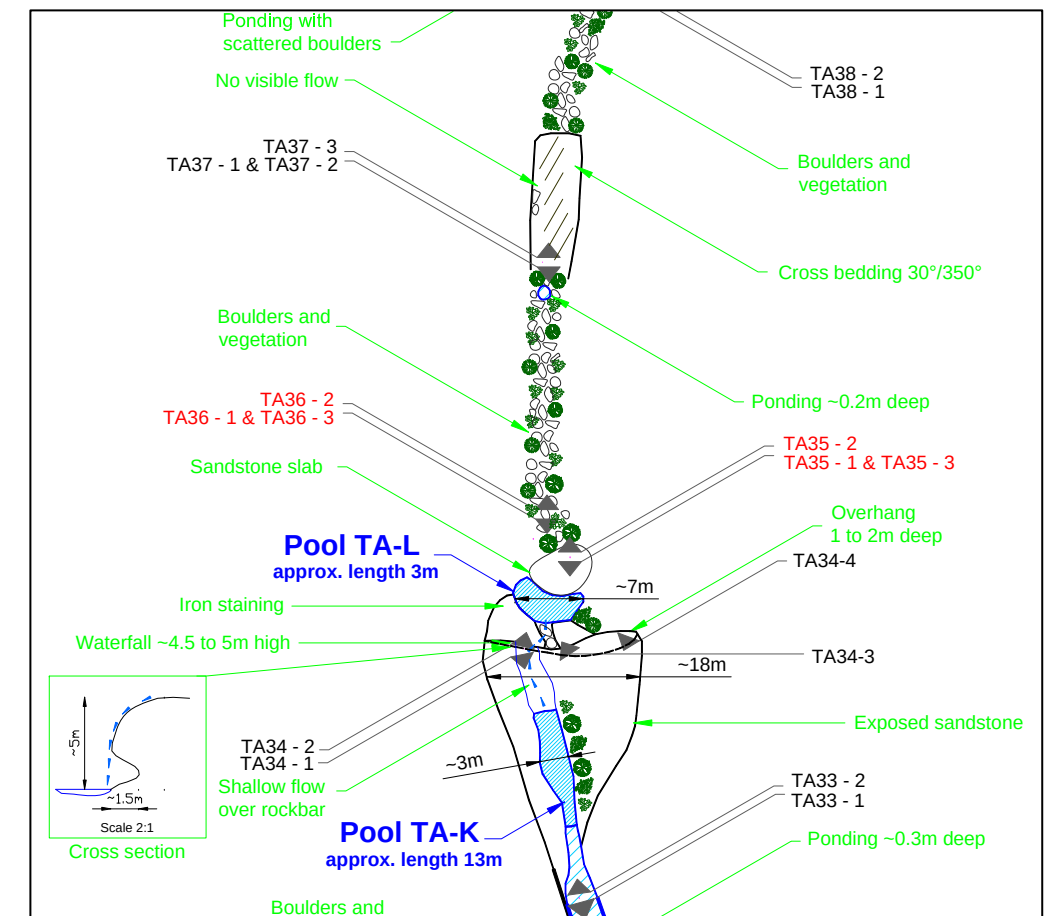


Photo Details

Photo ID	Easting	Northing	Bearing
TA35-1	310351	6214562	180
TA35-2	310351	6214562	0
TA35-3	310351	6214562	180
TA36-1	310347	6214564	180
TA36-2	310347	6214564	0
TA36-3	310347	6214564	180

TRIBUTARY A STREAM MAPPING SUMMARY



TA37-1 and TA37-2 Upstream end of rockbar looking Upstream



Notes (as at 5 January 2010)

- Rockbar approximately 15m long and 5m wide
- Cross bedding and scattered debris
- No visible flow across rockbar
- Boulder field, vegetation and ponding upstream of rockbar
- Boulder field and vegetation downstream of rockbar



TA37-3 Upstream end of rockbar looking Downstream



TA38-1 Downstream end of boulder field looking Upstream



TA38-2 Downstream end of boulder field looking Downstream

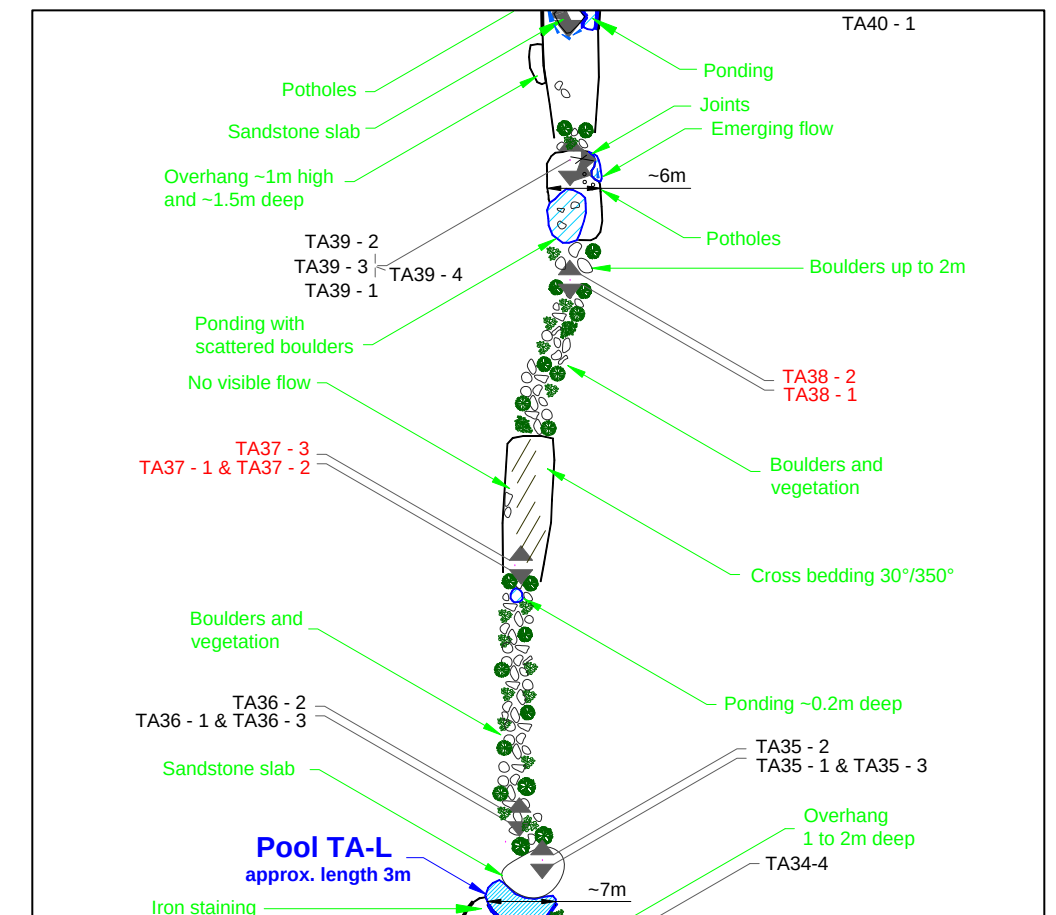


Photo Details

Photo ID	Easting	Northing	Bearing
TA37-1	310348	6214594	180
TA37-2	310348	6214594	180
TA37-3	310348	6214594	0
TA38-1	310354	6214625	180
TA38-2	310354	6214625	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA39-1 Downstream end of rockbar looking Upstream



TA39-2 Downstream end of rockbar looking Downstream



TA39-3 Emerging flow on eastern side



TA39-4 Joints and potholes

Notes (as at 5 January 2010)

- Rockbar approximately 9m long and 6m wide
- Ponding at upstream end of rockbar on western side
- Flow emerges at downstream end of rockbar on eastern side
- Joints and potholes at downstream end

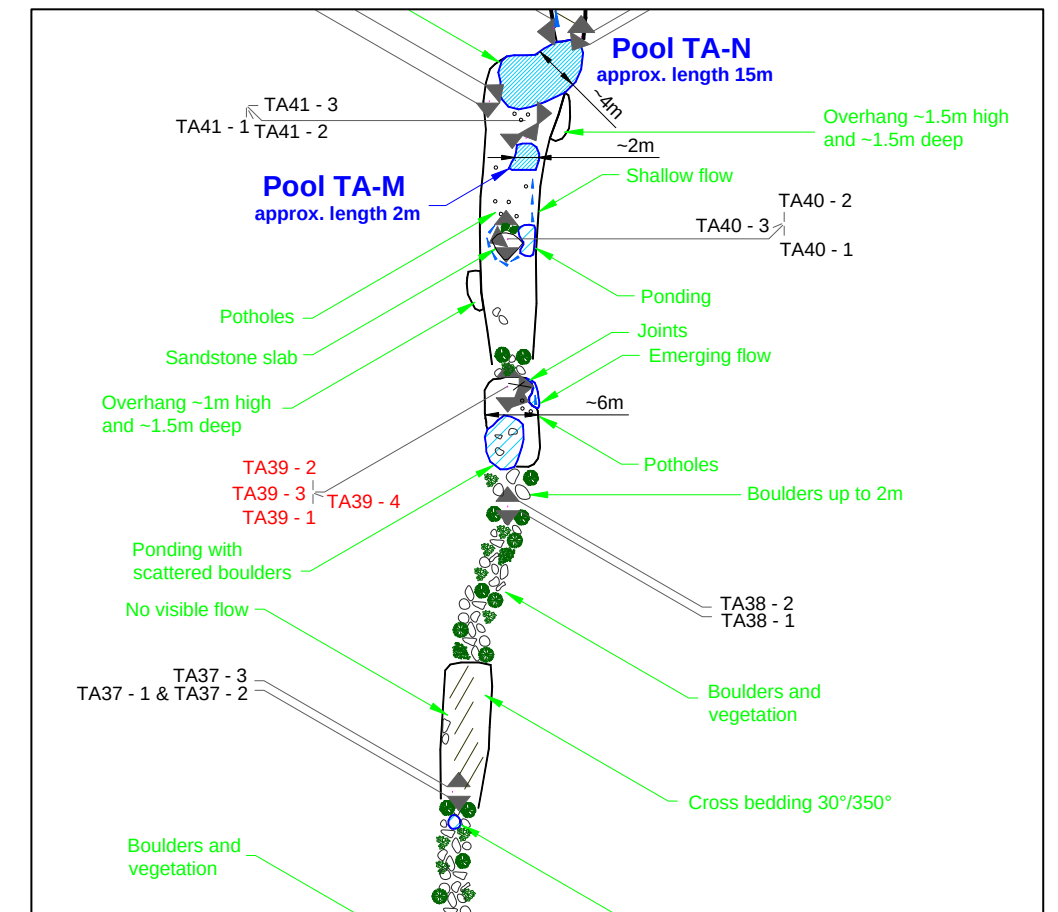


Photo Details

Photo ID	Easting	Northing	Bearing
TA39-1	310354	6214638	180
TA39-2	310354	6214638	0
TA39-3	310354	6214638	110
TA39-4	310354	6214638	90

TRIBUTARY A STREAM MAPPING SUMMARY



TA40-1 Rockbar upstream of Pool TA-M looking Upstream



TA40-2 Rockbar upstream of Pool TA-M looking Downstream

Notes (as at 5 January 2010)

- Pool TA-M approximately 2.5m long, 2m wide and 0.6m deep
- Base of the pool is sandstone with alluvial deposits and small boulders
- Rockbar upstream of pool has ponding and many potholes
- No visible flow at upstream end of rockbar
- Flow path at downstream end of rockbar along eastern side toward Pool TA-M



TA40-3 Overhang on west bank



TA41-1 Downstream end of Pool TA-M looking Upstream



TA41-2 Pool TA-M



TA41-3 Overhang on east bank

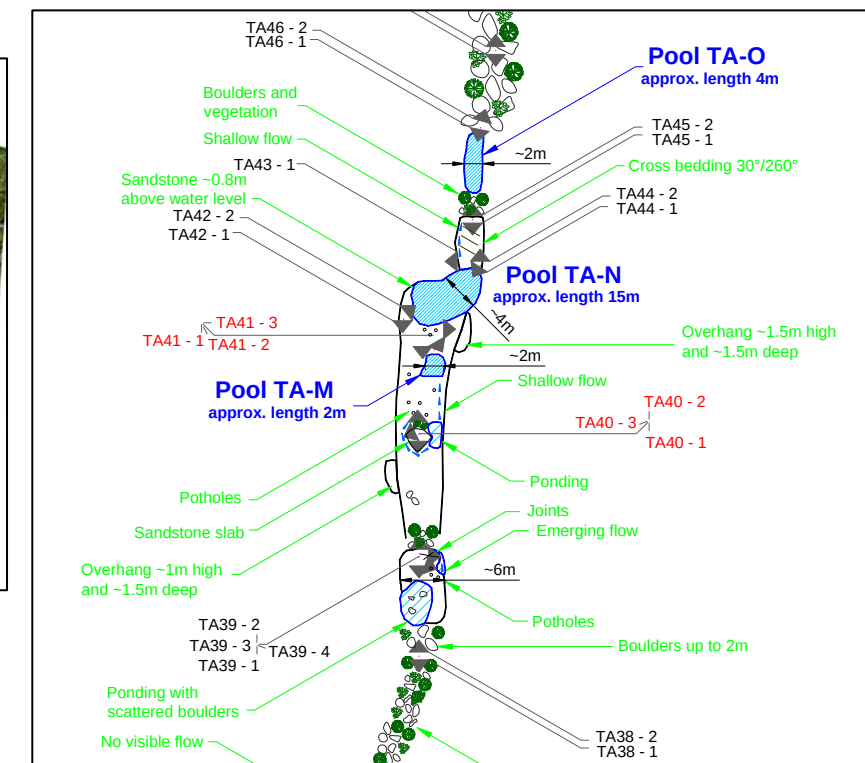


Photo Details

Photo ID	Easting	Northing	Bearing
TA40-1	310354	6214654	180
TA40-2	310354	6214654	0
TA40-3	310354	6214654	245
TA41-1	310356	6214665	180
TA41-2	310356	6214665	150
TA41-3	310356	6214665	90

TRIBUTARY A STREAM MAPPING SUMMARY



Notes (as at 5 January 2010)

- Pool TA-N approximately 15m long, 4m wide and 0.8m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar at upstream end is approximately 0.8m above water level
- Rockbar at downstream end is approximately 6m long and 3m wide with cross bedding
- Flow path down western side of rockbar

TA42-1 Upstream end of Pool TA-N looking Upstream

TA42-2 Upstream end of Pool TA-N looking Downstream



TA44-1 Downstream end of Pool TA-N looking Upstream



TA44-2 Downstream end of Pool TA-N looking Downstream



TA43-1 Overhang on west bank



TA44-2 Downstream end of Pool TA-N looking Downstream

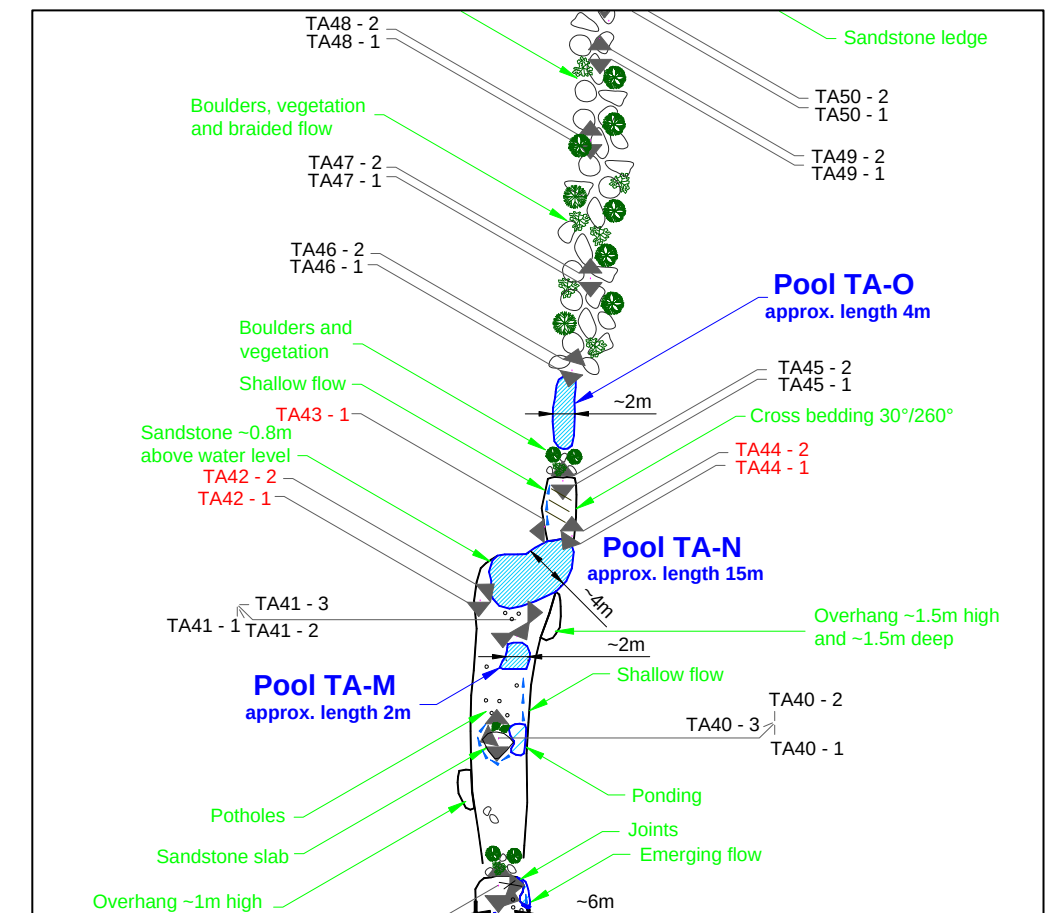


Photo Details

Photo ID	Easting	Northing	Bearing
TA42-1	310352	6214669	180
TA42-2	310352	6214669	50
TA43-1	310359	6214677	270
TA44-1	310362	6214676	215
TA44-2	310362	6214676	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA45-1 Downstream end of rockbar looking Upstream



TA45-2 Downstream end of rockbar looking Downstream

Notes (as at 5 January 2010)

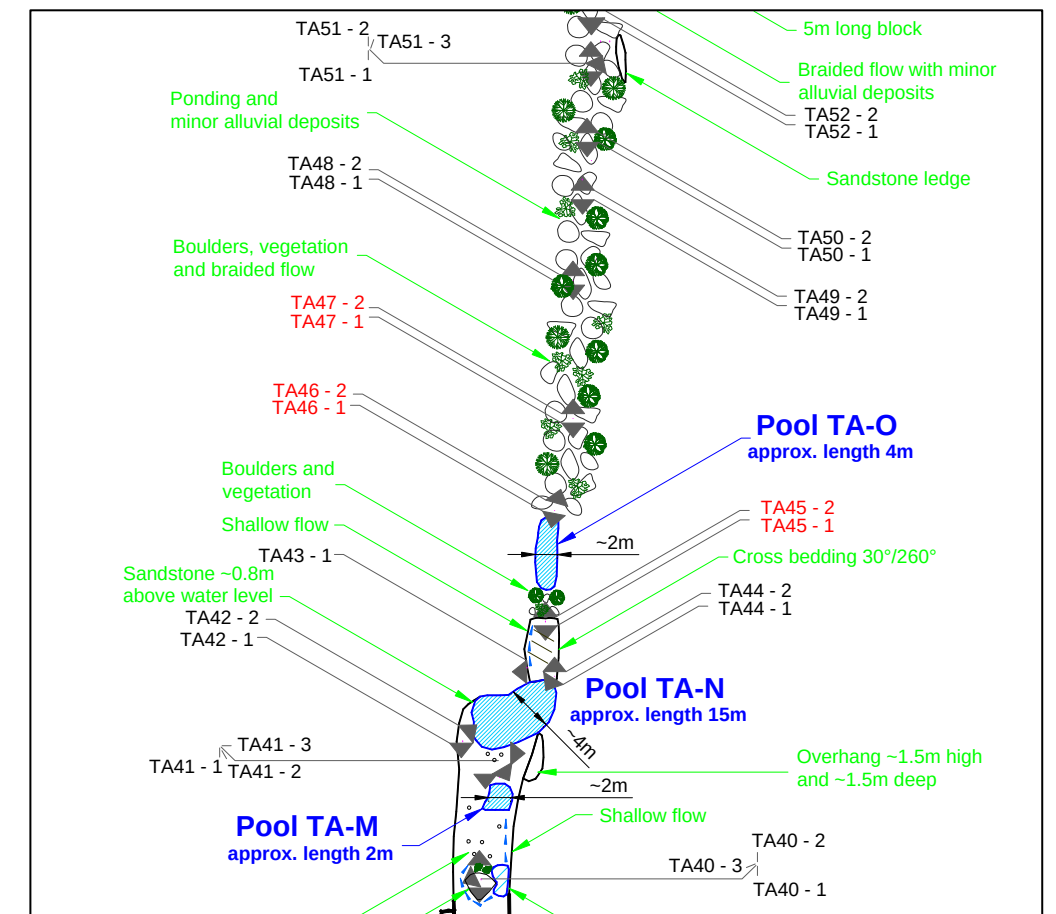
- Pool TA-O approximately 4m long, 2m wide and 0.2m deep
- Base of the pool is sandstone with alluvial deposits and small boulders
- Boulders, vegetation and braided flow downstream of pool



TA46-1 Downstream end of Pool TA-O looking Upstream



TA46-2 Downstream end of Pool TA-O looking Downstream



TA47-1 Boulder field looking Upstream



TA47-2 Boulder field looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TA45-1	310361	6214682	180
TA45-2	310361	6214682	0
TA46-1	310362	6214694	190
TA46-2	310362	6214694	15
TA47-1	310364	6214704	180
TA47-2	310364	6214704	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA48-1 Boulder field looking Upstream



TA48-2 Boulder field looking Downstream



TA49-1 Boulder field looking Upstream



TA49-2 Boulder field looking Downstream



TA50-1 Boulder field looking Upstream



TA50-2 Boulder field looking Downstream

Notes (as at 5 January 2010)

- Boulder field with vegetation, braided flow, minor alluvial deposits and minor ponding
- Boulder field extends over approximately 55m

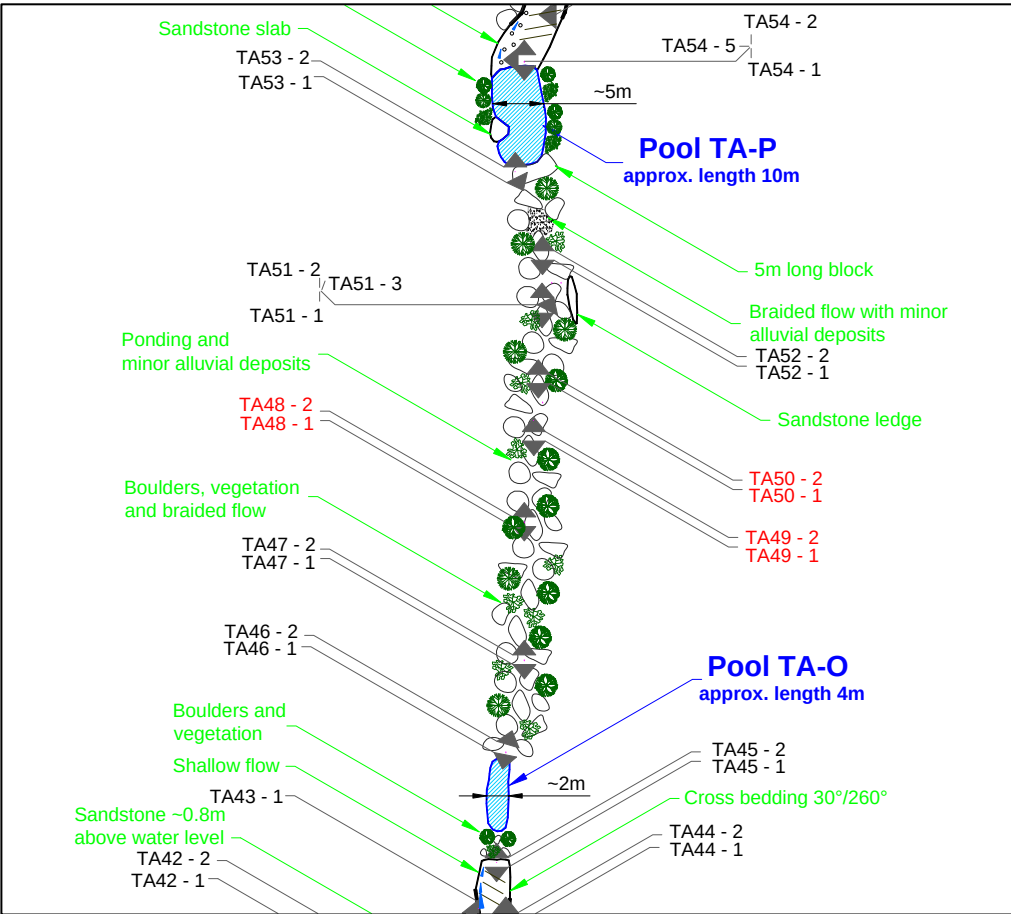


Photo Details

Photo ID	Easting	Northing	Bearing
TA48-1	310364	6214719	180
TA48-2	310364	6214719	0
TA49-1	310365	6214730	180
TA49-2	310365	6214730	0
TA50-1	310366	6214732	180
TA50-2	310366	6214732	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA51-1 At sandstone ledge looking Upstream



TA51-2 At sandstone ledge looking Downstream



TA51-3 East bank looking Downstream

Notes (as at 5 January 2010)

- Boulder field with vegetation, braided flow, minor alluvial deposits and minor ponding
- Boulder field extends over approximately 55m



TA52-1 Boulder field looking Upstream



TA52-2 Boulder field looking Downstream



TA53-1 Upstream end of Pool TA-P looking Upstream



TA53-2 Upstream end of Pool TA-P looking Downstream

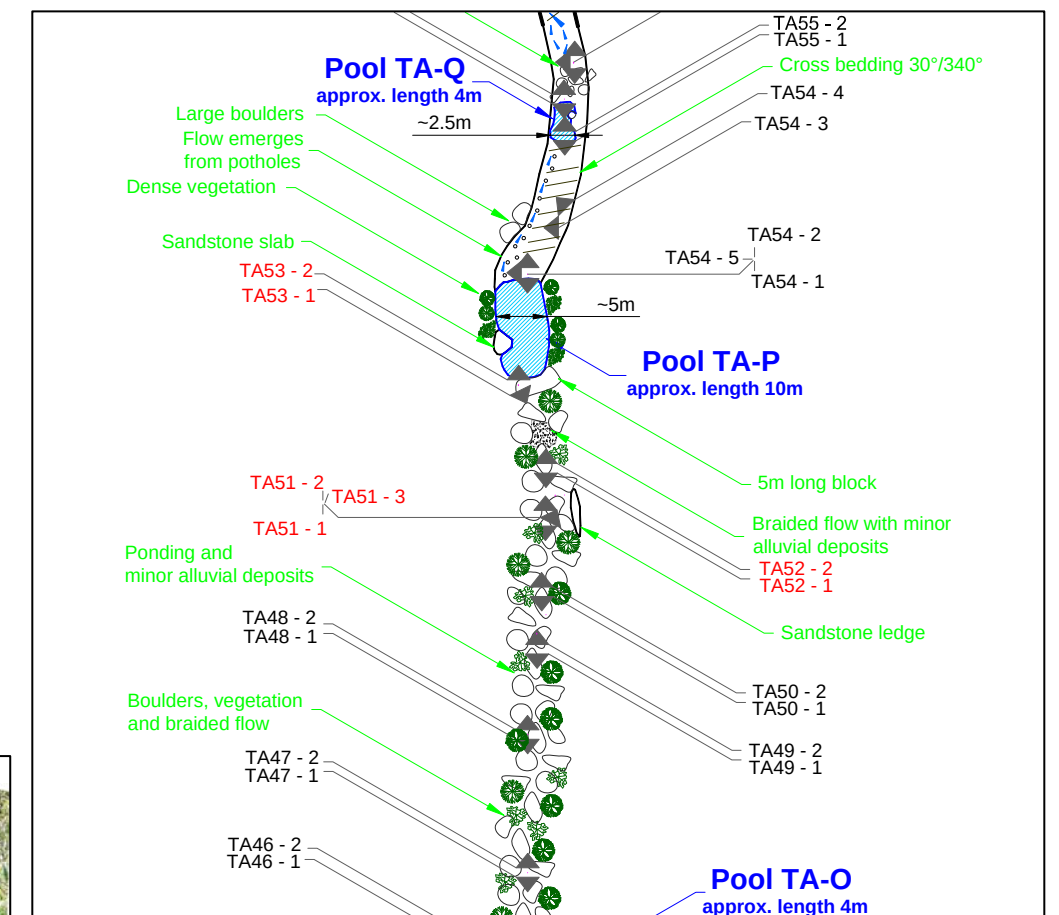


Photo Details

Photo ID	Easting	Northing	Bearing
TA51-1	310367	6214745	180
TA51-2	310367	6214745	0
TA51-3	310367	6214745	20
TA52-1	310368	6214745	180
TA52-2	310368	6214745	0
TA53-1	310363	6214757	160
TA53-2	310363	6214757	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA54-1 Downstream end of Pool TA-P looking Upstream



TA54-2 Downstream end of Pool TA-P looking Downstream



TA54-3 Cross bedding



TA54-4 Potholes at downstream end of rockbar



TA54-5 Potholes at upstream end of rockbar

Notes (as at 5 January 2010)

- Pool TA-P approximately 10m long, 5m wide and 0.7 to 1m deep
- Base of the pool is sandstone with alluvial deposits and boulders up to 1m
- Rockbar downstream of the pool is approximately 14m long and 4m wide
- Cross bedding along length of rockbar with many potholes
- Flow path down western side of rockbar

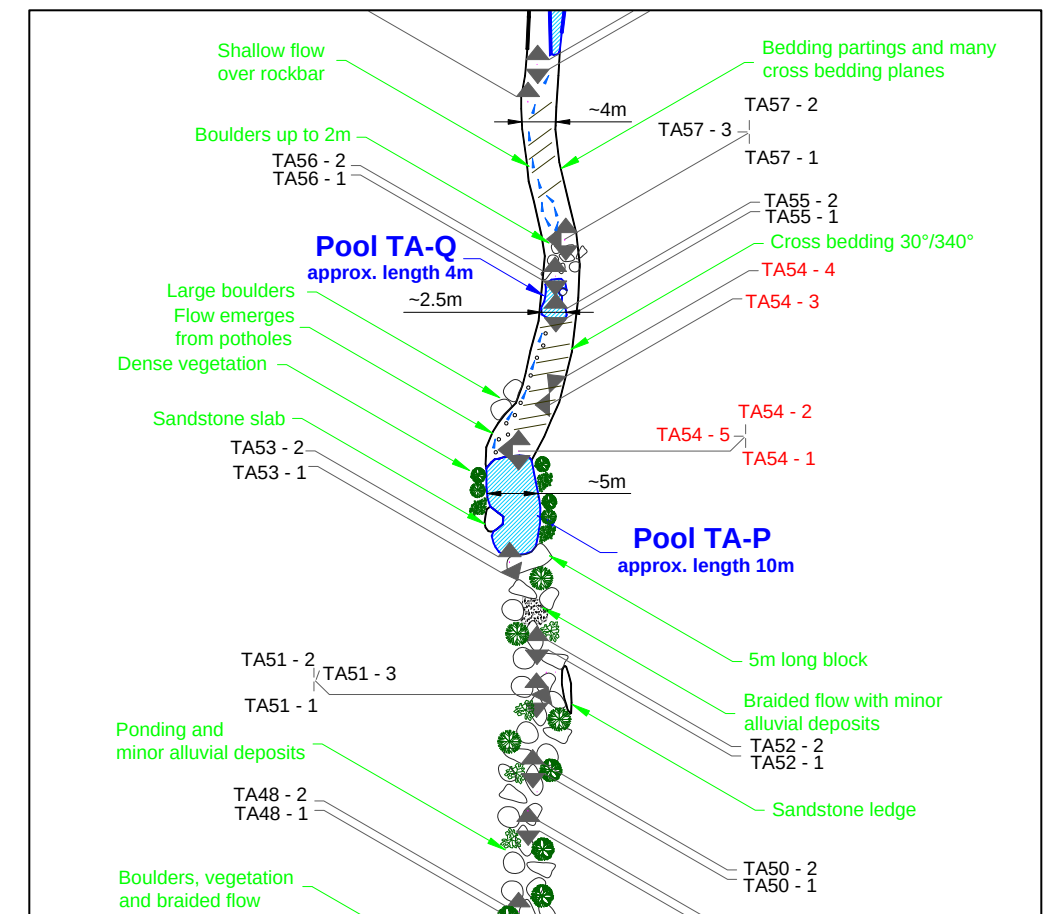


Photo Details

Photo ID	Easting	Northing	Bearing
TA54-1	310364	6214769	180
TA54-2	310364	6214769	0
TA54-3	310368	6214775	270
TA54-4	310368	6214775	315
TA54-5	310364	6214769	270

TRIBUTARY A STREAM MAPPING SUMMARY



TA55-1 Upstream end of Pool TA-Q looking Upstream



TA55-2 Upstream end of Pool TA-Q looking Downstream



TA56-1 Downstream end of Pool TA-Q looking Upstream



TA56-2 Downstream end of Pool TA-Q looking Downstream

Notes (as at 5 January 2010)

- Pool TA-Q approximately 4m long, 2.5m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits and algae
- Rockbar with scattered boulders and minor ponding downstream of pool

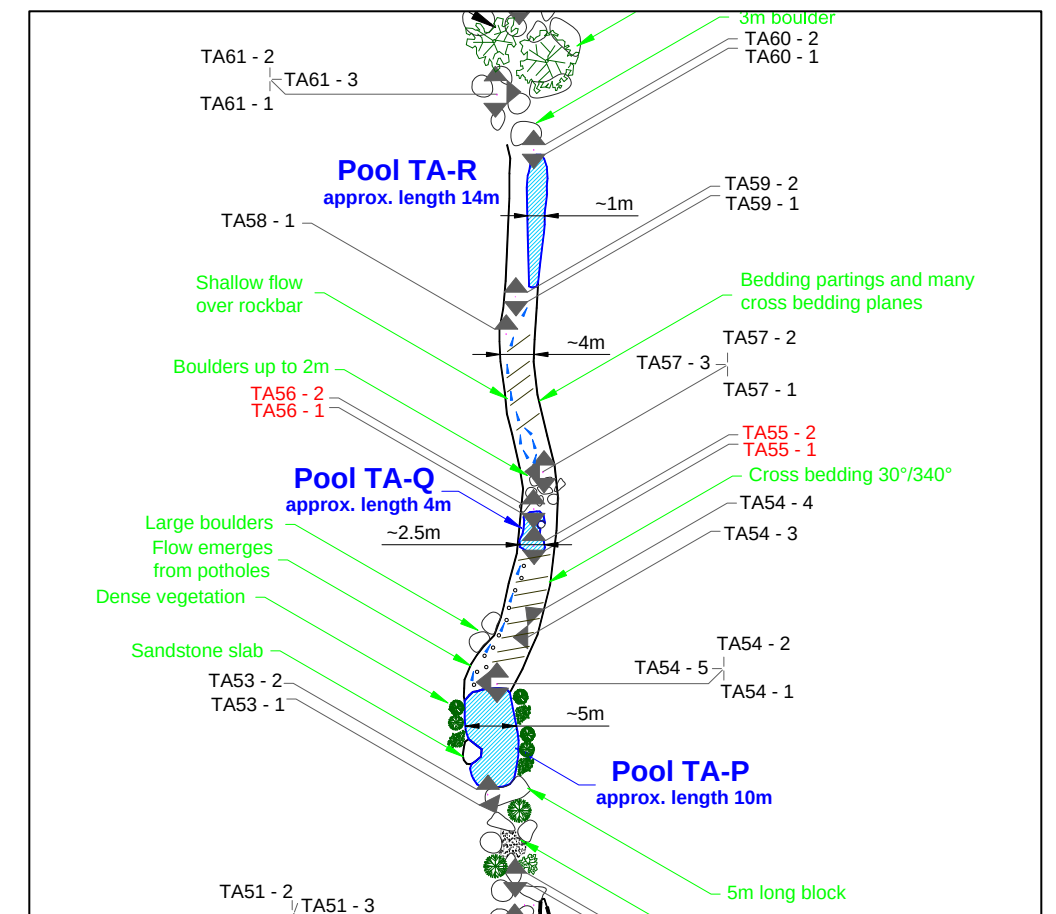


Photo Details

Photo ID	Easting	Northing	Bearing
TA55-1	310368	6214784	180
TA55-2	310368	6214784	0
TA56-1	310368	6214788	180
TA56-2	310368	6214788	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA57-1 Upstream end of rockbar looking Upstream



TA57-2 Upstream end of rockbar looking Downstream



TA57-3 West bank



TA58-1 Downstream end of rockbar looking Downstream

Notes (as at 5 January 2010)

- Rockbar approximately 20m long and 4m wide
- Cross bedding
- Flow path along western side of rockbar toward Pool TA-R

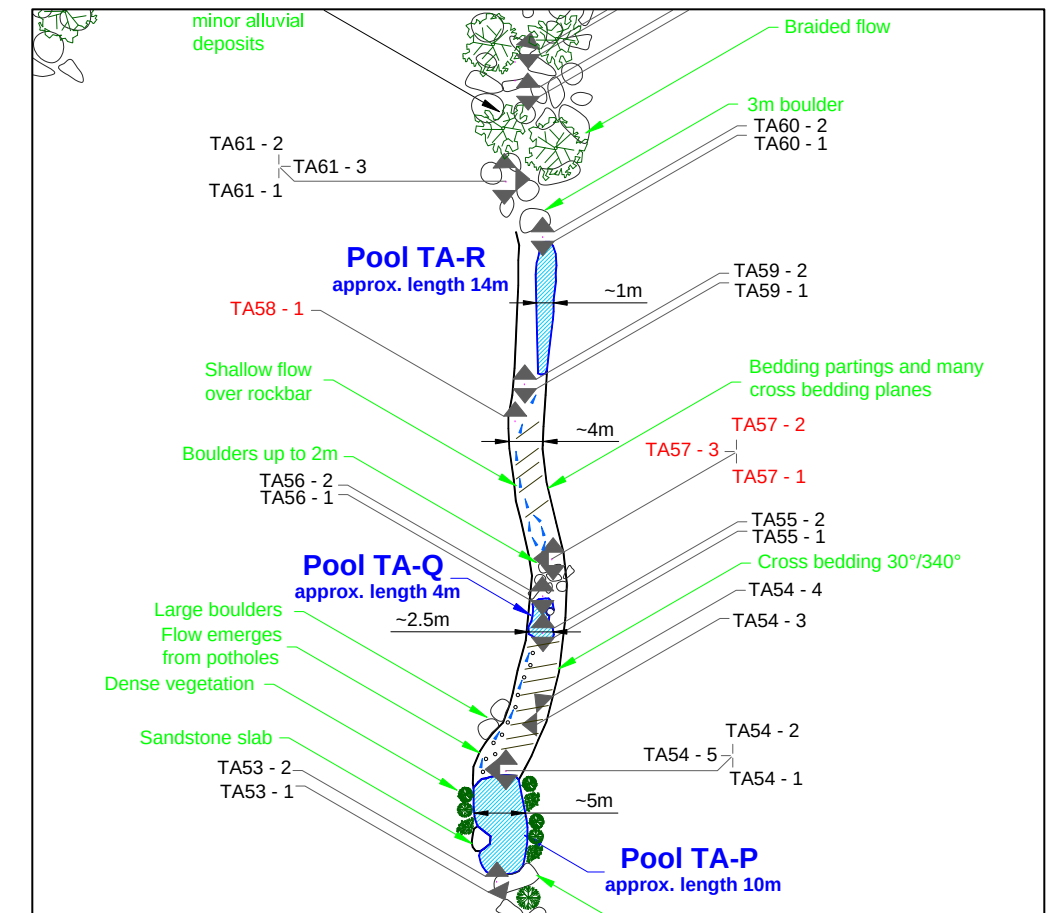


Photo Details

Photo ID	Easting	Northing	Bearing
TA57-1	310369	6214792	180
TA57-2	310369	6214792	0
TA57-3	310369	6214792	270
TA58-1	310365	6214807	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA59-1 Upstream end of Pool TA-R looking Upstream



TA59-2 Upstream end of Pool TA-R looking Downstream



TA60-1 Downstream end of Pool TA-R looking Upstream



TA60-2 Downstream end of Pool TA-R looking Downstream

Notes (as at 5 January 2010)

- Pool TA-R approximately 14m long, 1m wide and 0.3m deep
- Base of the pool is sandstone with minor alluvial deposits
- Boulder field, vegetation and braided flow downstream of pool

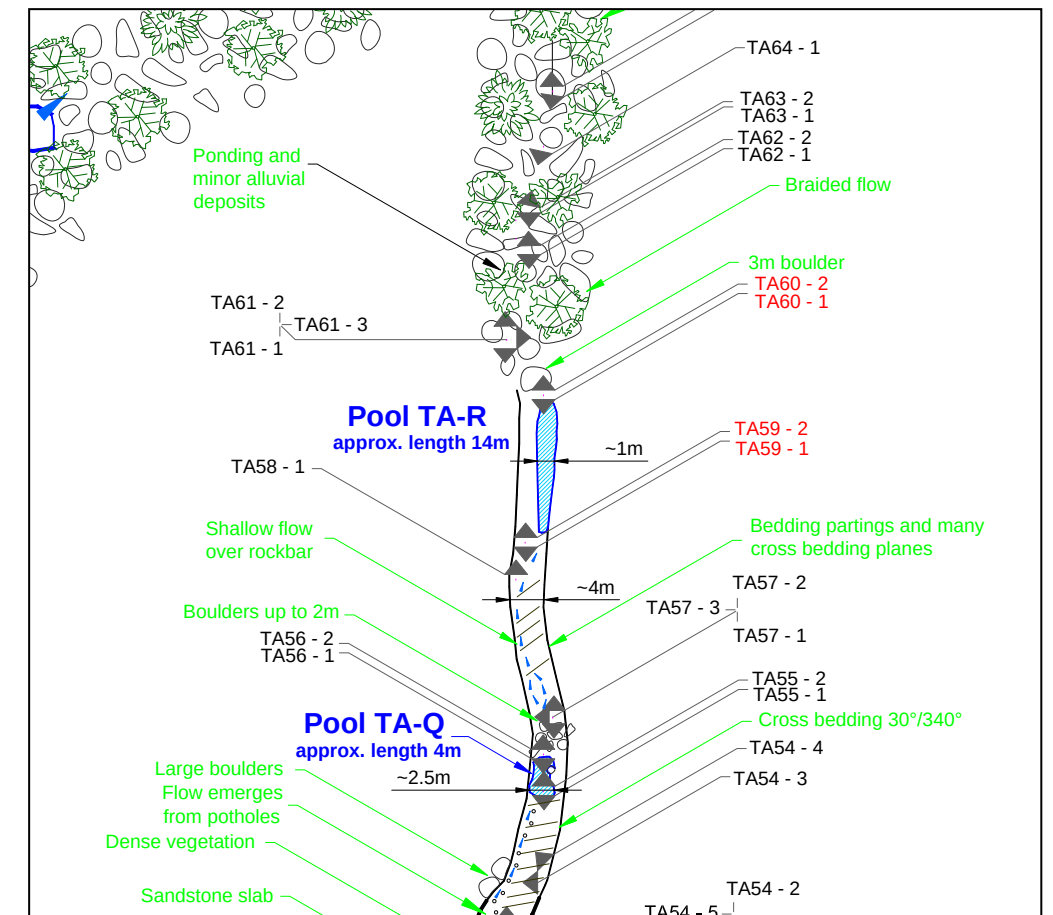


Photo Details

Photo ID	Easting	Northing	Bearing
TA59-1	310366	6214811	180
TA59-2	310366	6214811	0
TA60-1	310368	6214827	180
TA60-2	310368	6214827	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA61-1 Boulder field looking Upstream



TA61-2 Boulder field looking Downstream

Notes (as at 5 January 2010)

- Boulder field extends over approximately 50m
- Boulders up to 2m, vegetation and braided flow



TA61-3 East bank



TA62-1 Boulder field looking Upstream



TA62-2 Boulder field looking Downstream

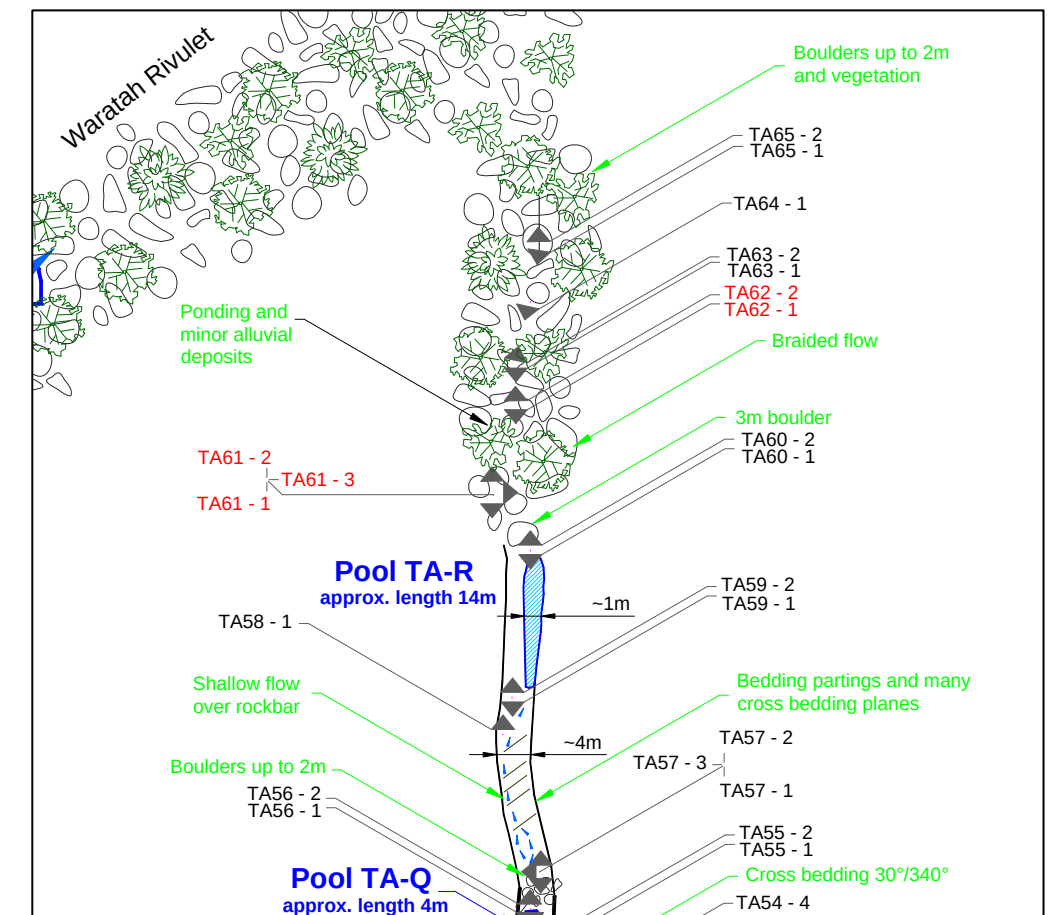


Photo Details

Photo ID	Easting	Northing	Bearing
TA61-1	310364	6214833	180
TA61-2	310364	6214833	0
TA61-3	310364	6214833	90
TA62-1	310365	6214844	180
TA62-2	310365	6214844	0

TRIBUTARY A STREAM MAPPING SUMMARY



TA63-1 Boulder field looking Upstream



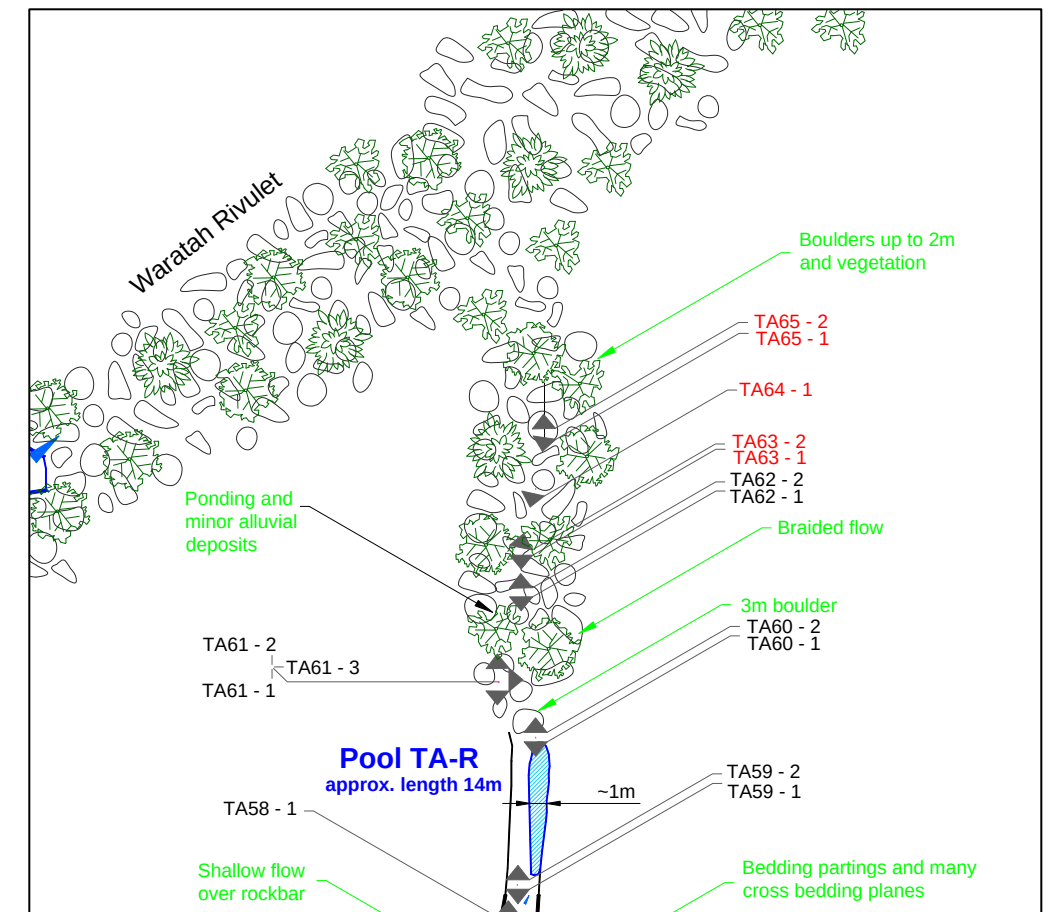
TA63-2 Boulder field looking Downstream

Notes (as at 5 January 2010)

- Boulder field extends over approximately 50m
- Boulders up to 2m, vegetation and braided flow



TA64-1 Boulder field looking Upstream



TA65-1 Boulder field looking Upstream



TA65-2 Boulder field looking Downstream toward Waratah Rivulet

Photo Details

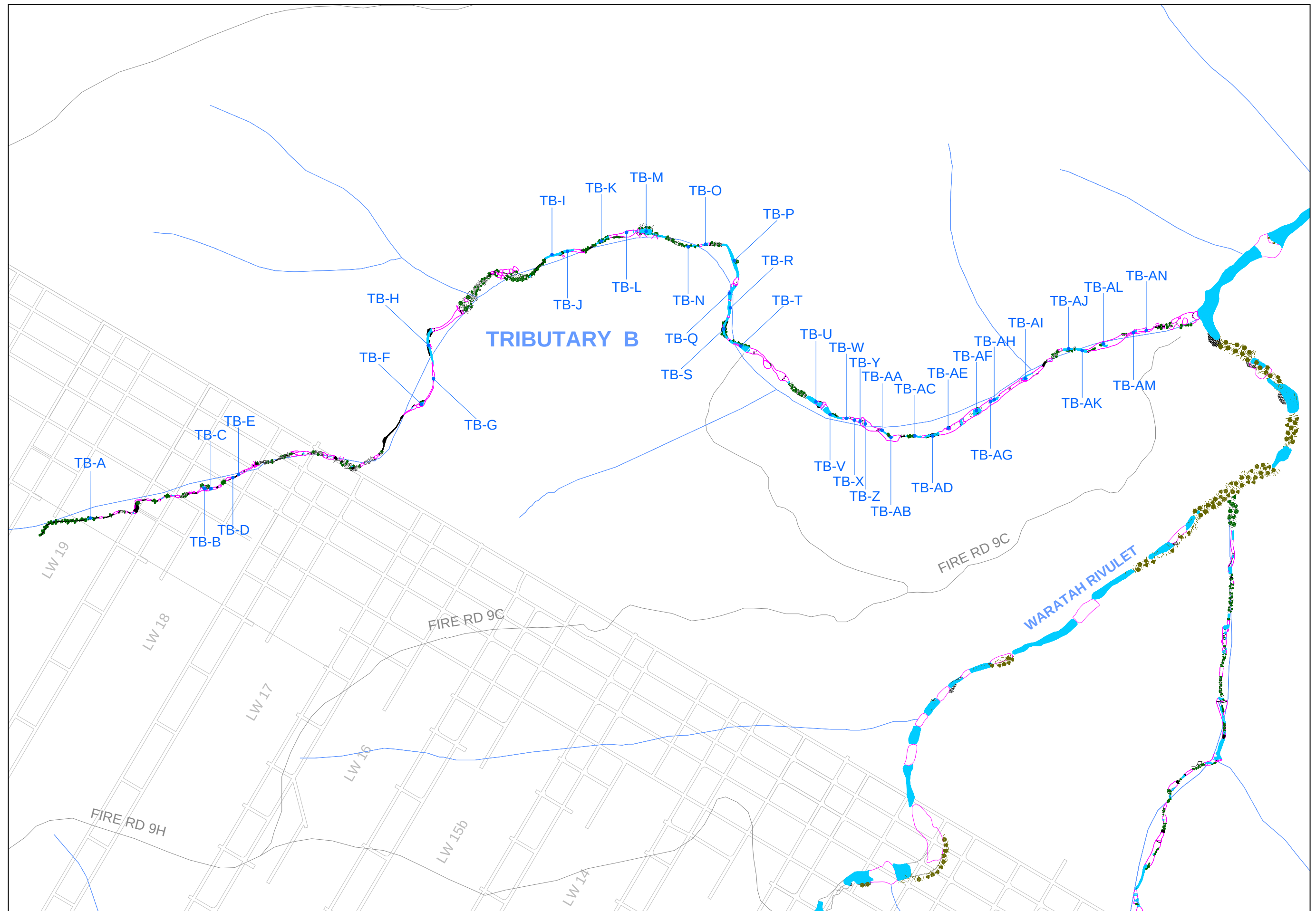
Photo ID	Easting	Northing	Bearing
TA63-1	310365	6214846	180
TA63-2	310365	6214846	10
TA64-1	310368	6214854	190
TA65-1	310369	6214860	190
TA65-2	310369	6214860	0

APPENDIX 4

TRIBUTARY B STREAM MAPPING AND PHOTOGRAPHIC RECORD

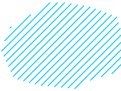
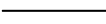
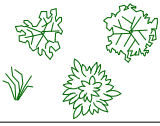
Metropolitan Coal – Water Management Plan		
Revision No. WMP-R01-A		
Document ID: Water Management Plan		

TRIBUTARY B – GENERAL LAYOUT



TRIBUTARY B STREAM MAPPING SUMMARY

Legend:

 A-1	Photo Direction Arrow		Water flow
	Pool		Pooled Water
	Rockbar		Alluvial Deposits (Sand)
	Boulders		Potholes
	Cross bedding		Vegetation - shrubs, bushes and small trees
	Joint		Slope Direction

TRIBUTARY B STREAM MAPPING SUMMARY



TB001-1 Upstream end of Tributary B looking toward northern bank



TB002-1 Upstream end of Tributary B looking Upstream



TB002-2 Upstream end of Tributary B looking Downstream



TB002-3 Upstream end of Tributary B looking down



TB003-1 Upstream end of Tributary B looking down



TB004-1 Upstream end of Tributary B looking toward northern bank

Notes (as at 22 December 2009)

- Damp, sandy creek bed with alluvial deposits
- No flow visible
- Dense vegetation

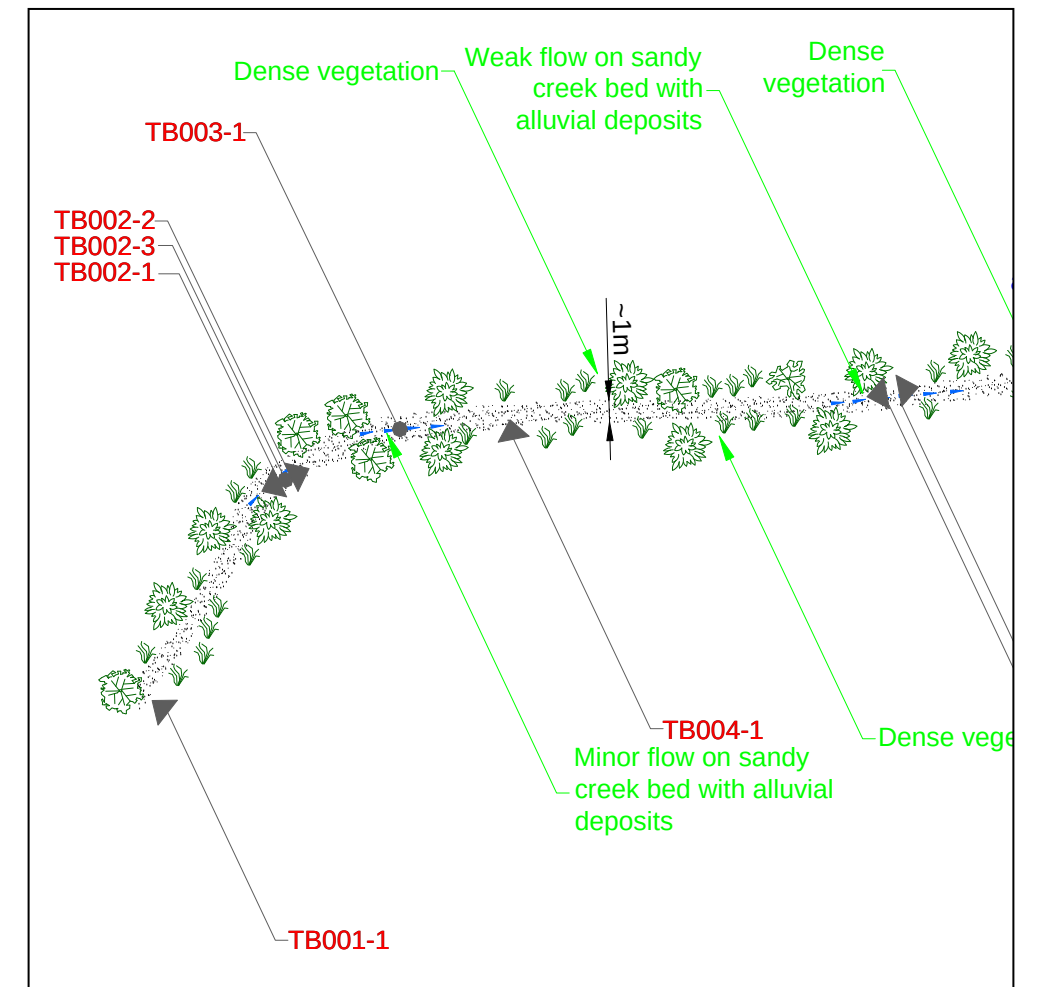


Photo Details

Photo ID	Easting	Northing	Bearing
TB001-1	308457	6214818	310
TB002-1	308466	6214836	240
TB002-2	308466	6214836	65
TB002-3	308466	6214836	-
TB003-1	308475	6214840	-
TB004-1	308484	6214839	350

TRIBUTARY B STREAM MAPPING SUMMARY



TB005-1 Upstream from Pool TB-A looking Upstream



TB005-2 Upstream from Pool TB-A looking Downstream



TB006-1 Midway along Pool TB-A looking Upstream



TB006-2 Midway along Pool TB-A looking Downstream



TB007-1 Downstream from Pool TB-A looking Upstream



TB007-2 Downstream from Pool TB-A looking Downstream

Notes (as at 22 December 2009)

- Pool TB-A approximately 8m long, 1m wide and 0.2m deep
- Base of the pool is alluvial with leaf litter
- Vegetation encroaches on pool from both sides
- Dense vegetation upstream of the pool
- Alluvial deposits downstream of the pool

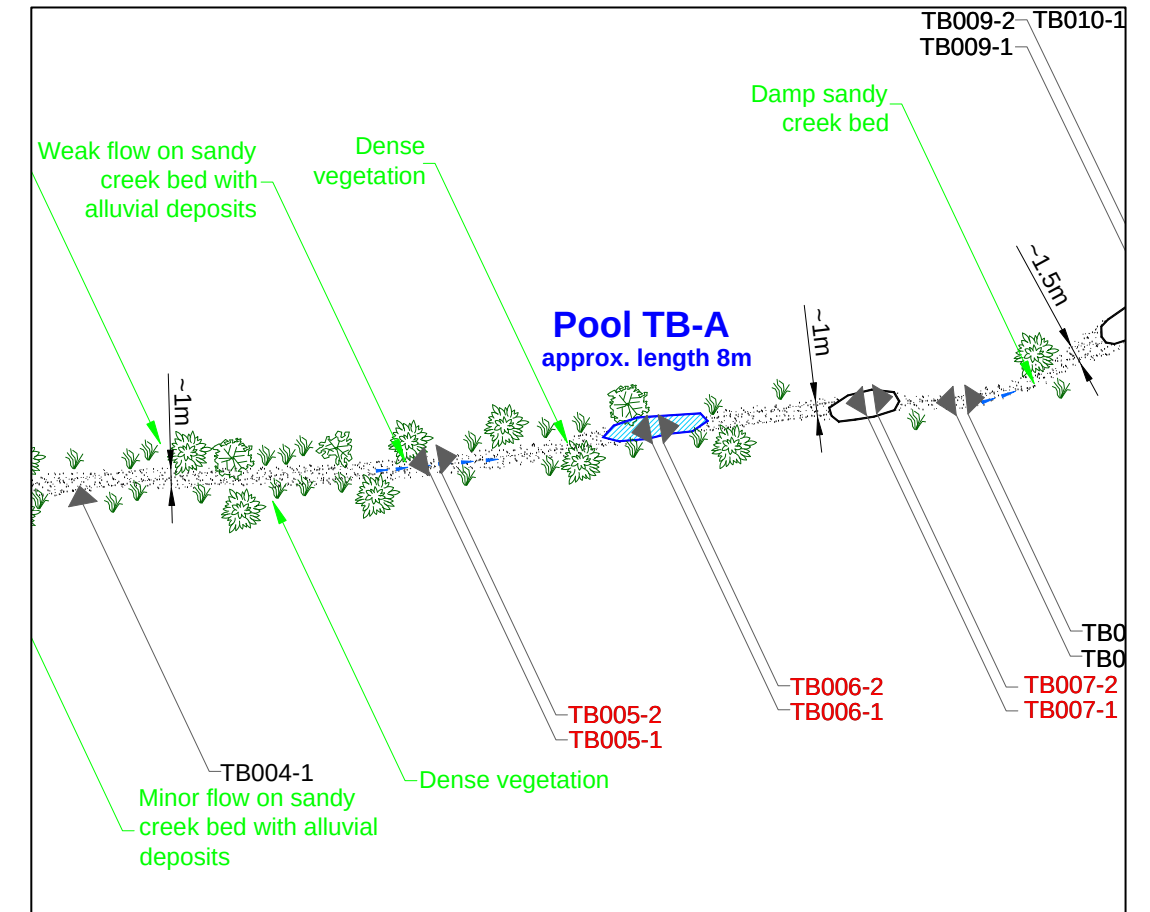


Photo Details

Photo ID	Easting	Northing	Bearing
TB005-1	308514	6214843	260
TB005-2	308514	6214843	80
TB006-1	308532	6214849	260
TB006-2	308532	6214849	85
TB007-1	308551	6214848	265
TB007-2	308551	6214848	80

TRIBUTARY B STREAM MAPPING SUMMARY



TB008-1 Downstream from Pool TB-A looking Upstream



TB008-2 Downstream from Pool TB-A looking Downstream



TB009-1 Downstream from Pool TB-A looking Upstream

Notes (as at 22 December 2009)

- Damp, sandy creek bed approximately 1m wide
- Flow path along southern side downstream of TB008
- Sandy banks with vegetation
- Rockbar at TB009 approximately 1.5m wide, with boulders downstream



TB009-2 Downstream from Pool TB-A looking Downstream



TB010-1 Downstream from Pool TB-A looking Upstream



TB010-2 Downstream from Pool TB-A looking Upstream



TB010-3 Downstream from Pool TB-A looking Upstream



TB010-4 Downstream from Pool TB-A looking Downstream

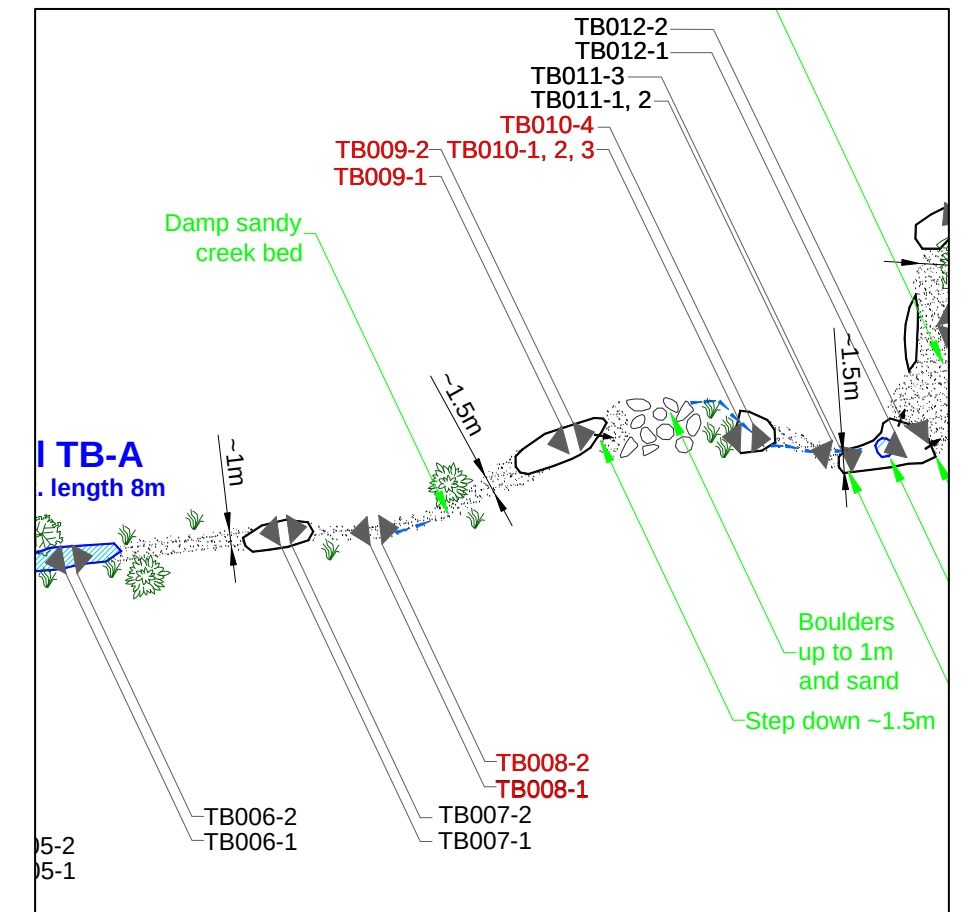


Photo Details

Photo ID	Easting	Northing	Bearing
TB008-1	308559	6214848	265
TB008-2	308559	6214848	80
TB009-1	308576	6214856	250
TB009-2	308576	6214856	80
TB010-1	308591	6214856	275
TB010-2	308591	6214856	275
TB010-3	308591	6214856	275
TB010-4	308591	6214856	95

TRIBUTARY B STREAM MAPPING SUMMARY



TB011-1 Rockbar looking Upstream



TB011-2 Rockbar looking Upstream



TB011-3 Rockbar looking Downstream

Notes (as at 22 December 2009)

- Rockbar at TB011 approximately 1.5m wide at upstream end
- Rockbar has ponding and iron staining downstream
- Step down approximately 1m at TB013 with alluvial deposits downstream



TB012-1 Rockbar looking Upstream



TB012-2 Rockbar looking Downstream



TB013-1 Dry creek bed looking Upstream



TB013-2 Dry creek bed looking Downstream

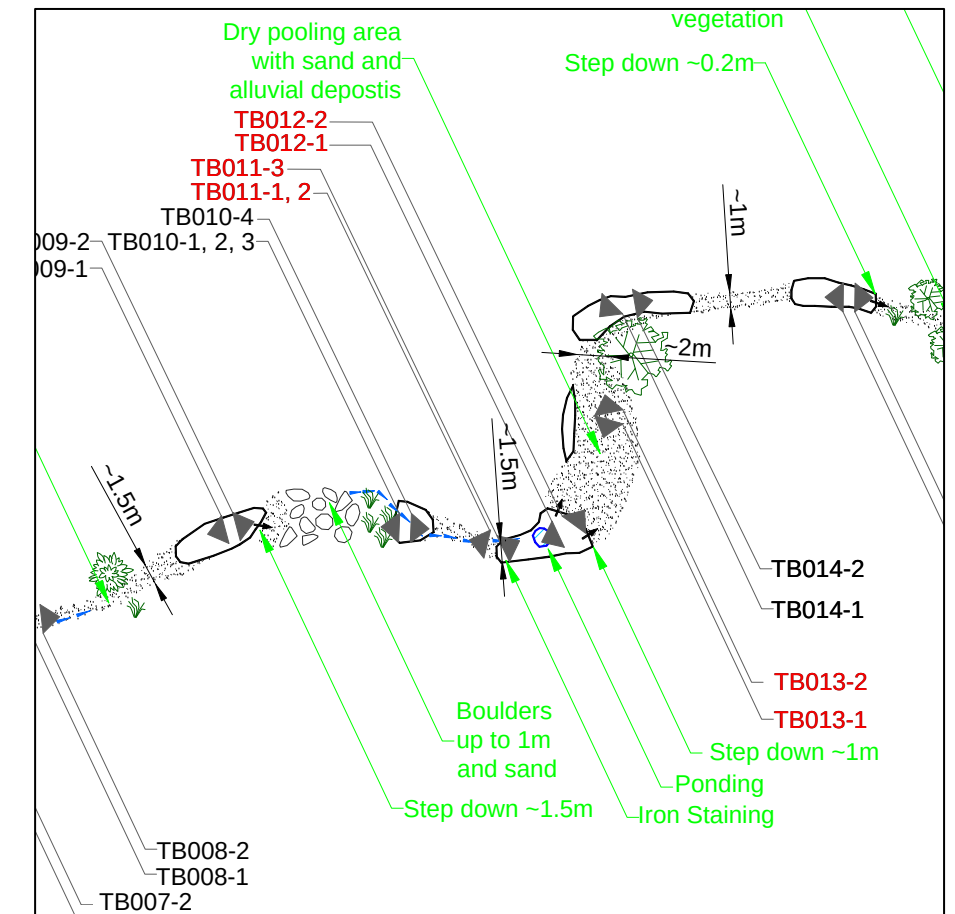


Photo Details

Photo ID	Easting	Northing	Bearing
TB011-1	308599	6214854	285
TB011-2	308599	6214854	285
TB011-3	308599	6214854	65
TB012-1	308603	6214854	245
TB012-2	308603	6214854	70
TB013-1	308610	6214866	195
TB013-2	308610	6214866	345

TRIBUTARY B STREAM MAPPING SUMMARY



TB014-1 Rockbar looking Upstream



TB014-2 Rockbar looking Downstream



TB015-1 Rockbar looking Upstream

Notes (as at 22 December 2009)

- Rockbar at TB014 approximately 1m wide, with alluvial deposits upstream and downstream
- Rockbar at TB015 approximately 1.5m wide, with alluvial deposits upstream and vegetation downstream
- Ponding with iron staining at TB016



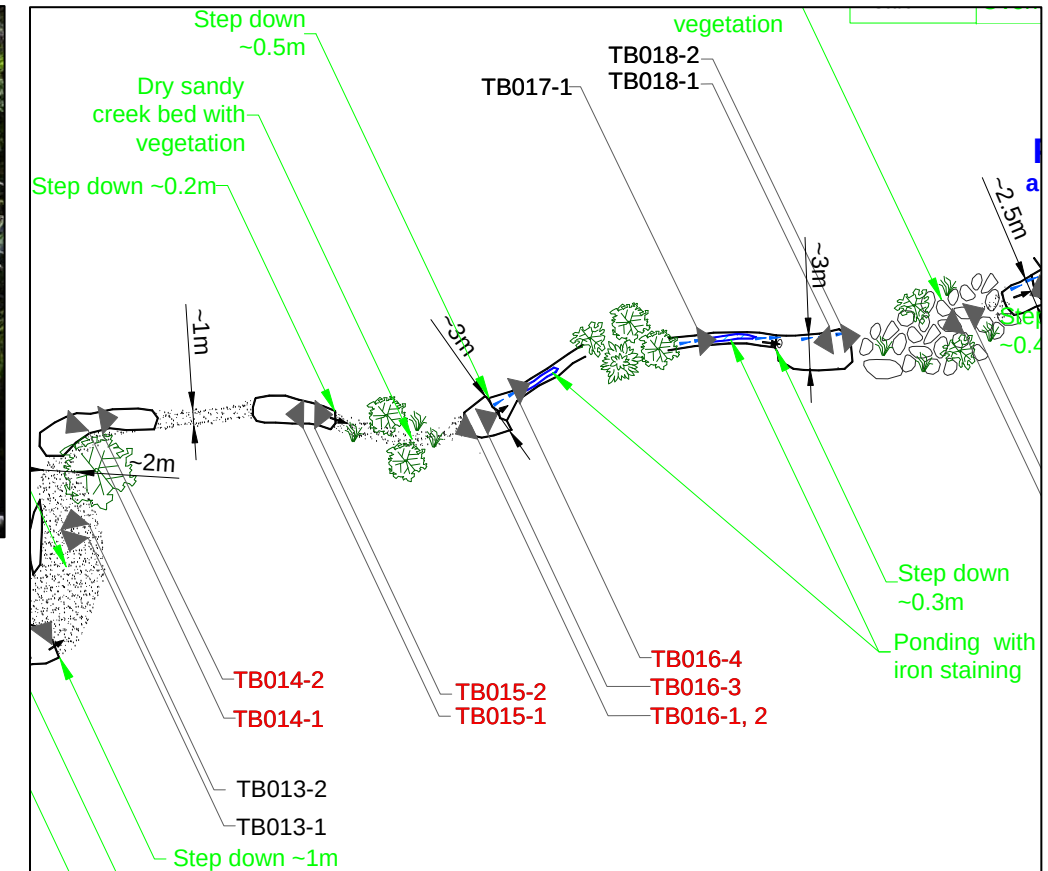
TB015-2 Rockbar looking Downstream



TB016- Looking Upstream



TB016-2 Looking Upstream



TB016-3 Looking Downstream



TB016-4 Ponding and iron staining looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB014-1	308610	6214875	285
TB014-2	308610	6214875	85
TB015-1	308628	6214876	180
TB015-2	308628	6214876	90
TB016-1	308644	6214875	245
TB016-2	308644	6214875	245
TB016-3	308644	6214875	65
TB016-4	308644	6214875	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB017-1 Upstream from Pool TB-B looking Downstream



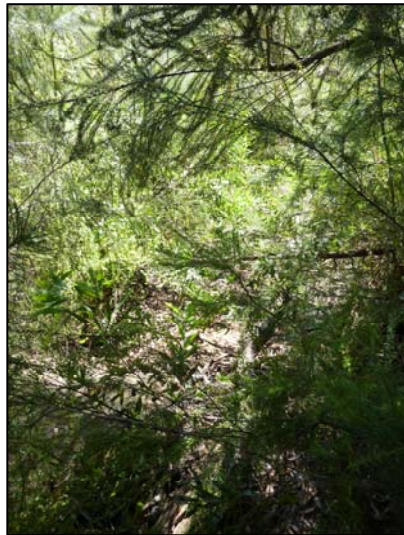
TB018-1 Upstream from Pool TB-B looking Upstream



TB018-2 Upstream from Pool TB-B looking Downstream

Notes (as at 22 December 2009)

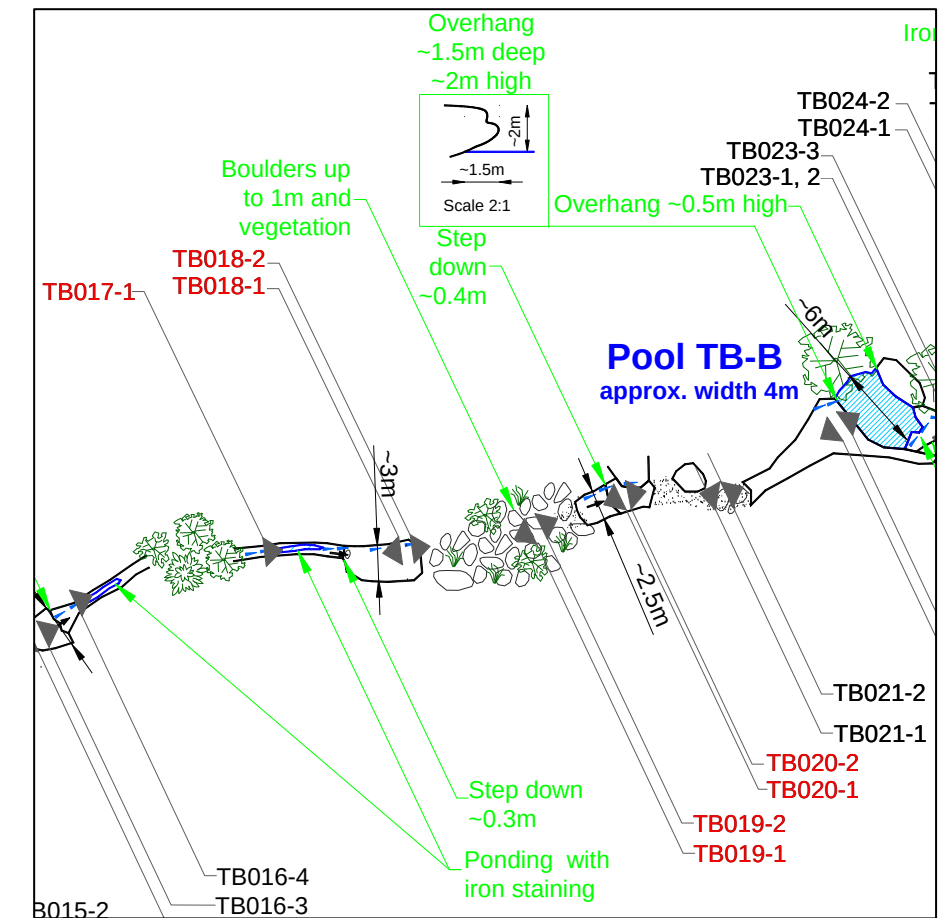
- Rockbar at TB018 approximately 6m long and 3m wide, with ponding and iron staining upstream
- Flow path along northern side of rockbar
- Vegetation and boulders up to 1m at TB019
- Rockbar at TB020 approximately 6m long and 2.5m wide
- Overhang on western bank approximately 2m high



TB019-1 Upstream from Pool TB-B looking Upstream



TB019-2 Upstream from Pool TB-B looking Downstream



TB020-1 Upstream from Pool TB-B looking Upstream



TB020-2 Upstream from Pool TB-B looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB017-1	308664	6214883	85
TB018-1	308676	6214883	260
TB018-2	308676	6214883	80
TB019-1	308690	6214879	245
TB019-2	308690	6214879	65
TB020-1	308694	6214887	240
TB020-2	308694	6214887	80

TRIBUTARY B STREAM MAPPING SUMMARY



TB021-1 Upstream from Pool TB-B looking Upstream



TB021-2 Upstream from Pool TB-B looking Downstream

Notes (as at 22 December 2009)

- Pool TB-B approximately 6m long, 4m wide and up to 1m deep
- Base of the pool is sandstone
- Rockbar upstream of the pool is approximately 8m wide at the downstream end
- Flow path along northern side of rockbar into Pool TB-B
- Overhang at upstream end of pool approximately 2m high and 1.5m deep
- Overhang at eastern side of pool approximately 0.5m high



TA022-2 Upstream end of Pool TB-B looking Downstream



TB022-1 Upstream end of Pool TB-B looking Upstream



TB022-3 Upstream end of Pool TB-B looking to overhang on eastern bank

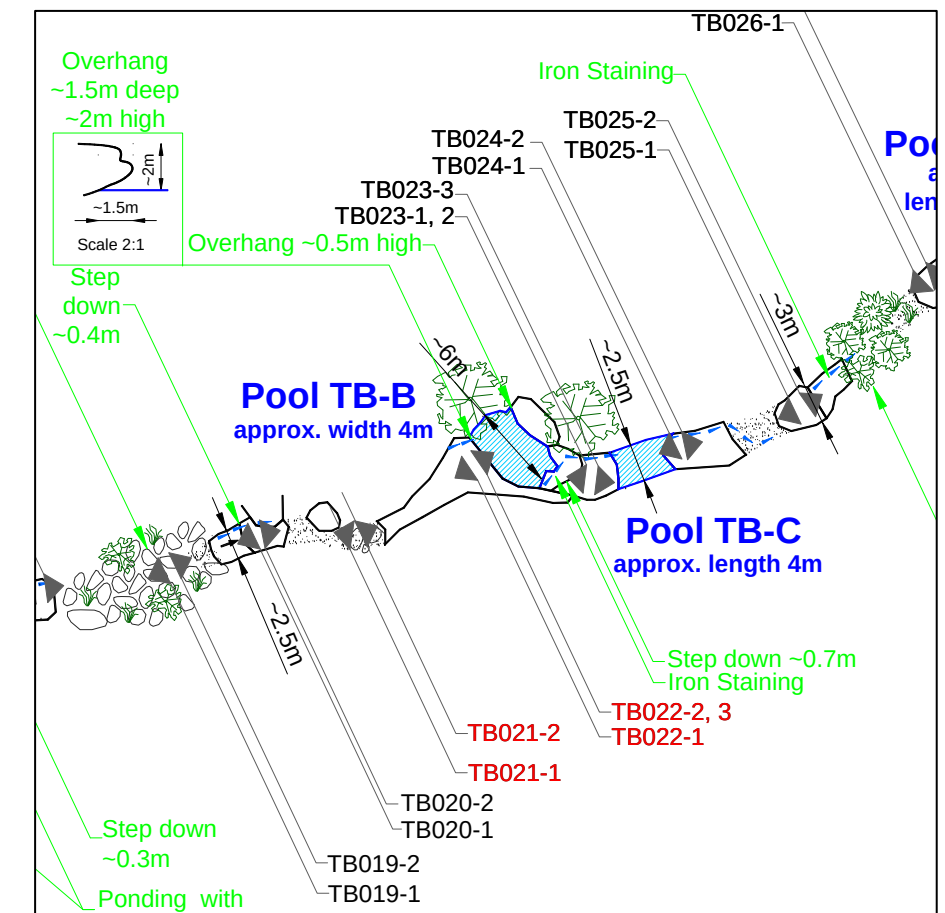


Photo Details

Photo ID	Easting	Northing	Bearing
TB021-1	308703	6214887	280
TB021-2	308703	6214887	65
TB022-1	308717	6214892	240
TB022-2	308717	6214892	60
TB022-3	308717	6214892	60

TRIBUTARY B STREAM MAPPING SUMMARY



TB023-1 Downstream end of Pool TB-B looking Upstream



TB023-2 Upstream from Pool TB-C looking Upstream



TB023-3 Upstream from Pool TB-C looking Downstream

Notes (as at 22 December 2009)

- Pool TB-C approximately 4m long, 2.5m wide and 0.2m deep
- Base of the pool is sandstone with scattered vegetation at the upstream end
- Flow path along northern side of rockbar into Pool TB-C
- Rockbar upstream of the pool is approximately 5m long and 2.5m wide



TB024-1 Downstream end of Pool TB-C looking Upstream



TB024-2 Downstream end of Pool TB-C looking Downstream



TB025-1 Downstream from Pool TB-C looking Upstream



TB025-2 Downstream from Pool TB-C looking Downstream

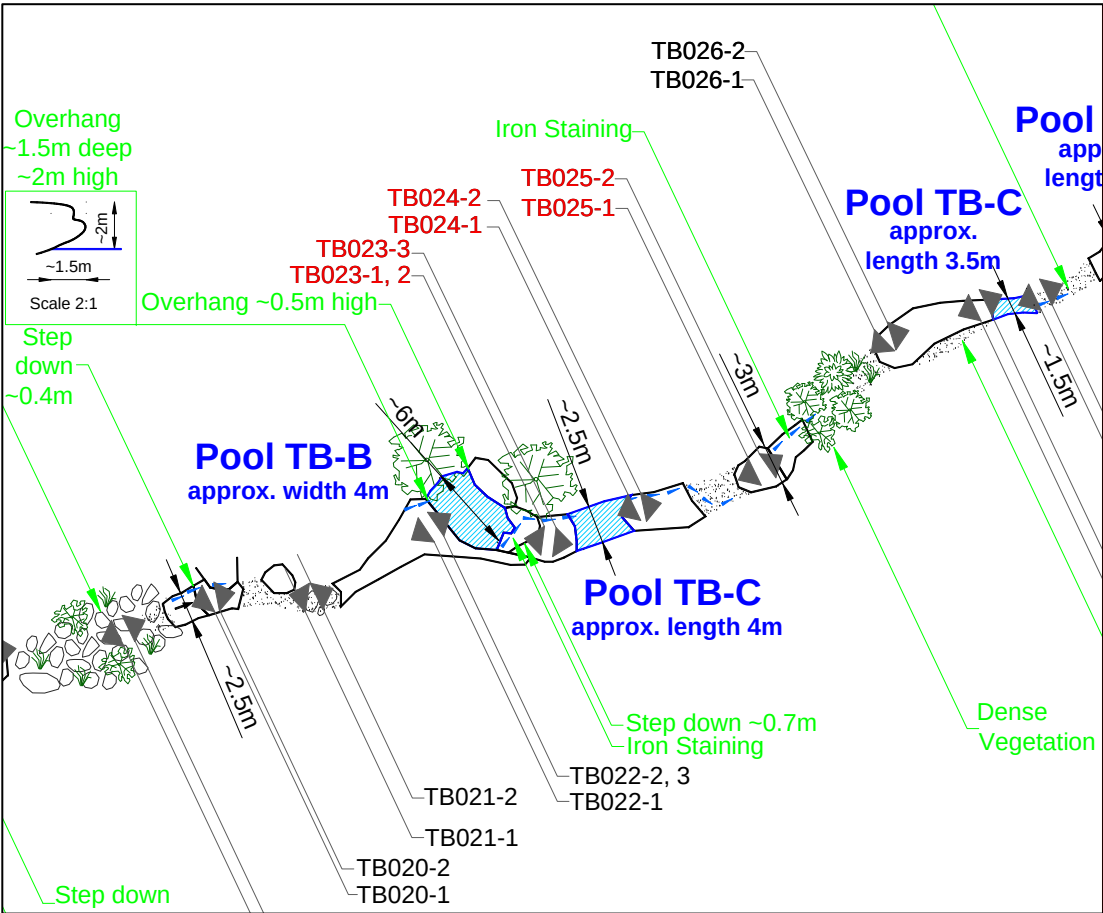


Photo Details			
Photo ID	Easting	Northing	Bearing
TB023-1	308720	6214893	275
TB023-2	308720	6214893	275
TB023-3	308720	6214893	95
TB024-1	308731	6214895	245
TB024-2	308731	6214895	80
TB025-1	308742	6214897	245
TB025-2	308742	6214897	55

TRIBUTARY B STREAM MAPPING SUMMARY



TB026-1 Upstream from Pool TB-D looking Upstream



TB026-2 Upstream from Pool TB-D looking Downstream



TB027-1 Upstream end of Pool TB-D looking Upstream

Notes (as at 22 December 2009)

- Pool TB-D approximately 3.5m long, 1.5m wide and 0.2m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar upstream of the pool is approximately 10m long with scattered vegetation debris
- Rockbar and alluvial deposits downstream of the pool
- Pool TB-E approximately 3m long, 3m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits



TB027-2 Upstream end of Pool TB-D looking Downstream



TB028-1 Downstream end of Pool TB-D looking Upstream



TB028-2 Downstream end of Pool TB-D looking Downstream



TB029-1 Downstream end of Pool TB-E looking Upstream



TB029-2 Downstream end Pool TB-E looking Downstream

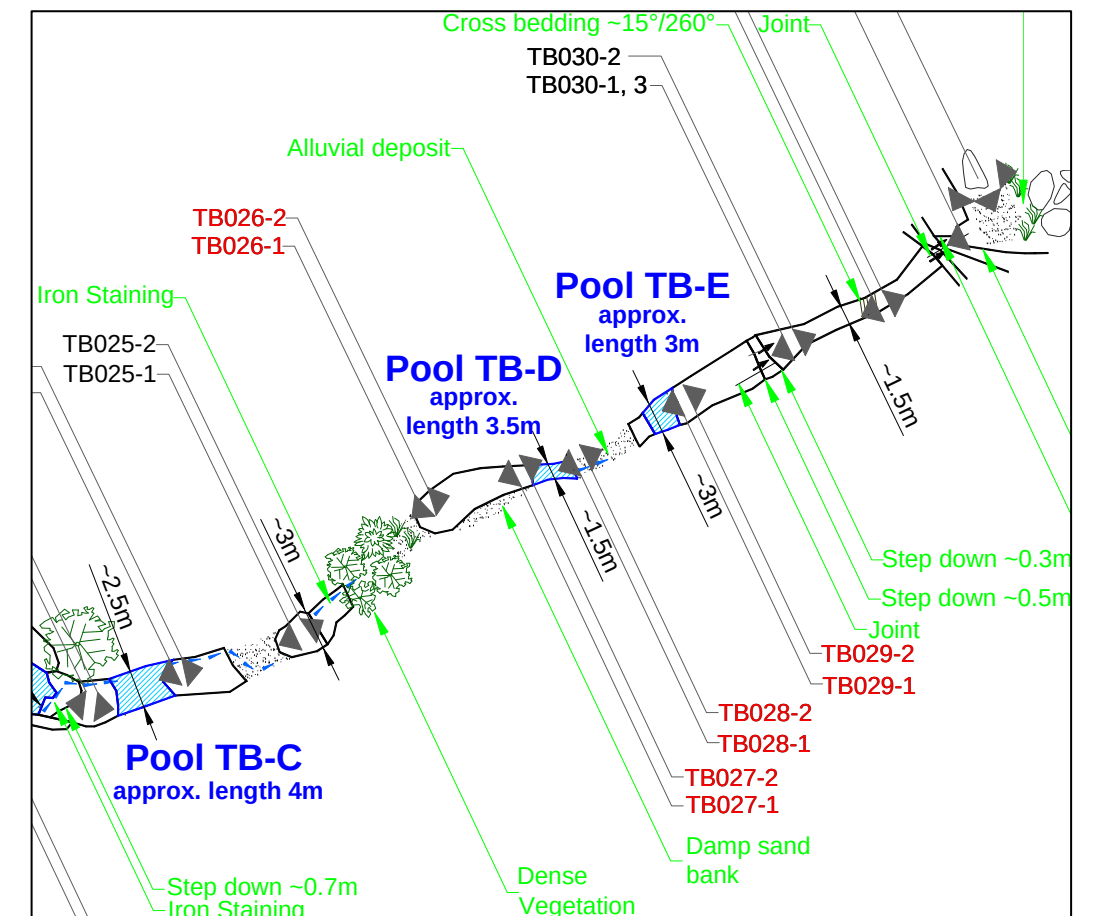


Photo Details

Photo ID	Easting	Northing	Bearing
TB026-1	308752	6214909	215
TB026-2	308752	6214909	70
TB027-1	308760	6214912	245
TB027-2	308760	6214912	65
TB028-1	308765	6214911	245
TB028-2	308765	6214911	65
TB029-1	308774	6214918	245
TB029-2	308774	6214918	65

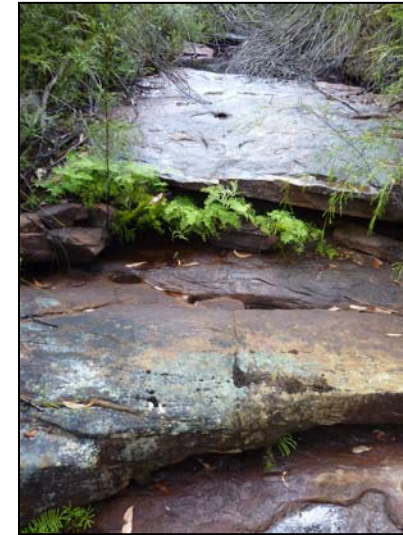
TRIBUTARY B STREAM MAPPING SUMMARY



TB030-1 Downstream from Pool TB-E looking Upstream



TB030-2 Downstream from Pool TB-E looking Downstream



TB030-3 Downstream from Pool TB-E looking Upstream

Notes (as at 22 December 2009)

- Approximate 0.8m change in height along rockbar downstream of Pool TB-E toward TB030
- Rockbar at TB031 approximately 1.5m wide with cross bedding and scattered vegetation debris



TB031-1 Downstream from Pool TB-E looking Upstream



TB031-2 Downstream from Pool TB-E looking Downstream



TB032-1 Downstream from Pool TB-E looking Upstream

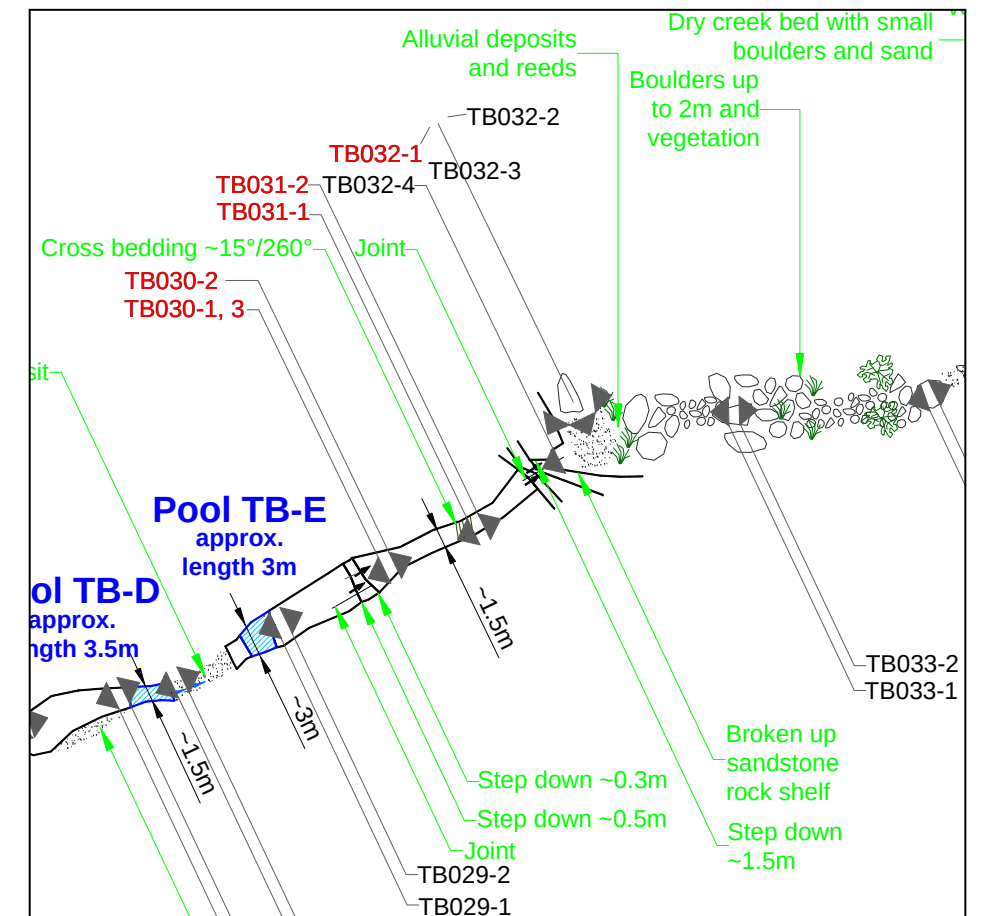


Photo Details

Photo ID	Easting	Northing	Bearing
TB030-1	308781	6214922	245
TB030-2	308781	6214922	65
TB030-3	308781	6214922	245
TB031-1	308791	6214927	245
TB031-2	308791	6214927	65
TB032-1	308799	6214937	205

TRIBUTARY B STREAM MAPPING SUMMARY



TB032-2 Downstream from Pool TB-E looking Downstream



TB032-3 Downstream from Pool TB-E looking toward southern bank

Notes (as at 22 December 2009)

- Alluvial deposits and reeds at TB032
- Boulders up to 2m and vegetation downstream
- No flow visible
- Approximate 1.5m change in height at TB032



TB032-4 Joint



TB033-1 Downstream from Pool TB-E looking Upstream



TB033-2 Downstream from Pool TB-E looking Downstream

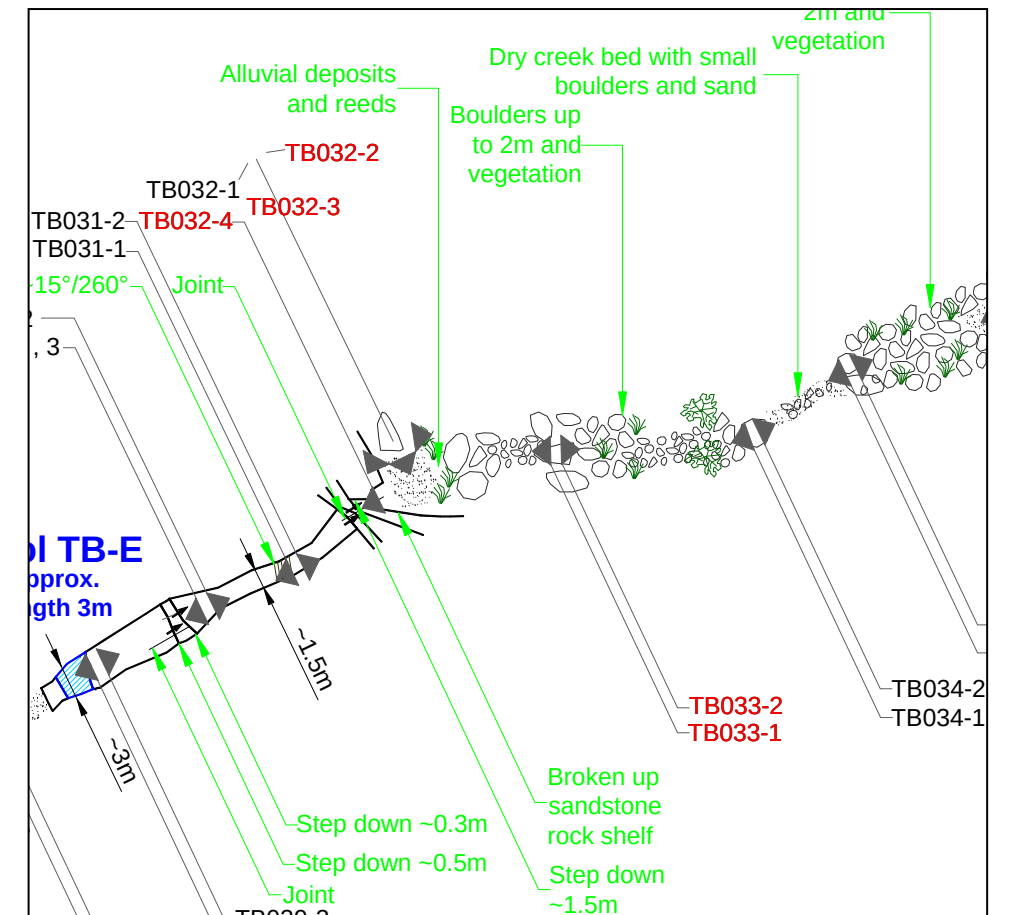


Photo Details

Photo ID	Easting	Northing	Bearing
TB032-2	308799	6214937	85
TB032-3	308799	6214937	155
TB032-4	308799	6214937	245
TB033-1	308813	6214936	270
TB033-2	308813	6214936	90

TRIBUTARY B STREAM MAPPING SUMMARY



TB034-1 Boulder field looking Upstream

Notes (as at 22 December 2009)

- Boulders up to 2m and vegetation
- Dry creek bed with small boulders and alluvial deposits
- No flow visible



TB034-2 Boulder field looking Downstream



TB035-1 Dry creek bed looking Upstream



TB035-2 Boulder field looking Downstream



TB036-1 Boulder field looking Upstream



TB036-2 Boulder field looking Downstream

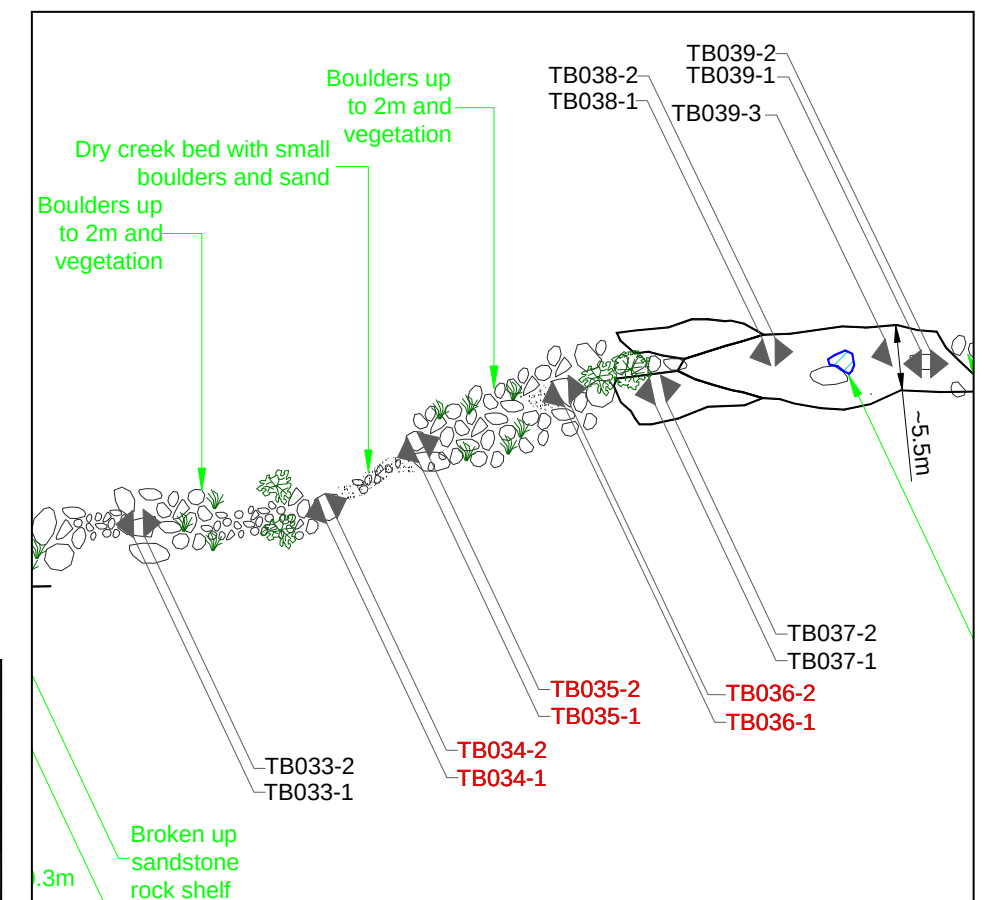


Photo Details

Photo ID	Easting	Northing	Bearing
TB034-1	308830	6214937	250
TB034-2	308830	6214937	50
TB035-1	308838	6214943	245
TB035-2	308838	6214943	65
TB036-1	308851	6214948	245
TB036-2	308851	6214948	85

TRIBUTARY B STREAM MAPPING SUMMARY



TB037-1 Rockbar looking Upstream



TB037-2 Rockbar looking Downstream



TB038-1 Rockbar looking Upstream

Notes (as at 22 December 2009)

- Rockbar at TB038 approximately 25m long and 5.5m wide with minor ponding
- Boulders and vegetation both upstream and downstream of the rockbar



TB038-2 Rockbar looking Downstream



TB039-1 Rockbar looking Upstream



TB039-2 Rockbar looking Downstream



TB039-3 Ponding

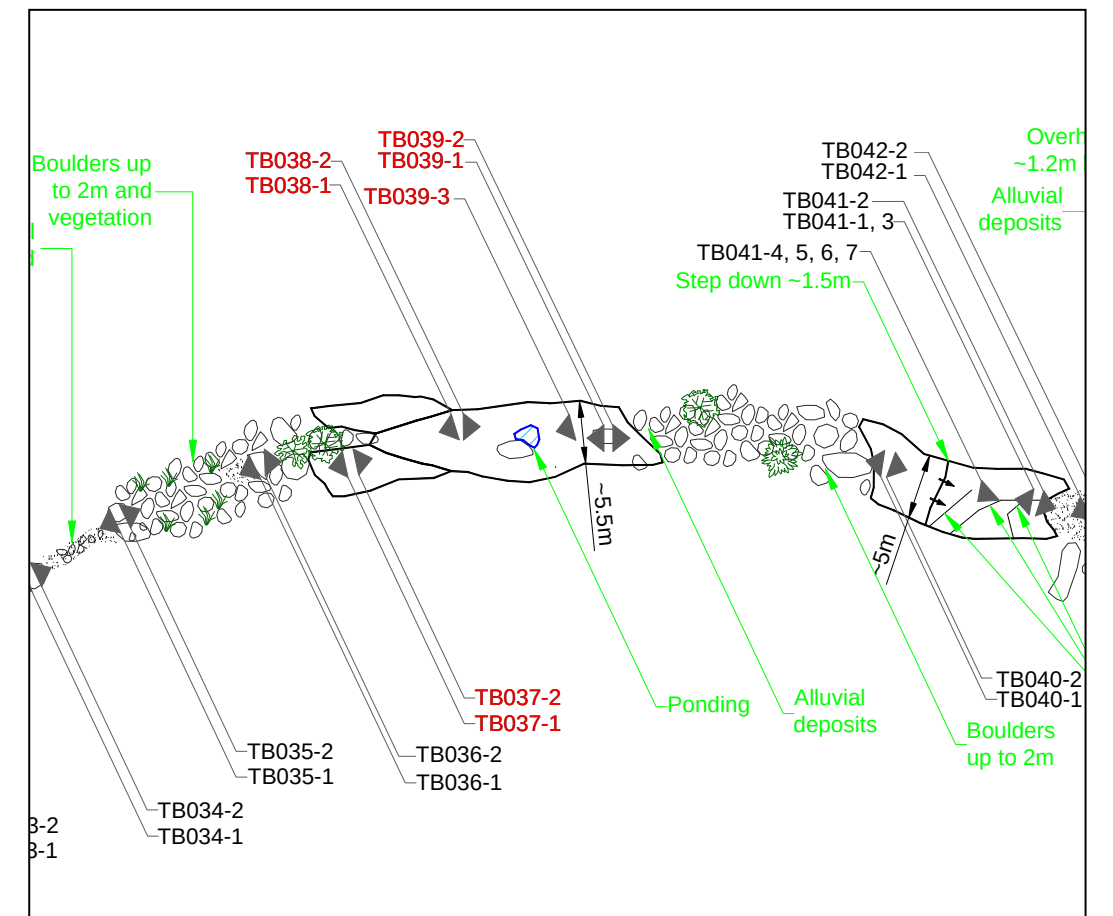


Photo Details

Photo ID	Easting	Northing	Bearing
TB037-1	308857	6214947	260
TB037-2	308857	6214947	80
TB038-1	308870	6214952	250
TB038-2	308870	6214952	90
TB039-1	308884	6214949	270
TB039-2	308884	6214949	90
TB039-3	308884	6214949	255

TRIBUTARY B STREAM MAPPING SUMMARY



TB040-1 Rockbar looking Upstream



TB040-2 Rockbar looking Downstream



TB041-1 Rockbar looking Upstream

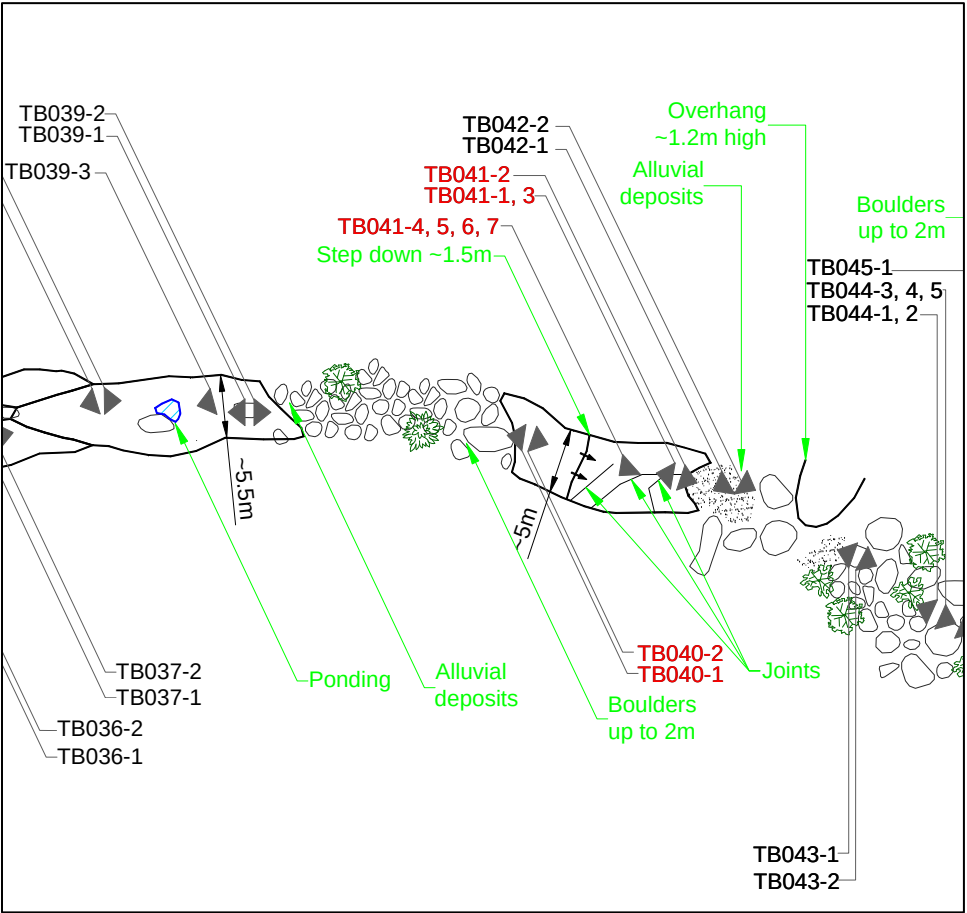
- Notes (as at 22 December 2009)
- Rockbar at TB040 approximately 18m long and 5m wide, with a step down of approximately 1.5m half way along
 - Rockbar has many joints
 - No visible flow



TB041-2 Rockbar looking Downstream



TB041-3 Joints



TB041-4 Joint



TB041-5 Joint



TB041-6 Joint



TB041-7 Joint

Photo Details			
Photo ID	Easting	Northing	Bearing
TB040-1	308908	6214951	275
TB040-2	308908	6214951	105
TB041-1	308913	6214946	280
TB041-2	308913	6214946	110
TB041-3	308913	6214946	280
TB041-4	308913	6214946	230
TB041-5	308913	6214946	230
TB041-6	308913	6214946	230
TB041-7	308913	6214946	230

TRIBUTARY B STREAM MAPPING SUMMARY



TB042-1 Rockbar looking Upstream



TB042-2 Rockbar looking Downstream



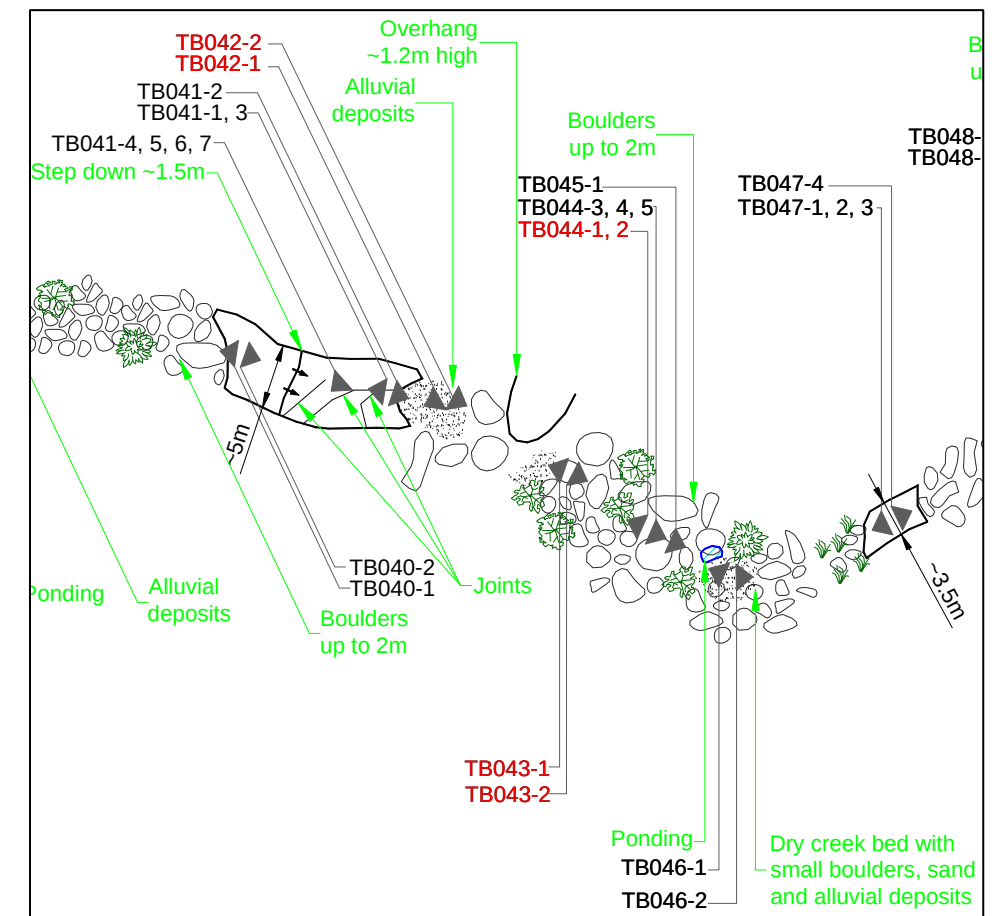
TB043-1 Boulder field looking Upstream

Notes (as at 22 December 2009)

- Alluvial deposits, large boulders and scattered vegetation at TB042 and TB043
- No flow visible
- Overhang on northern bank approximately 1.2m high



TB043-2 Boulder field looking Downstream



TB044-1 Boulder field looking Upstream



TB044-2 Boulder field looking Upstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB042-1	308927	6214944	240
TB042-2	308927	6214944	120
TB043-1	308940	6214937	285
TB043-2	308940	6214937	115
TB044-1	308947	6214932	295
TB044-2	308947	6214932	295

TRIBUTARY B STREAM MAPPING SUMMARY



TB044-3 Boulder field looking Downstream



TB044-4 Boulder field looking Downstream



TB044-5 Boulder field looking Downstream

Notes (as at 22 December 2009)

- Minor ponding and alluvial deposits at TB046
- Rockbar at TB047 approximately 6m long and 3.5m wide, with boulders downstream and vegetation upstream



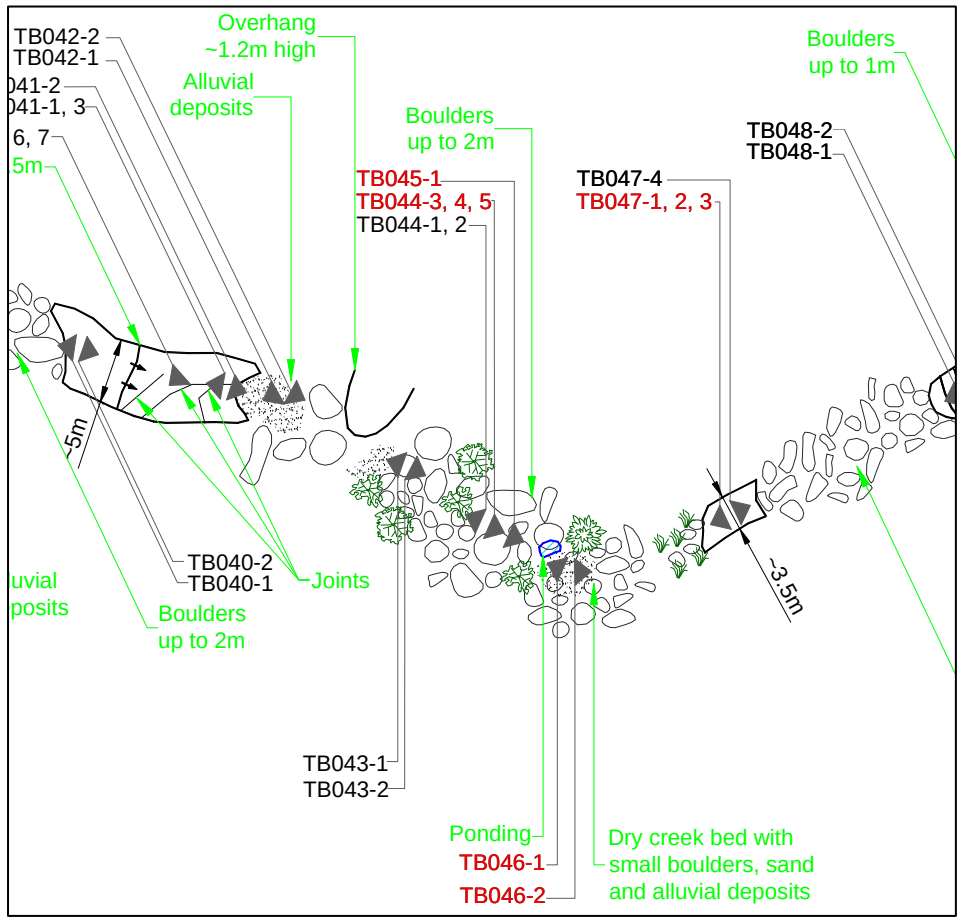
TB045-1 Dry creek bed looking Upstream



TB046-1 Boulder field looking Upstream



TB046-2 Boulder field looking Downstream



TB047-1 Rockbar looking Upstream



TB047-2 Rockbar looking Upstream



TB047-3 Rockbar looking Upstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB044-3	308947	6214932	115
TB044-4	308947	6214932	115
TB044-5	308947	6214932	115
TB045-1	308947	6214932	115
TB046-1	308949	6214925	295
TB046-2	308949	6214925	90
TB047-1	308969	6214933	245
TB047-2	308969	6214933	245
TB047-3	308969	6214933	245

TRIBUTARY B STREAM MAPPING SUMMARY



TB047-4 Rockbar looking Downstream



TB048-1 Rockbar looking Upstream

- Notes (as at 22 December 2009)
- Rockbar at TB048 approximately 10m long and 4.5m wide
 - Rockbar has a step down of approximately 0.4m at the upstream end
 - Rockbar has a step down of approximately 0.8m at the downstream end



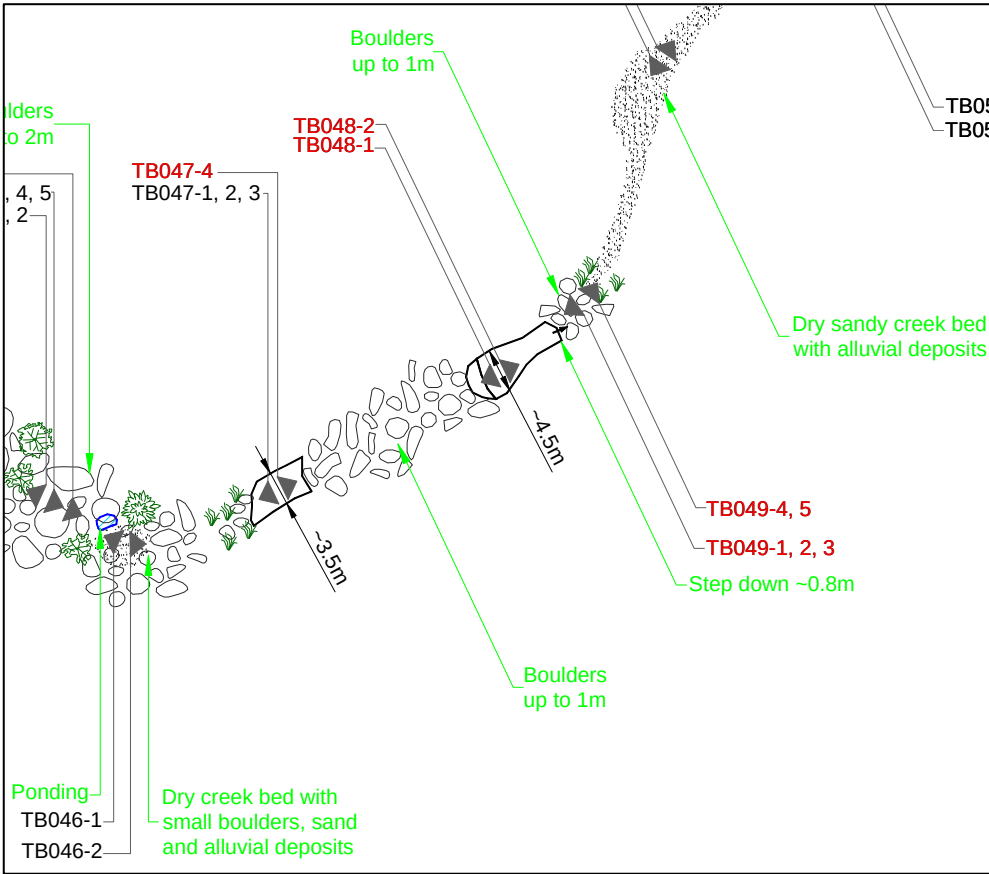
TB048-2 Rockbar looking Downstream



TB049-1 Rockbar looking Upstream



TB049-2 Rockbar looking Upstream



TB049-3 Rockbar looking Upstream



TB049-4 Sandy creek bed looking Downstream



TB049-5 Sandy creek bed looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB047-4	308969	6214933	65
TB048-1	308992	6214944	245
TB048-2	308992	6214944	65
TB049-1	309000	6214951	235
TB049-2	309000	6214951	235
TB049-3	309000	6214951	235
TB049-4	309000	6214951	40
TB049-5	309000	6214951	40

TRIBUTARY B STREAM MAPPING SUMMARY



TB050-1 Sandy creek bed looking Upstream



TB050-2 Sandy creek bed looking Downstream



TB051-1 Sandy creek bed looking Upstream



TB051-2 Sandy creek bed looking Downstream



TB052-1 Sandy creek bed looking Upstream



TB052-2 Sandy creek bed looking Downstream



TB053-1 Sandy creek bed looking Upstream



TB053-2 Sandy creek bed looking Downstream



TB054-1 Dry sandstone creek bed looking Upstream



TB054-2 Dry sandstone creek bed looking Downstream

Notes (as at 22 December 2009)

- Alluvial deposits extend over approximately 65m downstream between TB049 and TB053
- Alluvial deposits open up to dry sandstone creek bed at TB054

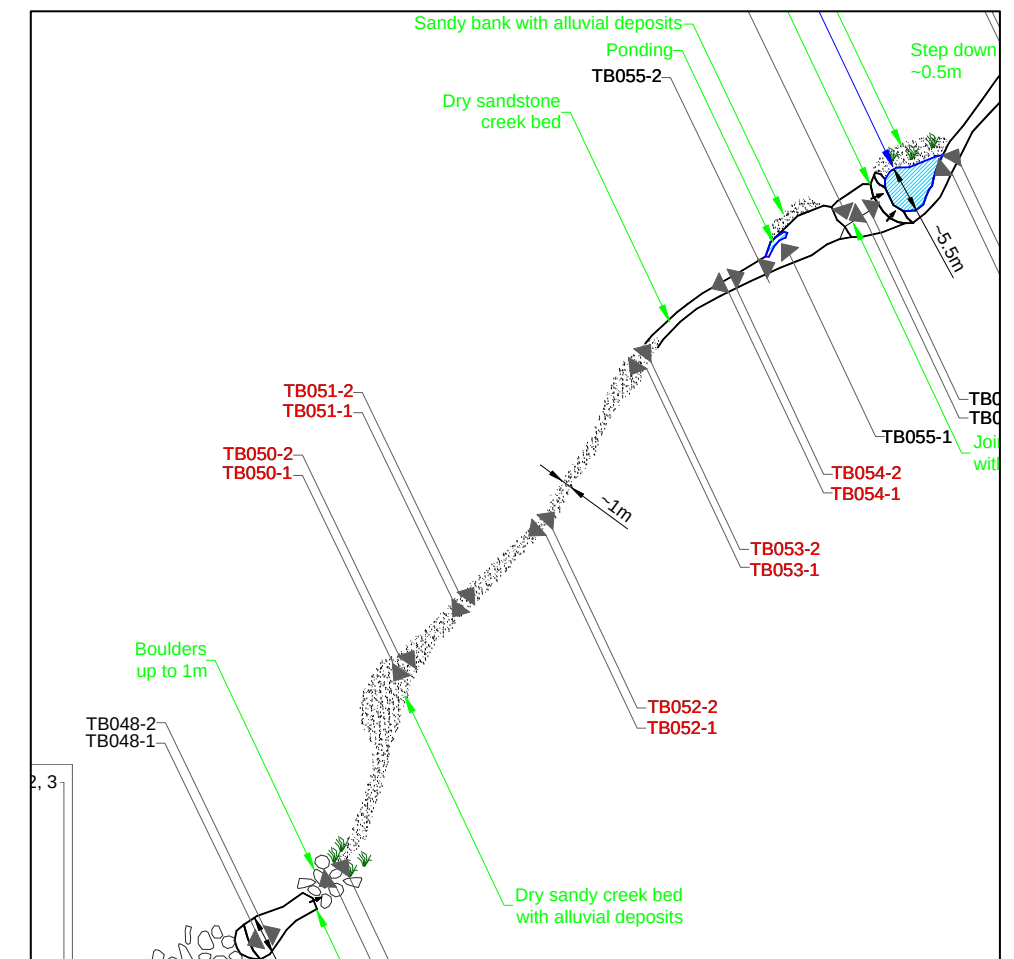


Photo Details

Photo ID	Easting	Northing	Bearing
TB050-1	309008	6214975	215
TB050-2	309008	6214975	35
TB051-1	309010	6214986	215
TB051-2	309010	6214986	35
TB052-1	309026	6214988	230
TB052-2	309026	6214988	45
TB053-1	309035	6215010	210
TB053-2	309035	6215010	35
TB054-1	309045	6215019	245
TB054-2	309045	6215019	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB055-1 Upstream from Pool TB-F looking toward northern bank



TB055-2 Upstream from Pool TB-F looking Downstream



TB056-1 Upstream end of Pool TB-F looking Upstream

Notes (as at 22 December 2009)

- Minor ponding at TB055 with scattered vegetation debris and alluvial deposits on northern bank
- Joint along centre of rockbar at TB056
- Pool TB-F approximately 8m long, 5.5m wide and 0.5 m deep
- Sand deposit on northern bank
- Rockbar upstream steps down approximately 0.5m to Pool TB-F
- No flow visible downstream of pool



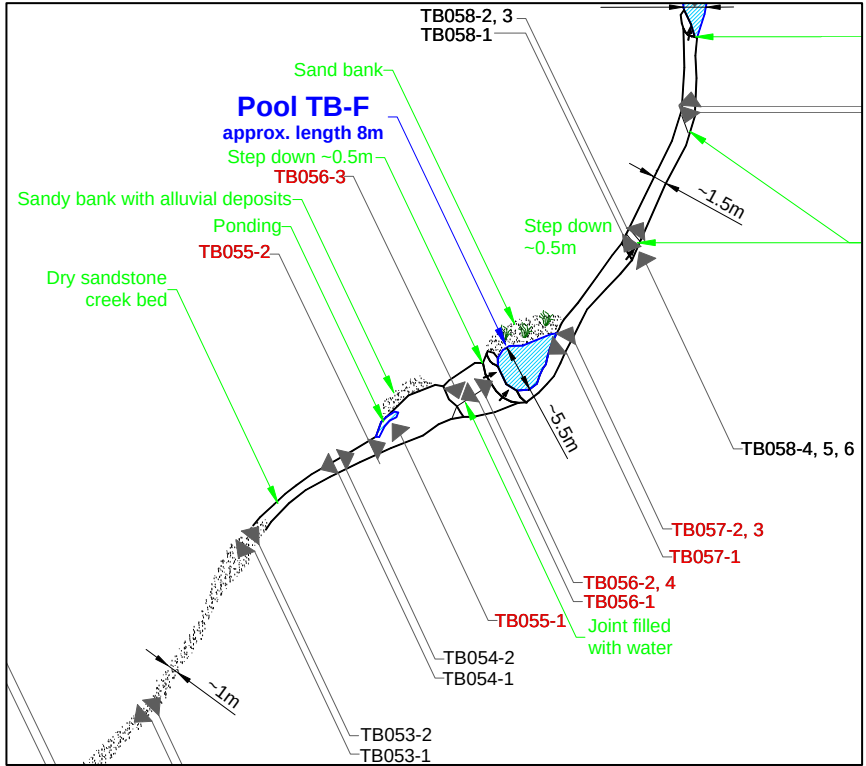
TB056-2 Upstream end of Pool TB-F looking Downstream



TB056-3 Joint



TB056-4 Joint



TB057-1 Downstream end of Pool TB-F looking Upstream



TB057-2 Downstream end of Pool TB-F looking Downstream



TB057-3 Downstream end of Pool TB-F looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB055-1	309052	6215022	325
TB055-2	309052	6215022	65
TB056-1	309057	6215026	240
TB056-2	309057	6215026	60
TB056-3	309057	6215026	155
TB056-4	309057	6215026	60
TB057-1	309070	6215032	235
TB057-2	309070	6215032	30
TB057-3	309070	6215032	30

TRIBUTARY B STREAM MAPPING SUMMARY



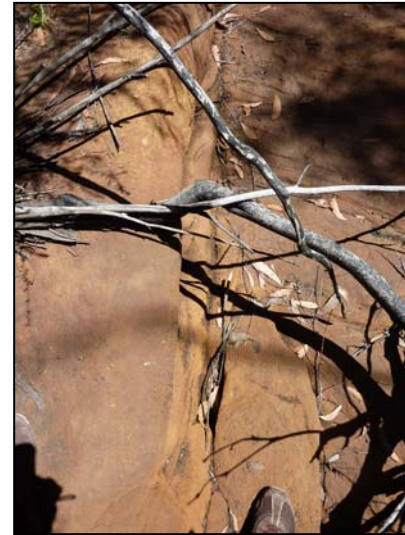
TB058-1 Downstream from Pool TB-F looking Upstream



TB058-2 Downstream from Pool TB-F looking Downstream



TB058-3 Downstream from Pool TB-F looking Downstream



TB058-4 Joint



TB058-5 Joint



TB058-6 Joint



TB059-1 Upstream from Pool TB-G looking Upstream



TB059-2 Upstream from Pool TB-G looking Downstream



TB059-3 Joint



TB060-1 Downstream end of Pool TB-G looking Upstream



TB060-2 Downstream end of Pool TB-G looking Downstream

Notes (as at 22 December 2009)

- Rockbar at TB058 approximately 1.5m wide, with a step down of approximately 0.5m
- Water-filled joints across rockbar at TB058 and TB059
- Step down of approximately 0.8m at upstream end of Pool TB-G
- Pool TB-G approximately 5m long, 2m wide and 0.5m deep
- Base of the pool is sandstone
- Exposed sandstone with scattered vegetation debris downstream of the pool

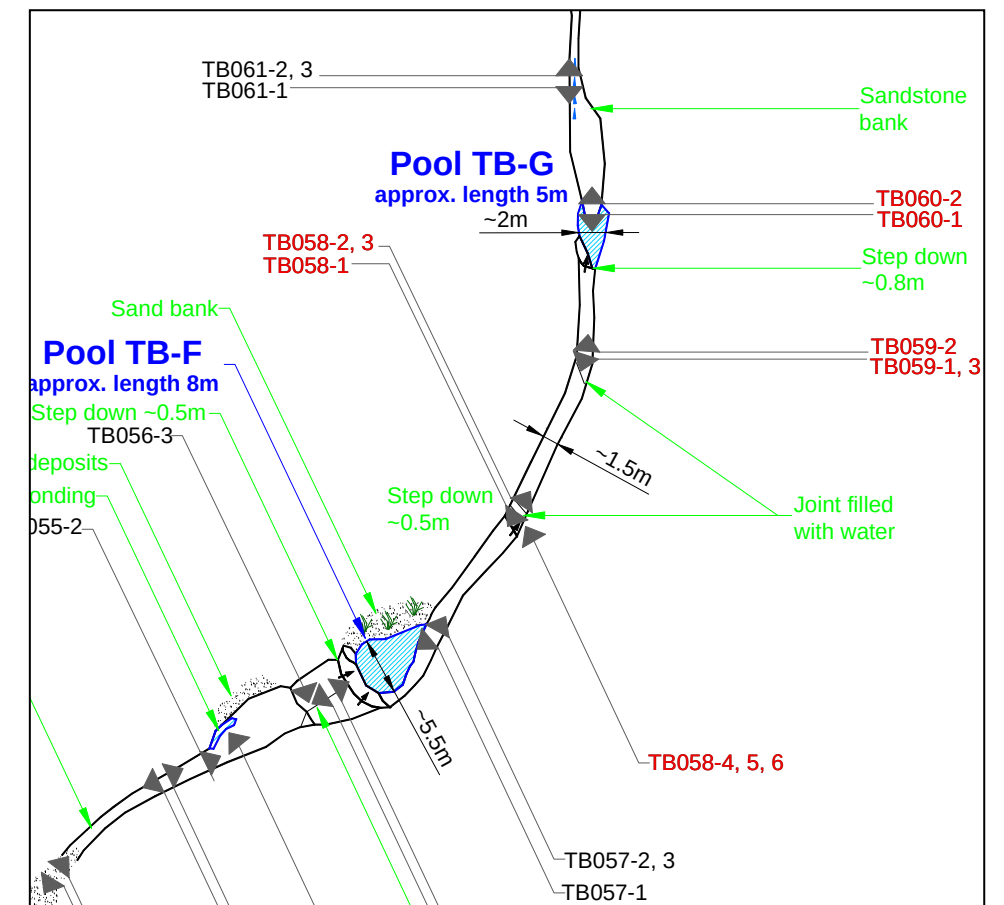


Photo Details

Photo ID	Easting	Northing	Bearing
TB058-1	309077	6215042	215
TB058-2	309077	6215042	30
TB058-3	309077	6215042	30
TB058-4	309077	6215042	330
TB058-5	309077	6215042	330
TB058-6	309077	6215042	330
TB059-1	309084	6215057	195
TB059-2	309084	6215057	10
TB059-3	309084	6215057	195
TB060-1	309085	6215072	180
TB060-2	309085	6215072	0

TRIBUTARY B STREAM MAPPING SUMMARY



TB061-1 Downstream from Pool TB-G looking Upstream



TB061-2 Downstream from Pool TB-G looking Downstream



TB061-3 Joint

Notes (as at 22 December 2009)

- Flow path along western side of rockbar at TB061
- Pool TB-H approximately 60m long, up to 3m wide and up to 0.4m deep
- Base of the pool is sandstone with vegetation encroaching on both sides
- Vegetation debris across pool at many locations
- Alluvial deposits on banks at downstream end of pool



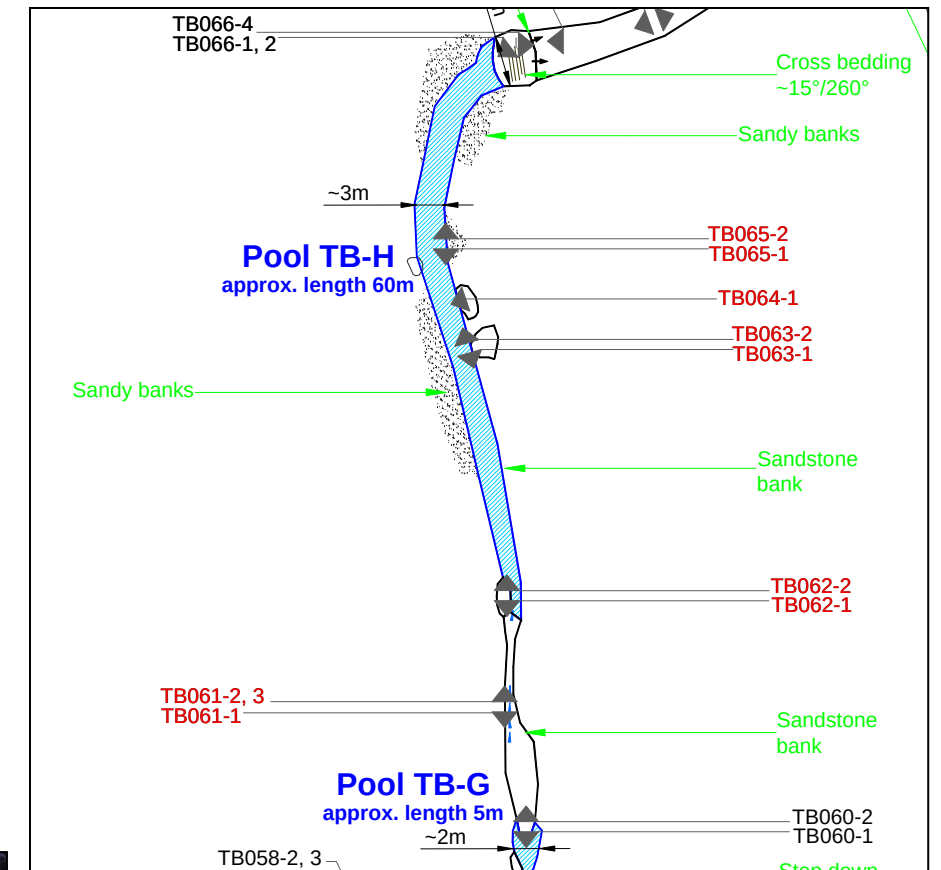
TB062-1 Upstream end of Pool TB-H looking Upstream



TB062-2 Upstream end of Pool TB-H looking Downstream



TB063-1 Midway along Pool TB-H looking Upstream



TB063-2 Midway along Pool TB-H looking Downstream



TB064-1 Midway along Pool TB-H looking toward western bank



TB065-1 Midway along Pool TB-H looking Upstream



TB065-2 Midway along Pool TB-H looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB061-1	309082	6215084	180
TB061-2	309082	6215084	0
TB061-3	309082	6215084	0
TB062-1	309086	6215095	180
TB062-2	309086	6215095	0
TB063-1	309080	6215120	165
TB063-2	309080	6215120	345
TB064-1	309079	6215125	250
TB065-1	309077	6215130	180
TB065-2	309077	6215130	0

TRIBUTARY B STREAM MAPPING SUMMARY



TB066-1 Downstream end of Pool TB-H looking Upstream



TB066-2 Downstream end of Pool TB-H looking Upstream



TB066-3 Downstream end of Pool TB-H looking Upstream



TB066-4 Downstream end of Pool TB-H looking Downstream



TB067-1 Downstream of Pool TB-H looking Upstream



TB067-2 Downstream of Pool TB-H looking Downstream



TB068-1 Downstream of Pool TB-H looking Upstream



TB068-2 Downstream of Pool TB-H looking Downstream

Notes (as at 22 December 2009)

- Rockbar at downstream end of Pool TB-H approximately 4m long and 5m wide with cross bedding
- Approximate 1m step down at downstream end of rockbar
- Rockbar approximately 50m long through TB067 and TB068, with much vegetation debris
- No flow visible on rockbar

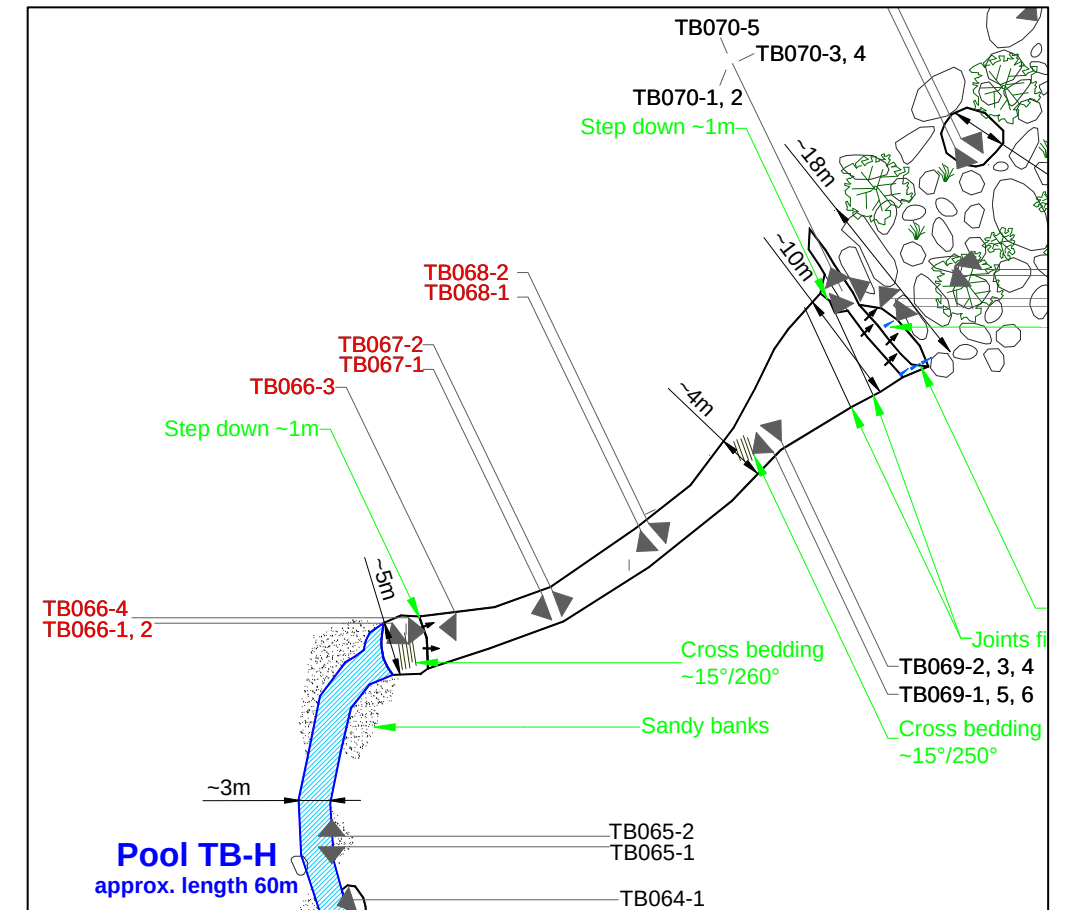


Photo Details

Photo ID	Easting	Northing	Bearing
TB066-1	309084	6215150	235
TB066-2	309084	6215150	235
TB066-3	309084	6215150	270
TB066-4	309084	6215150	90
TB067-1	309098	6215151	250
TB067-2	309098	6215151	70
TB068-1	309104	6215156	235
TB068-2	309104	6215156	45

TRIBUTARY B STREAM MAPPING SUMMARY



TB069-1 Rockbar looking Upstream



TB069-2 Rockbar looking Downstream



TB069-3 Cross bedding

Notes (as at 22 December 2009)

- Rockbar at TB069 approximately 4m wide with cross bedding
- Rockbar widens to approximately 10m at TB070, with a step down of approximately 1m
- Joints across width of rockbar at downstream end



TB069-4 Cross bedding



TB069-5 Joint with water



TB069-6 Joint with water



TB070-1 Rockshelf looking Upstream



TB070-2 Rockshelf looking Upstream

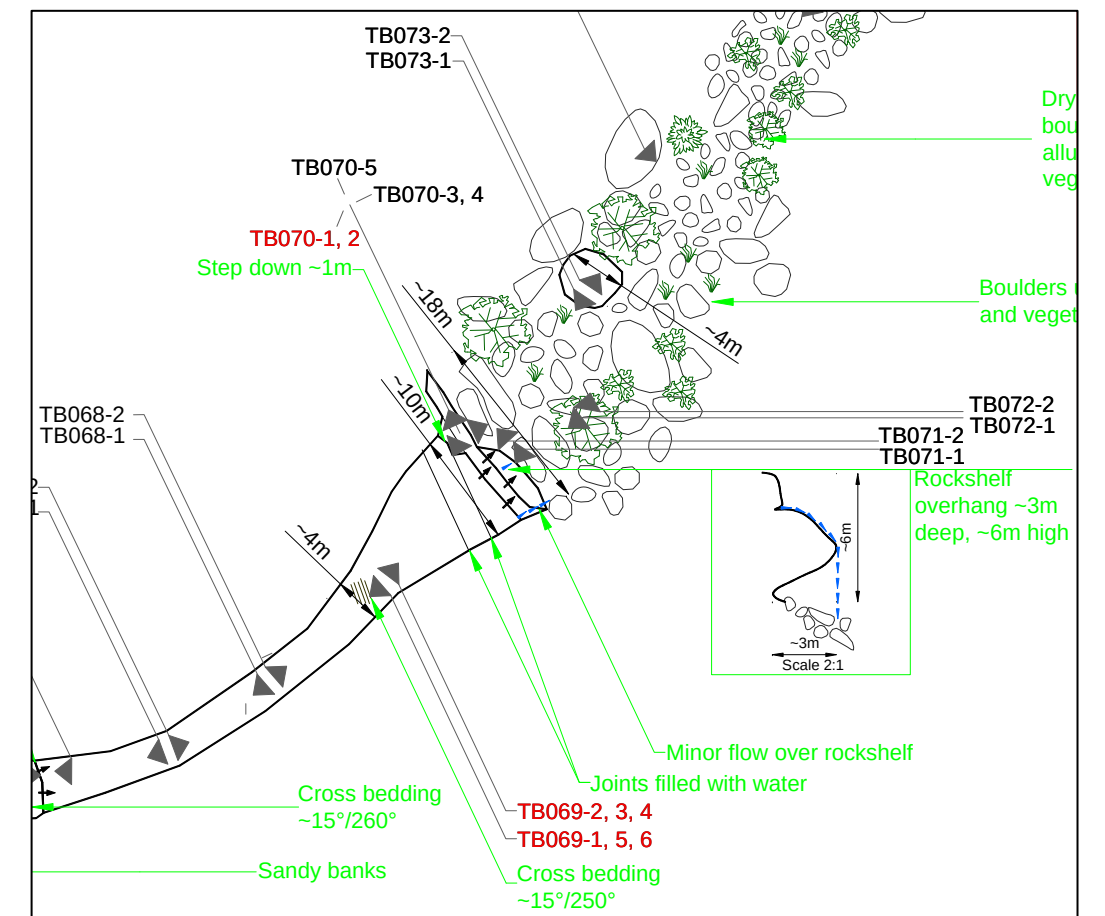


Photo Details

Photo ID	Easting	Northing	Bearing
TB069-1	309115	6215167	225
TB069-2	309115	6215167	35
TB069-3	309115	6215167	35
TB069-4	309115	6215167	35
TB069-5	309115	6215167	225
TB069-6	309115	6215167	225
TB070-1	309126	6215181	200
TB070-2	309126	6215181	200

TRIBUTARY B STREAM MAPPING SUMMARY



TB070-3 Looking Downstream from high rockshelf



TB070-4 Looking Downstream from top of rockshelf



TB070-5 Joint



TB071-2 Looking North West along rockshelf



TB071-1 Looking Upstream to rockshelf

Notes (as at 22 December 2009)

- Rockshelf approximately 6m high and 3m deep at TB071
- Minor flow over rockshelf on southern side
- Boulders and vegetation at base of rockshelf and downstream

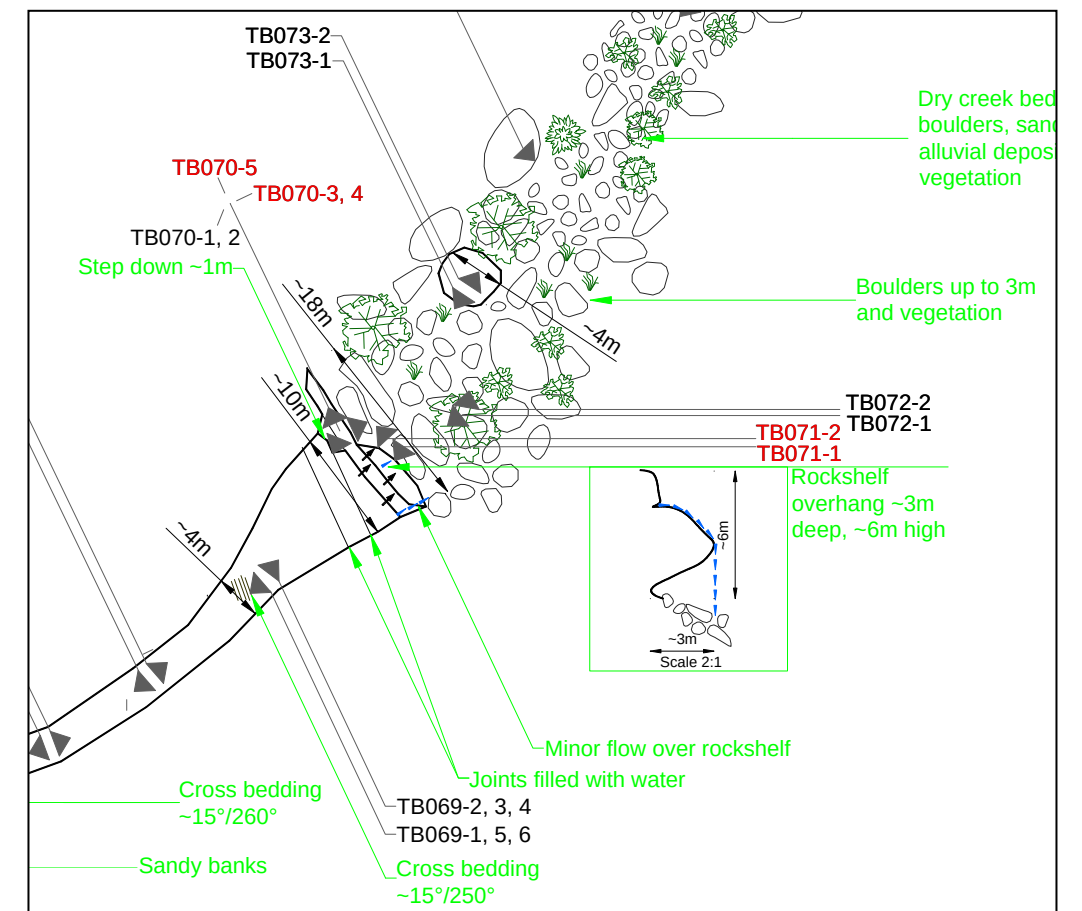


Photo Details

Photo ID	Easting	Northing	Bearing
TB070-3	309126	6215181	70
TB070-4	309126	6215181	70
TB070-5	309126	6215181	335
TB071-1	309131	6215182	205
TB071-2	309131	6215182	215

TRIBUTARY B STREAM MAPPING SUMMARY



TB072-1 Boulder field looking Upstream



TB072-2 Boulder field looking Downstream



TB073-1 Boulder field looking Upstream

Notes (as at 21 & 22 December 2009)

- Boulder field and vegetation through TB072, TB073 and TB074, with boulders up to 3m
- Minor alluvial deposits
- No flow visible



TB073-2 Boulder field looking Downstream



TB074-1 Boulder field looking toward eastern bank

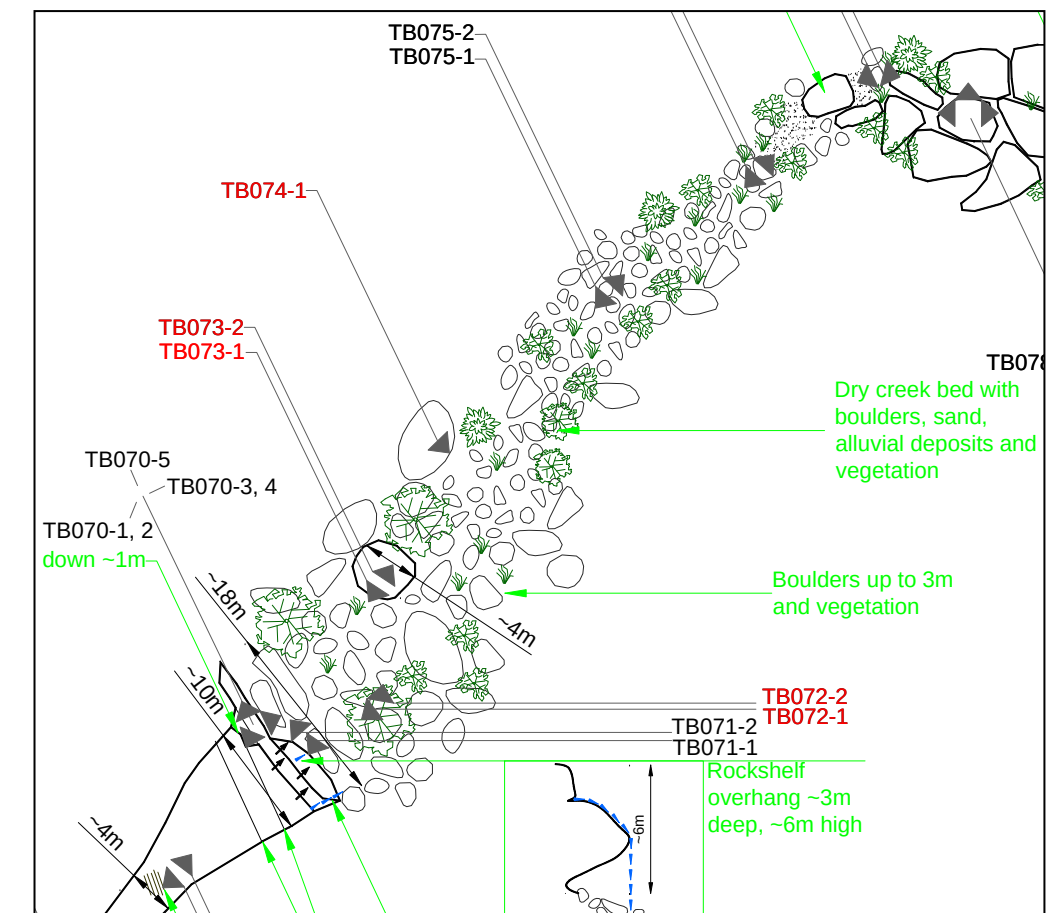


Photo Details

Photo ID	Easting	Northing	Bearing
TB072-1	309133	6215178	230
TB072-2	309133	6215178	35
TB073-1	309137	6215195	205
TB073-2	309137	6215195	35
TB074-1	309141	6215208	135

TRIBUTARY B STREAM MAPPING SUMMARY



TB075-1 Dry creek bed looking Upstream



TB075-2 Dry creek bed looking Downstream



TB076-1 Dry creek bed looking Upstream

- Notes (as at 21 December 2009)
- Boulder field and vegetation through TB075, TB076 and TB077, with minor alluvial deposits
 - No flow visible



TB076-2 Dry creek bed looking Downstream



TB076-3 Dry creek bed looking Upstream



TB077-1 Boulder field looking Upstream



TB077-2 Boulder field looking Downstream

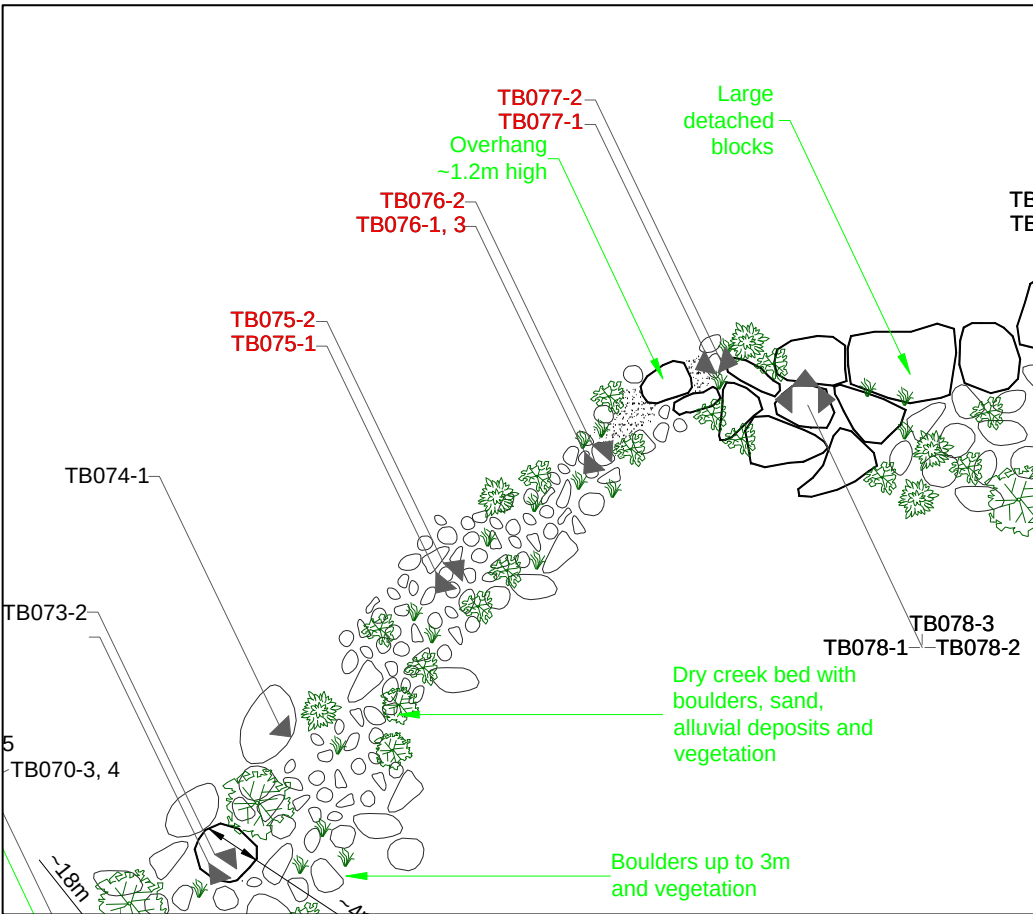


Photo Details

Photo ID	Easting	Northing	Bearing
TB075-1	309157	6215224	220
TB075-2	309157	6215224	45
TB076-1	309173	6215234	225
TB076-2	309173	6215234	35
TB076-3	309173	6215234	225
TB077-1	309183	6215242	245
TB077-2	309183	6215242	100

TRIBUTARY B STREAM MAPPING SUMMARY



TB078-1 Large detached blocks looking Upstream



TB078-2 Large detached blocks looking Downstream



TB078-3 Large detached blocks looking toward northern bank

Notes (as at 21 December 2009)

- Large detached blocks on northern bank and tributary path
- No flow visible through boulder field

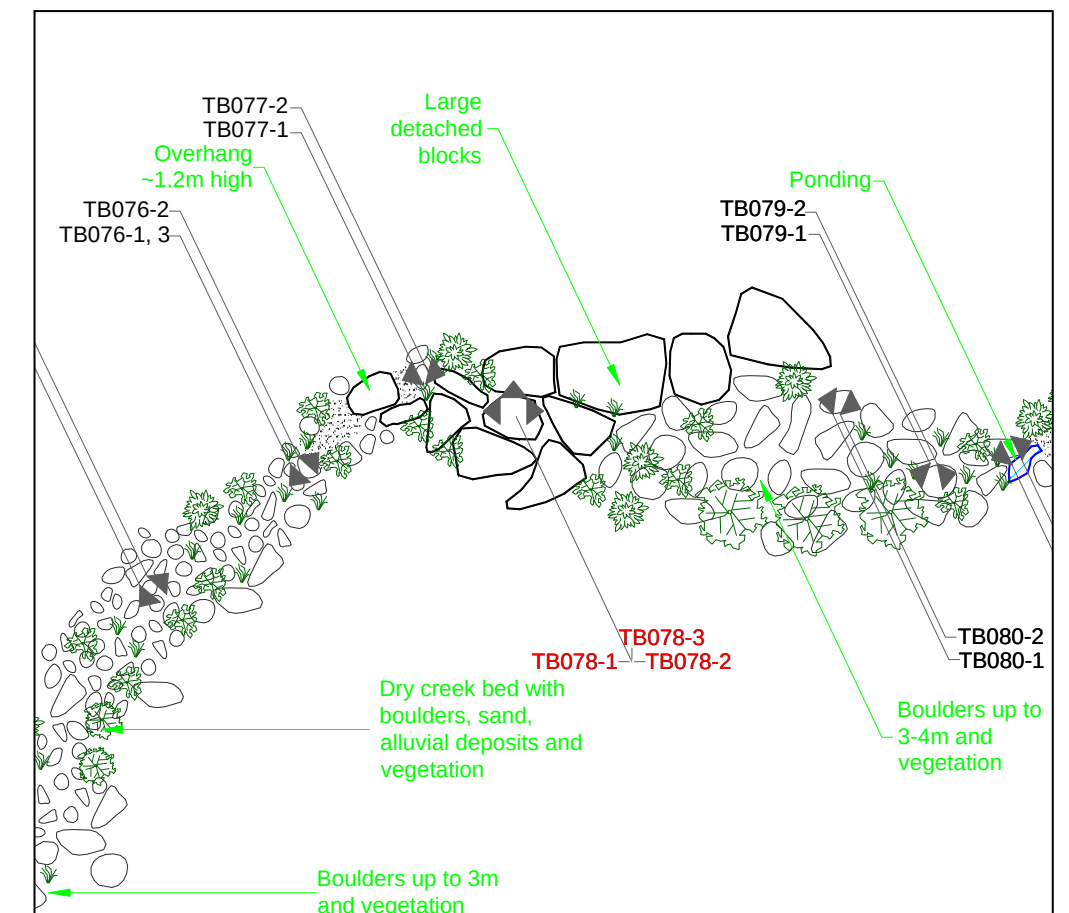


Photo Details

Photo ID	Easting	Northing	Bearing
TB078-1	309192	6215239	270
TB078-2	309192	6215239	90
TB078-3	309192	6215239	0

TRIBUTARY B STREAM MAPPING SUMMARY



Notes (as at 21 December 2009)

- Large boulders and vegetation through TB079 and TB080
- No flow visible
- Ponding and alluvial deposits at TB081, with vegetation downstream

TA079-1 Boulder field looking Upstream

TA079-2 Boulder field looking Downstream



TA080-1 Boulder field looking Upstream

TA080-2 Boulder field looking Downstream



TA081-1 Upstream of Pool TB-I looking Upstream

TA081-2 Upstream of Pool TB-I looking Downstream

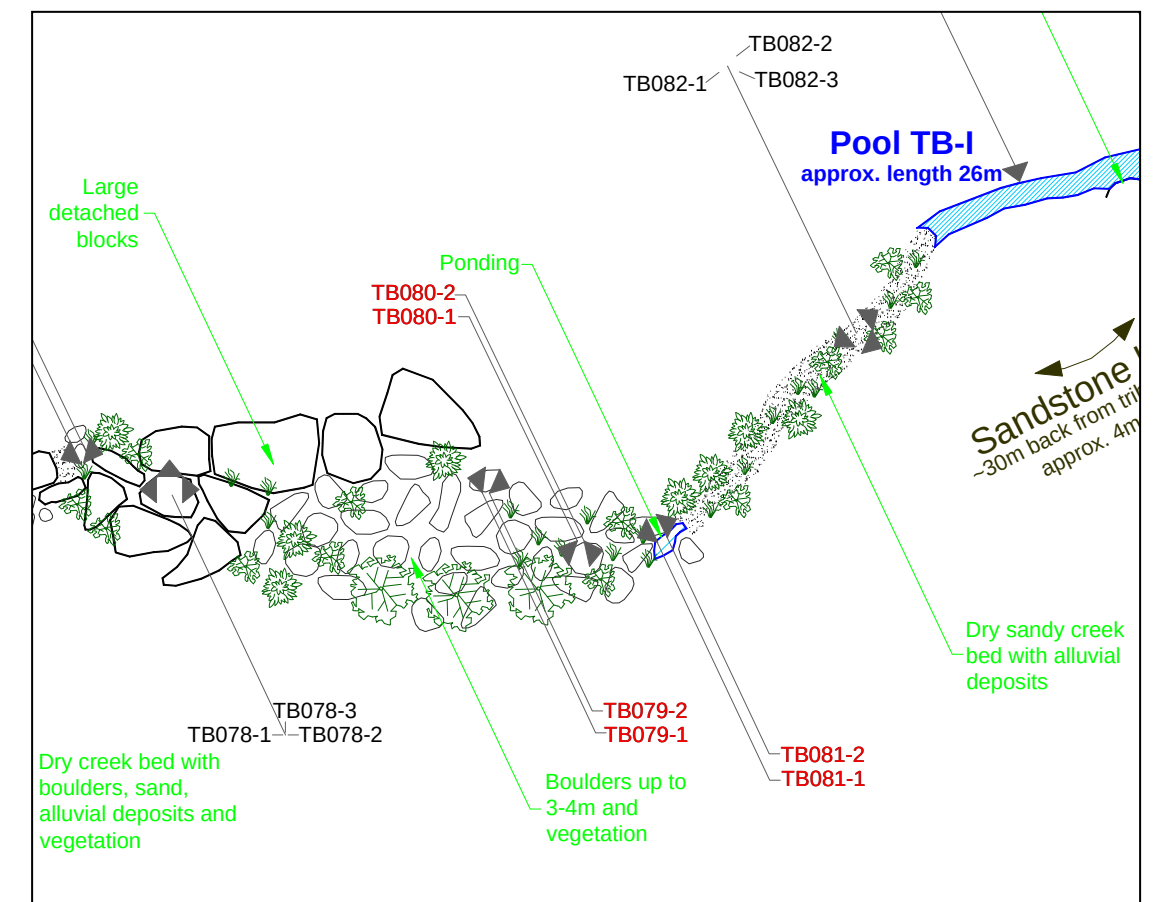


Photo Details

Photo ID	Easting	Northing	Bearing
TB079-1	309223	6215242	290
TB079-2	309223	6215242	75
TB080-1	309232	6215234	275
TB080-2	309232	6215234	115
TB081-1	309238	6215235	245
TB081-2	309238	6215235	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB082-1 Upstream of Pool TB-I looking Upstream



TB082-2 Upstream of Pool TB-I looking Downstream



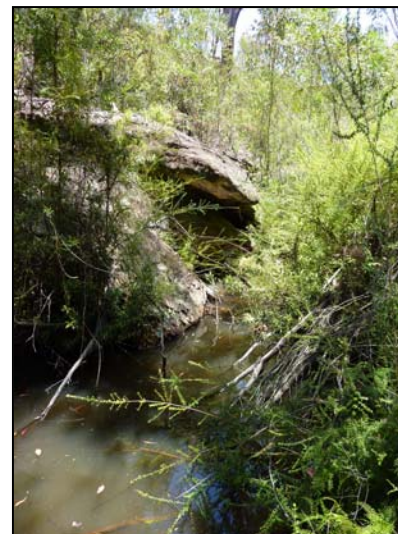
TB082-3 Upstream of Pool TB-I looking toward southern bank



TB083-1 Midway along Pool TB-I looking toward southern bank



TB084-1 Downstream end of Pool TB-I looking Upstream



TB084-2 Overhang

Notes (as at 21 December 2009)

- Dry creek bed with alluvial deposits upstream of Pool TB-I
- Pool TB-I approximately 26m long, up to 3.5m wide and 0.5m deep
- Base of the pool is sandstone
- Overhang on southern bank approximately 1.8m high and 1m deep
- Alluvial deposits downstream of pool
- Sandstone ledge up to 4m high on southern side of Pool TB-I at a distance of approximately 30m

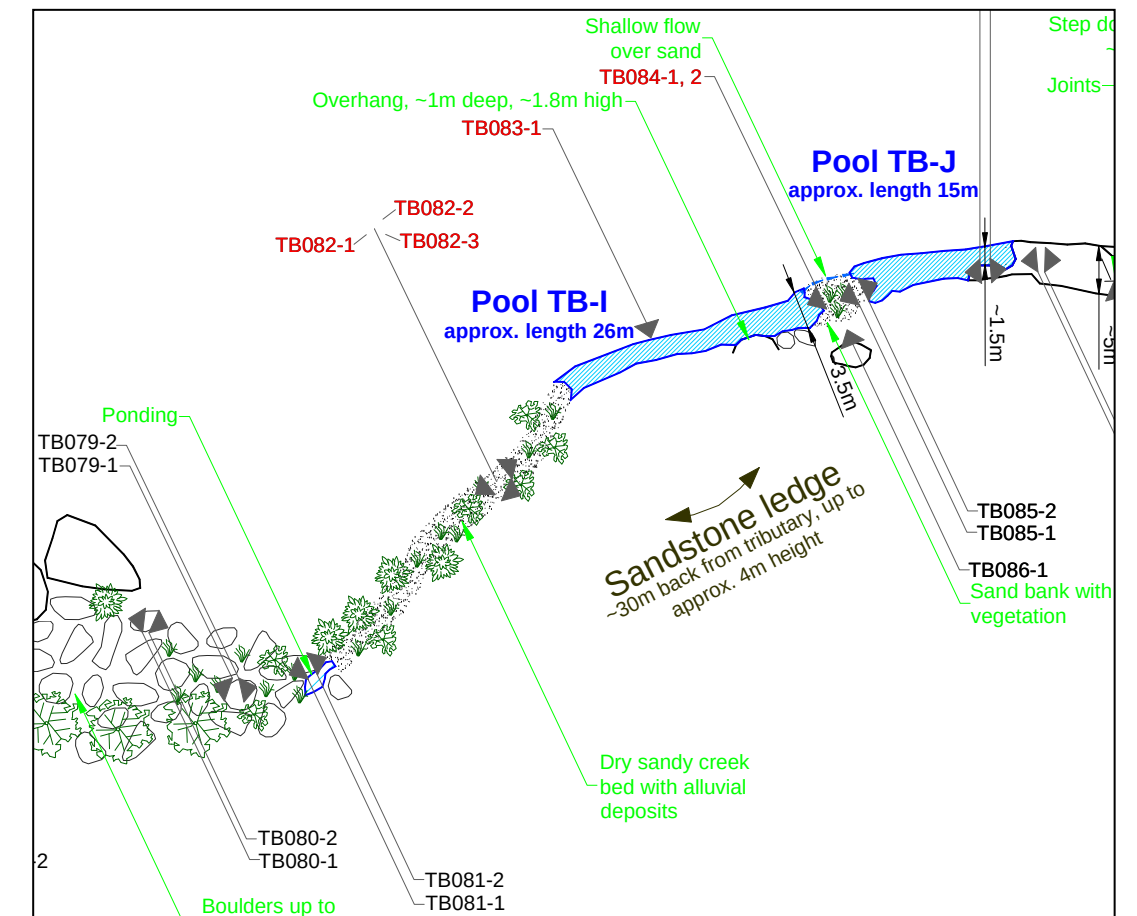


Photo Details

Photo ID	Easting	Northing	Bearing
TB082-1	309256	6215256	235
TB082-2	309256	6215256	50
TB082-3	309256	6215256	110
TB083-1	309273	6215270	165
TB084-1	309290	6215270	245
TB084-2	309290	6215270	245

TRIBUTARY B STREAM MAPPING SUMMARY



TB085-1 Upstream end of Pool TB-J looking Upstream



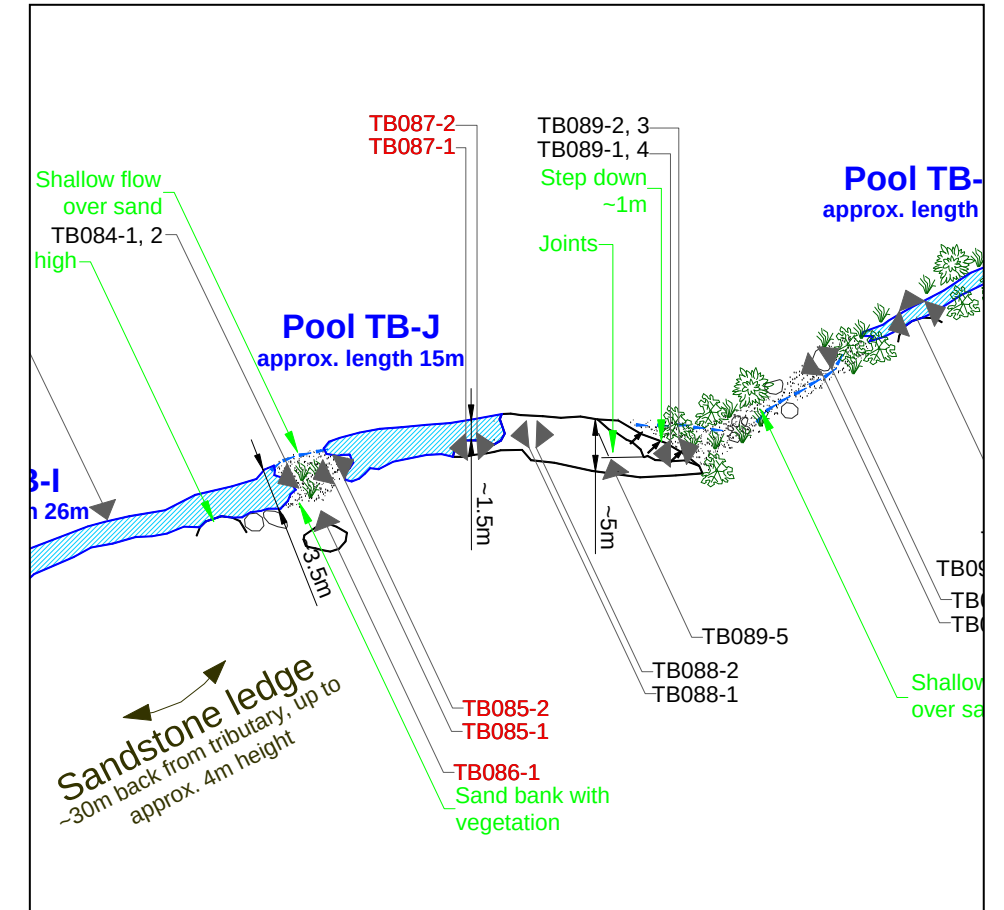
TB085-2 Upstream end of Pool TB-J looking Downstream

Notes (as at 21 December 2009)

- Pool TB-J approximately 5m long, 1.5m wide and 0.3m deep
- Base of the pool is alluvial at the upstream end and sandstone at the downstream end
- Sand bank with vegetation upstream of the pool
- Shallow flow along northern side of sand bank at upstream end of pool



TB086-1 Between Pools TB-I and TB-J looking toward northern bank



TB087-1 Along Pool TB-J looking Upstream



TB087-2 Along Pool TB-J looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB085-1	309294	6215273	245
TB085-2	309294	6215273	65
TB086-1	309300	6215265	340
TB087-1	309310	6215276	265
TB087-2	309310	6215276	85

TRIBUTARY B STREAM MAPPING SUMMARY



TB088-1 Downstream end of Pool TB-J looking Upstream



TB088-2 Downstream end of Pool TB-J looking Downstream

Notes (as at 21 December 2009)

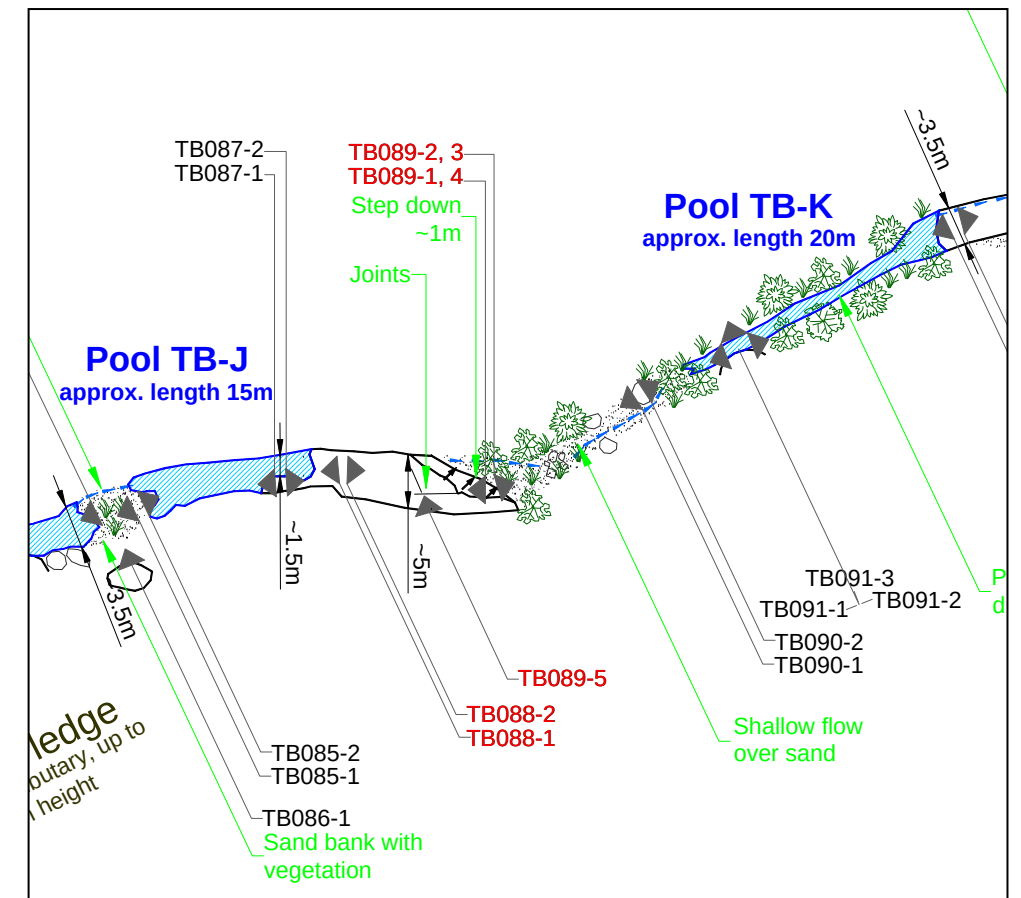
- Rockbar downstream of Pool TB-J approximately 19m long and up to 5m wide
- Joints across rockbar at TB089
- Step down approximately 1m at downstream end of rockbar
- Vegetation and alluvial deposits downstream of rockbar



TB089-1 Downstream of Pool TB-J looking Upstream



TB089-2 Downstream of Pool TB-J looking Downstream



TB089-3 Downstream of Pool TB-J looking Downstream



TB089-4 Joint



TB089-5 Joint

Photo Details

Photo ID	Easting	Northing	Bearing
TB088-1	309312	6215274	265
TB088-2	309312	6215274	90
TB089-1	309323	6215274	270
TB089-2	309323	6215274	70
TB089-3	309323	6215274	70
TB089-4	309323	6215274	270
TB089-5	309323	6215274	345

TRIBUTARY B STREAM MAPPING SUMMARY



TB090-1 Upstream of Pool TB-K looking Upstream



TB090-2 Upstream of Pool TB-K looking Downstream



TB091-1 Near upstream end of Pool TB-K looking Upstream



TB091-2 Near upstream end of Pool TB-K looking Downstream



TB091-3 Near upstream end of Pool TB-K looking toward northern bank

Notes (as at 21 December 2009)

- Pool TB-K approximately 20m long, up to 3.5m wide at the downstream end, and 0.5m deep
- Base of the pool is sandstone with vegetation encroaching on both sides
- Shallow flow over sand upstream of pool

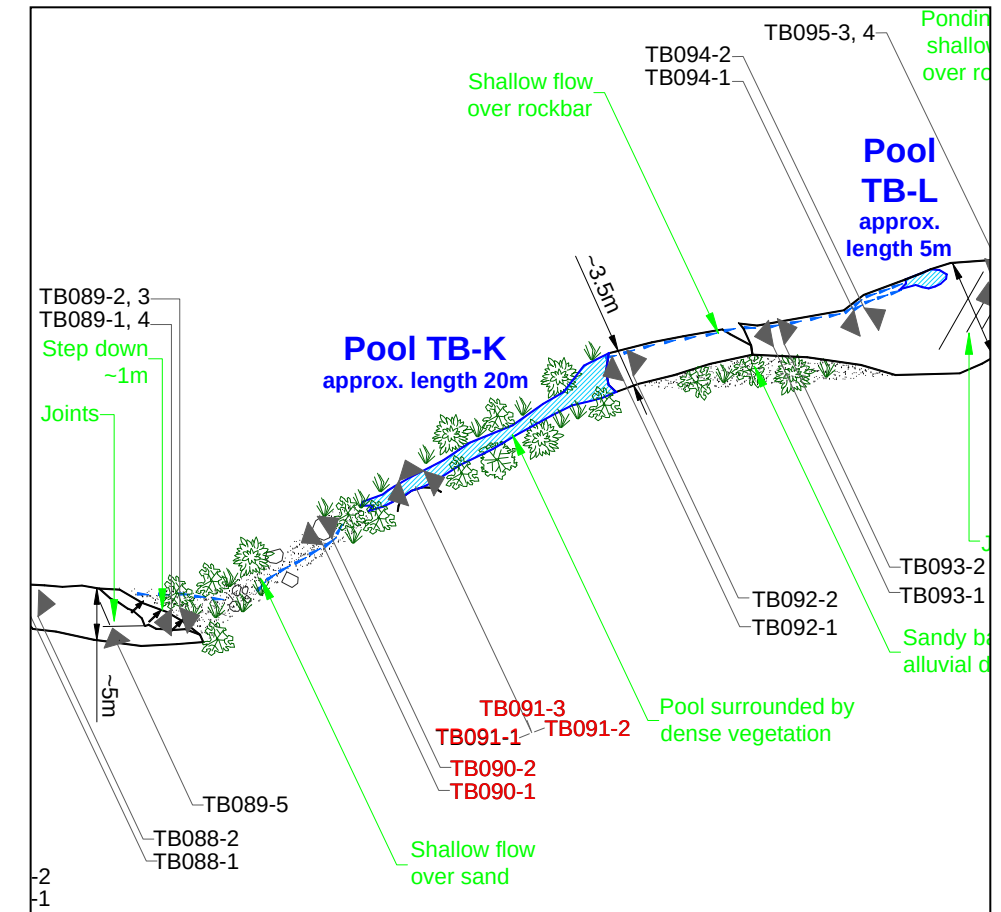


Photo Details

Photo ID	Easting	Northing	Bearing
TB090-1	309339	6215283	235
TB090-2	309339	6215283	55
TB091-1	309348	6215287	250
TB091-2	309348	6215287	70
TB091-3	309348	6215287	340

TRIBUTARY B STREAM MAPPING SUMMARY



TB092-1 Downstream end of Pool TB-K looking Upstream



TB092-2 Downstream end of Pool TB-K looking Downstream

Notes (as at 21 December 2009)

- Rockbar downstream of Pool TB-K approximately 3.5m wide
- Flow path along northern side of rockbar into Pool TB-L
- Pool TB-L approximately 5m long, 1.5m wide and 0.2m deep
- Base of the pool is sandstone



TB093-1 Upstream of Pool TB-L looking Upstream



TB094-1 Upstream end of Pool TB-L looking Upstream



TB093-2 Upstream of Pool TB-L looking Downstream



TB094-2 Upstream end of Pool TB-L looking Downstream

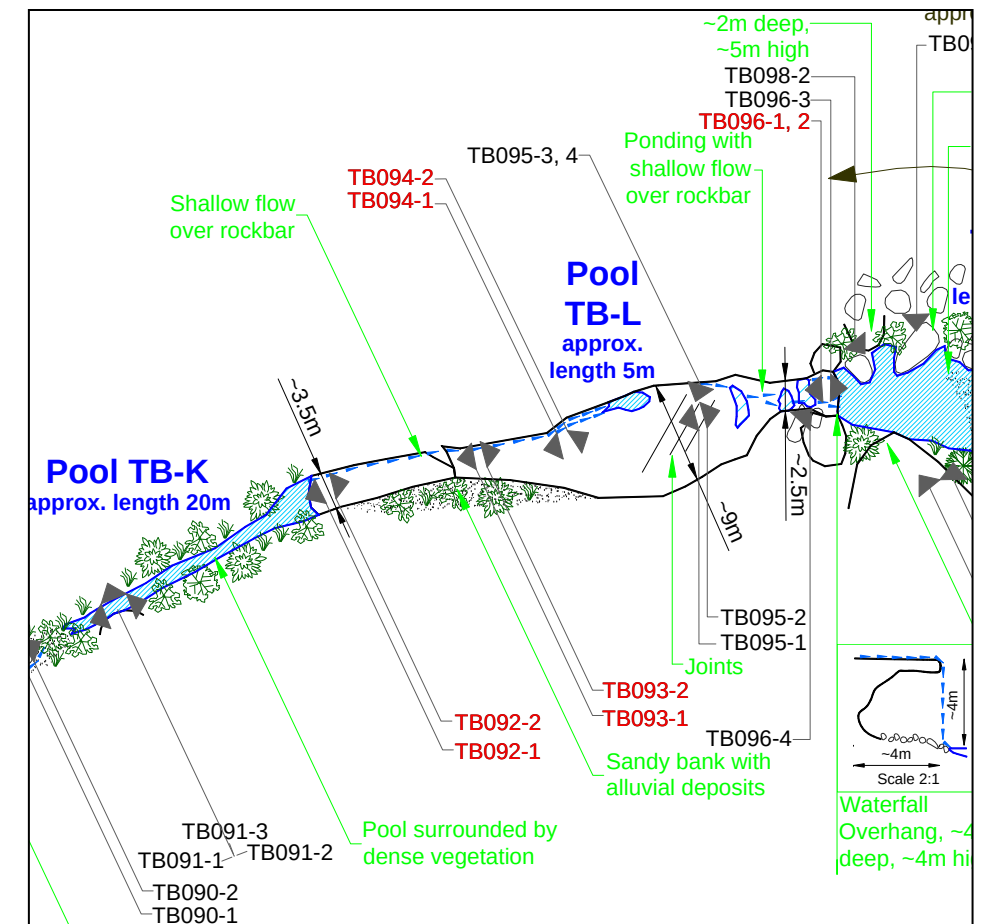


Photo Details

Photo ID	Easting	Northing	Bearing
TB092-1	309367	6215299	245
TB092-2	309367	6215299	80
TB093-1	309384	6215301	260
TB093-2	309384	6215301	75
TB094-1	309396	6215296	260
TB094-2	309396	6215296	55

TRIBUTARY B STREAM MAPPING SUMMARY



TB095-1 Downstream of Pool TB-L looking Upstream



TB095-2 Downstream of Pool TB-L looking Downstream

Notes (as at 21 December 2009)

- Rockbar downstream of Pool TB-L approximately 9m wide, with several joints at TB095
- Ponding and shallow flow over rockbar downstream



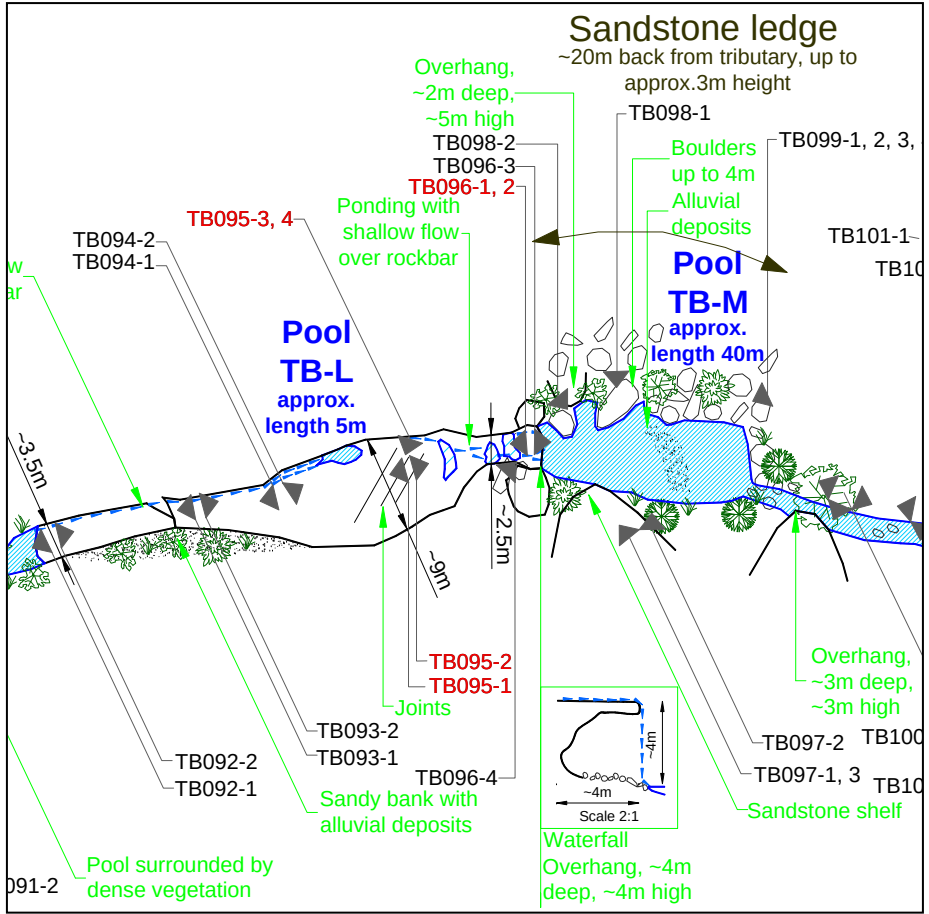
TB095-3 Joint



TB095-4 Joint



TB096-1 Upstream of Pool TB-M looking Upstream



TB096-2 Upstream end of Pool TB-M looking Upstream

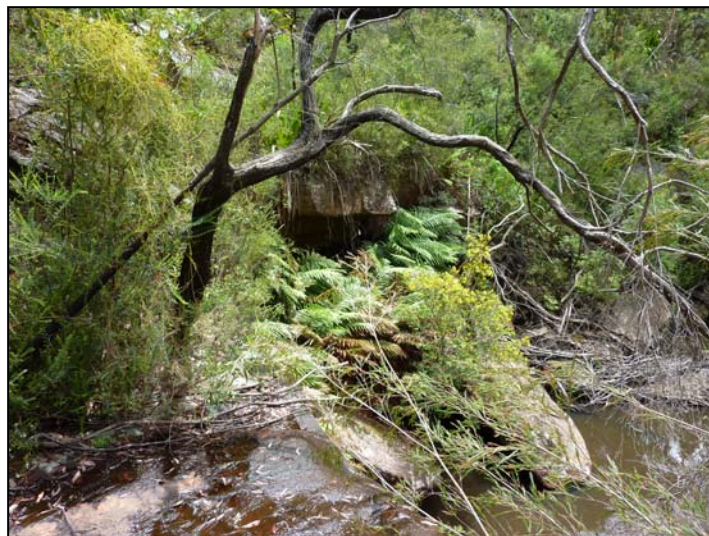
Photo Details

Photo ID	Easting	Northing	Bearing
TB095-1	309406	6215311	250
TB095-2	309406	6215311	75
TB095-3	309406	6215311	195
TB095-4	309406	6215311	195
TB096-1	309413	6215308	270
TB096-2	309413	6215308	270

TRIBUTARY B STREAM MAPPING SUMMARY



TB096-3 Upstream end of Pool TB-M looking Downstream



TB096-4 Upstream end of Pool TB-M looking toward overhang on northern bank



TB097-2 Near upstream end of Pool TB-M looking toward northern bank

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TB097-1 Near upstream end of Pool TB-M looking toward overhang on northern bank



TB097-3 Sandstone shelf on southern bank near upstream end of Pool TB-M

Notes (as at 21 December 2009)

- Pool TB-M approximately 40m long, up to 7m wide and up to 1m deep at the upstream end
- Base of the pool is sandstone
- Alluvial deposits and vegetation across pool
- Waterfall at upstream end of pool drops approximately 4m, with depth of overhang approximately 4m
- Small boulders at base of waterfall
- Overhang on northern bank approximately 5m high and 2m deep
- Steep slope toward sandstone ledge with large boulders along northern bank of Pool TB-M

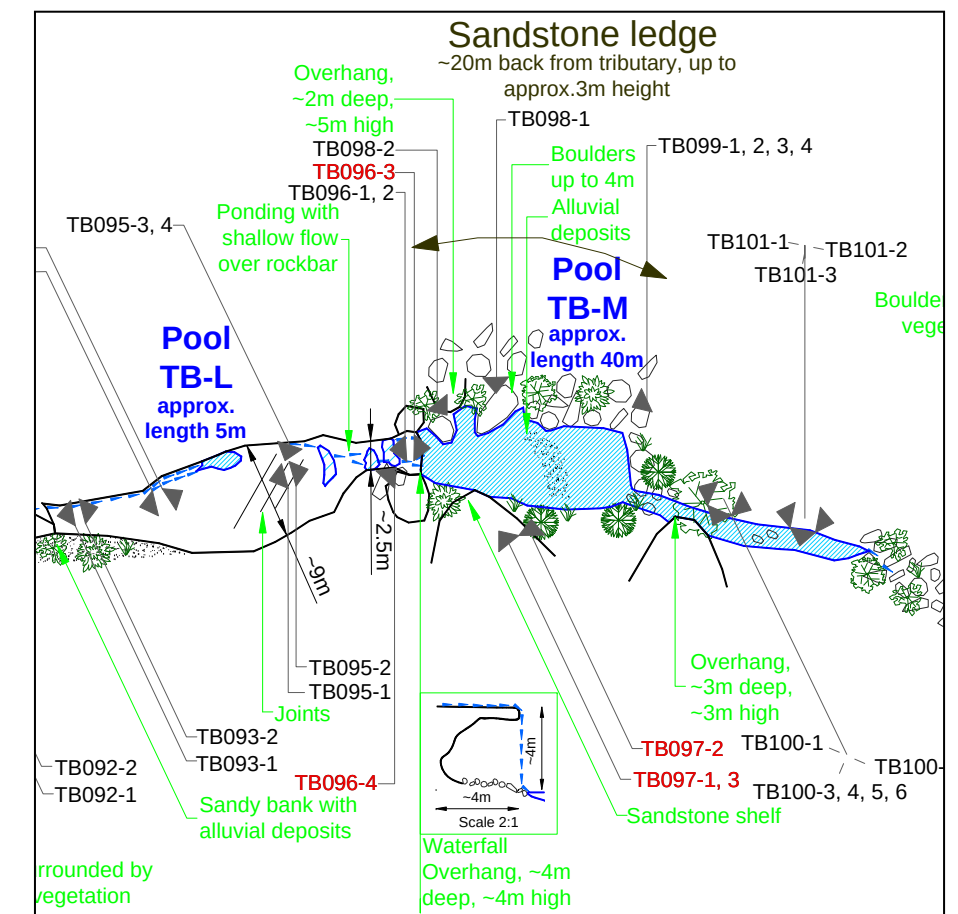


Photo Details

Photo ID	Easting	Northing	Bearing
TB096-3	309416	6215311	85
TB096-4	309416	6215311	45
TB097-1	309439	6215295	320
TB097-2	309439	6215295	0
TB097-3	309439	6215295	320

TRIBUTARY B STREAM MAPPING SUMMARY



TB098-1 Near Upstream end of Pool TB-M looking toward southern bank



TB098-2 Near Upstream end of Pool TB-M looking toward southern bank



TB099-1 Midway along Pool TB-M looking toward waterfall at Upstream end of pool



TB099-2 Midway along Pool TB-M looking toward waterfall at Upstream end of pool



TB099-3 Midway along Pool TB-M looking toward southern bank



TB099-4 Midway along Pool TB-M looking toward southern bank

Notes (as at 21 December 2009)

- Pool TB-M approximately 40m long, up to 7m wide and up to 1m deep at the upstream end
- Base of the pool is sandstone
- Alluvial deposits and vegetation across pool (TB098-2)

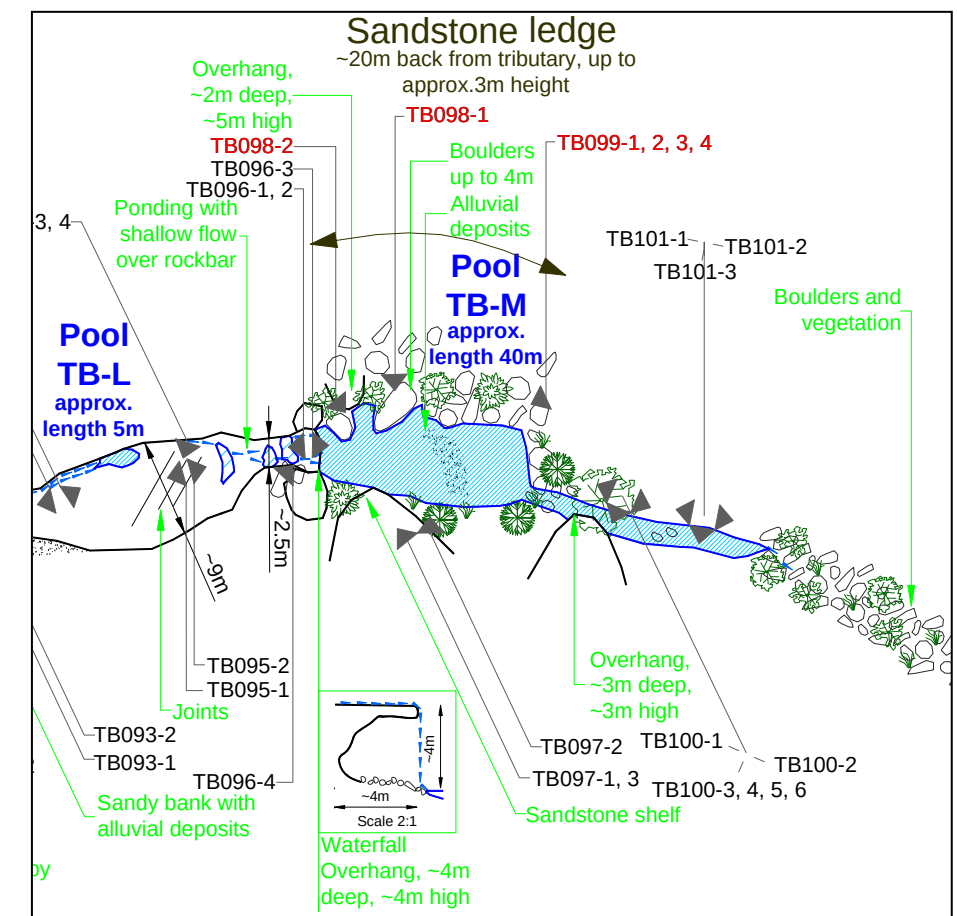


Photo Details

Photo ID	Easting	Northing	Bearing
TB098-1	309416	6215311	175
TB098-2	309416	6215311	145
TB099-1	309444	6215304	245
TB099-2	309444	6215304	245
TB099-3	309444	6215304	245
TB099-4	309444	6215304	245

TRIBUTARY B STREAM MAPPING SUMMARY



TB100-1 Near Downstream end of Pool TB-M looking Upstream



TB0100-2 Near Downstream end of Pool TB-M looking Downstream



TB100-3 Near Downstream end of Pool TB-M looking toward southern bank



TB100-4 Near Downstream end of Pool TB-M looking toward southern bank



TB100-5 Overhang on southern bank



TB100-6 Overhang on southern bank

Notes (as at 21 December 2009)

- Pool TB-M approximately 2m wide at downstream end
- Boulders and vegetation downstream of pool
- Overhang on southern bank approximately 3m high and 3m deep
- Alluvial deposits beneath overhang

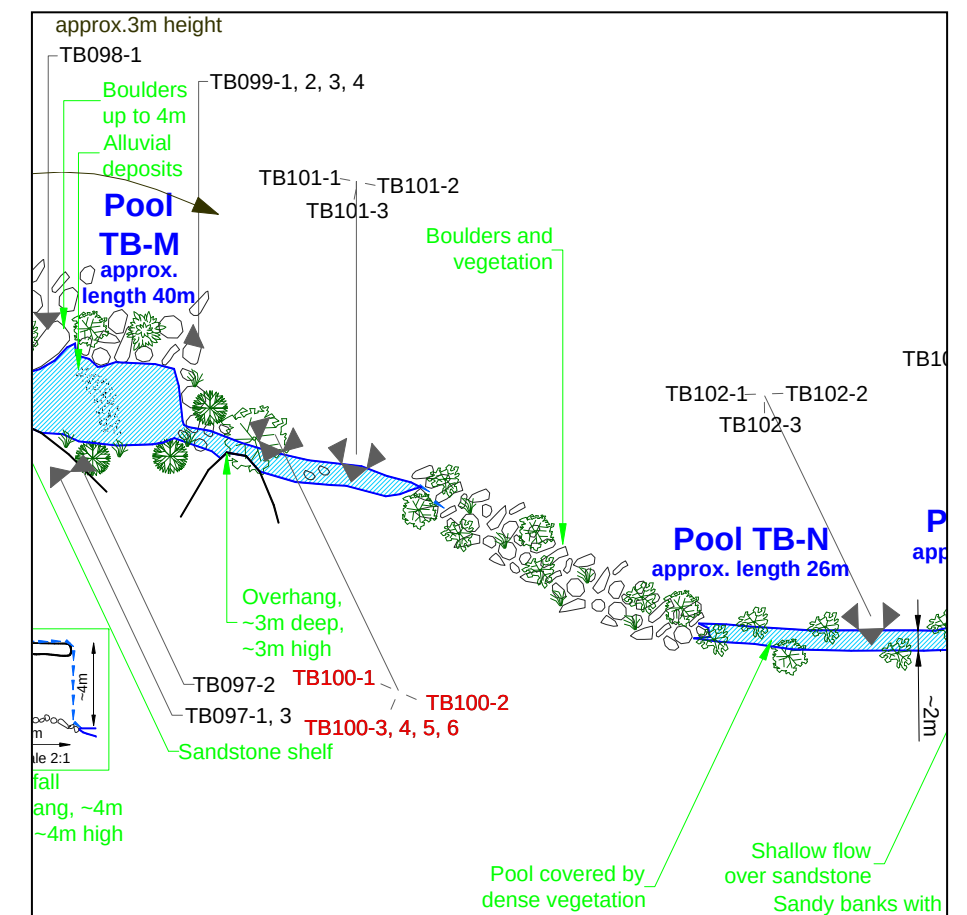


Photo Details

Photo ID	Easting	Northing	Bearing
TB100-1	309454	6215304	295
TB100-2	309454	6215304	115
TB100-3	309454	6215304	205
TB100-4	309454	6215304	205
TB100-5	309454	6215304	205
TB100-6	309454	6215304	205

TRIBUTARY B STREAM MAPPING SUMMARY



TB101-1 Downstream end of Pool TB-M looking Upstream



TB0101-2 Downstream end of Pool TB-M looking Downstream

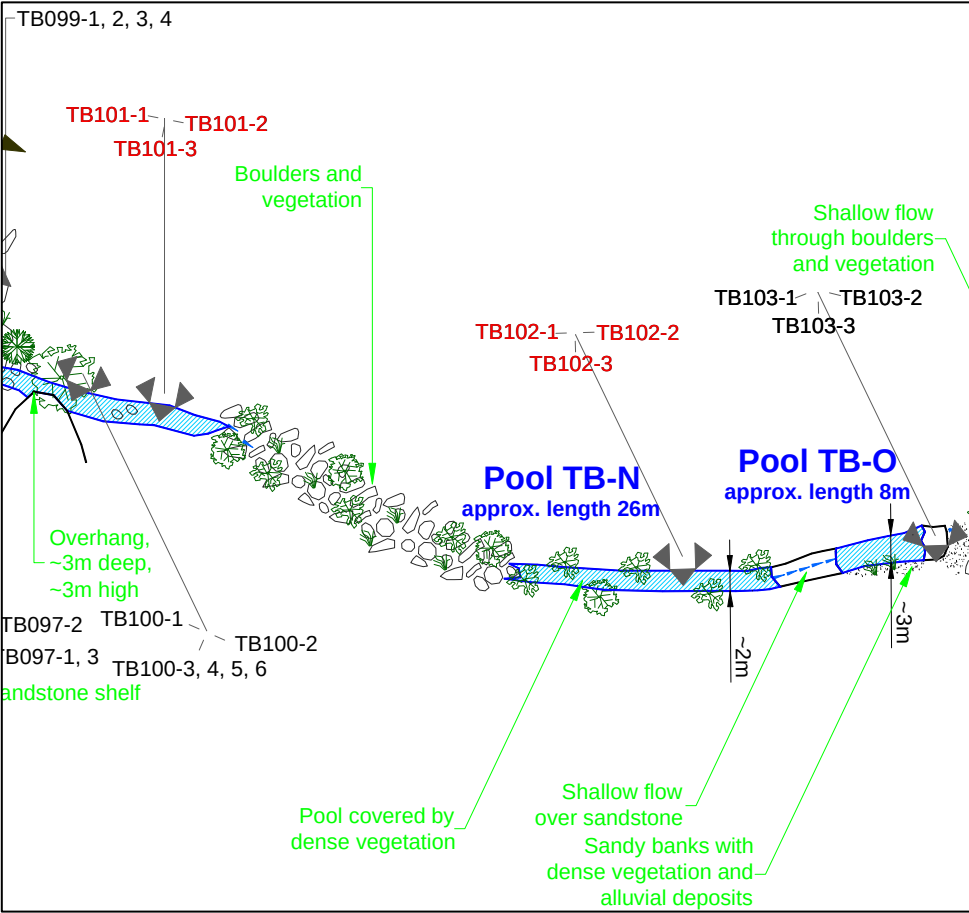
- Notes (as at 21 December 2009)
- Pool TB-N approximately 26m long and 2m wide
 - Base of the pool not visible
 - Vegetation encroaches on both sides of pool
 - Shallow flow over sandstone downstream of pool



TB101-3 Downstream end of Pool TB-M looking toward southern bank



TB102-1 Midway along Pool TB-N looking Upstream



TB0102-2 Midway along Pool TB-N looking Downstream



TB102-3 Midway along Pool TB-N looking toward southern bank

Photo Details

Photo ID	Easting	Northing	Bearing
TB101-1	309456	6215296	280
TB101-2	309456	6215296	190
TB101-3	309456	6215296	100
TB102-1	309502	6215284	270
TB102-2	309502	6215284	90
TB102-3	309502	6215284	180

TRIBUTARY B STREAM MAPPING SUMMARY



TB103-1 Downstream end of Pool TB-O looking Upstream



TB103-2 Downstream end of Pool TB-O looking Downstream



TB103-3 Downstream end of Pool TB-O looking toward southern bank



TB104-1 Near upstream end of Pool TB-P looking toward sandstone ledge



TB104-2 Near upstream end of Pool TB-P looking toward sandstone ledge



TB105-1 Midway along Pool TB-P looking toward eastern bank

Notes (as at 21 December 2009)

- Pool TB-O approximately 8m long, 3m wide and 0.4m deep
- Base of the pool is sandstone with vegetation debris at the downstream end
- Alluvial deposits on southern bank at downstream end of the pool
- Shallow flow through boulders and vegetation downstream into Pool TB-P
- Sandstone ledge up to 4m high on northern side of Pool TB-P at a distance of approximately 40m (TB104)
- Boulders up to 2m on eastern bank (TB105)

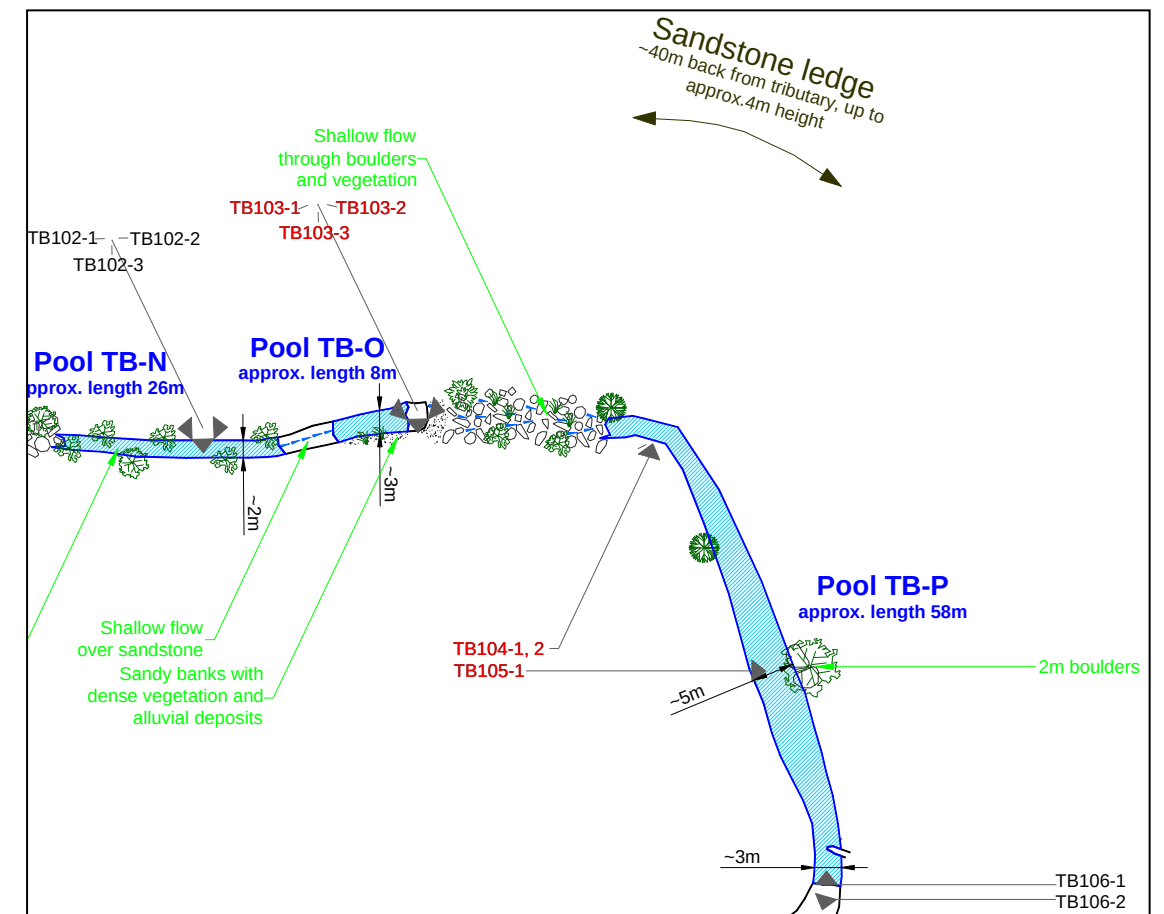


Photo Details

Photo ID	Easting	Northing	Bearing
TB103-1	309526	6215287	250
TB103-2	309526	6215287	100
TB103-3	309526	6215287	180
TB104-1	309552	6215283	25
TB104-2	309552	6215283	25
TB105-1	309564	6215257	90

TRIBUTARY B STREAM MAPPING SUMMARY



TB106-1 Downstream end of Pool TB-P looking Upstream



TB106-2 Downstream end of Pool TB-P looking Downstream

Notes (as at 21 December 2009)

- Pool TB-P approximately 58m long and 3 to 5m wide
- Base of the pool not visible
- Rockbar downstream of Pool TB-P is approximately 12m long and 8m wide
- No flow visible on rockbar, but minor ponding evident
- Approximate 1m change in height along rockbar approaching Pool TB-Q



TB107-1 Upstream end of Pool TB-Q looking Upstream



TB107-2 Upstream end of Pool TB-Q looking Downstream



TB107-3 Upstream end of Pool TB-Q looking toward western bank

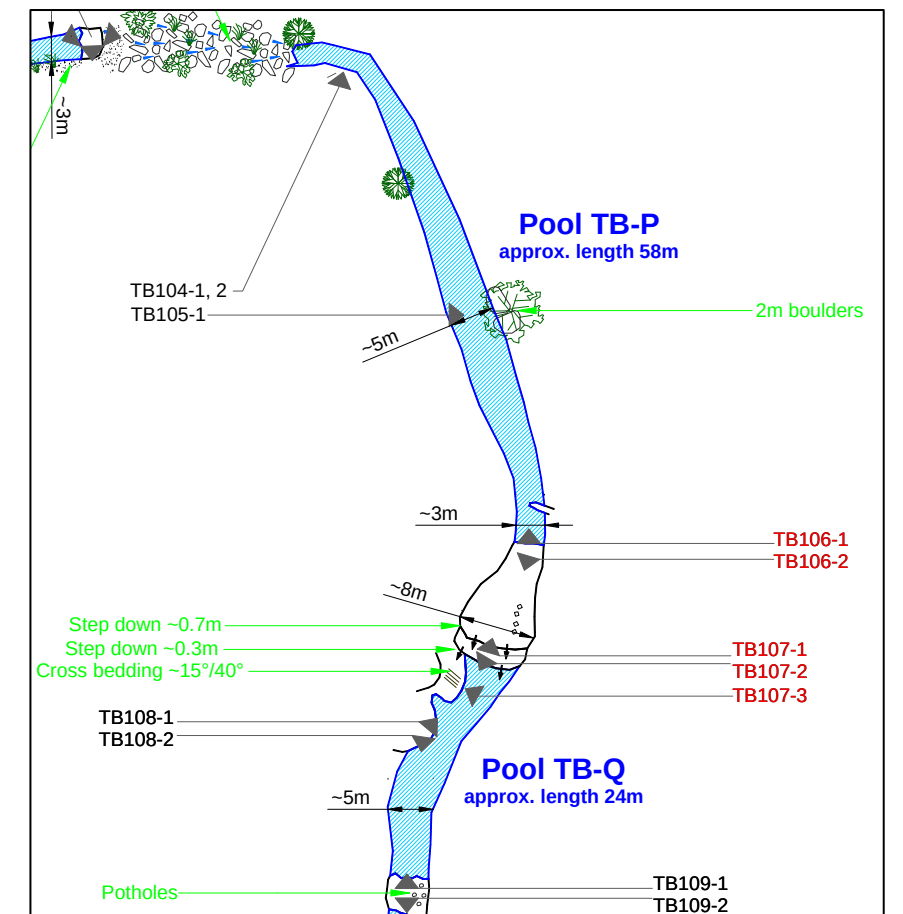


Photo Details

Photo ID	Easting	Northing	Bearing
TB106-1	309574	6215234	0
TB106-2	309574	6215234	200
TB107-1	309568	6215228	15
TB107-2	309568	6215228	210
TB107-3	309568	6215228	300

TRIBUTARY B STREAM MAPPING SUMMARY



TB108-1 Midway along Pool TB-Q looking Upstream



TB108-2 Midway along Pool TB-Q looking Downstream

Notes (as at 21 December 2009)

- Pool TB-Q approximately 24m long, 5m wide and 1m deep
- Base of the pool is sandstone
- Rockbar downstream of pool approximately 4m long and 4.5m wide
- Pool TB-R approximately 22m long, 4m wide and 0.5m deep
- Base of the pool is sandstone
- Scattered vegetation debris at downstream end of pool



TB109-1 Downstream end of Pool TB-Q looking Upstream



TB109-2 Upstream end of Pool TB-R looking Downstream



TB110-1 Downstream end of Pool TB-R looking Upstream



TB110-2 Upstream end of Pool TB-S looking Downstream

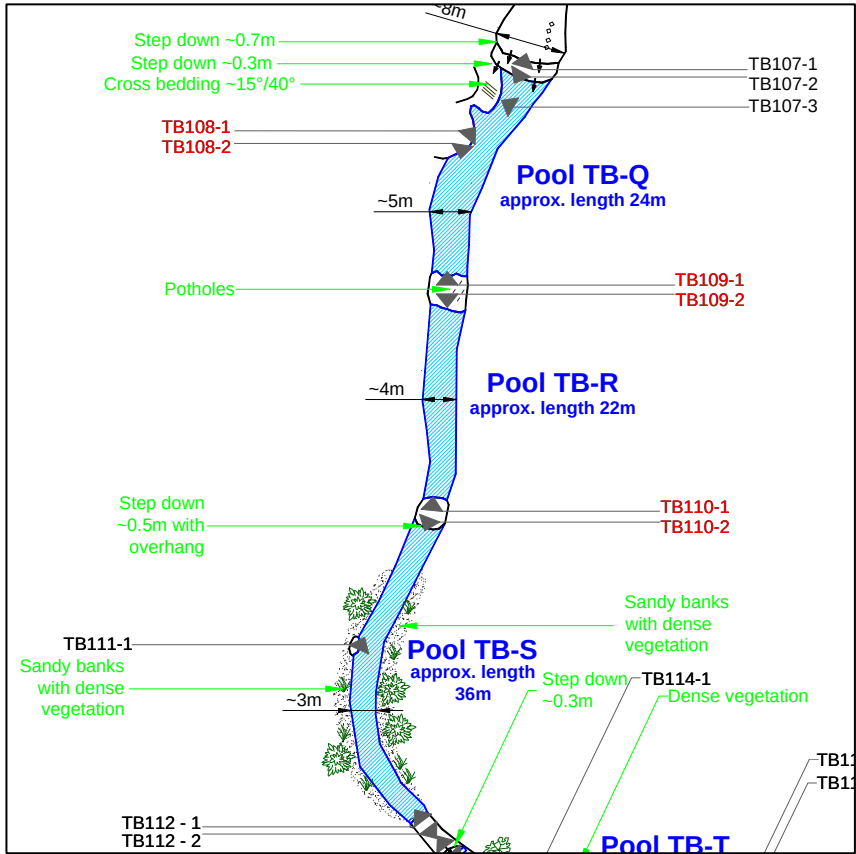


Photo Details

Photo ID	Easting	Northing	Bearing
TB108-1	309562	6215213	40
TB108-2	309562	6215213	190
TB109-1	309560	6215196	0
TB109-2	309560	6215196	180
TB110-1	309559	6215170	5
TB110-2	309559	6215170	205

TRIBUTARY B STREAM MAPPING SUMMARY



TB111-1 Midway along Pool TB-S looking Upstream



TB112-1 Downstream end of Pool TB-S looking Upstream

Notes (as at 21 December 2009)

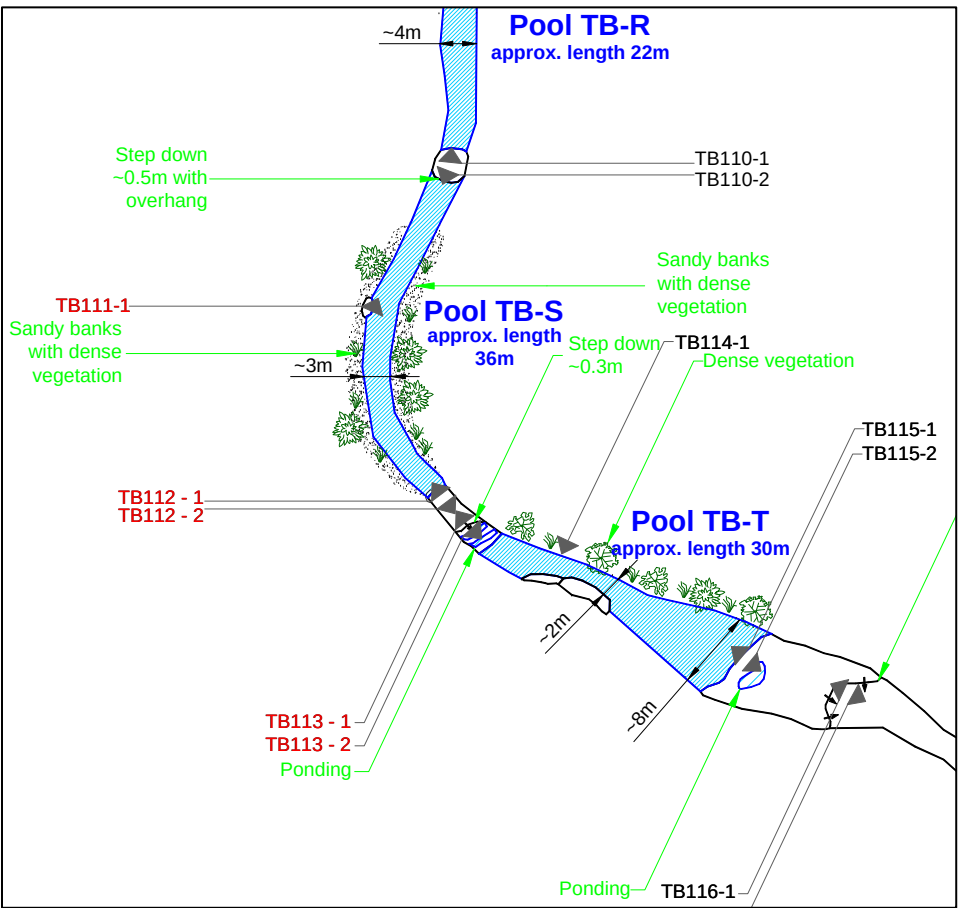
- Pool TB-S approximately 36m long, 3m wide and 0.3m deep
- Base of the pool is sandstone
- Sandy banks and dense vegetation on both sides of pool
- Rockbar downstream of pool approximately 5m long with a step down of approximately 0.3m at the downstream end
- Shallow ponding on rockbar



TB112-1 Downstream end of Pool TB-S looking Downstream



TB113-1 Upstream of Pool TB-T looking Upstream



TB113-2 Upstream of Pool TB-T looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB111-1	309556	6215156	25
TB112-1	309558	6215135	325
TB112-2	309558	6215135	145
TB113-1	309559	6215132	325
TB113-2	309559	6215132	135

TRIBUTARY B STREAM MAPPING SUMMARY



TB114-1 Midway along Pool TB-T looking toward southern bank



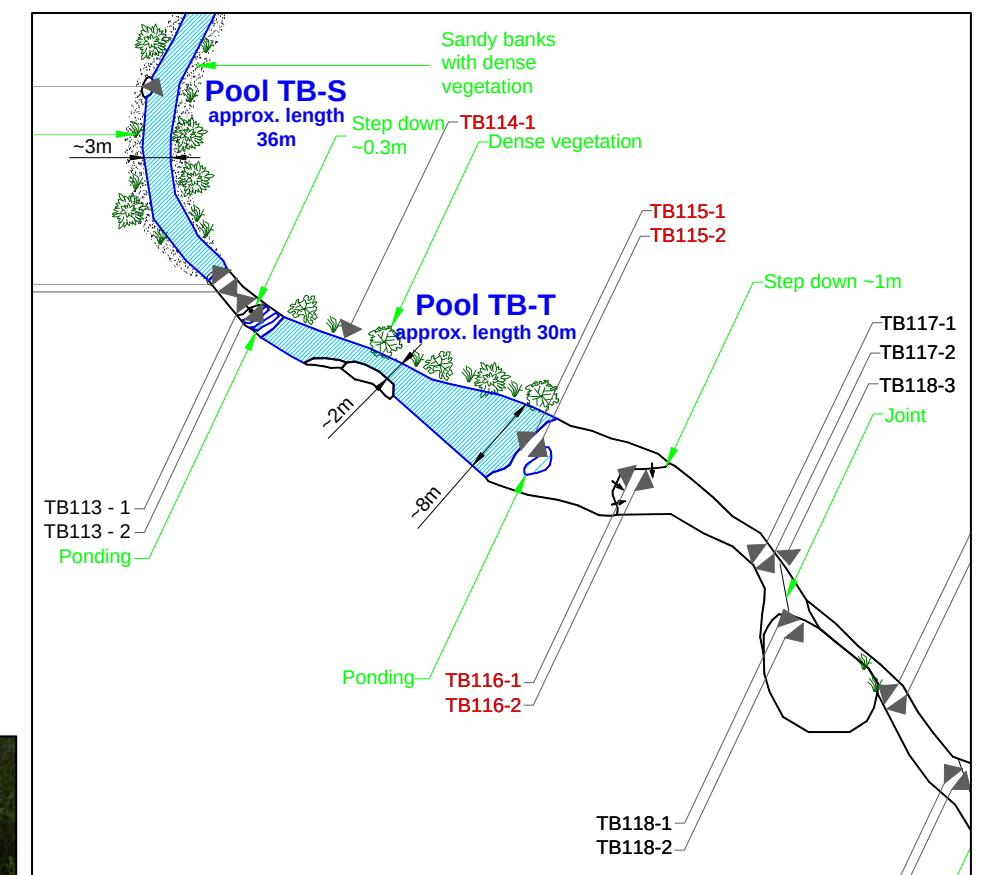
TB115-1 Downstream end of Pool TB-T looking Upstream

Notes (as at 15 & 21 December 2009)

- Pool TB-T approximately 30m long, 2 to 8m wide and 0.3m deep
- Base of the pool is sandstone with algae
- Sandstone ledge on southern bank and dense vegetation on northern bank
- Ponding and potholes on wide rockbar at downstream end of pool
- Rockbar steps down approximately 1m at TB116



TB115-2 Downstream end of Pool TB-T looking Downstream



TB116-1 Downstream of Pool TB-T looking Upstream



TB116-2 Downstream of Pool TB-T looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB114-1	309572	6215129	210
TB115-1	309589	6215116	310
TB115-2	309589	6215116	130
TB116-1	309601	6215114	295
TB116-2	309601	6215114	115

TRIBUTARY B STREAM MAPPING SUMMARY



TB117-1 Downstream of Pool TB-T looking Upstream



TB117-2 Downstream of Pool TB-T looking Downstream

Notes (as at 15 December 2009)

- Rockbar downstream of Pool TB-T extends through TB117, TB118 and TB119
- No flow visible



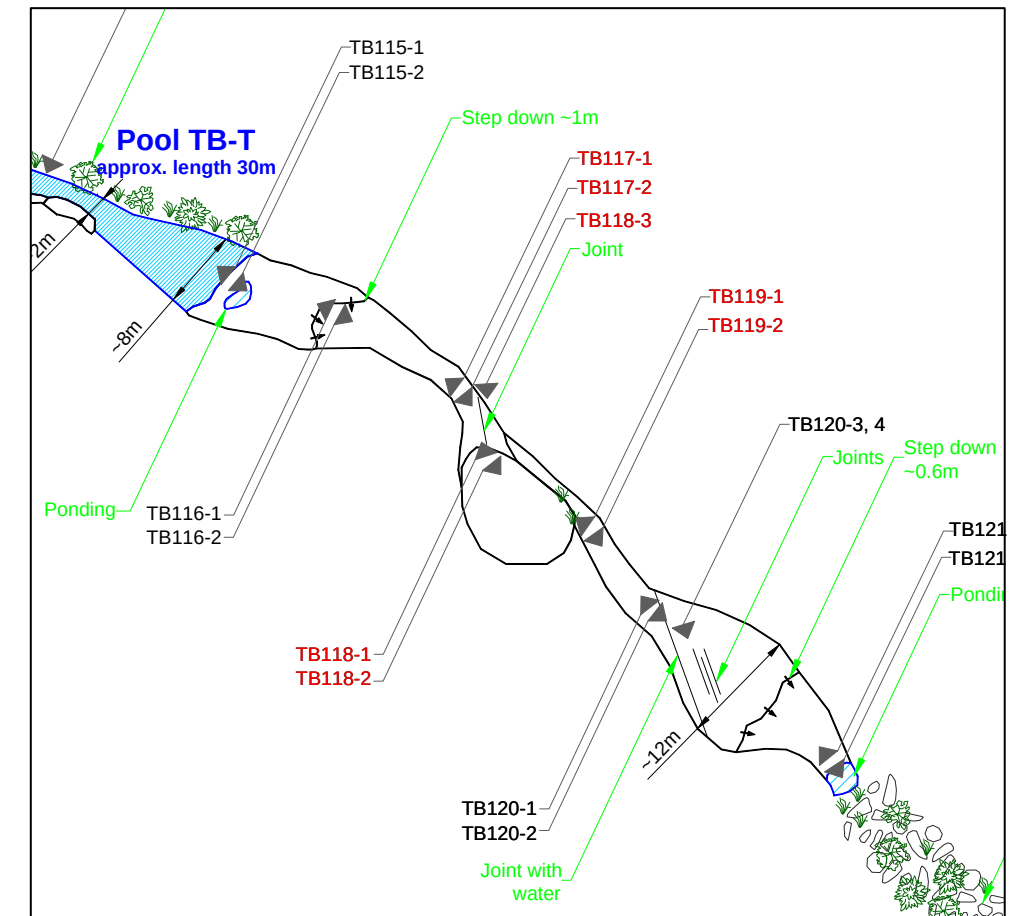
TB118-1 Downstream of Pool TB-T looking Upstream



TB118-2 Downstream of Pool TB-T looking Downstream



TB118-3 Joint



TB119-1 Downstream of Pool TB-T looking Upstream



TB119-2 Downstream of Pool TB-T looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB117-1	309614	6215105	305
TB117-2	309614	6215105	145
TB118-1	309615	6215097	340
TB118-2	309615	6215097	145
TB118-3	309615	6215097	175
TB119-1	309628	6215091	305
TB119-2	309628	6215091	145

TRIBUTARY B STREAM MAPPING SUMMARY



TB120-1 Rockbar looking Upstream



TB120-3 Joint with water



TB120-4 Joint

- Notes (as at 15 December 2009)
- Rockbar between TB120 and TB121 approximately 12m wide and 24m long, with many joints
 - Step down of approximately 0.6m approaching TB121
 - Ponding at downstream end of rockbar leading into boulder field



TB120-2 Rockbar looking Downstream



TB121-1 Upstream of Pool TB-U looking Upstream



TB121-2 Upstream of Pool TB-U looking Downstream

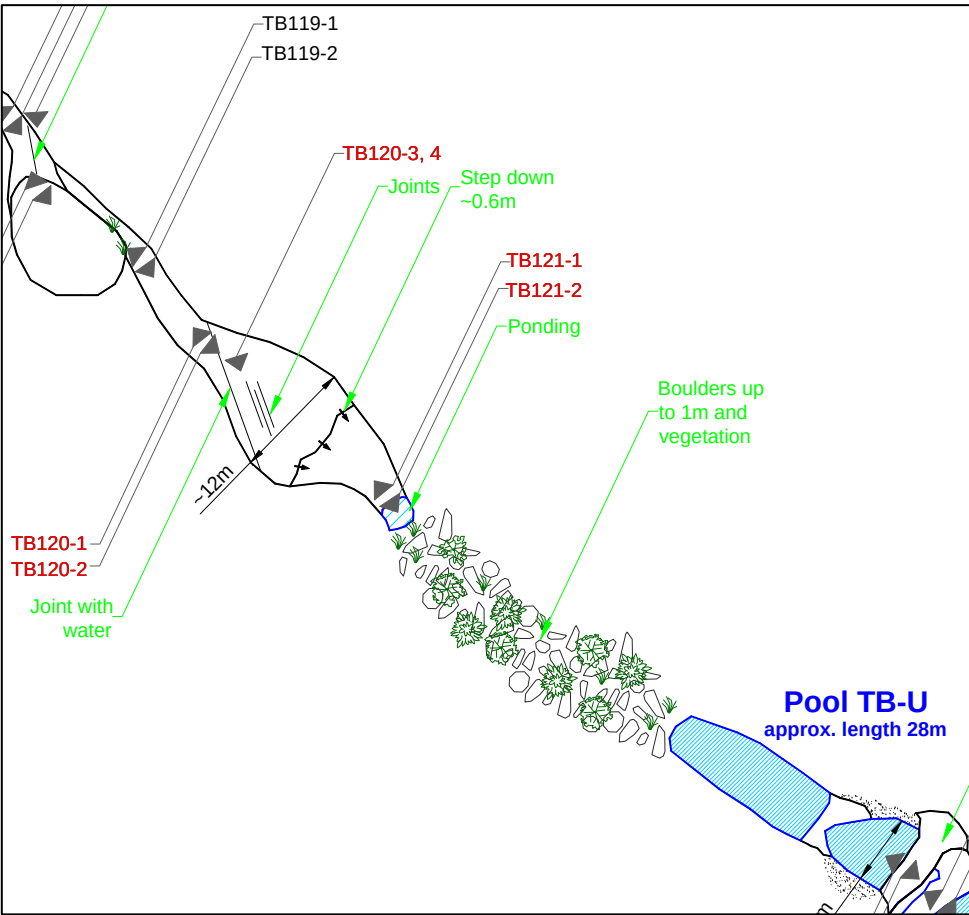


Photo Details

Photo ID	Easting	Northing	Bearing
TB120-1	309635	6215082	320
TB120-2	309635	6215082	125
TB120-3	309635	6215082	160
TB120-4	309635	6215082	160
TB121-1	309654	6215066	320
TB121-2	309654	6215066	150

TRIBUTARY B STREAM MAPPING SUMMARY



TB122-1 Downstream end of Pool TB-U looking Upstream



TB122-2 Downstream end of Pool TB-U looking Downstream

Notes (as at 15 December 2009)

- Pool TB-U approximately 28m long, 7m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits on the northern and southern banks at the downstream end
- Pool TB-V approximately 30m long, 8m wide at the upstream end, 2m wide at the downstream end, and up to 1m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar between Pools TB-U and TB-V approximately 6.5m long and 11m wide, with raised sandstone shelf approximately 0.5m high with underflow



TB123-1 Upstream end of Pool TB-V looking Upstream



TB123-2 Upstream end of Pool TB-V looking Downstream

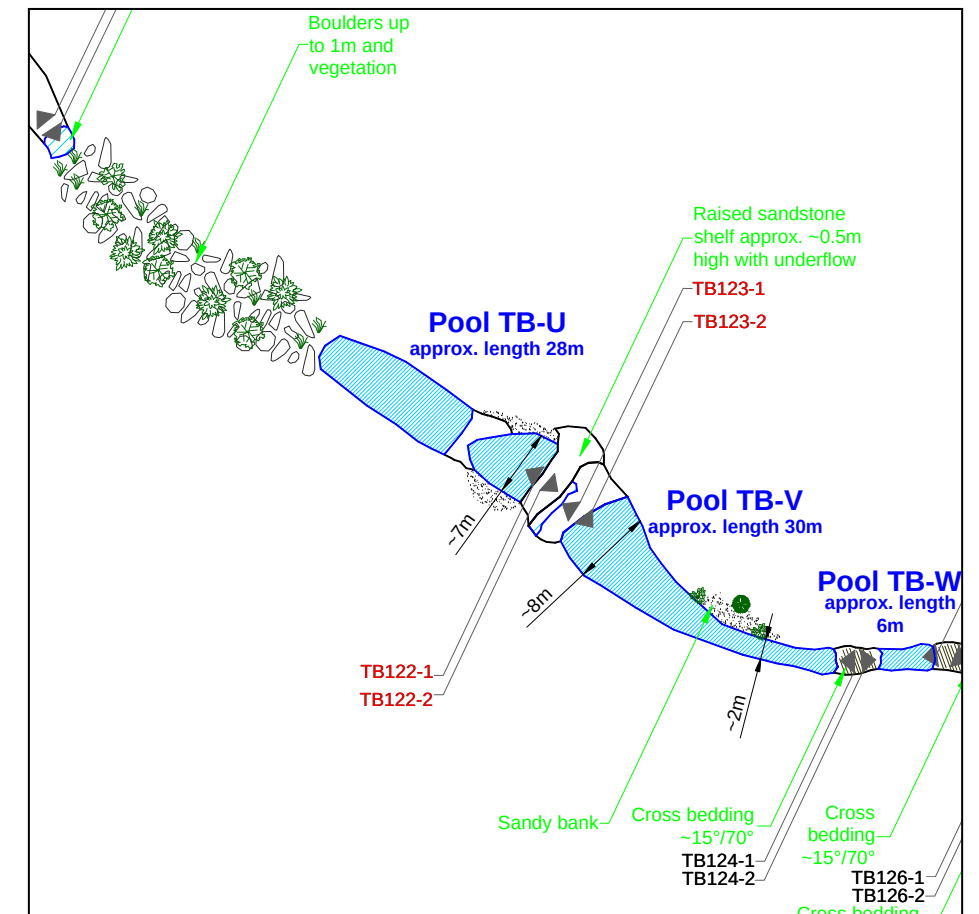


Photo Details

Photo ID	Easting	Northing	Bearing
TB122-1	309707	6215027	300
TB122-2	309707	6215027	130
TB123-1	309711	6215024	305
TB123-2	309711	6215024	140

TRIBUTARY B STREAM MAPPING SUMMARY



TB124-1 Downstream end of Pool TB-V looking Upstream



TB124-2 Upstream end of Pool TB-W looking Downstream

Notes (as at 15 December 2009)

- Rockbar between Pools TB-V and TB-W approximately 5m long and 2m wide with some cross bedding evident
- Pool TB-W approximately 6m long, 2.5m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits
- Pool TB-X approximately 1m long, 3m wide and 0.4 m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar between Pools TB-W and TB-X approximately 8m long and 3m wide, with cross bedding evident along the whole length of the rockbar



TB125-1 Downstream end of Pool TB-W looking Upstream



TB125-2 Downstream end of Pool TB-W looking Downstream



TB126-1 Downstream end of Pool TB-X looking Upstream



TB126-2 Downstream end of Pool TB-X looking Downstream

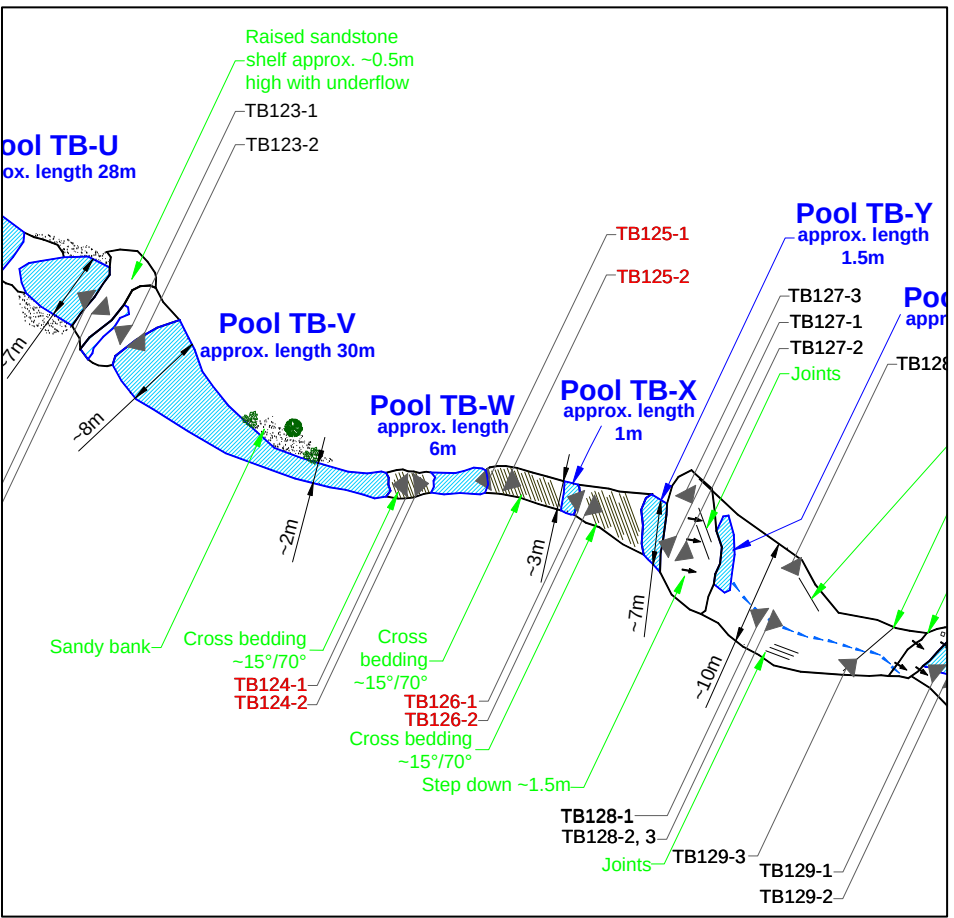


Photo Details

Photo ID	Easting	Northing	Bearing
TB124-1	309744	6215006	275
TB124-2	309744	6215006	85
TB125-1	309753	6215010	265
TB125-2	309753	6215010	115
TB126-1	309762	6215005	285
TB126-2	309762	6215005	115

TRIBUTARY B STREAM MAPPING SUMMARY



TB127-1 Downstream end of Pool TB-Y looking Upstream



TB127-2 Downstream end of Pool TB-Y looking Downstream



TB127-3 Joint

Notes (as at 15 December 2009)

- Pool TB-Y approximately 1.5m long, 7m wide and 0.2m deep
- Base of the pool is sandstone
- Pool TB-Z approximately 1m long, 8m wide and 0.2m deep
- Base of the pool is sandstone
- Rockbar between Pools TB-Y and TB-Z approximately 6.5m long and 14m wide, with several joints
- Approximate 1.5m change in height between Pools TB-Y and TB-Z



TB128-1 Downstream end of Pool TB-Z looking Upstream



TB128-2 Downstream end of Pool TB-Z looking Downstream



TB128-3 Joints



TB128-4 Joint

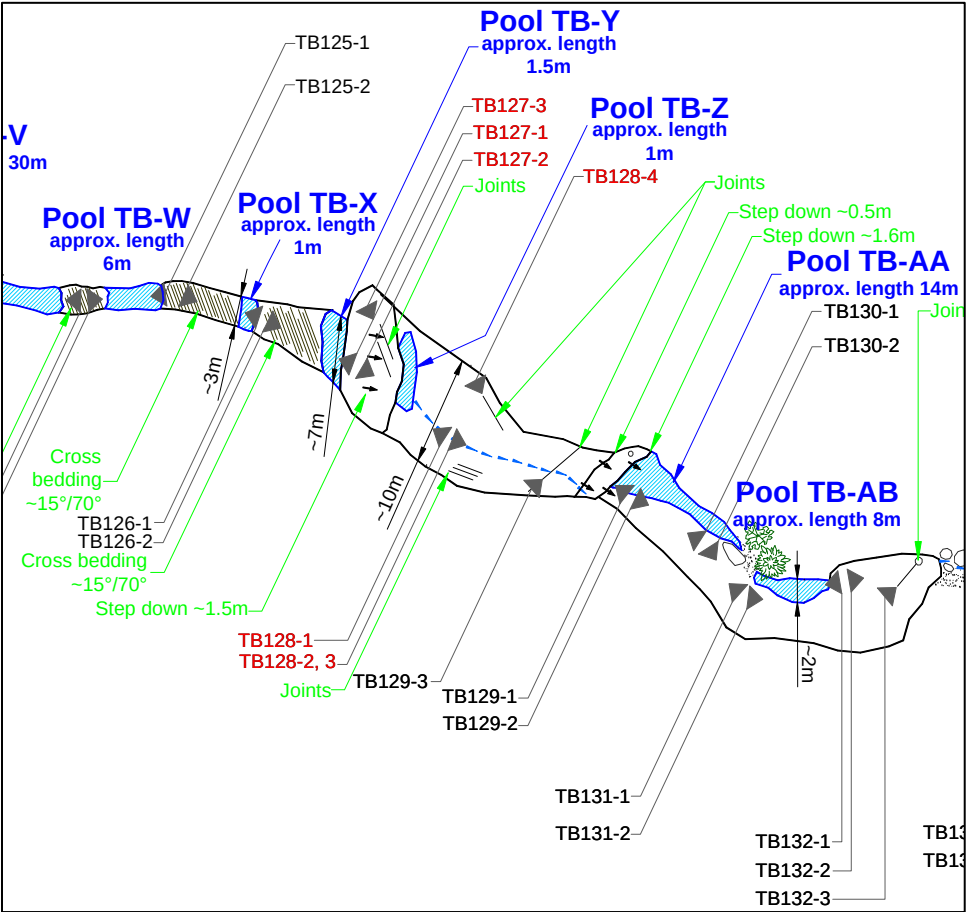


Photo Details

Photo ID	Easting	Northing	Bearing
TB127-1	309772	6215000	290
TB127-2	309772	6215000	120
TB127-3	309772	6215000	155
TB128-1	309783	6214996	305
TB128-2	309783	6214996	110
TB128-3	309783	6214996	110
TB128-4	309783	6214996	155

TRIBUTARY B STREAM MAPPING SUMMARY



TB129-1 Upstream end of Pool TB-AA looking Upstream



TB129-2 Upstream end of Pool TB-AA looking Downstream



TB129-3 Joint



TB130-1 Downstream end of Pool TB-AA looking Upstream



TB130-2 Downstream end of Pool TB-AA looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AA approximately 14m long, 1 to 5.5m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar upstream of Pool TB-AA approximately 23m long and up to 10m wide at the upstream end
- Flow path down centre of rockbar between Pools TB-Z and TB-AA, but no flow visible
- Approximate 2.1m change in height between Pools TB-Z and TB-AA

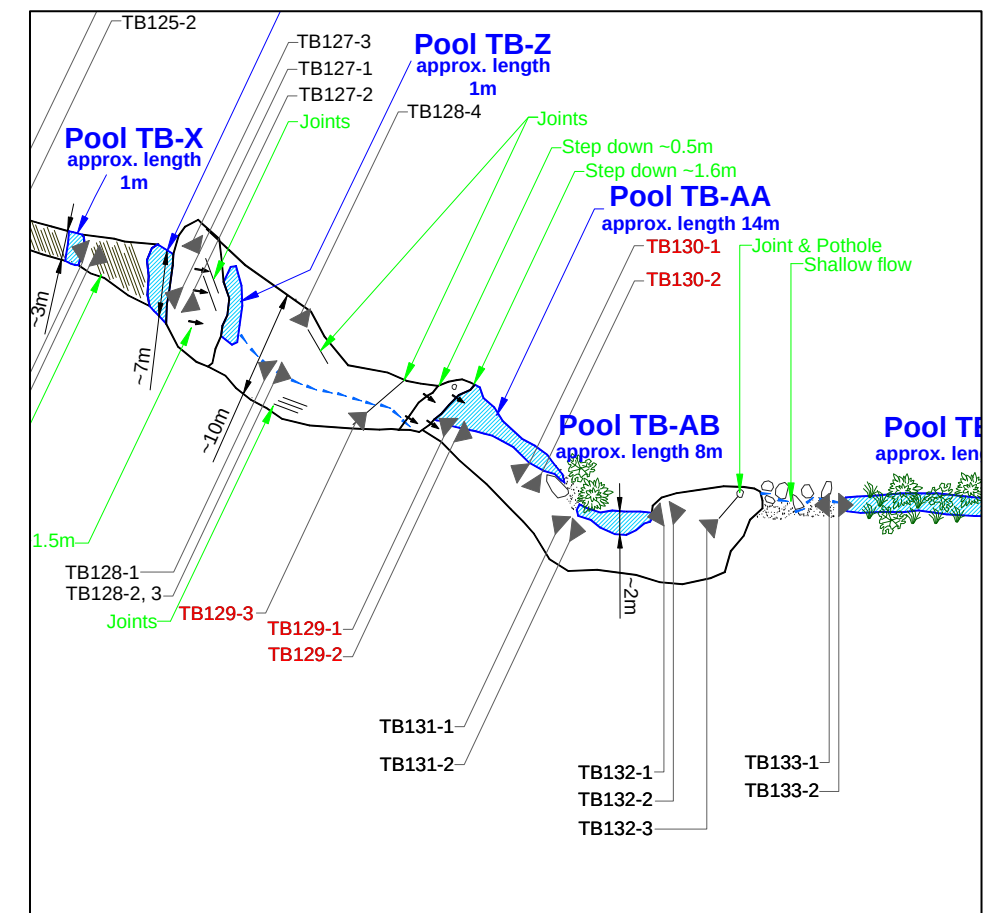


Photo Details

Photo ID	Easting	Northing	Bearing
TB129-1	309800	6214988	310
TB129-2	309800	6214988	115
TB129-3	309800	6214988	50
TB130-1	309809	6214979	300
TB130-2	309809	6214979	145

TRIBUTARY B STREAM MAPPING SUMMARY



TB131-1 Upstream end of Pool TB-AB looking Upstream



TB131-2 Upstream end of Pool TB-AB looking Downstream

Notes (as at 15 December 2009)

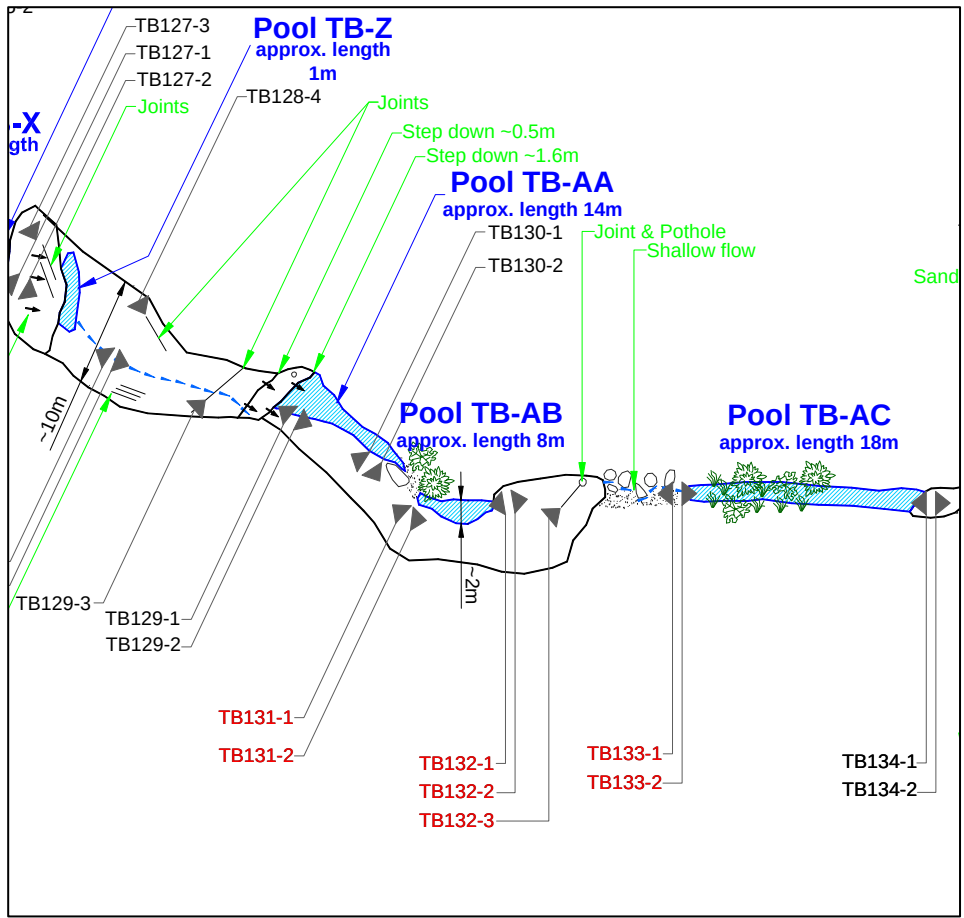
- Pool TB-AB approximately 8m long, 2m wide and 0.2m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar downstream of the pool approximately 10m wide with long joint and pothole
- Shallow flow over small boulders and alluvial deposits in to Pool TB-AC



TB132-1 Downstream end of Pool TB-AB looking Upstream



TB132-2 Downstream end of Pool TB-AB looking Downstream



TB132-3 Joint and pothole



TB133-1 Upstream end of Pool TB-AC looking Upstream



TB133-2 Upstream end of Pool TB-AC looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB131-1	309814	6214973	315
TB131-2	309814	6214973	95
TB132-1	309824	6214977	260
TB132-2	309824	6214977	80
TB132-3	309824	6214977	50
TB133-1	309842	6214978	270
TB133-2	309842	6214978	90

TRIBUTARY B STREAM MAPPING SUMMARY



TB134-1 Downstream end of Pool TB-AC looking Upstream



TB134-2 Upstream end of Pool TB-AD looking Downstream



TB135-1 Midway along Pool TB-AD looking Upstream



TB135-2 Midway along Pool TB-AD looking Downstream



TB135-3 Midway along Pool TB-AD looking toward southern bank



TB136-1 Downstream end of Pool TB-AD looking Upstream



TB136-2 Downstream end of Pool TB-AD looking Downstream

- Notes (as at 15 December 2009)
- Pool TB-AC approximately 18m long, 2m wide and 0.2m deep
 - Base of the pool is sandstone with alluvial deposits on southern bank
 - Pool TB-AD approximately 22m long, up to 4.5m wide at the downstream end, and 0.5m deep
 - Rockbar between Pools TB-AC and TB-AD approximately 7m long

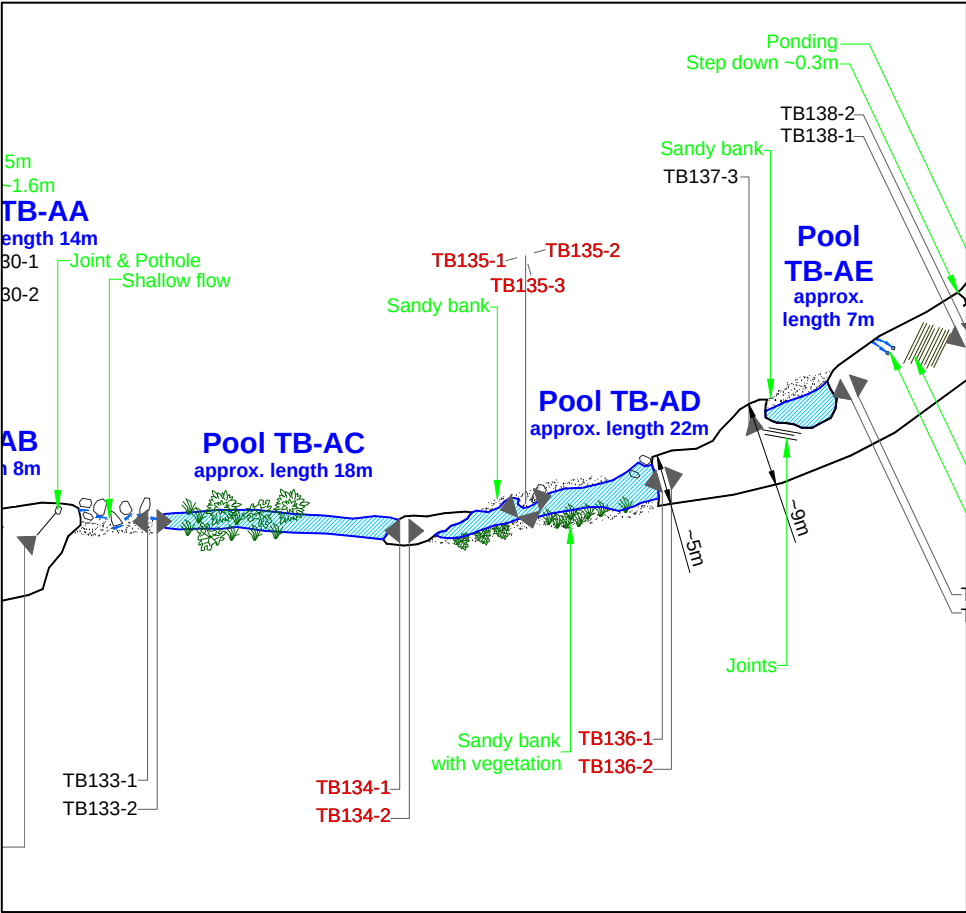


Photo Details

Photo ID	Easting	Northing	Bearing
TB134-1	309869	6214977	270
TB134-2	309869	6214977	90
TB135-1	309882	6214980	255
TB135-2	309882	6214980	75
TB135-3	309882	6214980	165
TB136-1	309897	6214982	255
TB136-2	309897	6214982	75

TRIBUTARY B STREAM MAPPING SUMMARY



TB137-1 Downstream end of Pool TB-AE looking Upstream



TB137-2 Downstream end of Pool TB-AE looking Downstream



TB137-3 Joints



TB138-1 Downstream of Pool TB-AE looking Upstream



TB138-2 Downstream of Pool TB-AE looking Downstream



TB139-1 Upstream of Pool TB-AF looking Upstream



TB139-2 Upstream of Pool TB-AF looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AE approximately 7m long, 3.5m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits and scattered vegetation debris on the northern bank
- Rockbar downstream of the pool approximately 16m long with cross bedding
- Rockbar steps down approximately 0.3m at TB138, with ponding downstream (TB138-2)
- Rockbar steps down approximately 1m at TB139 (TB139-1)

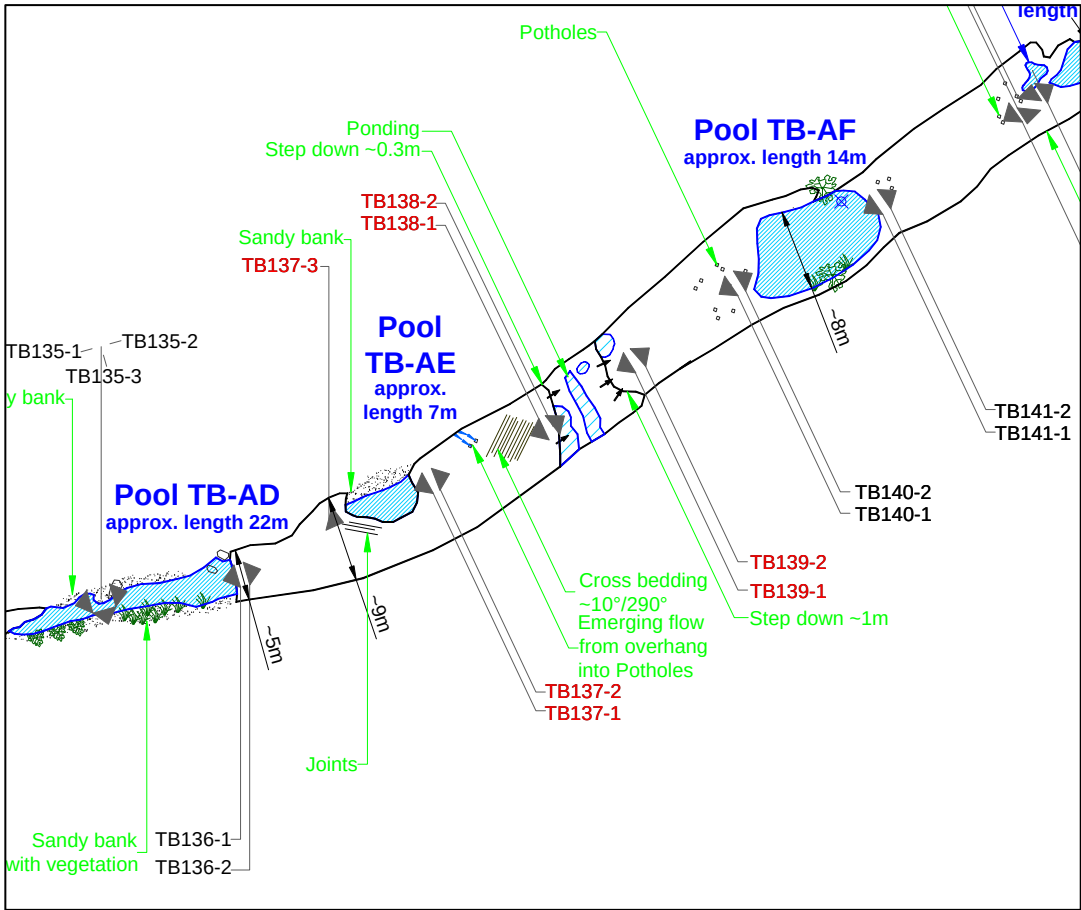


Photo Details

Photo ID	Easting	Northing	Bearing
TB137-1	309916	6214992	245
TB137-2	309916	6214992	65
TB137-3	309916	6214992	100
TB138-1	309929	6214998	245
TB138-2	309929	6214998	55
TB139-1	309938	6215005	240
TB139-2	309938	6215005	50

A photograph of a small, calm pool of water in a rocky, forested area. The water reflects the surrounding green trees and foliage. The foreground shows a large, flat rock with several small, dark, circular holes or depressions.

- Pool TB-AF approximately 14m long, 8m wide and up to 1.5m deep
- Base of the pool is sandstone with alluvial deposits
- Rockbar upstream of the pool has many potholes and no flow visible
- Rockbar downstream of the pool approximately 9m wide with many potholes at the downstream end

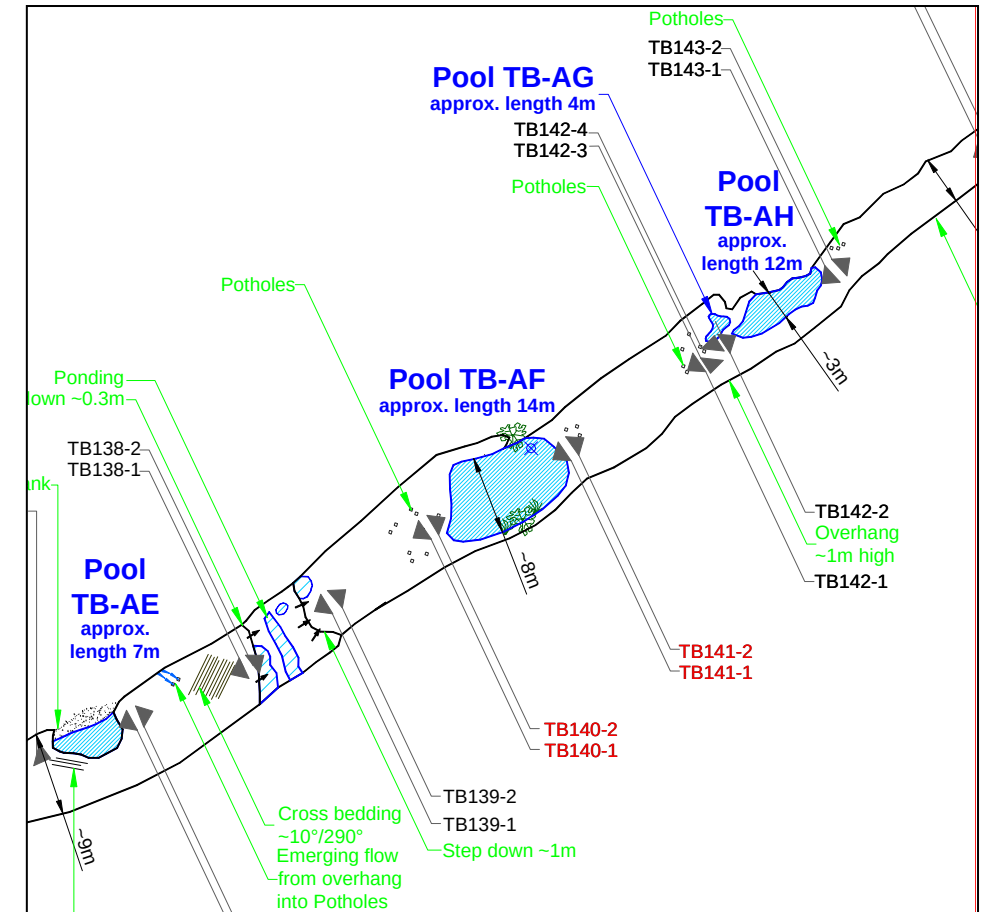
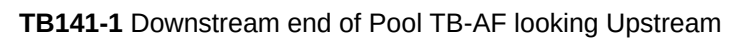


Photo ID	Easting	Northing	Bearing
TB140-1	309950	6215011	235
TB140-2	309950	6215011	60
TB141-1	309963	6215022	235
TB141-2	309963	6215022	55

TRIBUTARY B STREAM MAPPING SUMMARY



TB142-1 Upstream end of Pool TB-AG looking Upstream



TB142-2 Upstream end of Pool TB-AG looking Downstream



TB142-3 Pool TB-AG Looking toward northern bank



TB142-4 Overhang along southern bank Upstream of Pool TB-AG



TB143-1 Downstream end of Pool TB-AH looking Upstream



TB143-2 Downstream end of Pool TB-AH looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AG approximately 4m long, up to 2m wide and 0.3m deep
- Base of the pool is sandstone with alluvial deposits
- Pool TG-AH approximately 12m long, 3m wide and 0.5m deep
- Base of the pool is sandstone with alluvial deposits
- Overhang on southern bank approximately 1m high

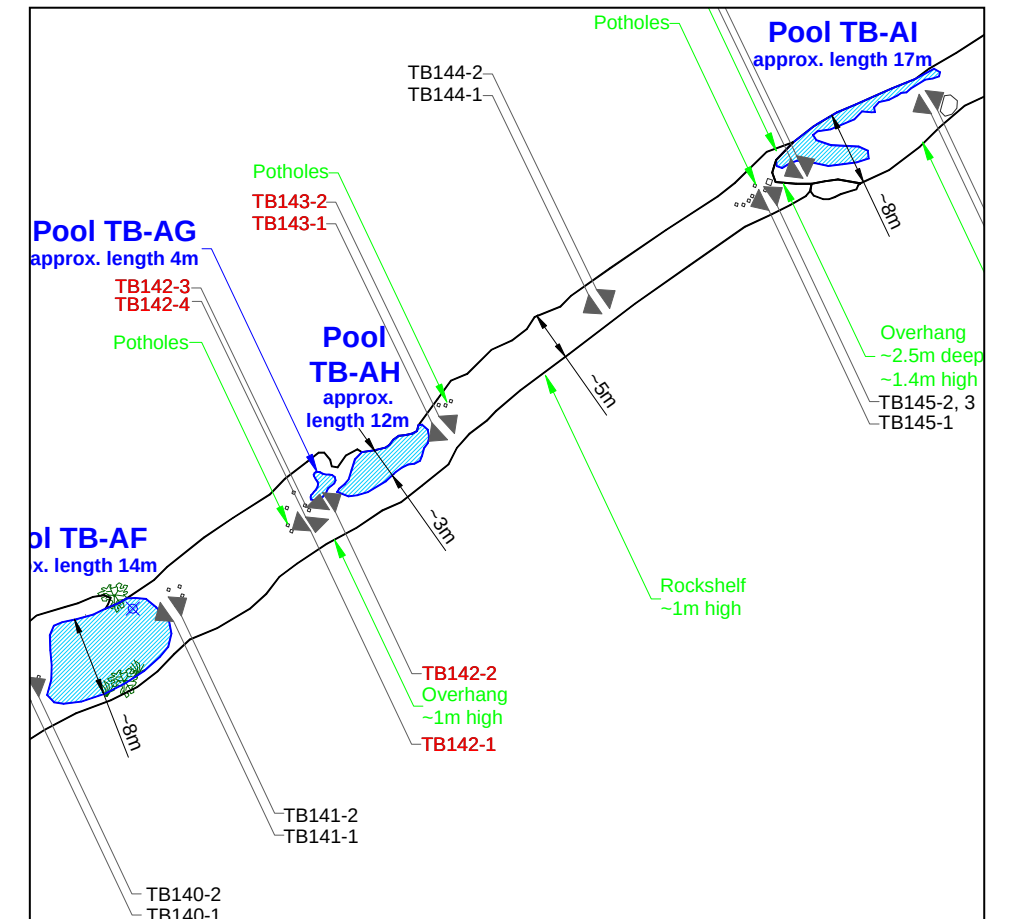


Photo Details

Photo ID	Easting	Northing	Bearing
TB142-1	309977	6215032	235
TB142-2	309977	6215032	55
TB142-3	309977	6215032	185
TB142-4	309977	6215032	5
TB143-1	309993	6215041	225
TB143-2	309993	6215041	45

TRIBUTARY B STREAM MAPPING SUMMARY



TB144-1 Downstream of Pool TB-AH looking Upstream



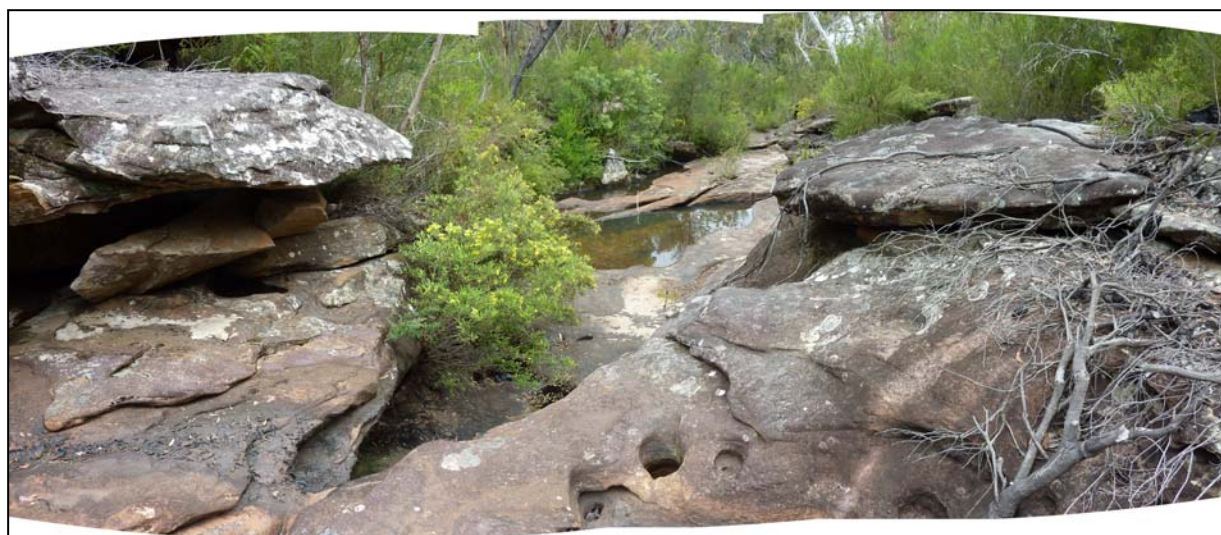
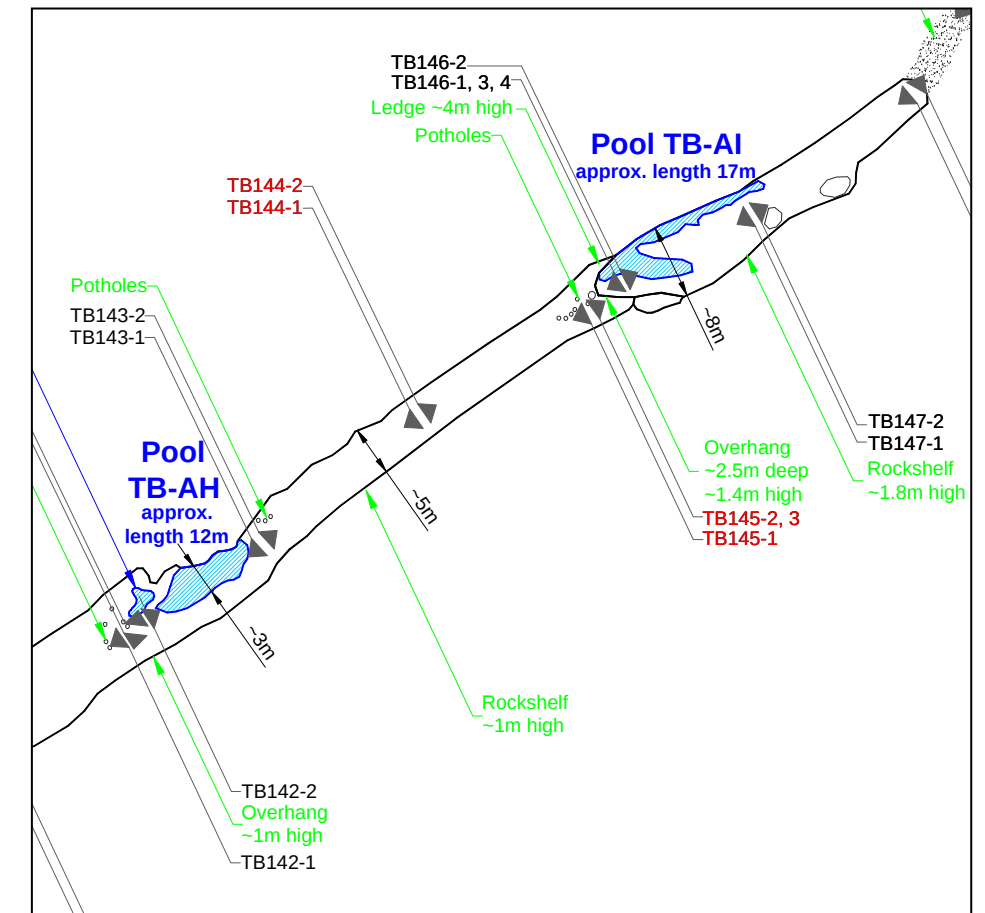
TB144-2 Downstream of Pool TB-AH looking Downstream

Notes (as at 15 December 2009)

- Rockbar between Pools TB-AH and TB-AI approximately 45m long and 5m wide, with many potholes
- Overhang at downstream end of rockbar approximately 1.4m high and 2.5m deep



TB145-1 Upstream of Pool TB-AI looking Upstream



TB145-2 Upstream of Pool TB-AI looking Downstream



TB145-3 Pothole in overhang

Photo Details

Photo ID	Easting	Northing	Bearing
TB144-1	310008	6215056	235
TB144-2	310008	6215056	55
TB145-1	310032	6215061	245
TB145-2	310032	6215061	55
TB145-3	310032	6215061	55

TRIBUTARY B STREAM MAPPING SUMMARY



TB146-1 Upstream end of Pool TB-AI looking Upstream



TB146-2 Upstream end of Pool TB-AI looking Downstream



TB146-3 Pothole in overhang

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February 2010



TB146-4 Pothole in overhang

Notes (as at 15 December 2009)

- Pool TB-AI approximately 17m long, up to 4m wide at the upstream end, and 0.3m deep
- Base of the pool is sandstone with alluvial deposits
- Overhang approximately 1.4m high and 2.5m deep, with large potholes

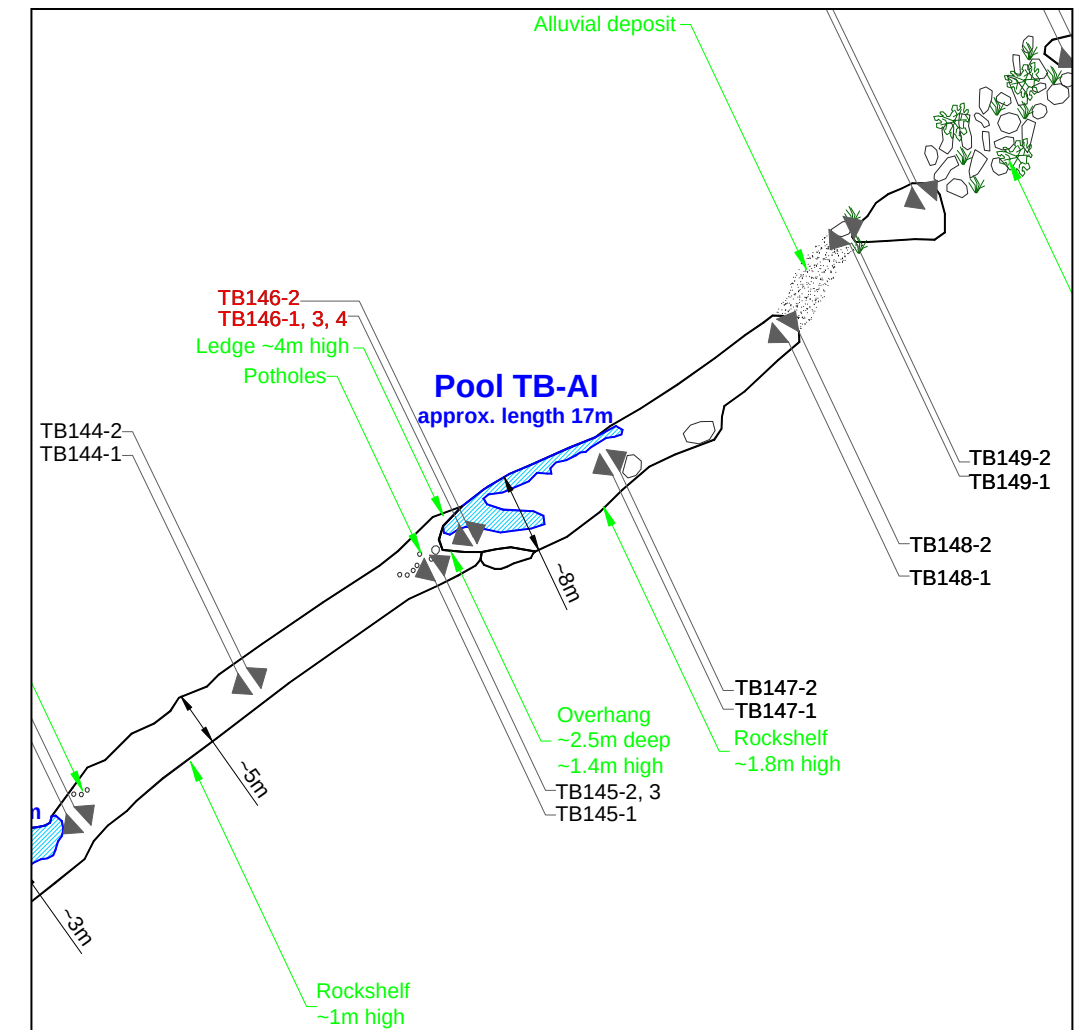


Photo Details

Photo ID	Easting	Northing	Bearing
TB146-1	310046	6215079	235
TB146-2	310046	6215079	65
TB146-3	310046	6215079	235
TB146-4	310046	6215079	235

TRIBUTARY B STREAM MAPPING SUMMARY



TB147-1 Downstream end of Pool TB-AI looking Upstream



TB147-2 Downstream end of Pool TB-AI looking Downstream



TB148-1 Downstream of Pool TB-AI looking Upstream



TB148-2 Downstream of Pool TB-AI looking Downstream



TB149-1 Downstream of Pool TB-AI looking Upstream



TB149-2 Downstream of Pool TB-AI looking Downstream

- Notes (as at 15 December 2009)
- Pool TB-AI approximately 17m long, up to 4m wide at the upstream end, and 0.3m deep
 - Base of the pool is sandstone with alluvial deposits
 - Alluvial deposits and scattered vegetation debris between TB148 and TB149

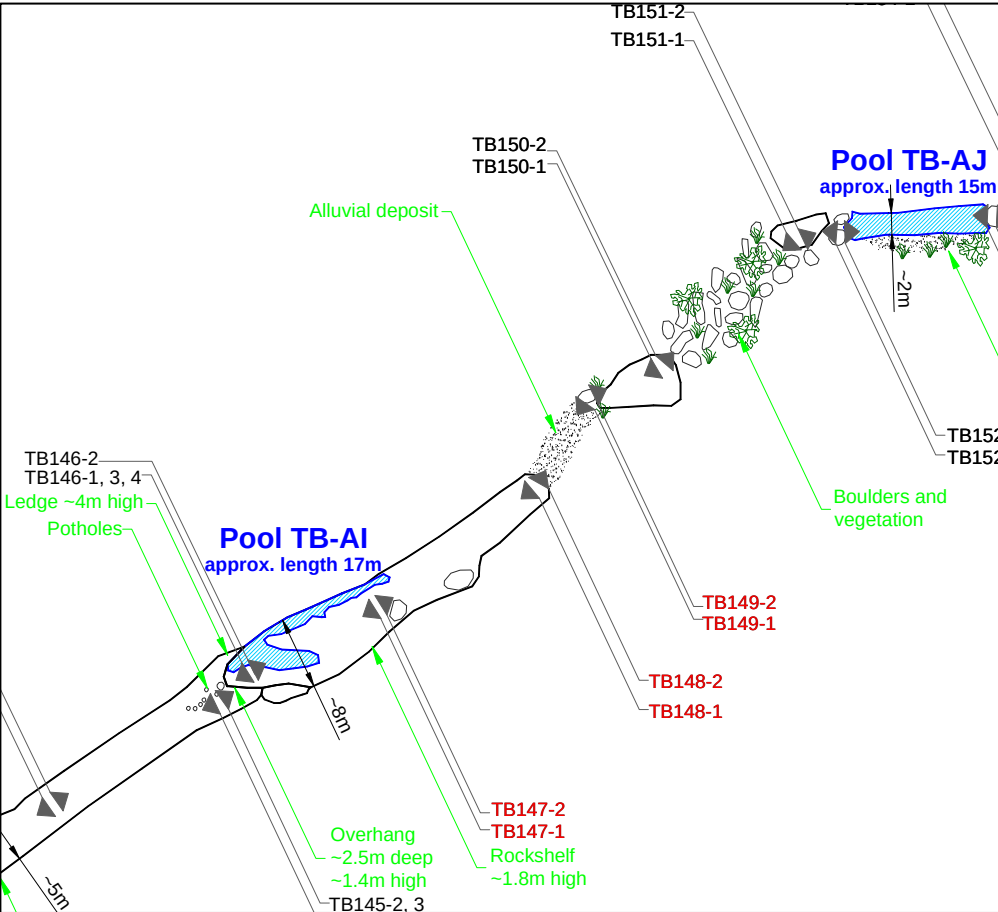


Photo Details

Photo ID	Easting	Northing	Bearing
TB147-1	310046	6215079	240
TB147-2	310046	6215079	60
TB148-1	310062	6215089	235
TB148-2	310062	6215089	30
TB149-1	310076	6215099	215
TB149-2	310076	6215099	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB150-1 Upstream of Pool TB-AJ looking Upstream



TB150-2 Upstream of Pool TB-AJ looking Downstream

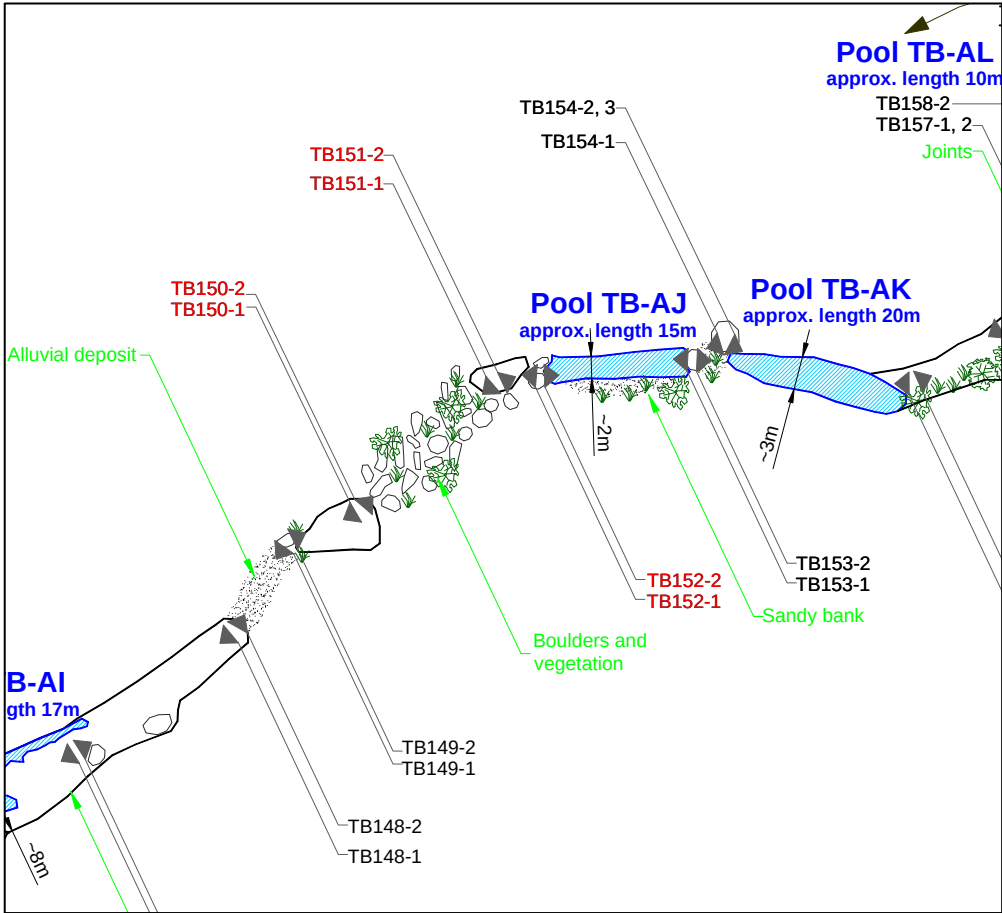
- Notes (as at 15 December 2009)
- Boulder field and vegetation upstream of Pool TB-AJ
 - Pool TB-AJ approximately 15m long, 2m wide and 0.3m deep
 - Base of the pool is sandstone with alluvial deposits



TB151-1 Upstream of Pool TB-AJ looking Upstream



TB151-2 Upstream of Pool TB-AJ looking Downstream



TB152-1 Upstream end of Pool TB-AJ looking Upstream



TB152-2 Upstream end of Pool TB-AJ looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB150-1	310076	6215099	240
TB150-2	310076	6215099	40
TB151-1	310090	6215117	230
TB151-2	310090	6215117	65
TB152-1	310095	6215116	280
TB152-2	310095	6215116	85

TRIBUTARY B STREAM MAPPING SUMMARY



TB153-1 Downstream end of Pool TB-AJ looking Upstream



TB153-2 Downstream end of Pool TB-AJ looking Downstream



TB154-1 Upstream end of Pool TB-AK looking Upstream

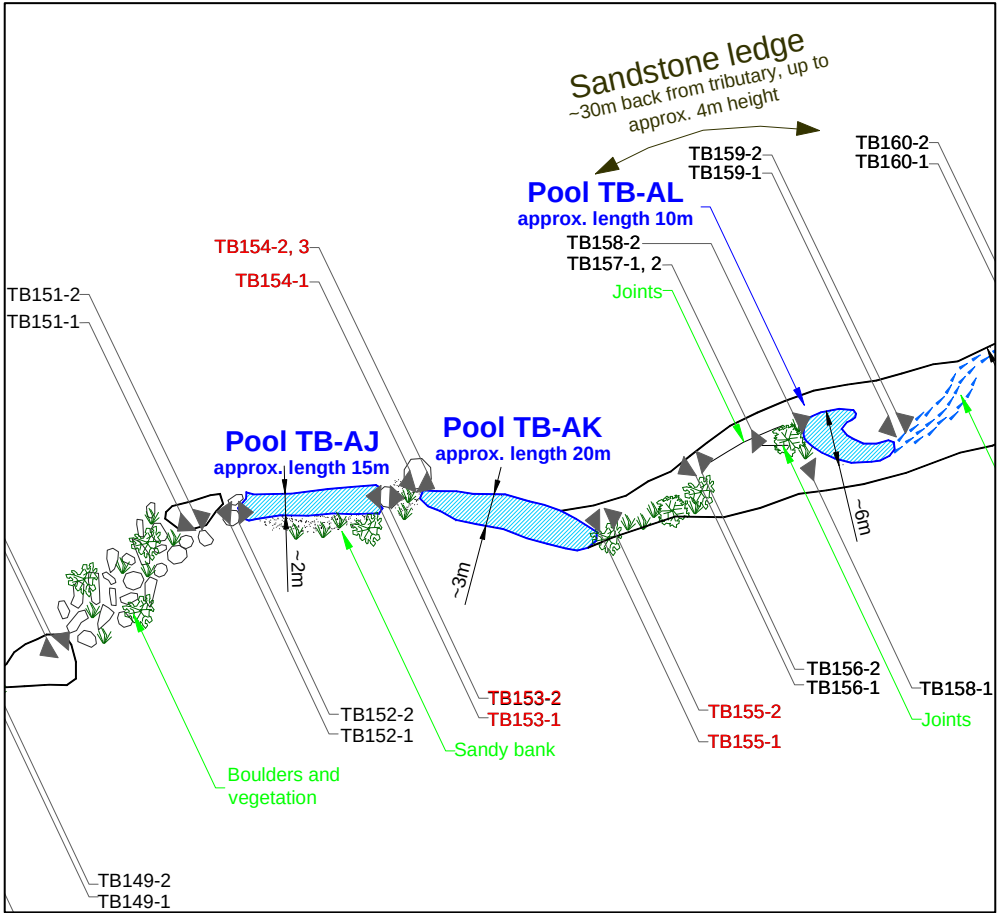
- Notes (as at 15 December 2009)
- Pool TB-AJ approximately 15m long, 2m wide and 0.3m deep
 - Base of the pool is sandstone with alluvial deposits
 - Pool TB-AK approximately 20m long, 3m wide and 0.3m deep
 - Base of the pool is sandstone with alluvial deposits
 - Vegetation and alluvial deposits between Pools TB-AJ and TB-AK
 - No flow visible downstream of Pool TB-AK



TB154-2 Upstream end of Pool TB-AK looking Downstream



TB154-3 Upstream end of Pool TB-AK looking Downstream



TB155-1 Downstream end of Pool TB-AK looking Upstream



TB155-2 Downstream end of Pool TB-AK looking Downstream

Photo Details

Photo ID	Easting	Northing	Bearing
TB153-1	310111	6215118	275
TB153-2	310111	6215118	95
TB154-1	310115	6215120	255
TB154-2	310115	6215120	120
TB154-3	310115	6215120	120
TB155-1	310135	6215117	270
TB155-2	310135	6215117	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB156-1 Downstream of Pool TB-AK looking Upstream



TB156-2 Downstream of Pool TB-AK looking Downstream



TB157-1 Joint

Notes (as at 15 December 2009)

- Rockbar upstream of Pool TB-AL approximately 23m long and up to 10m wide, with joints at the downstream end
- Pool TB-AL approximately 10m long, 6m wide and 0.3m deep
- Base of the pool is sandstone with algae at the downstream end
- Sandstone ledge up to 3m high on northern side of Pool TB-AL at a distance of approximately 30m



TB157-2 Joint



TB158-1 Upstream end of Pool TB-AL looking Upstream



TB158-2 Upstream end of Pool TB-AL looking Downstream

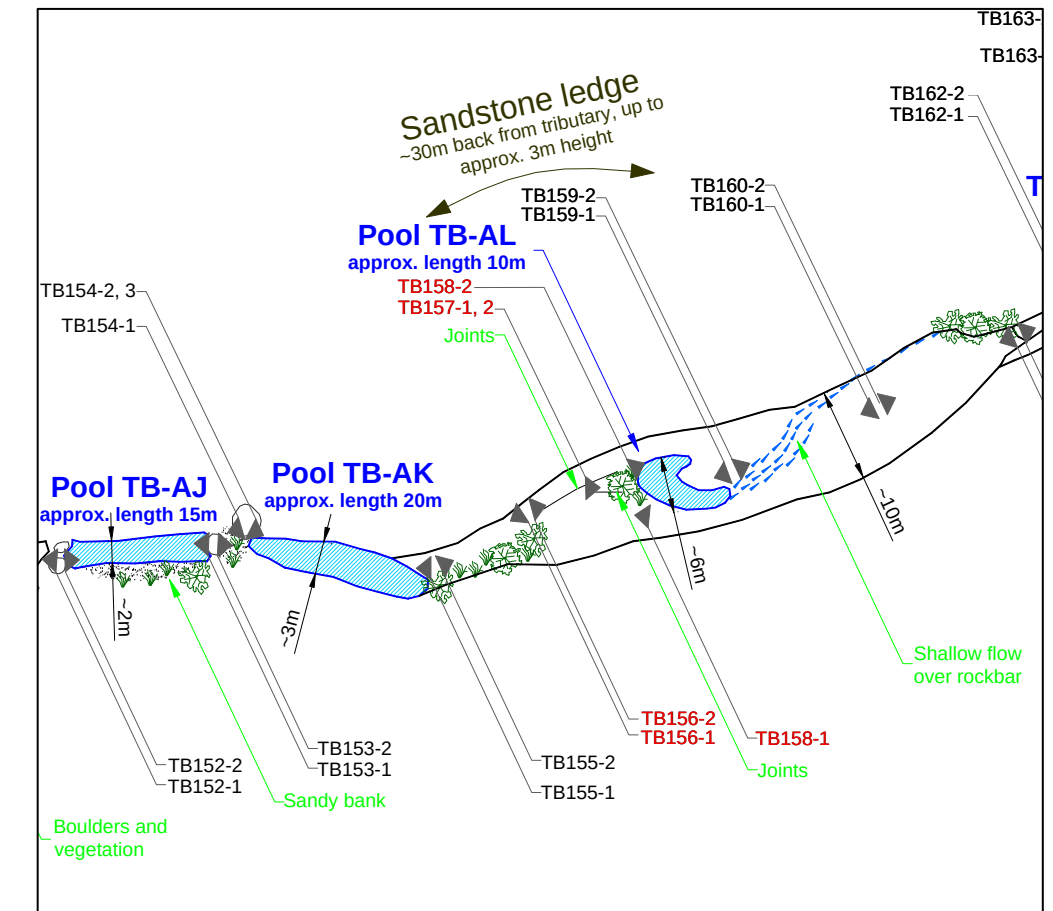


Photo Details

Photo ID	Easting	Northing	Bearing
TB156-1	310146	6215121	235
TB156-2	310146	6215121	75
TB157-1	310152	6215122	85
TB157-2	310152	6215122	85
TB158-1	310156	6215126	275
TB158-2	310156	6215126	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB159-1 Downstream end of Pool TB-AL looking Upstream



TB159-2 Downstream end of Pool TB-AL looking Downstream



TB160-1 Downstream of Pool TB-AL looking Upstream



TB160-2 Downstream of Pool TB-AL looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AL approximately 10m long, 6m wide and 0.3m deep
- Base of the pool is sandstone with algae at the downstream end
- Shallow flow over 10m wide rockbar downstream of the pool

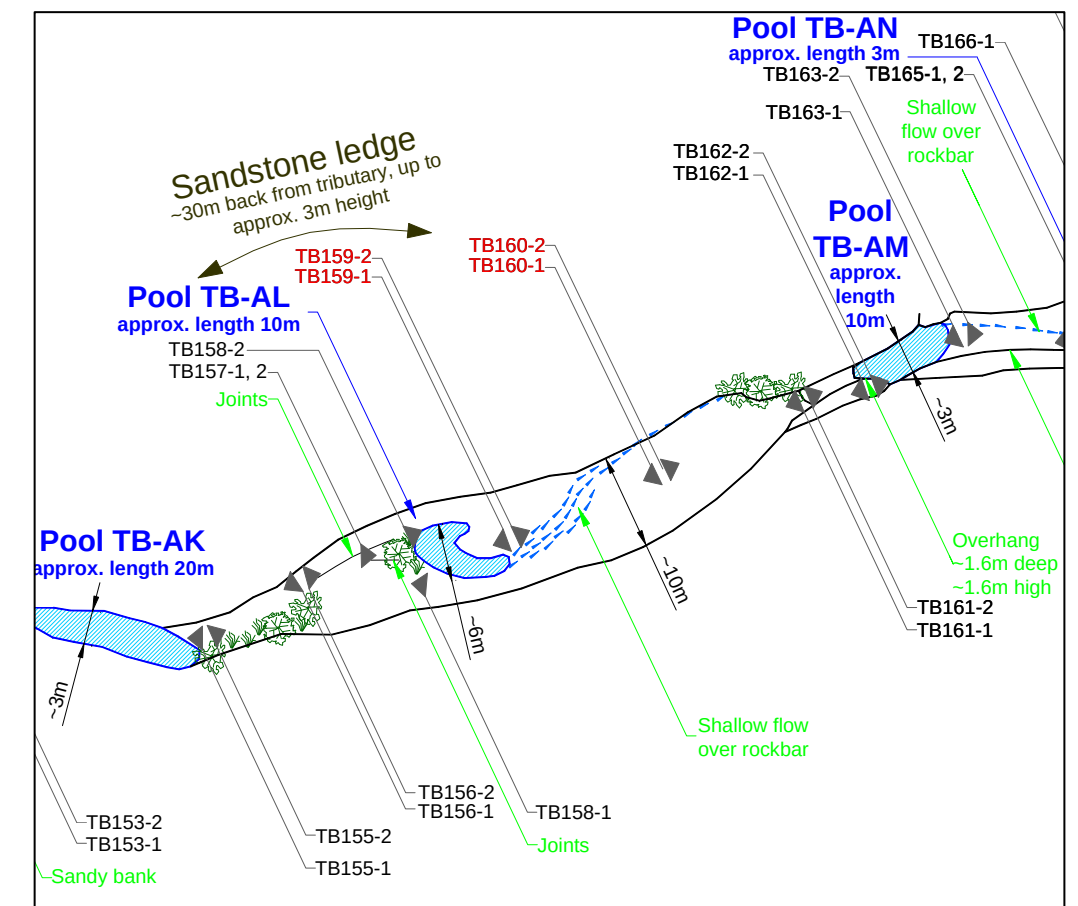


Photo Details

Photo ID	Easting	Northing	Bearing
TB159-1	310168	6215124	250
TB159-2	310168	6215124	65
TB160-1	310183	6215133	245
TB160-2	310183	6215133	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB161-1 Upstream of Pool TB-AM looking Upstream



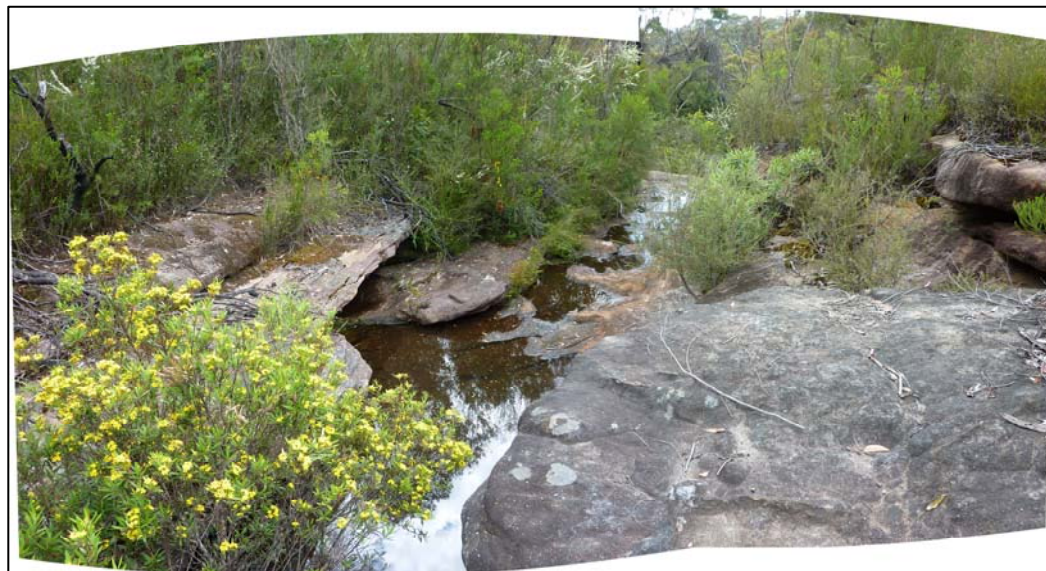
TB161-2 Upstream of Pool TB-AM looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AM approximately 10m long, 3m wide and 0.3m deep
- Base of the pool is sandstone
- Approximate 1.6m change in height from rockbar at TB162 down to Pool TB-AM



TB162-1 Upstream end of Pool TB-AM looking Upstream



TB162-2 Upstream end of Pool TB-AM looking Downstream

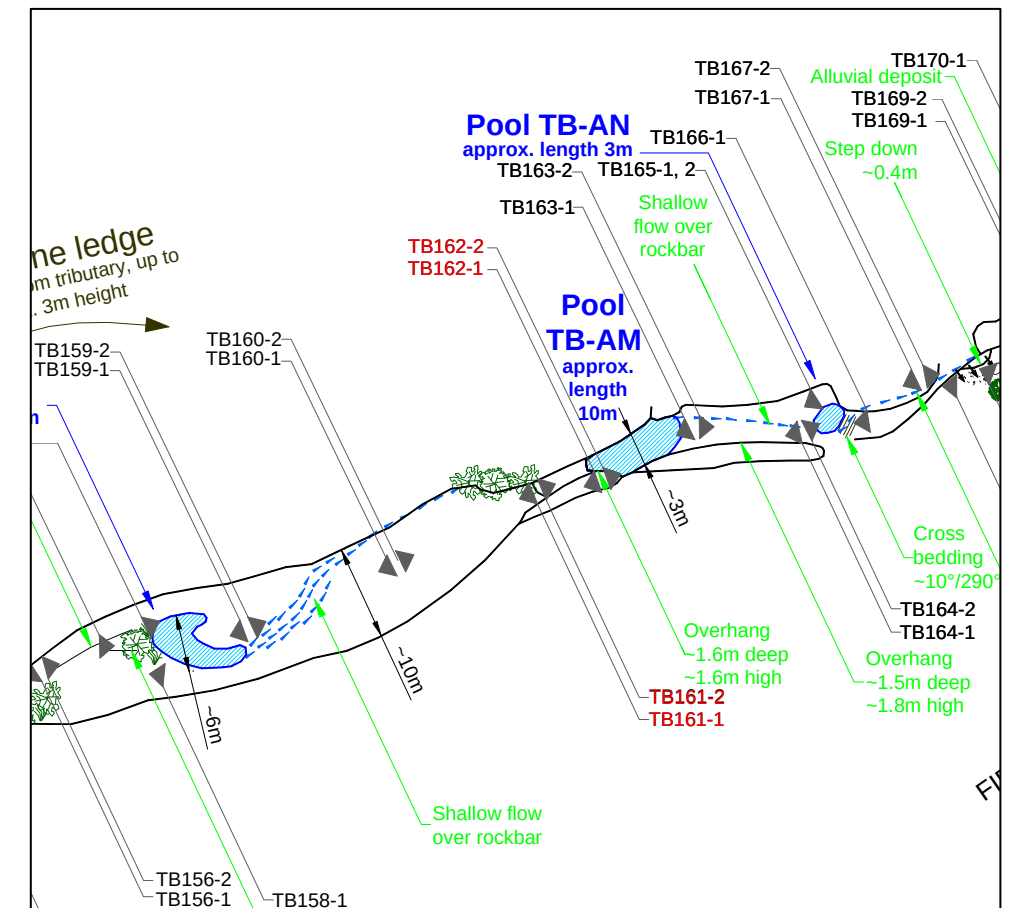


Photo Details

Photo ID	Easting	Northing	Bearing
TB161-1	310199	6215140	245
TB161-2	310199	6215140	65
TB162-1	310204	6215142	250
TB162-2	310204	6215142	70

TRIBUTARY B STREAM MAPPING SUMMARY



TB163-1 Downstream end of Pool TB-AM looking Upstream



TB163-2 Downstream end of Pool TB-AM looking Downstream

Notes (as at 15 December 2009)

- Pool TB-AM approximately 10m long, 3m wide and 0.3m deep
- Base of the pool is sandstone
- Overhang at upstream end of pool approximately 1.6m high and 1.6m deep
- Pool TB-AN approximately 3m long, 2.5m wide and 0.2m deep
- Base of the pool is sandstone
- Rockbar between Pools TB-AM and TB-AN approximately 16m long and 4m wide, with shallow flow
- Overhang on southern bank approximately 1.8m high and 1.5m deep, and runs along the length of the rockbar



TB164-1 Upstream end of Pool TB-AN looking Upstream



TB164-2 Upstream end of Pool TB-AN looking Downstream

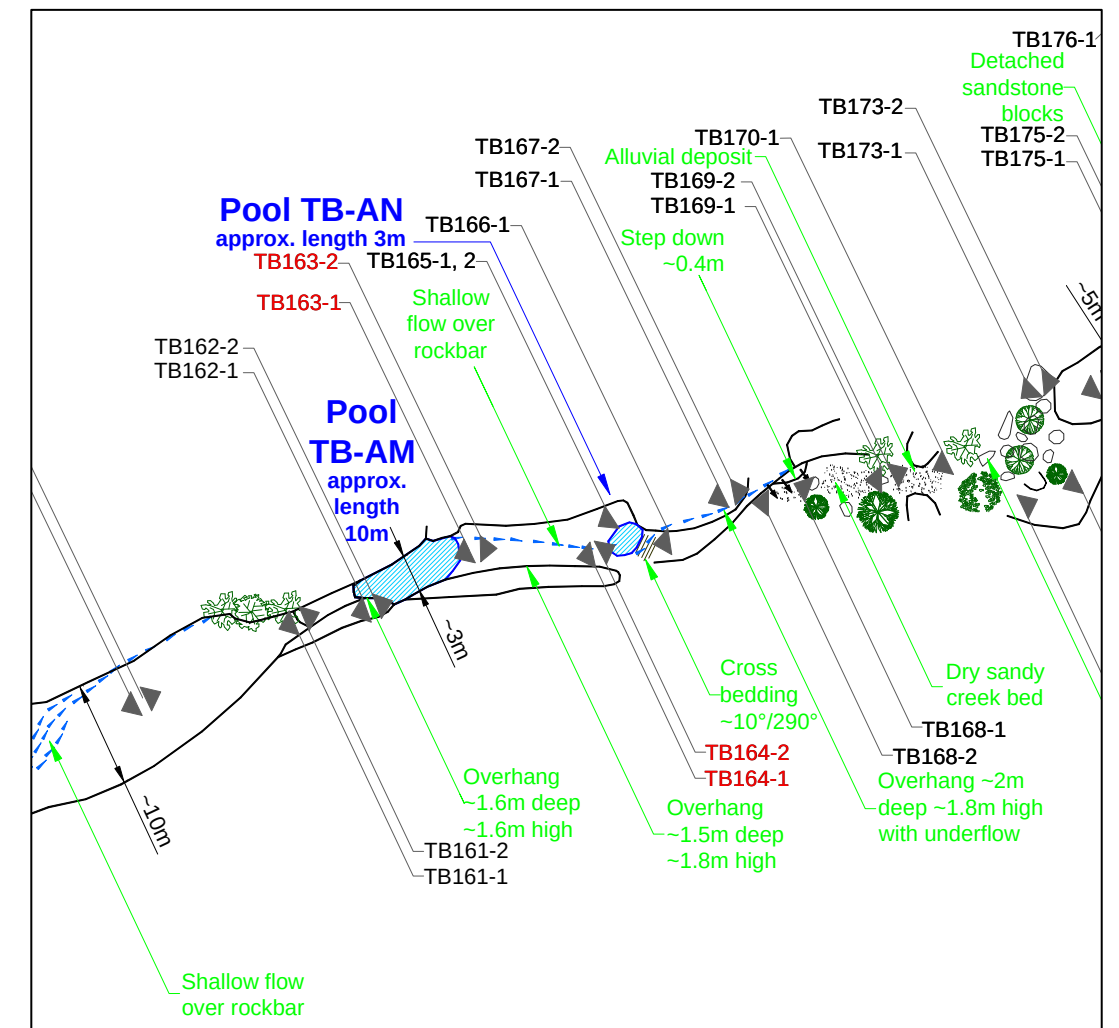


Photo Details

Photo ID	Easting	Northing	Bearing
TB163-1	310213	6215148	245
TB163-2	310213	6215148	90
TB164-1	310226	6215147	255
TB164-2	310226	6215147	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB165-1 Midway along Pool TB-AN looking Upstream



TB165-2 Overhang at Upstream end of Pool TB-AN



TB166-1 Downstream end of Pool TB-AN looking Upstream



TB167-2 Downstream of Pool TB-AN looking Downstream



TB167-1 Downstream of Pool TB-AN looking Upstream

Notes (as at 15 December 2009)

- Pool TB-AN approximately 3m long, 2.5m wide and 0.2m deep
- Base of the pool is sandstone
- Flow over cross bedding planes downstream of the pool, then underflow beneath overhang on northern bank

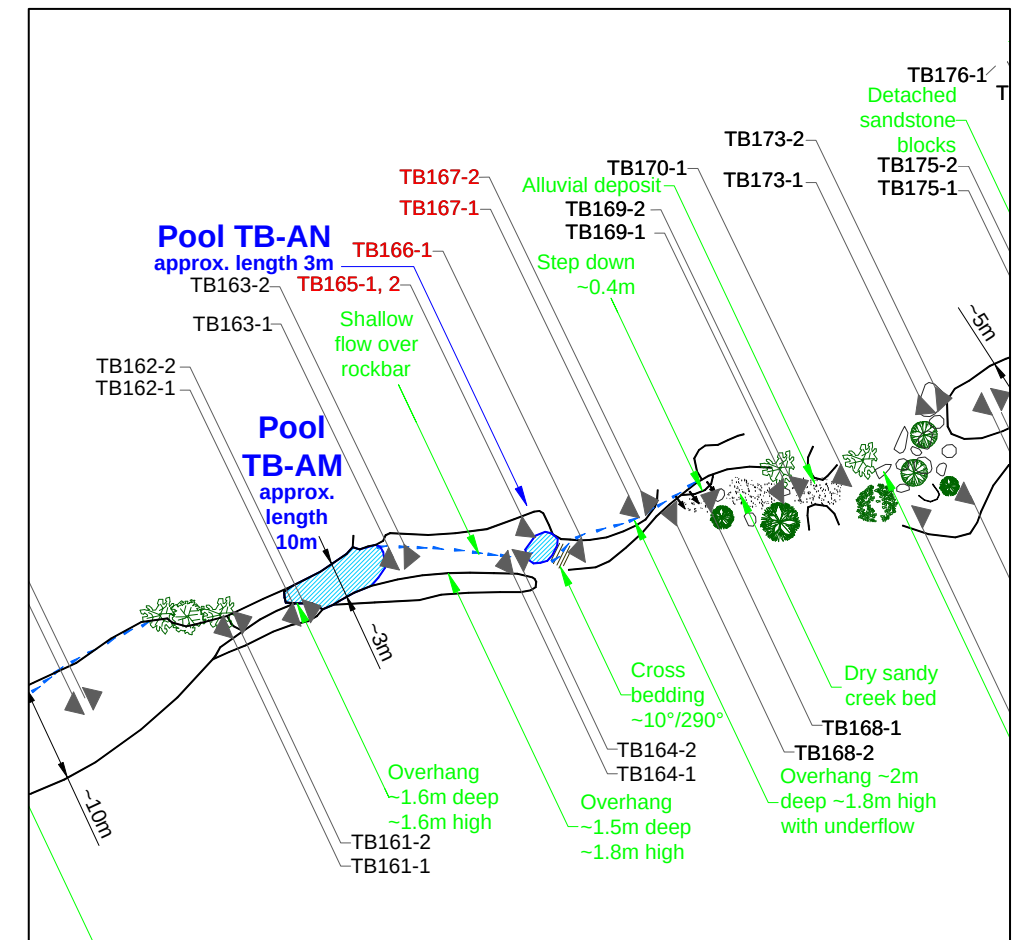


Photo Details

Photo ID	Easting	Northing	Bearing
TB165-1	310228	6215150	235
TB165-2	310228	6215150	235
TB166-1	310232	6215148	260
TB167-1	310239	6215152	245
TB167-2	310239	6215152	75

TRIBUTARY B STREAM MAPPING SUMMARY



TB168-1 Overhang downstream of Pool TB-AN



TB168-2 Downstream of Pool TB-AN looking Upstream

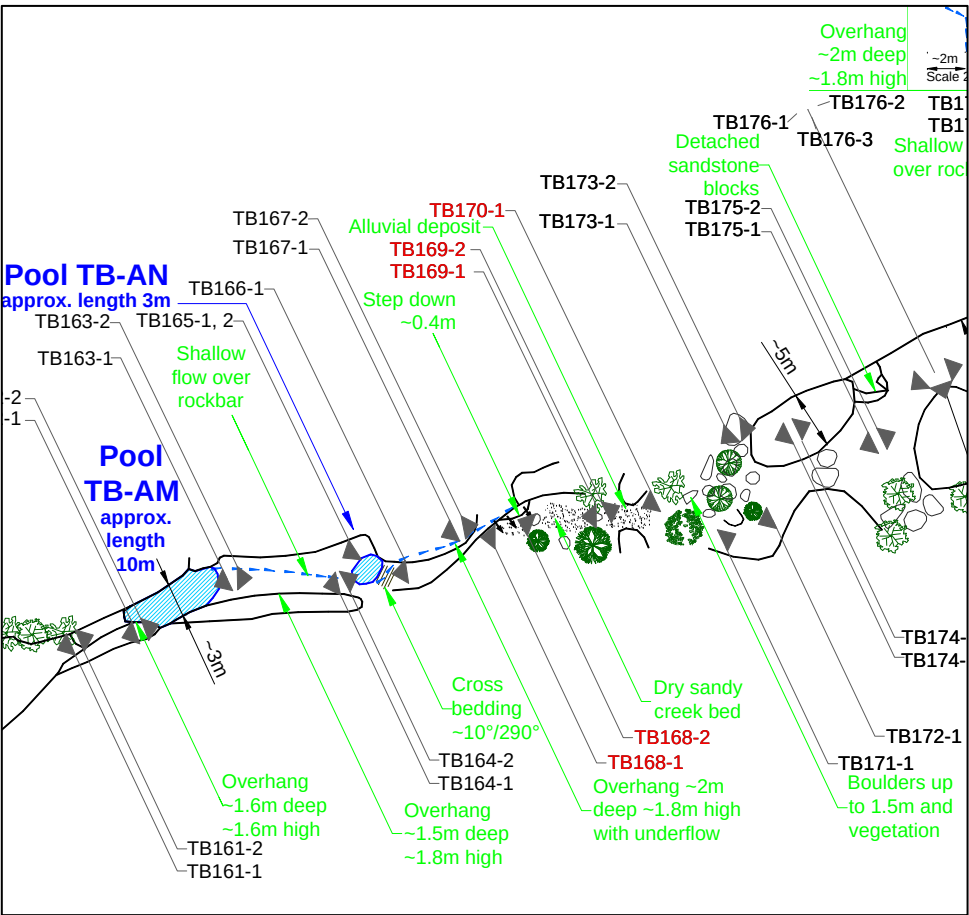
- Notes (as at 15 December 2009)
- Overhang downstream of Pool TB-AN approximately 1.8m high and 2m deep with underflow
 - Dry sandy creek bed with alluvial deposits downstream



TB169-1 Downstream of Pool TB-AN looking Upstream



TB169-2 Downstream of Pool TB-AN looking Downstream



TB170-1 Downstream of Pool TB-AN looking Upstream

Photo Details			
Photo ID	Easting	Northing	Bearing
TB168-1	310242	6215152	290
TB168-2	310242	6215152	270
TB169-1	310257	6215154	270
TB169-2	310257	6215154	65
TB170-1	310255	6215154	245

TRIBUTARY B STREAM MAPPING SUMMARY



TB171-1 Upstream of Pool P looking Downstream



TB172-1 Upstream of Pool P looking Upstream



TB173-1 Upstream of Pool P looking Upstream

Notes (as at 15 December 2009)

- Alluvial deposits open to boulder field and vegetation, with boulders up to 1m
- No flow visible through boulder field
- Boulder field opens to wide rockbar at TB173



TB173-2 Upstream of Pool P looking Downstream



TB174-1 Upstream of Pool P looking Upstream

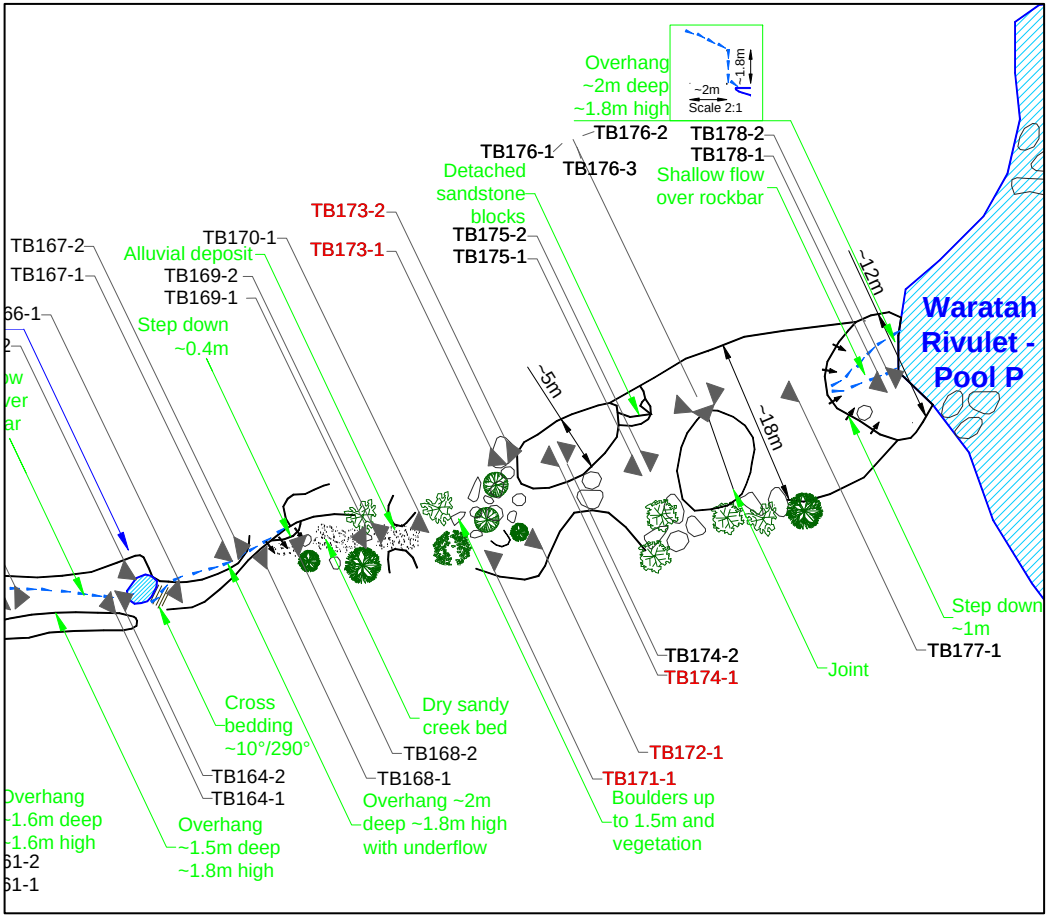


Photo Details

Photo ID	Easting	Northing	Bearing
TB171-1	310266	6215152	65
TB172-1	310271	6215151	245
TB173-1	310267	6215163	225
TB173-2	310267	6215163	85
TB174-1	310273	6215163	245

TRIBUTARY B STREAM MAPPING SUMMARY



TB174-2 Upstream of Pool P looking Downstream



TB175-1 Upstream of Pool P looking Upstream



TB175-2 Upstream of Pool P looking Downstream

Notes (as at 15 December 2009)

- Rockbar at TB175 approximately 12m wide
- No flow visible
- Scattered vegetation debris

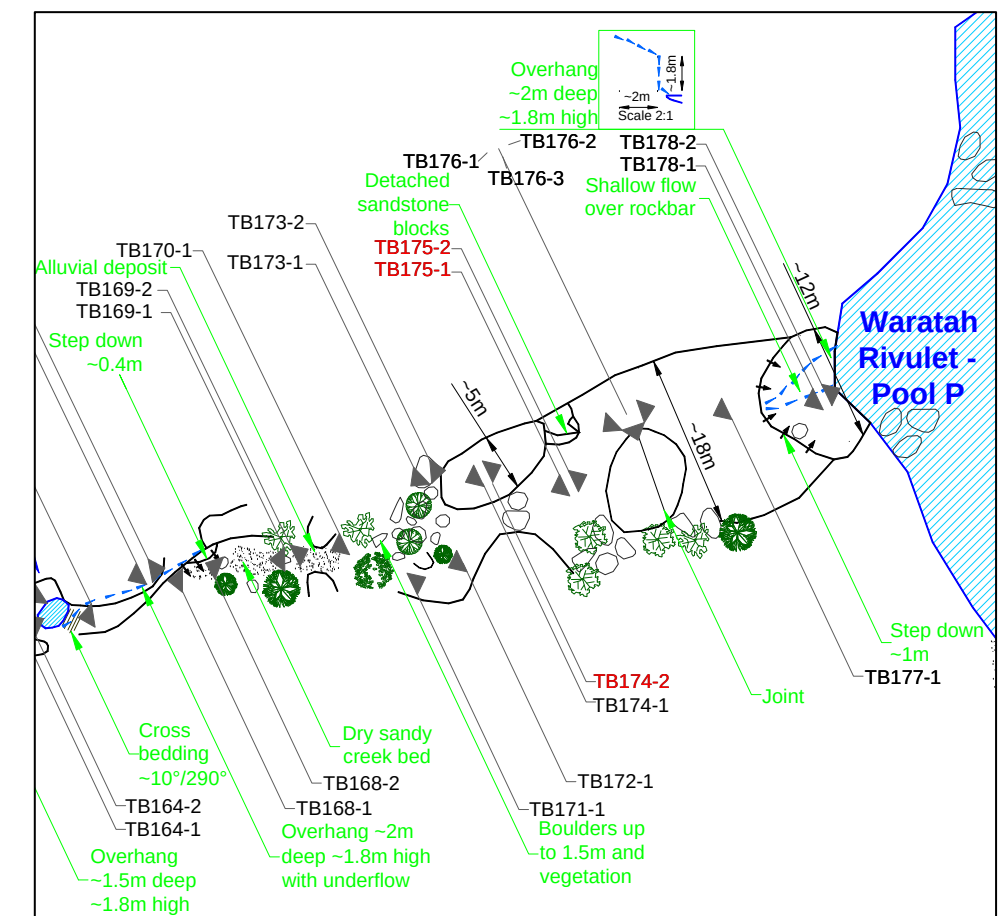


Photo Details

Photo ID	Easting	Northing	Bearing
TB174-2	310273	6215163	65
TB175-1	310283	6215162	245
TB175-2	310283	6215162	65

TRIBUTARY B STREAM MAPPING SUMMARY



TB176-1 Upstream of Pool P looking Upstream



TB176-2 Upstream of Pool P looking Downstream



TB176-3 Joint

Notes (as at 15 December 2009)

- Rockbar approximately 18m wide at TB176, with large detached sandstone blocks
- Large joint through rockshelf on southern bank

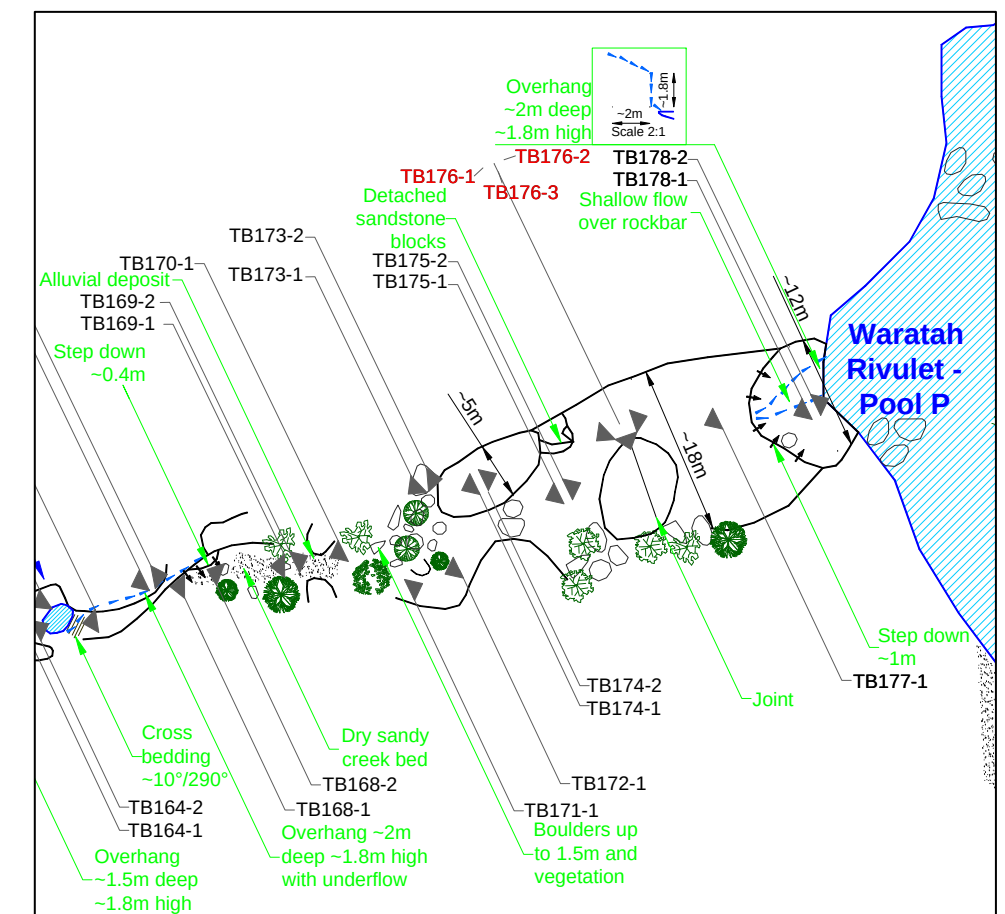


Photo Details

Photo ID	Easting	Northing	Bearing
TB176-1	310290	6215168	230
TB176-2	310290	6215168	70
TB176-3	310290	6215167	160

TRIBUTARY B STREAM MAPPING SUMMARY



TB177-1 Upstream of Pool P looking Upstream



TB178-1 Upstream of Pool P looking Upstream



TB178-2 Upstream of Pool P looking Downstream

Notes (as at 15 December 2009)

- Rockbar steps down approximately 1m at TB177 where flow emerges
- Shallow flow over rockbar downstream toward Waratah Rivulet
- Rockbar approximately 12m wide at the downstream end
- Overhang approximately 1.8m high and 2m deep

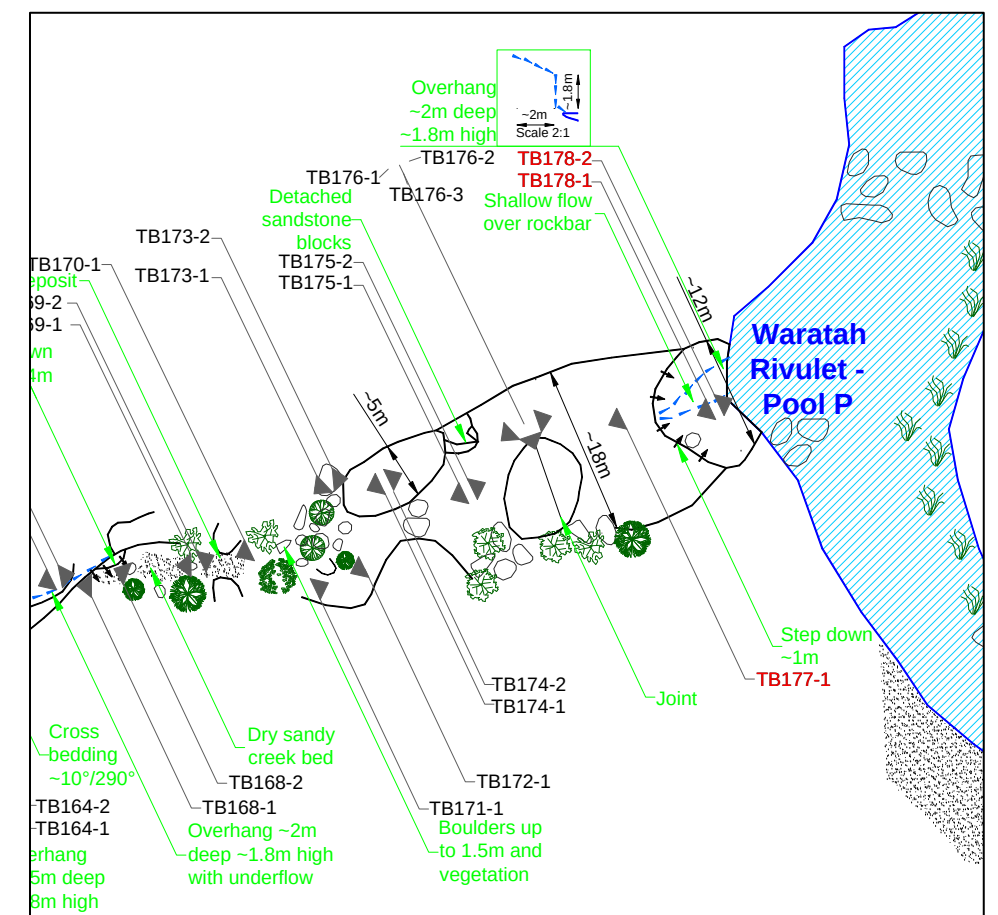


Photo Details

Photo ID	Easting	Northing	Bearing
TB177-1	310300	6215176	245
TB178-1	310312	6215174	245
TB178-2	310312	6215174	65

APPENDIX 5

VISUAL INSPECTION AND PHOTOGRAPHIC SURVEY OF STREAMS
IN THE VICINITY OF LONGWALLS 304 TO 310

Metropolitan Coal – Water Management Plan		
Revision No. WMP-R01-A		
Document ID: Water Management Plan		

Visual Inspection and Photographic Survey of Streams in the Vicinity of Longwalls 304 to 310

1.0 INTRODUCTION

A visual inspection and photographic survey of streams in the vicinity of Longwalls 304-310 was conducted by Hydro Engineering and Consulting Pty Ltd (HEC) in April 2018 to characterise and document the baseline conditions and prominent features in surface water streams overlying or in the vicinity of Longwalls 304-310 and, on the basis of the field inspections, consider surface water flow, pool water level or surface water quality monitoring.

HEC undertook a similar inspection and photographic survey of streams in the 301 to 303 area in July 2015 during preparation of the Longwalls 301-303 Water Management Plan. This exercise for Longwalls 304-310 expands on the previous HEC (2016)¹ stream survey.

2.0 DESKTOP REVIEW

An east-west divide runs approximately north to south to the east of the Longwalls 304-310 study area, dividing drainages which flow into the Eastern Tributary and the Woronora Reservoir (on the western side) from areas which flow into Wilsons Creek and Cawleys Creek (on the eastern side) (Figure 1).

One metre contours were used to refine the mapping available from the Department of Lands in the vicinity of Longwalls 304-310. The one metre contour mapping generated by Geo-Spectrum (Australia) Pty Ltd² was the most detailed mapping available and provided greater accuracy in terms of stream location, alignment and stream network for the field survey. Sixteen streams overlying or in close proximity to Longwalls 304-310 were identified using the one metre contours, as shown on Figure 1 (streams A, B, C, D, E, F, H, I, J, K, L, P, Q, R, S and T).

¹ Hydro Engineering & Consulting (2016). *Visual Inspection and Photographic Survey of Streams in the Vicinity of Longwalls 301 to 303*.

² Geo-Spectrum (Australia) Pty Limited (2007). *Orthophotomap (1:7,500) of Helensburgh Coal Metropolitan Colliery*. October 2007 from 1:20,000 Scale. Aerial photography from 27 August 2007. Ground survey by Monaghan Surveyors Pty Ltd.

The locations of stream lines shown in this report (Figure 1) have been adjusted from the locations shown in HEC (2016) so as to be more closely aligned to the valley floor and to reflect the actual stream bed alignment as observed during the reconnaissance surveys. The differences reflect the limitations of mapping produced from aerial photography of densely forested canopy and the difficulties of identifying the location of small first order streams in the underlying complex sandstone morphology.

The main streams that were inspected are shown as solid blue lines in Figure 1. Where tributaries to the streams have been observed, their alignments have been interpreted based on the 1 metre contours and are shown as dashed blue lines on Figure 1.

Streams A, B, C, H, I, J, K and L were considered and inspected as part of HEC's 2015 survey (Table 1).

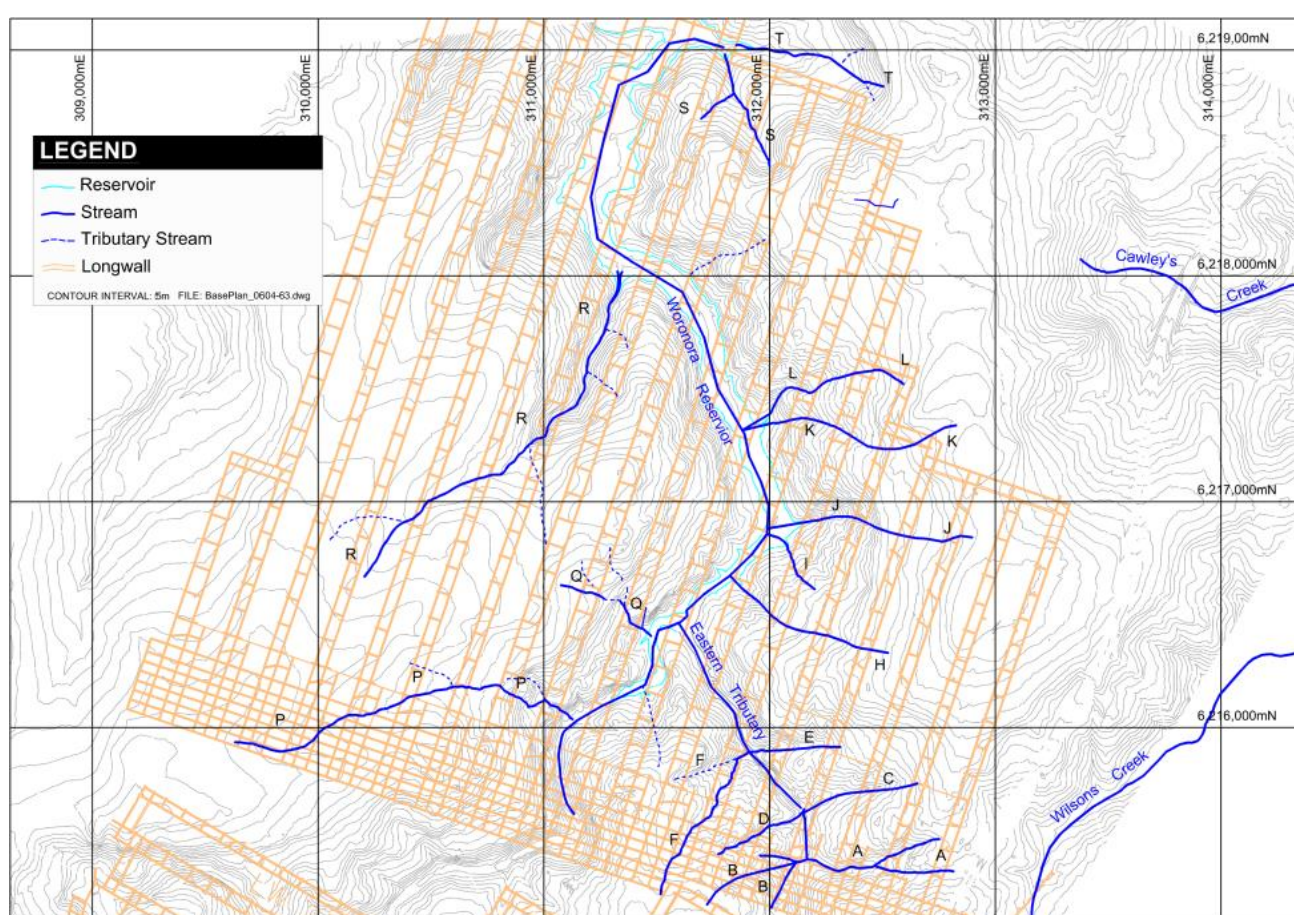


Figure 1 Streams Overlaying or Near to Proposed Longwalls 304 to 310³

³ Streams J and L shown in Figure 1 were referred to as Streams I and K, respectively, in an earlier draft of the Longwalls 301-303 reconnaissance report. Streamflow monitoring stations have been installed on these streams as a component of the Woronora Reservoir Impact Strategy.

Details of the streams overlying or near to Longwalls 304-310 are summarised in Table 1 below.

Table 1 Stream Reconnaissance Summary

Stream Label	Stream Order*	Comments
A	2	Previously inspected (HEC, 2016)
B	2	Previously inspected (HEC, 2016)
C	1	Previously inspected (HEC, 2016)
D	1	Inspected April 2018
E	1	Previously inspected (HEC, 2016)
F	2	Inspected April 2018
H	1	Previously inspected (HEC, 2016)
I	1	Previously inspected (HEC, 2016)
J	1	Previously inspected (HEC, 2016)
K	1	Previously inspected (HEC, 2016)
L	1	Previously inspected (HEC, 2016)
P	2	Inspected April 2018
Q	2	Inspected April 2018
R	2	Inspected April 2018
S	2	Inspected April 2018
T	2	Inspected April 2018

2.0 FIELD CONDITIONS

The stream reconnaissance was conducted between the 9th and 13th of April 2018. The weather was fine during the course of the reconnaissance. The period leading up to the reconnaissance had relatively low rainfall (refer Figure 2). January and early February experienced unusually low rainfall with only minor falls being recorded through to late February. Two moderate rainfall events on the 20th and 26th of February (44 and 47.5 mm respectively) were recorded at Metropolitan Coal's pluviometer PV7. Following these events there was no significant rainfall recorded until the 21st of March when a total of 96.5 mm was recorded between the 21st and 23rd of March. There was no significant rainfall recorded between the 23rd of March and the reconnaissance survey – indicated by the red lines on Figure 2. Flow in the surface catchments would therefore have been in recession from the 21st to the 23rd March rainfall event.

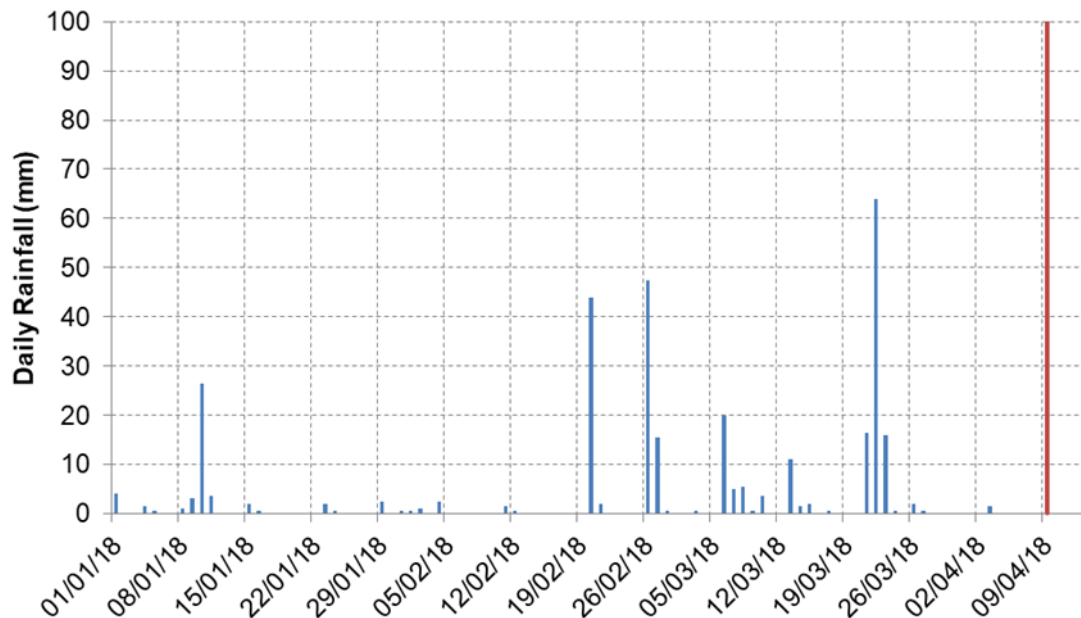


Figure 2 Rainfall Recorded at PV7 January to April 2018

Groundwater-fed baseflow in streams responds to dominant wetting (aquifer recharging) and drying (aquifer discharging) cycles. These cycles are typically evident in rainfall residual plots which can be correlated to periods when aquifers are predominantly recharging when groundwater levels are rising; and periods when aquifers are discharging and groundwater levels are declining. Figure 3 shows the rainfall residual for the period 1st January 2000 to 31st April 2018 derived from the rainfall record from the Bureau of Meteorology rain gauge at Darkes Forest – Station 68024. Periods where the residual rainfall curve is trending upward correspond to above average rainfall. Periods where the residual rainfall line decreases (slopes downward) reflect below average rainfall. The reconnaissance, shown by the vertical red line, was conducted during a pronounced drying period. The steep downward trend in the rainfall from mid-2017 indicates drying catchment conditions with declining groundwater outflows to streams (compared to the average) in the lead-up to the survey. The rainfall residual over this period is sloping unusually steeply downward for a prolonged period indicating likely low groundwater outflows to streams from groundwater sources.

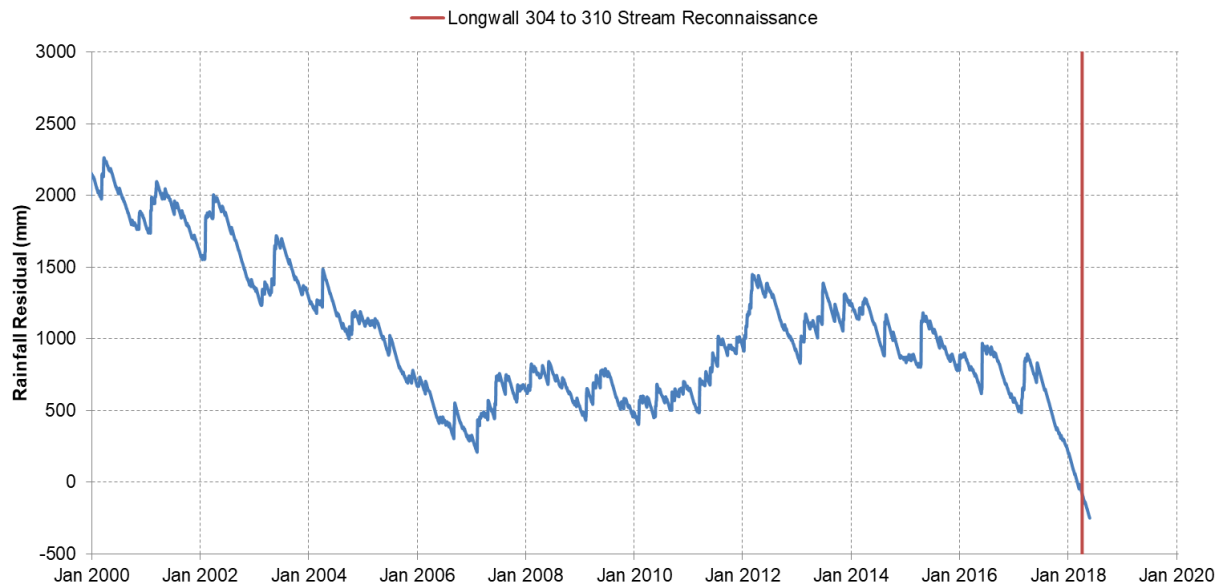


Figure 3 Darkes Forest Rainfall Residual Plot, January 2000 to May 2018

The water level in the Woronora Reservoir was about 5.4 m below the full supply level during the survey.

3.0 METHODOLOGY

Reconnaissance of the streams involved walking along the accessible length of the streams, mapping the geomorphic characteristics and features of the streams and compiling a photographic record. The observed features and mapping of each stream are shown and described in Section 4 and photographs of the features are provided in Attachment A.

Stream features have been mapped using the following alphabetic symbols:

- (US) Upland swamp
- (WF) Waterfall of at least 2 m near vertical drop.
- (BC) Boulder cascade comprising a steep chute of boulders. Water would be highly aerated by rapid flow over and through spaces between the boulders.
- (BF) Boulder field comprising an extended section of boulders with low flows passing through the interstices between the boulders and which acts to control upstream water level
- (RS) Rock shelf comprising a hard and relatively smooth rock outcrop often containing shallow depression(s).
- (RC) Rock cascade a steep chute of predominately cobbles and gravel sized bed sediment.
- (P_s) Small pool between 1 m and 3 m long and less than 0.3 m deep. These features would likely be transient but persist for some time following cessation of flow.
- (P_m) Medium sized pool larger than a small pool and typically 3 m to 5 m long and around 0.5 m deep. The largest pool observed was estimated to be less than 5 m long and less than 1 m deep at its deepest. These pools would be expected to retain ponded water under most climatic conditions.
- (P_l) Large pool longer than 5 m and greater than 0.5m deep.

4.0 RESULTS OF STREAM RECONNAISSANCE

4.1 Stream D

Stream D comprised a small first order stream which drained into Eastern Tributary (Figure 4) adjacent to the flow monitoring flume at Pool ETAU.

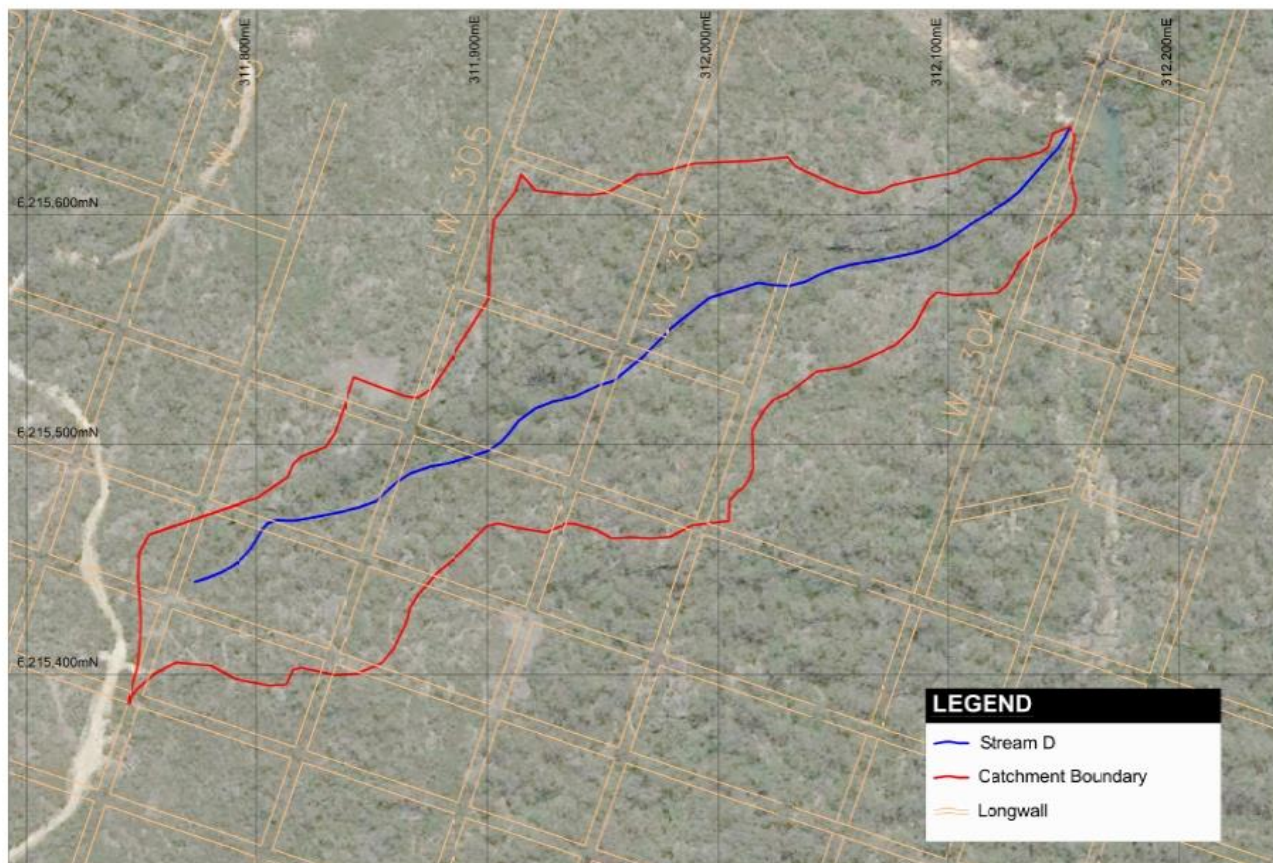


Figure 4 Stream D Catchment

There was no flow or significant water observed within the stream at the time of the reconnaissance. The upper sections comprised small localized and discontinuous drainage lines and depressions. The middle and lower sections of the stream comprised a steep incised channel with boulder cascades interspaced with rock shelves and shallow depressions – refer Figure 5. A summary of the catchment characteristics is provided in Table 2 below.

Table 2 Catchment Characteristics Stream D

Feature	Value
Stream order	1 st
Catchment area (km ²)	0.04
Stream length (km)	0.45
Average gradient (%)	13.5

The observed features in Stream D are shown on Figure 5.

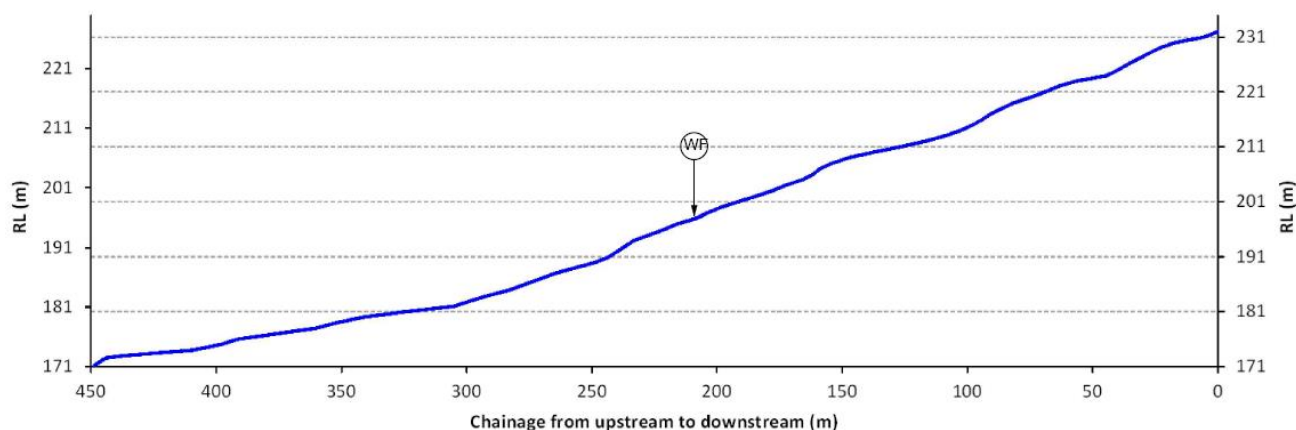


Figure 5 Features in Stream D

4.2 Stream F

Stream F is a longer stream which is joined by a one shorter stream near the inflow to the reservoir. The upper sections on the longer stream comprised a densely vegetated upland swamp – refer Figure 6 and 7. The only surface drainage features observed within the swamp comprised discontinuous depressions in the topographic “low” points of the swamp. The swamp terminated at an extensive rock bar. There was a trickle of water overflow on one section of the rock bar. Moss and stain markings on the rock bar however suggested that larger overflows would have occurred frequently in the past.

The reach downstream of the swamp comprised a series of rock cascades, small waterfalls, instream pools, rock shelves and sections of straight incised channel. Small semi-continuous flow was observed along the downstream reach. The instream pools became larger and more dominant in the lower sections of the stream.

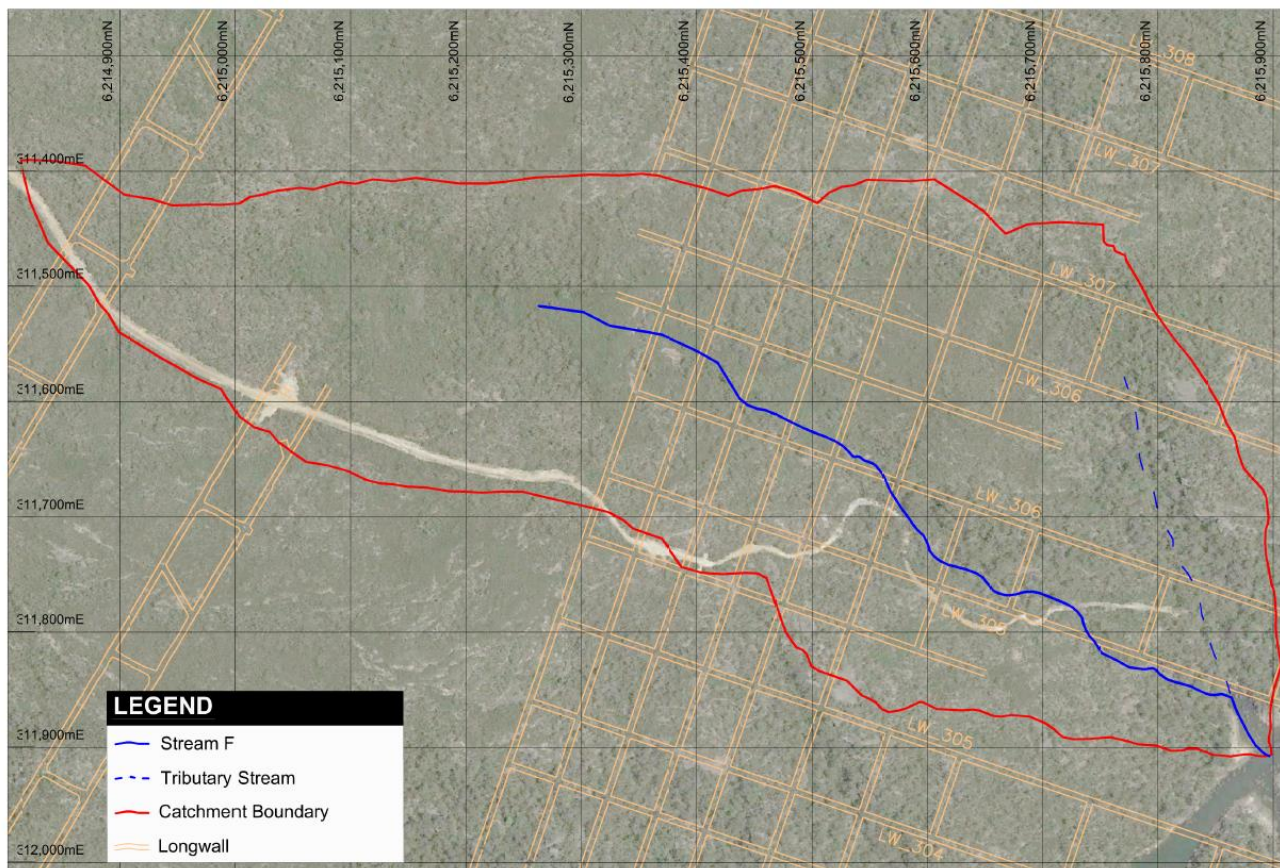


Figure 6 Stream F Catchment

The observed features in Stream F are shown in Figure 7.

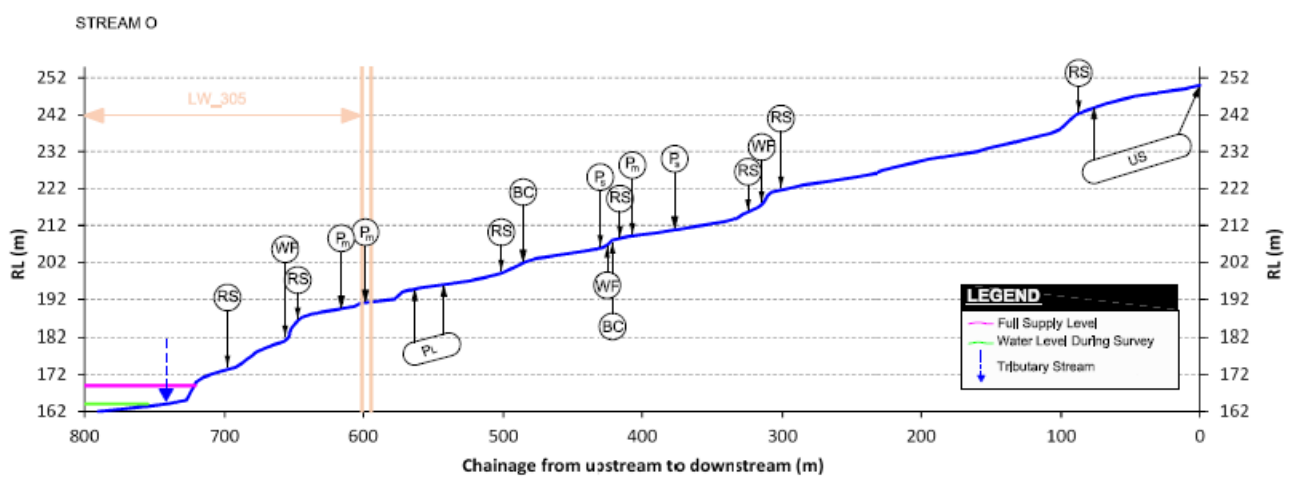


Figure 7 Features in Stream F

A summary of the catchment characteristics is provided in Table 3 below.

Table 3 Catchment Characteristics Stream F

Feature	Value
Stream order	2 nd
Catchment area (km ²)	0.324
Stream length (km)	0.80
Average gradient of upland swamp (%)	8.2
Average gradient downstream of swamp (%)	7.6

4.3 Stream P

Stream P comprised a long stream with shorter tributary streams which flowed into the stream near the reservoir – refer Figure 8. The upper sections of the main (longer) arm comprised a densely vegetated upland swamp. The only surface drainage features observed within the swamp comprised discontinuous depressions in the topographic “low” points of the swamp. The swamp terminated at an extensive rock bar. There was no overflow evident on the rock bar. Desiccated moss and staining markings on the rock bar suggested that overflows would have occurred frequently in the past and that the swamp would contribute flow to downstream reaches.

The reach on the main arm downstream of the swamp comprised a series of rock and boulder cascades, small waterfalls, instream pools, rock shelves and sections of straight incised channel. Small semi-continuous flow⁴ was observed along the downstream reach. The instream pools became larger and more dominant in the lower sections of the stream. The lower reach of shorter arm was also inspected. It comprised a series of dry boulder cascades and rock chutes – refer Figure 9.

⁴ Flow disappeared from view in the boulder cascades where it flowed along the base of the loose boulder field. Flow also disappeared from view in the sandy delta which had formed where the stream flowed into the reservoir.

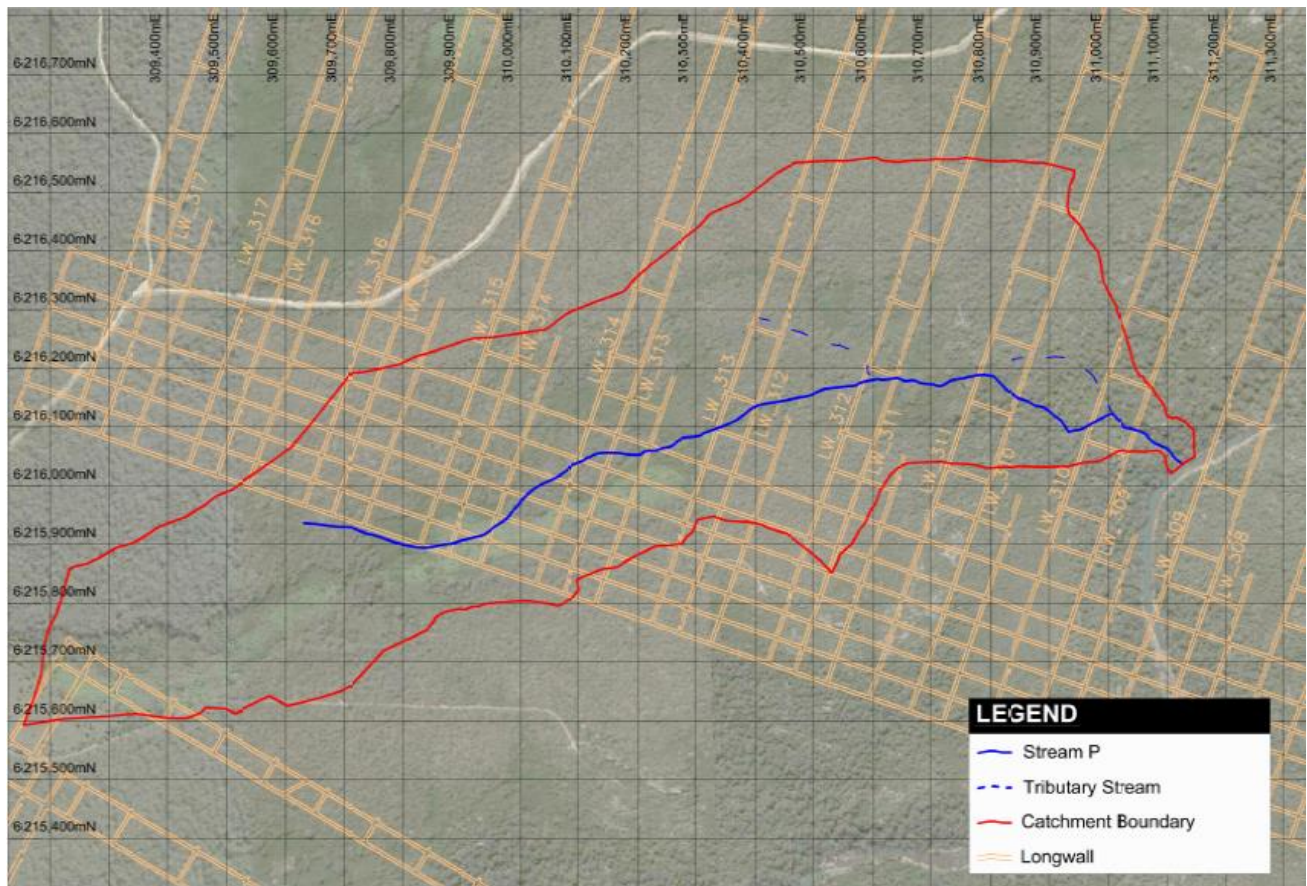


Figure 8 Stream P Catchment

The observed features in Stream P are shown in Figure 9.

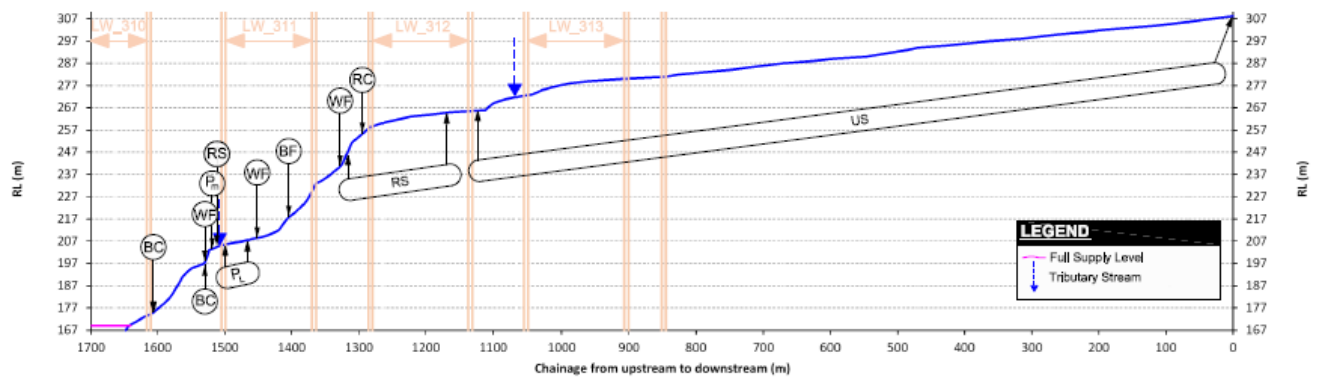


Figure 9 Features in Stream P

A summary of the catchment characteristics is provided in Table 4 below.

Table 4 Catchment Characteristics Stream P

Feature	Value
Stream order	2 nd
Catchment area (km ²)	0.864
Stream length main arm (km)	1.65
Stream length shorter arm (km)	1.62
Average gradient of upland swamp (%)	3.7
Average gradient downstream of swamp (%)	8.8

4.4 Stream Q

Stream Q comprised a small semi-continuous stream with small tributaries joining in three locations – refer Figure 10. The upper reaches comprised an ill-defined drainage path in a moderately steep gully. There was no water observed upstream of a significant waterfall which was partially obscured by dense vegetation. Access to the lower reaches of the stream was deemed too dangerous and completion of the planned reconnaissance of the lower sections of the creek was abandoned due to safety concern with very dense vegetation potentially obscuring steep drops.

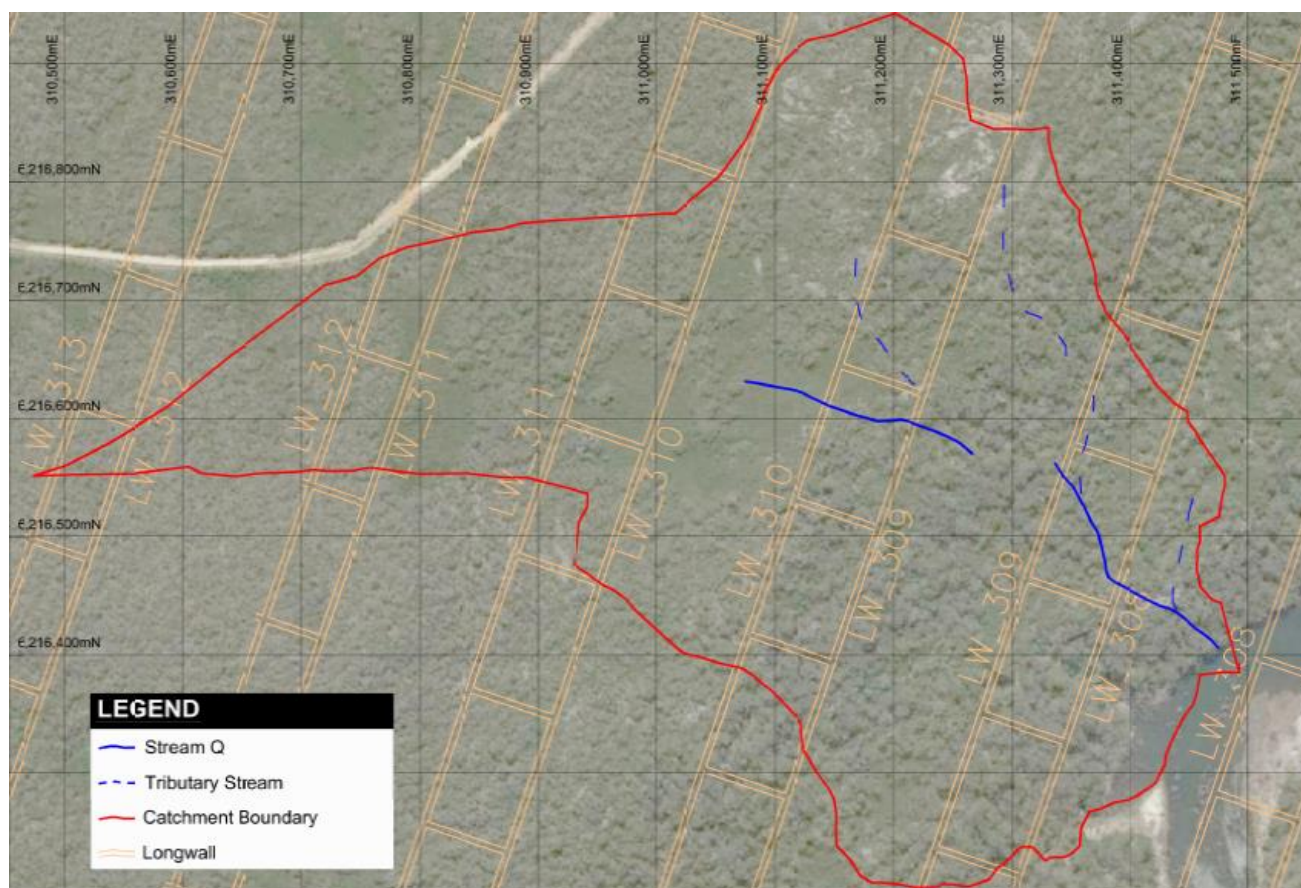


Figure 10 Stream Q Catchment

The observed features in Stream Q are shown in Figure 11.

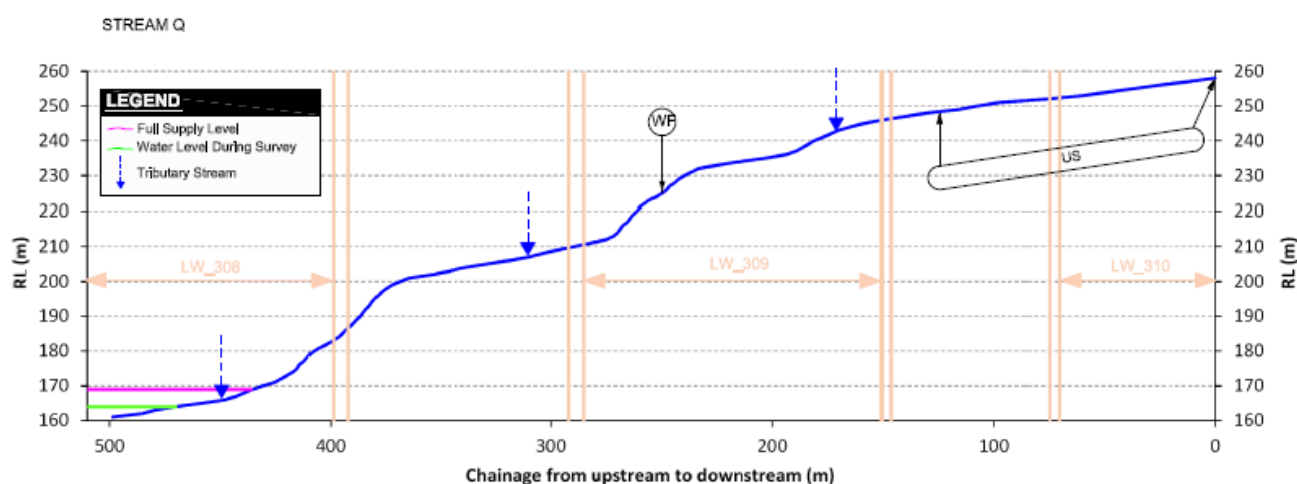


Figure 11 Stream Q Features

A summary of the catchment characteristics is provided in Table 5 below.

Table 5 Catchment Characteristics Stream Q

Feature	Value
Stream order	2 nd
Catchment area (km ²)	0.329
Stream length (km)	0.50
Average gradient (%)	19.1

4.5 Stream R

Stream R originates in an upland swamp and becomes a second order stream following inflow of a smaller stream line some 300m upstream of its outlet into the Woronora Reservoir – refer Figures 12 and 13.



Figure 12 Stream R Upper Catchment

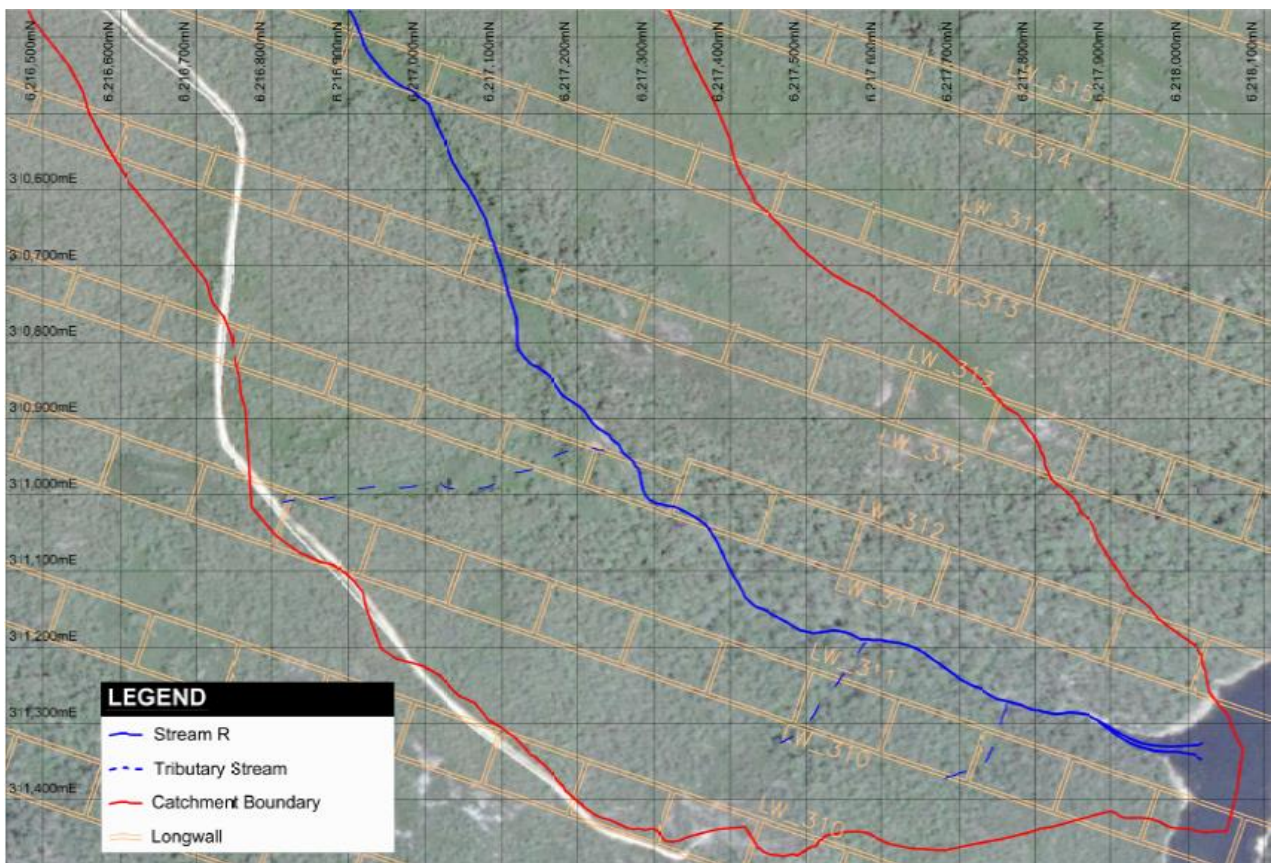


Figure 13 Stream R Lower Catchment

The upper reach comprised a large upland swamp. Swamp vegetation was very dense and inhibited access. The sections of the swamp accessed during the survey indicate it was similar to the swamps in the upstream reaches of Streams O and P with an ill-defined and discontinuous flow path. The swamp terminated at a large rock bar. There was no discernible flow over the rock bar however as with the other swamps it was apparent that there would be surface water flowing out of the swamp during wet periods. Downstream of the swamp the stream gradient changed with the stream morphology becoming more incised and comprising a series of rock and boulder cascades and waterfalls interspersed by pools and rock shelves. A continuous flow was observed in the lower reaches where relatively closely spaced pools become the dominant feature.

The tributary stream which flowed into the main arm some 250 m upstream of the outfall into Woronora Reservoir was dry. The largest pools downstream of this confluence were up to 25 m long which formed in depressions between low rock bars. The observed features in Stream R are shown in Figure 14.

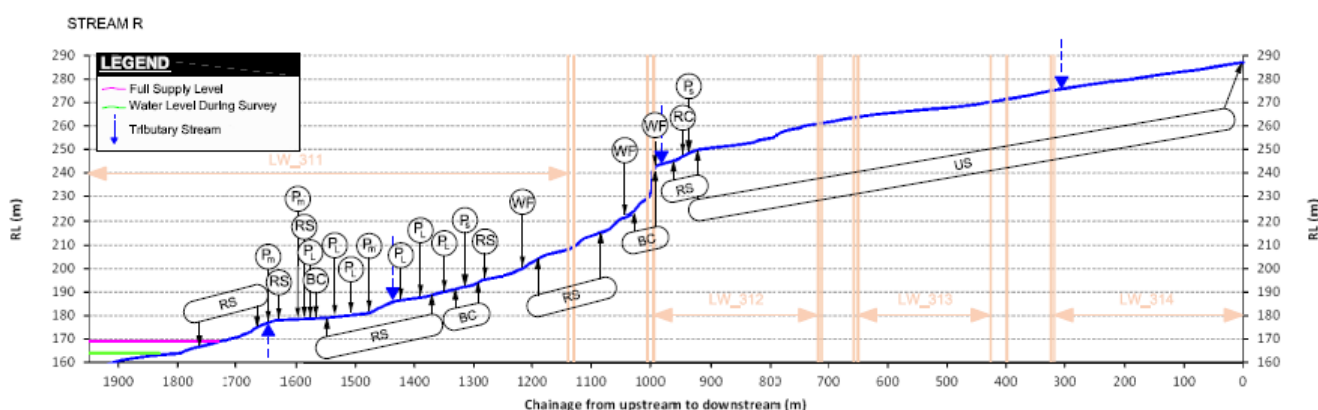


Figure 14 Stream R Features

A summary of the catchment characteristics is provided in Table 6 below.

Table 6 Catchment Characteristics Stream R

Feature	Value
Stream order	2 nd
Catchment area (km ²)	1.401
Stream length (km)	1.90
Average gradient (%)	6.7

4.6 Stream S

Stream S is joined by a small stream which flowed through a confined valley – refer Figure 15. The upper sections comprised a steep, gully form with ill-defined drainage channels and boulder cascades. Several pools were observed in the lower reaches with two medium pools near the confluence of the two arms of the stream. There was no significant flow observed and no visible flow at either the stream confluence or at the outflow to the Woronora Reservoir.

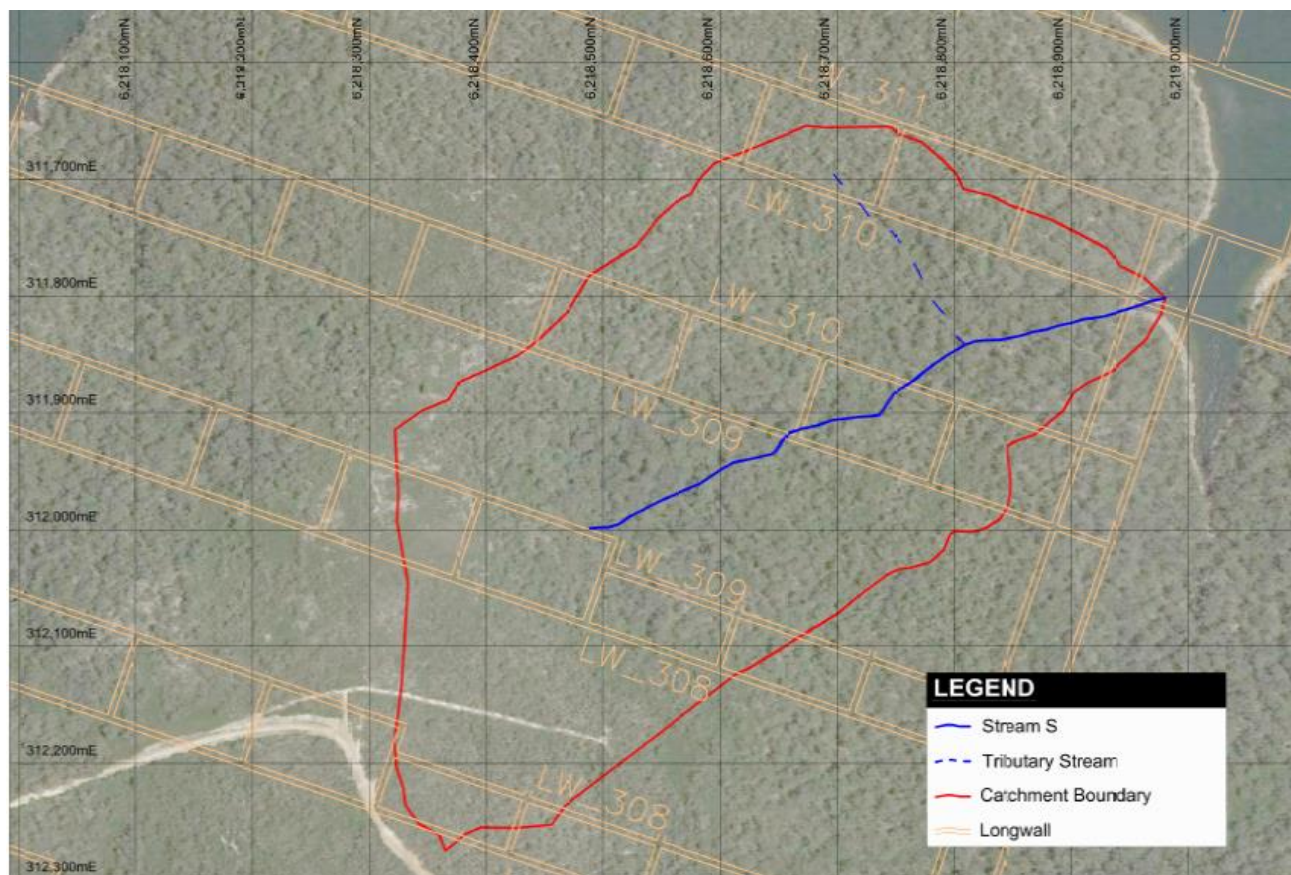


Figure 15 Stream S Catchment

The observed features in Stream S are shown in Figure 16.

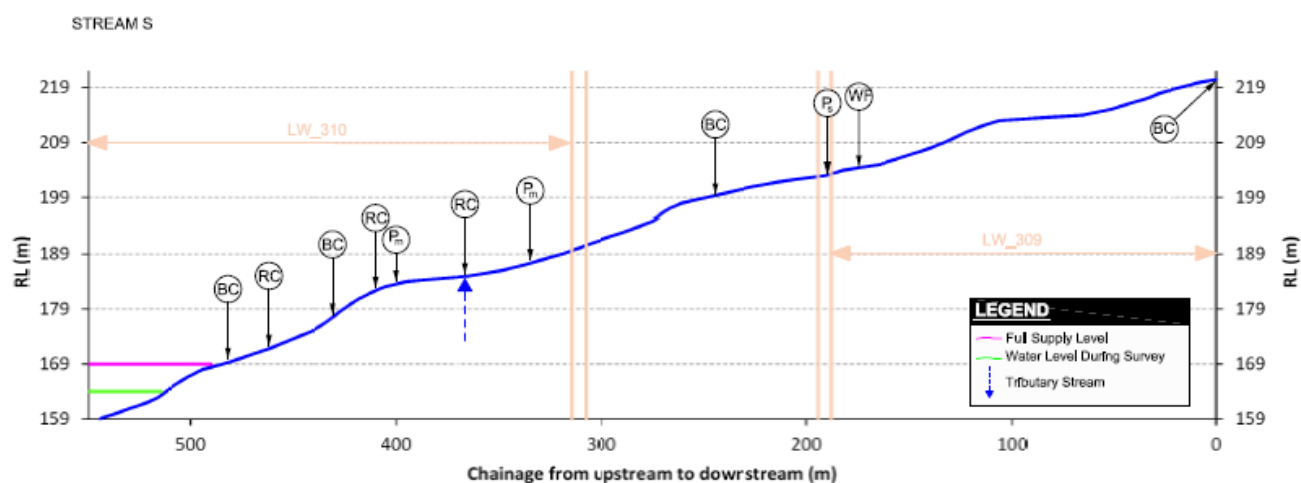


Figure 16 Stream S Features

A summary of the catchment characteristics is provided in Table 7 below.

Table 7 Catchment Characteristics Stream S

Feature	Value
Stream order	2 nd
Catchment area (km ²)	0.224
Stream length (km)	0.55
Average gradient (%)	11.3

4.7 Stream T

Stream T is a small second order stream – refer Figure 17. The stream morphology is similar to Stream S. There was a small continuous flow in the lower reaches of the stream which carried through to the Woronora Reservoir. The medium and larger pools mapped were larger than those observed in Stream S.



Figure 17 Stream T Catchment

The observed features in Stream T are shown in Figure 18.

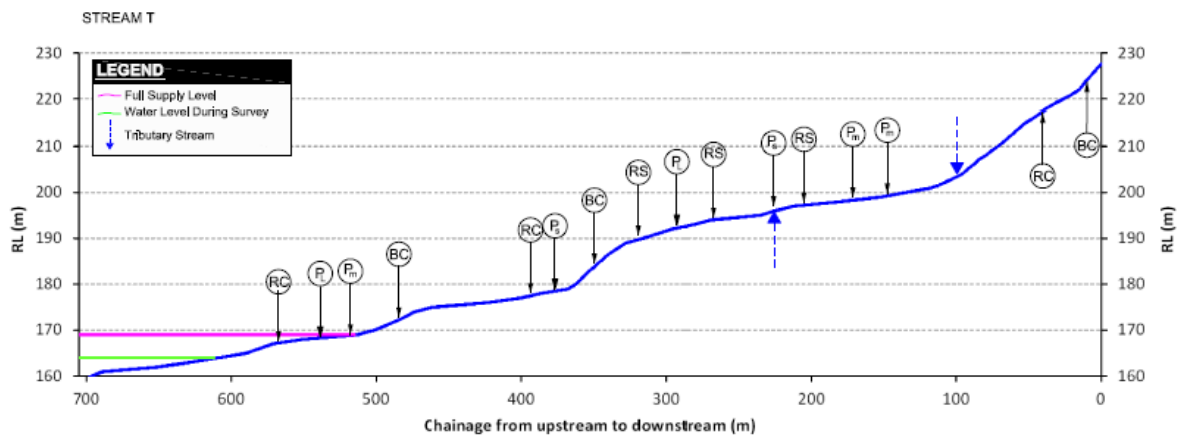


Figure 18 Stream T Features

A summary of the catchment characteristics is provided in Table 8 below.

Table 8 Catchment Characteristics Stream T

Feature	Value
Stream order	2 nd
Catchment area (km ²)	0.716
Stream length (km)	0.71
Average gradient (%)	9.8

5.0 RECOMMENDATIONS FOR MONITORING

The inspected streams are all small 1st and 2nd order streams. Based on observation of the effects of subsidence and non-conventional subsidence impacts on similar streams, including Forest Gully and Tributary B and D, it is expected that longwall mining will result in fracturing of bed rock and underflow and loss of function of some of what are currently a mixture of both intermittent and permanent pools.

It is recommended that, subject to access constraints, Metropolitan Coal investigate the potential to install:

- a pool water level meter in the large pool mapped on Stream P (Figure 9);
- a pool water level meter in two large pools in the lower reaches of Stream R (Figure 14);
- a small flow measuring flume immediately downstream of the upland swamp associated with Streams P (Figure 9) (no pool has been mapped at this location, however there may be potential to direct flow from the upland swamp toward a flume); and
- a small flow measuring flume in the vicinity of the first small pool mapped on Stream R to provide data on outflows from the swamp in the headwaters of this catchment (Figure 14).

Yours sincerely



Lindsay Gilbert
Principal Water Resources Engineer

ATTACHMENT A

Stream Reconnaissance Photographs

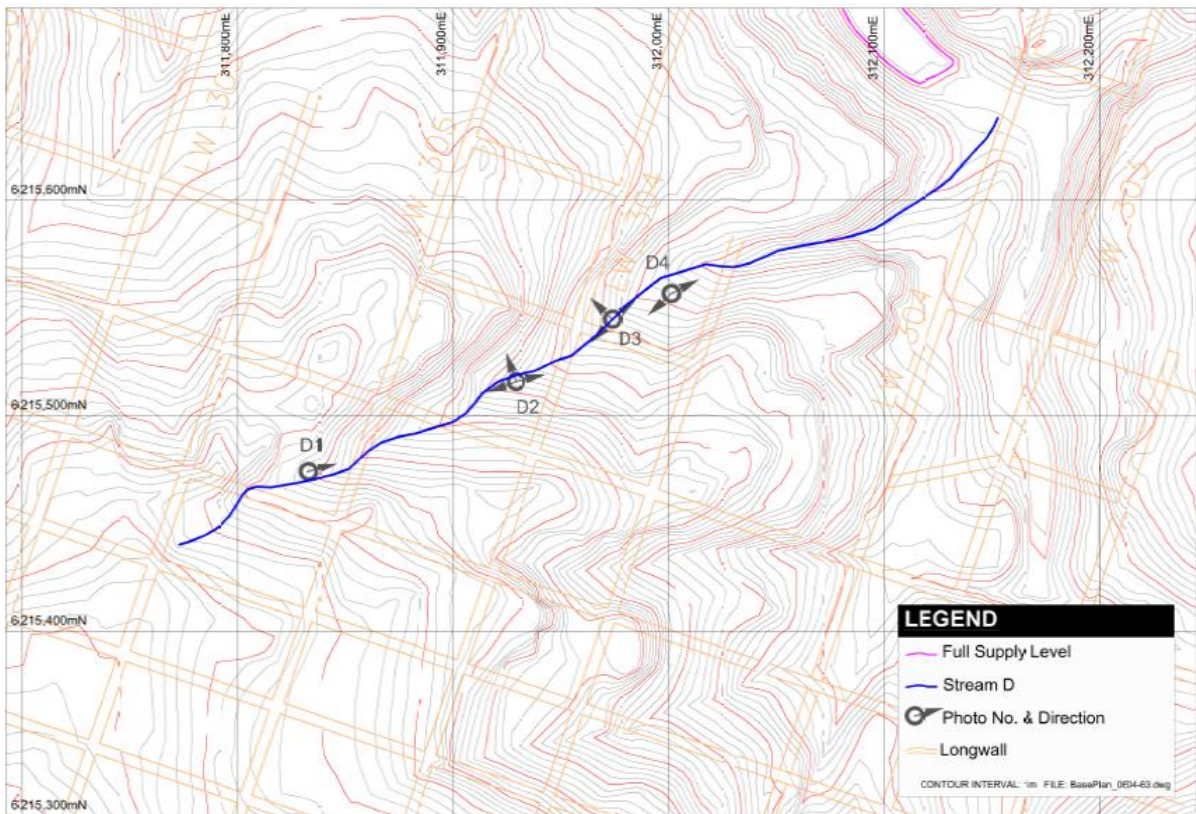


Photo D1 (Downstream)



Photo D2 (Downstream)



Photo D2 (Left Bank)



Photo D2 (Upstream)



Photo D3 (Downstream)



Photo D3 (Left Bank)

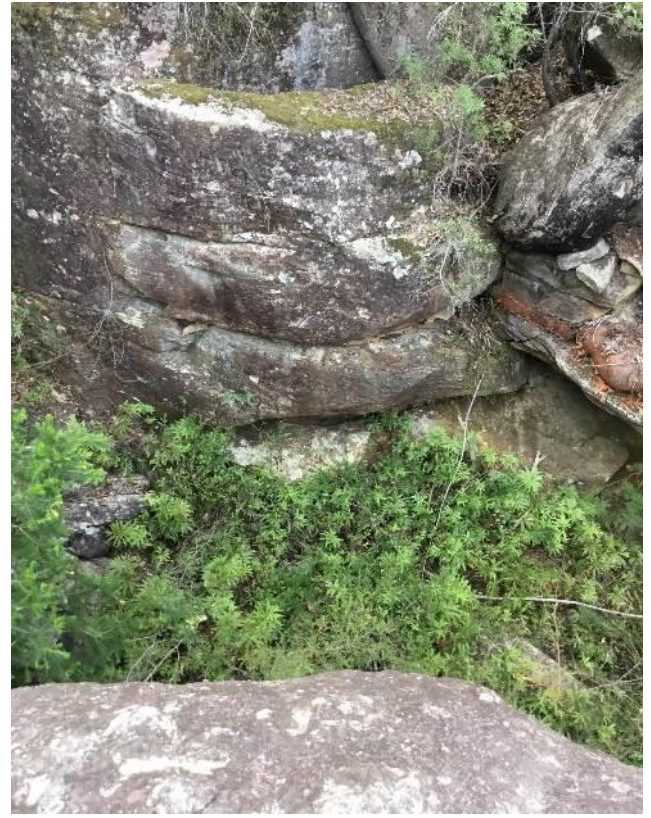


Photo D3 (Upstream)



Photo D4 (Downstream)



Photo D4 (Upstream)



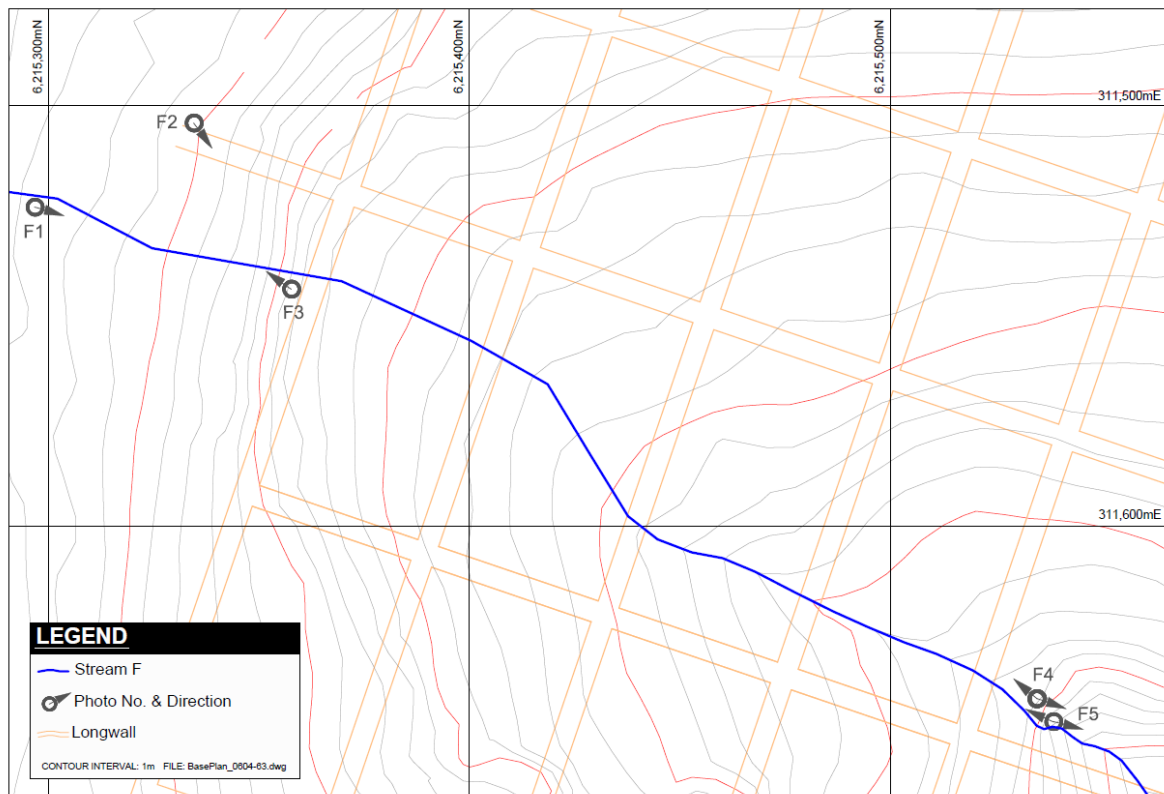


Photo F1 (Downstream)



Photo F2 (Downstream)



Photo F3 (Upstream)



Photo F4 (Downstream)



Photo F4 (Upstream)



Photo F5 (Downstream)

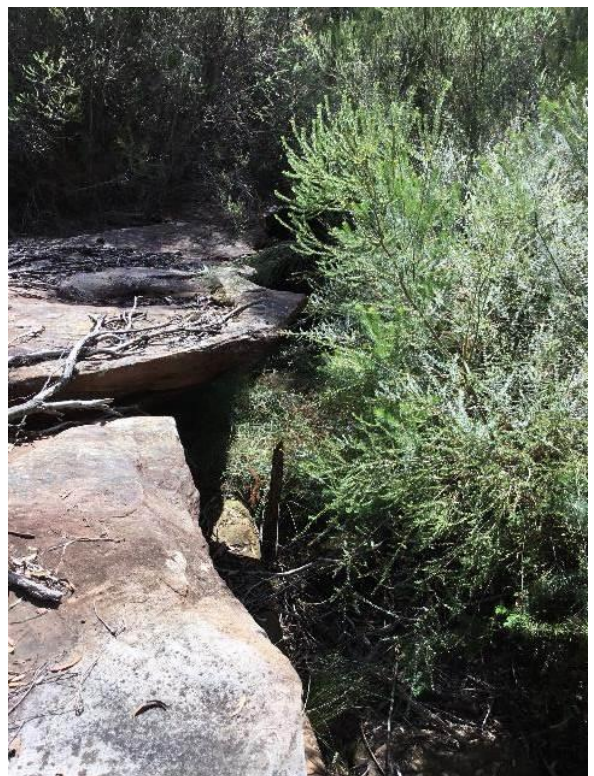


Photo F5 (Upstream)



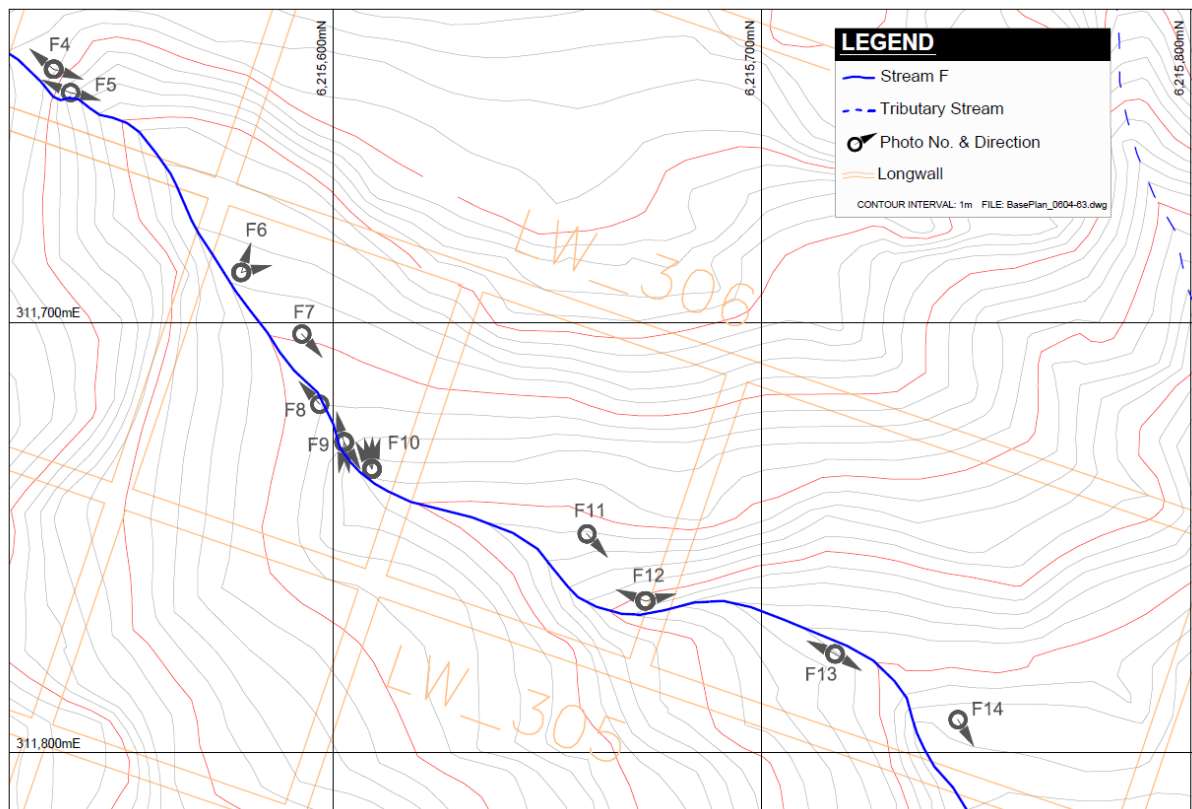


Photo F6 (Left Bank 1)



Photo F6 (Left Bank 2)



Photo F7 (Downstream)



Photo F8 (Upstream)



Photo F8 (Downstream 1)



Photo F8 (Downstream 2)



Photo F8 (Downstream 3)



Photo F9 (Upstream 1)

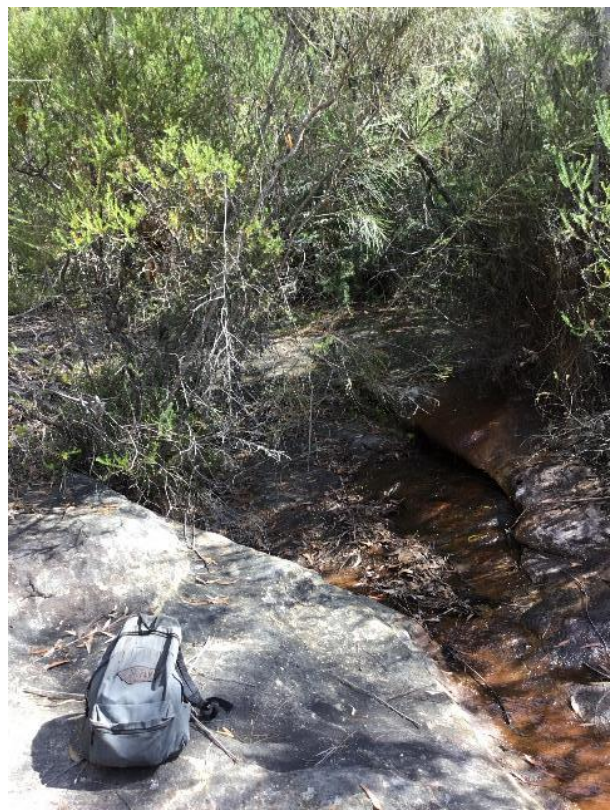


Photo F9 (Upstream 2)



Photo F10 (Upstream 1)



Photo F10 (Upstream 2)



Photo F10 (Upstream 3)



Photo F10 (Upstream 4)



Photo F11 (Downstream)



Photo F12 (Downstream)



Photo F12 (Upstream)



Photo F13 (Downstream)



Photo F13 (Upstream)



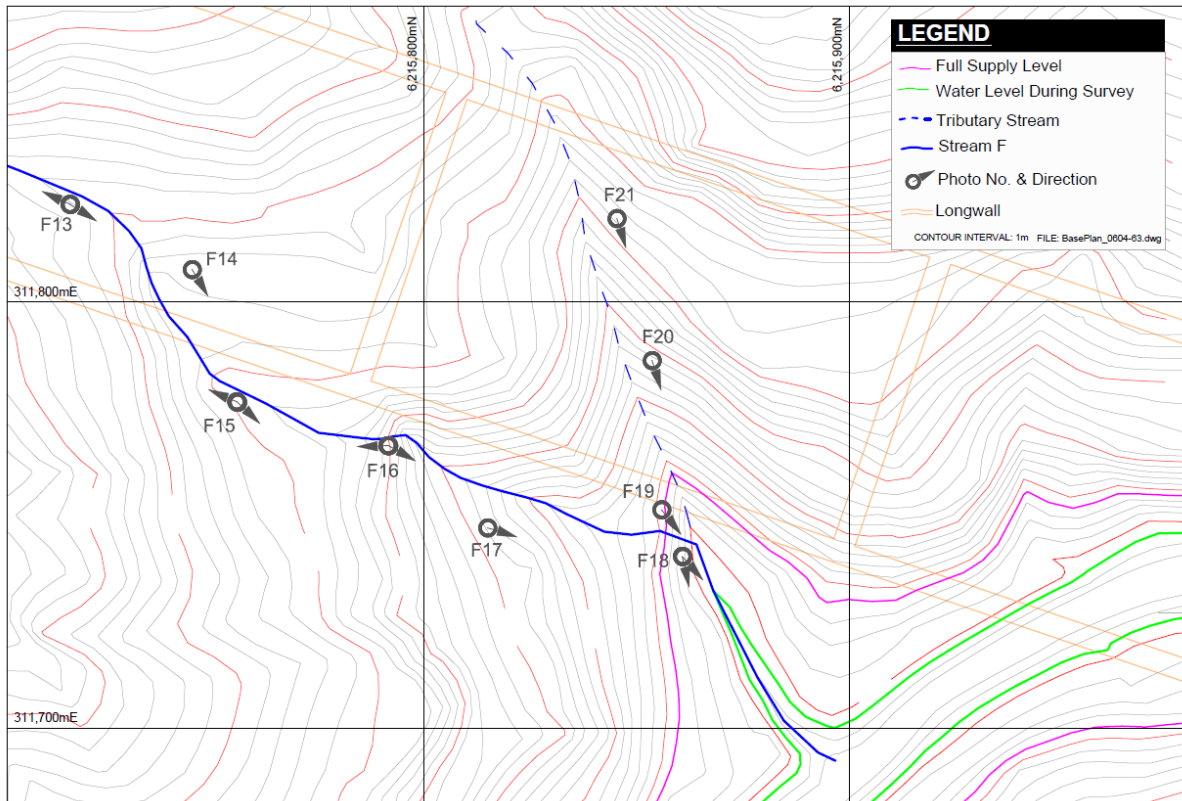


Photo F14 (Downstream)



Photo F15 (Downstream)



Photo F15 (Upstream)



Photo F16 (Downstream)

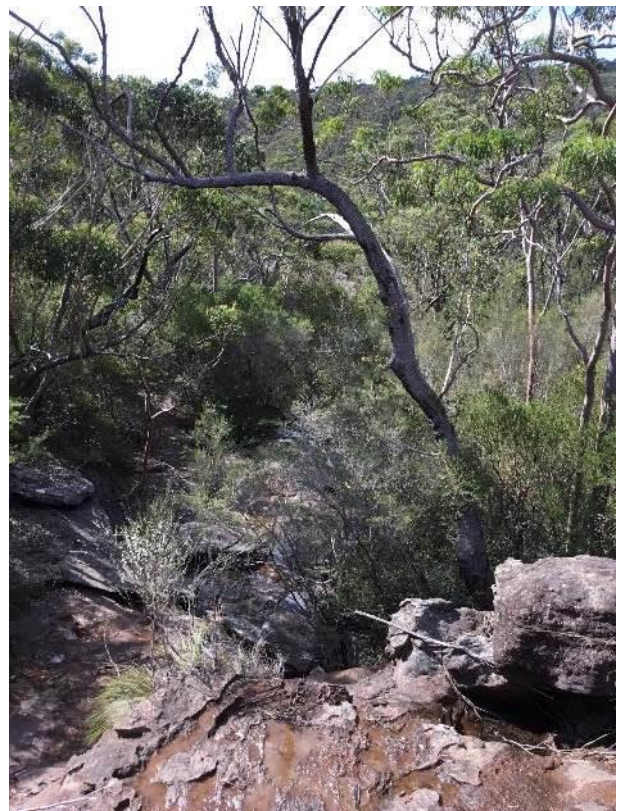


Photo F16 (Upstream)



Photo F17 (Downstream)



Photo F18 (Downstream 1)



Photo F18 (Downstream 2)



Photo F19 (Downstream)



Photo F20 (Downstream)



Photo F21 (Downstream)



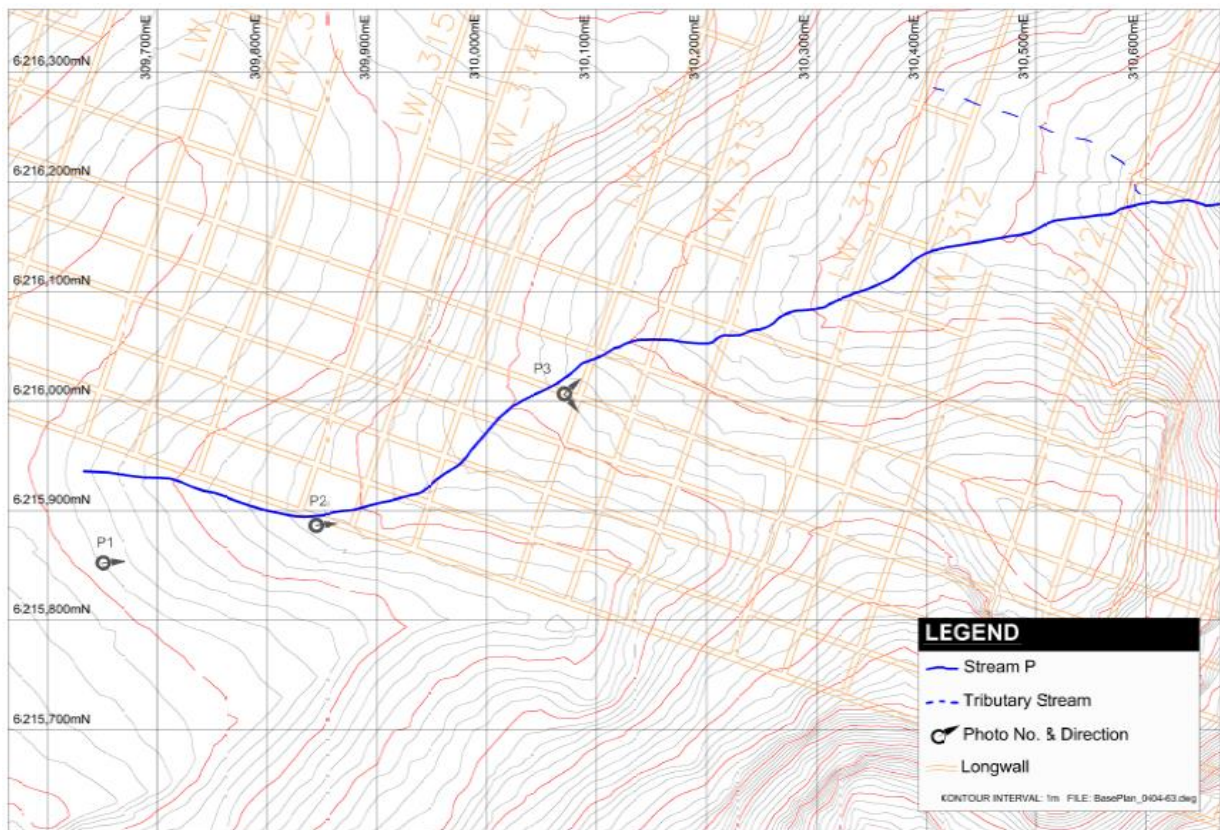


Photo P1 (Downstream)

Photo P2 (Downstream)

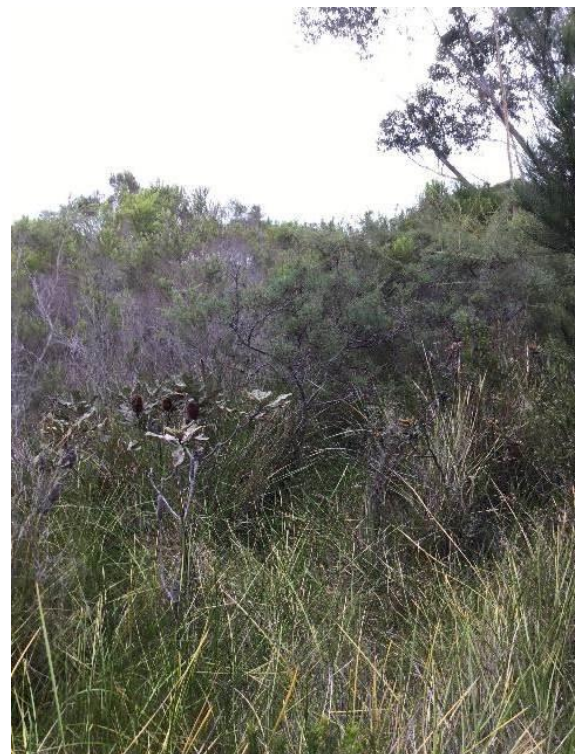


Photo P3 (Right Bank Bore)



Photo P3 (Downstream)



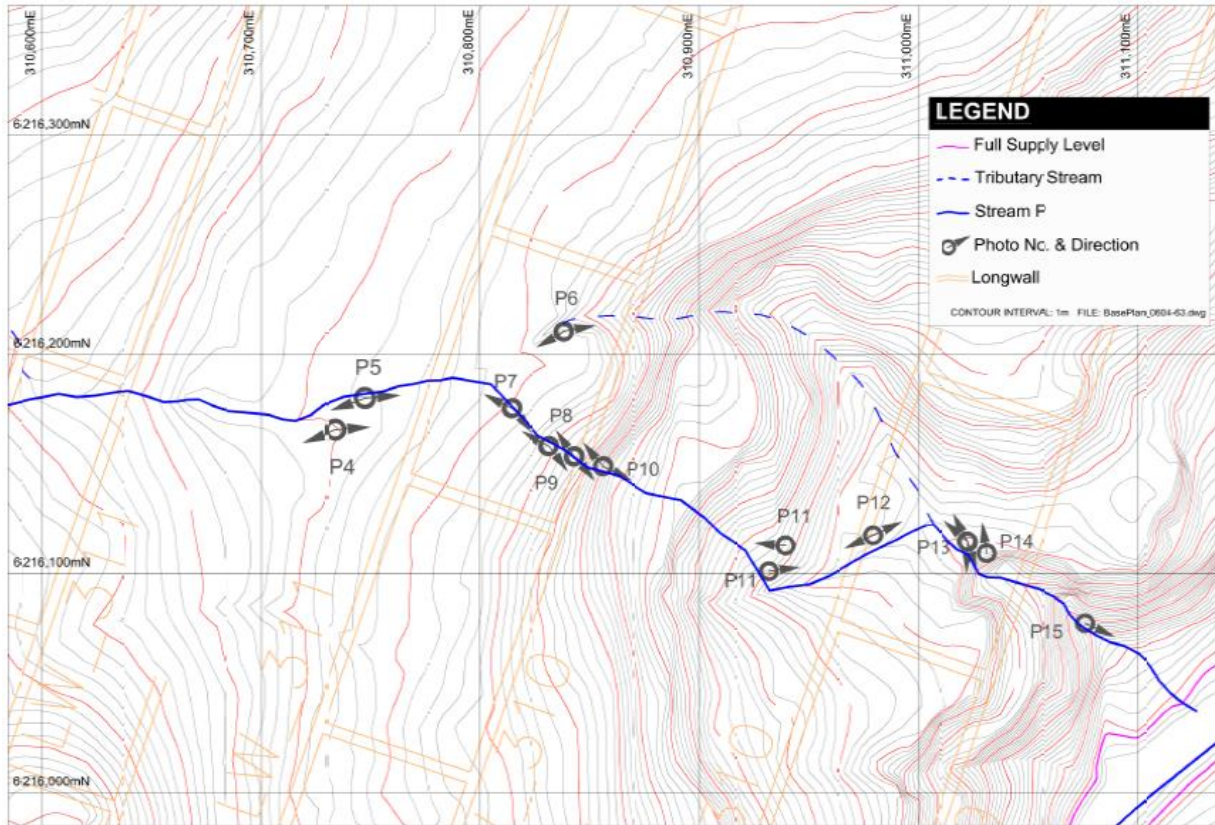


Photo P4 (Downstream)



Photo P4 (Upstream)



Photo P5 (Downstream)



Photo P5 (Upstream)



Photo P6 (Downstream)



Photo P6 (Upstream)

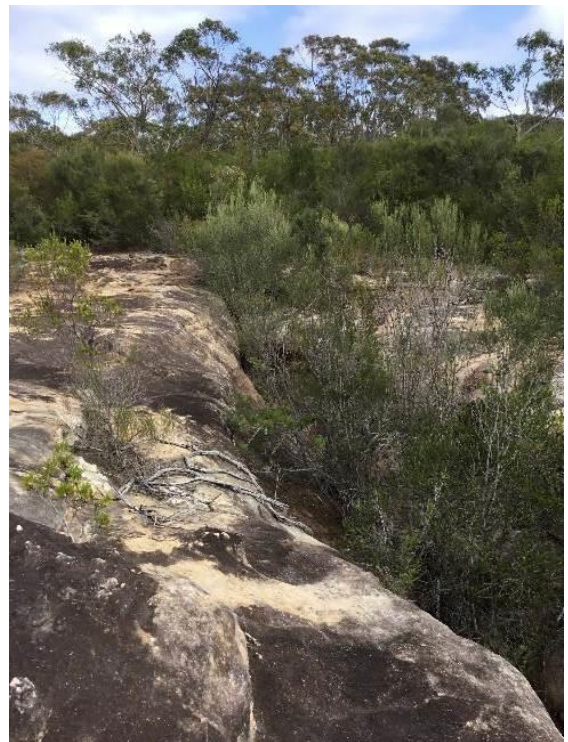


Photo P7 (Downstream)



Photo P7 (Upstream)



Photo P8 (Downstream)



Photo P8 (Upstream)



Photo P9 (Downstream)



Photo P9 (Upstream)



Photo P10 (Downstream)



Photo P10 (Upstream)



Photo P11 (Downstream)



Photo P11 (Upstream)



Photo P12 (Downstream)



Photo P12 (Upstream)



Photo P13 (Downstream 1)



Photo P13 (Downstream 2)



Photo P13 (Upstream 1)



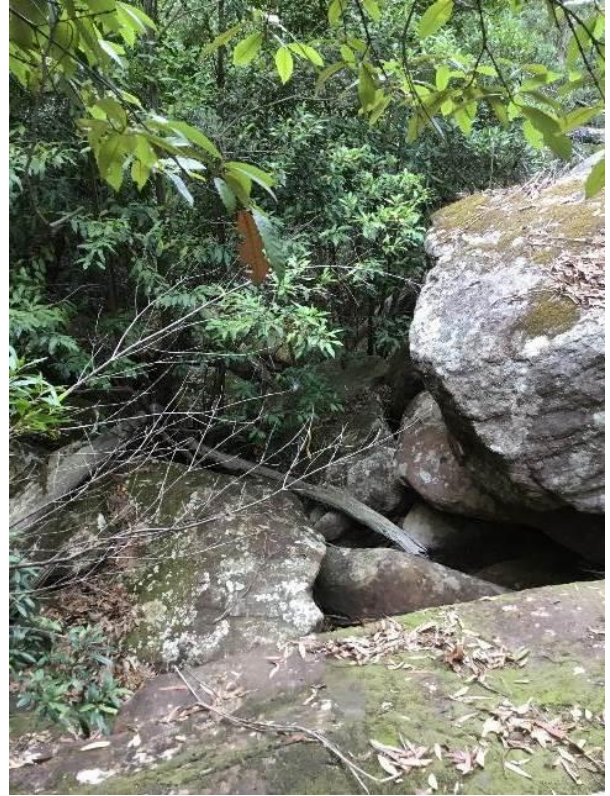
Photo P13 (Upstream 2)



Photo P14 (Upstream)



Photo P15 (Downstream)



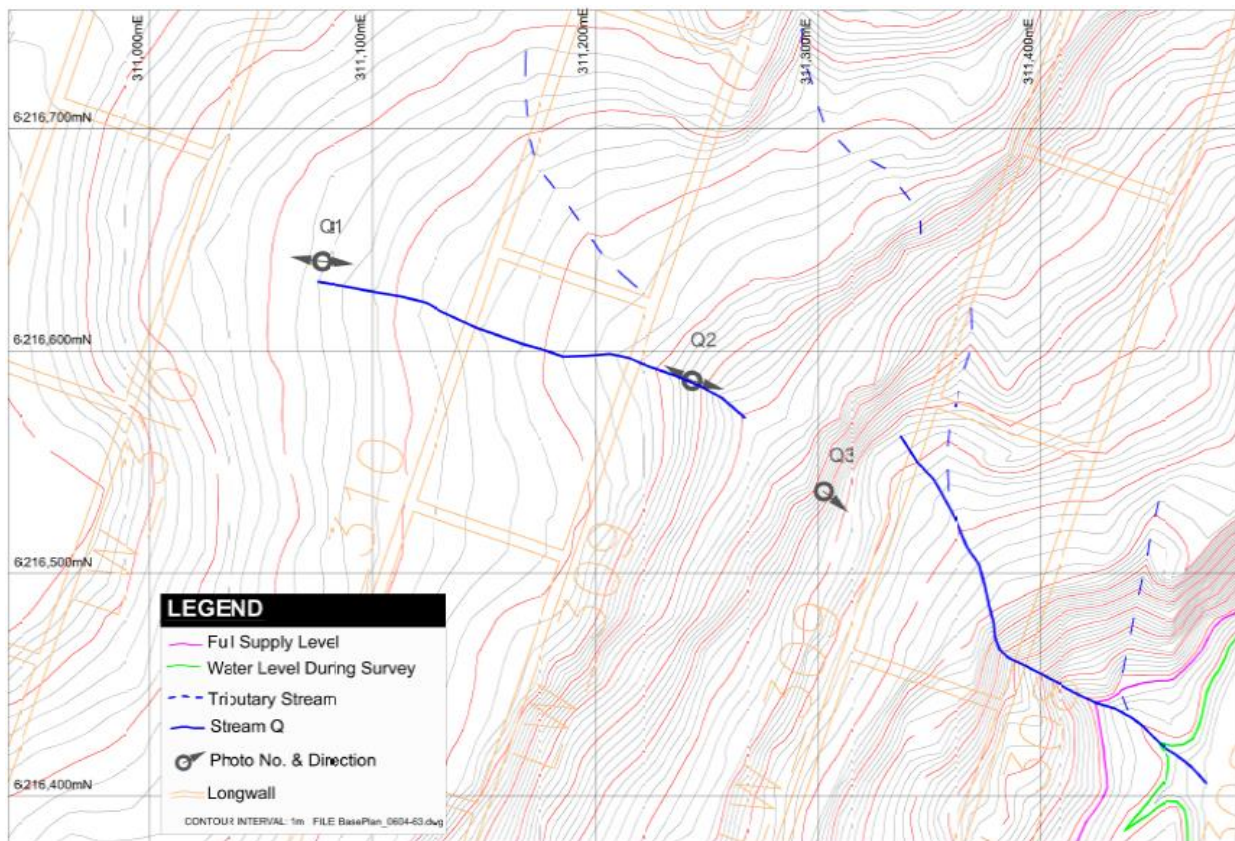


Photo Q1 (Downstream)



Photo Q1 (Upstream)



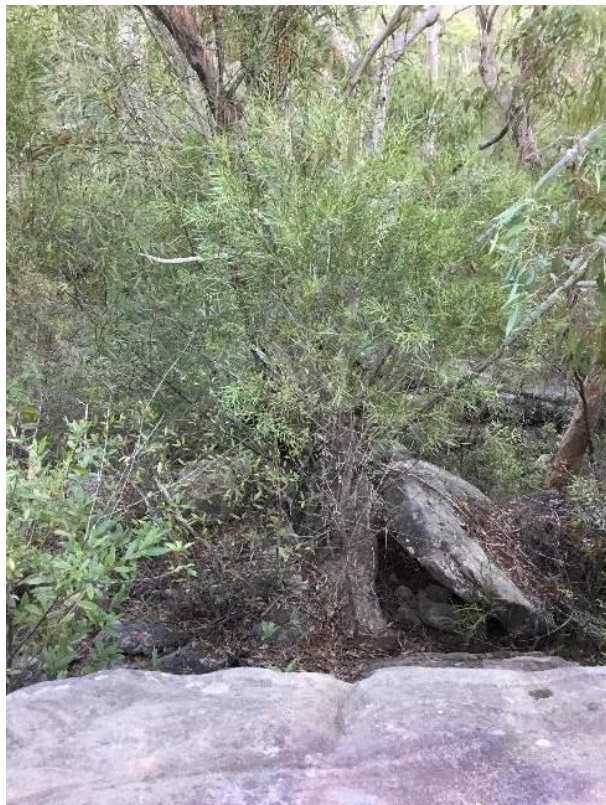
Photo Q2 (Downstream)



Photo Q2 (Upstream)



Photo Q3 (Downstream)



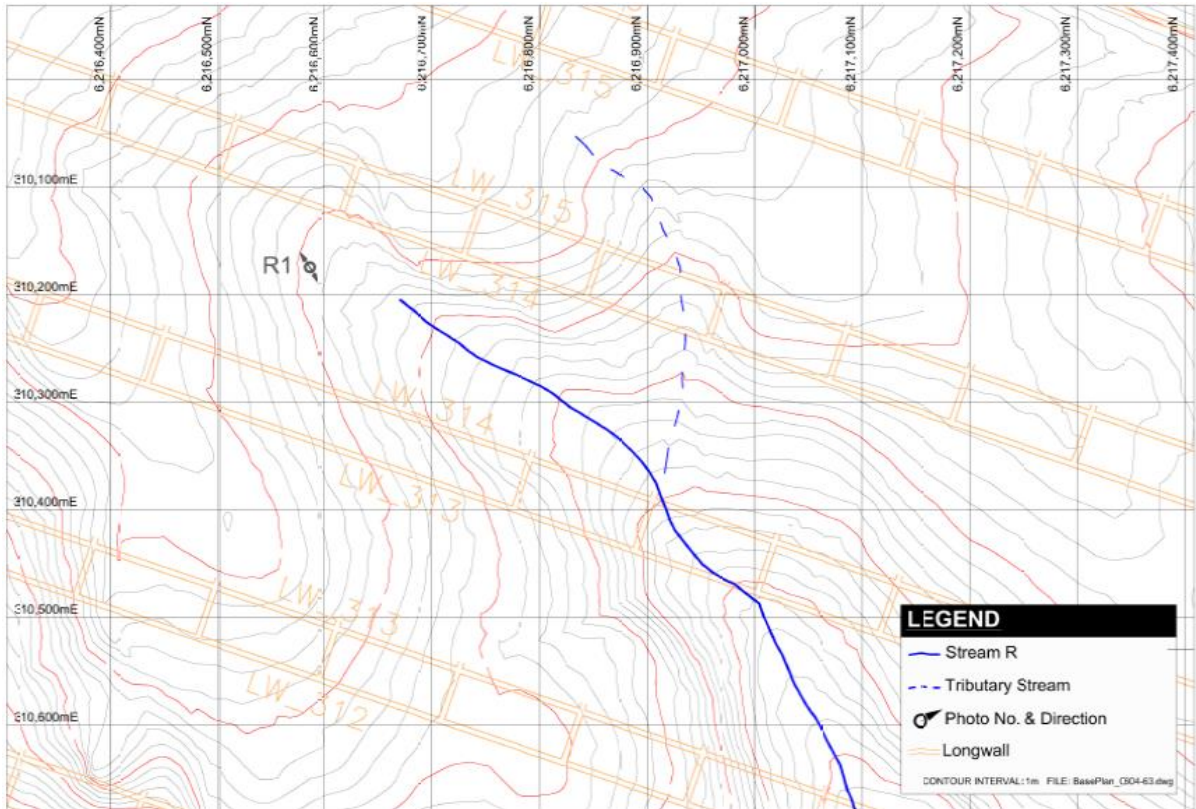


Photo R1 (Downstream)



Photo R1 (Upstream)



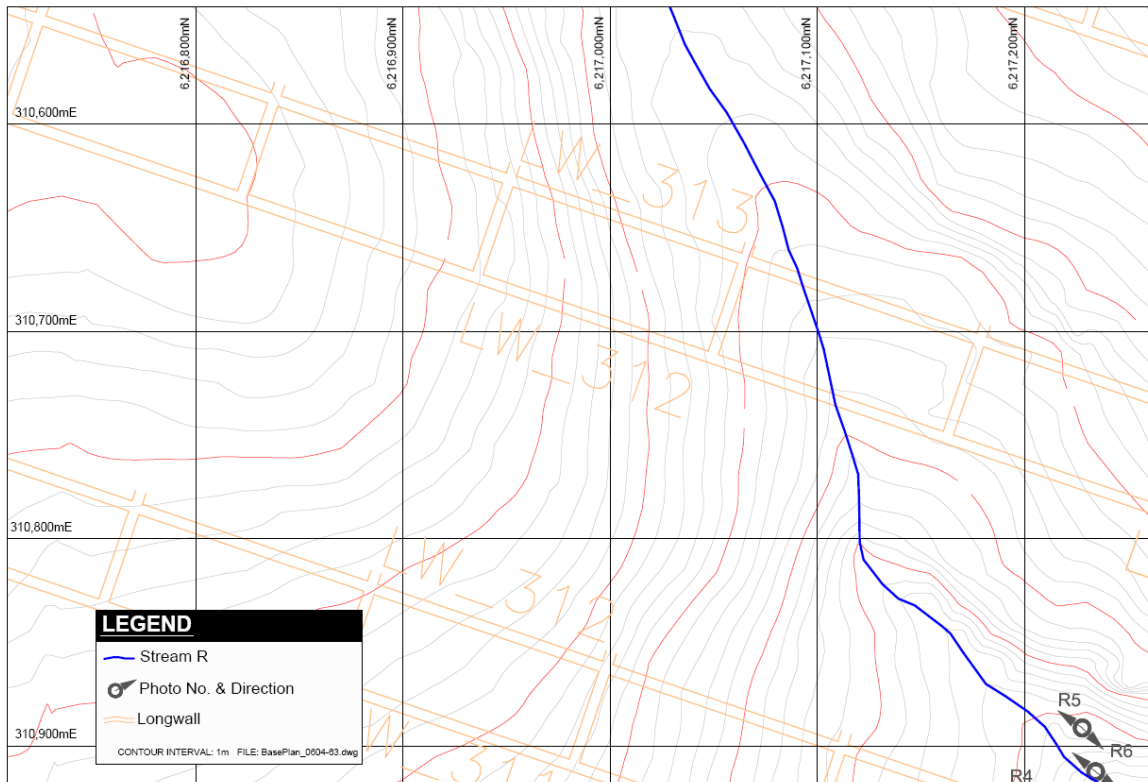


Photo R5 (Downstream)



Photo R5 (Upstream)



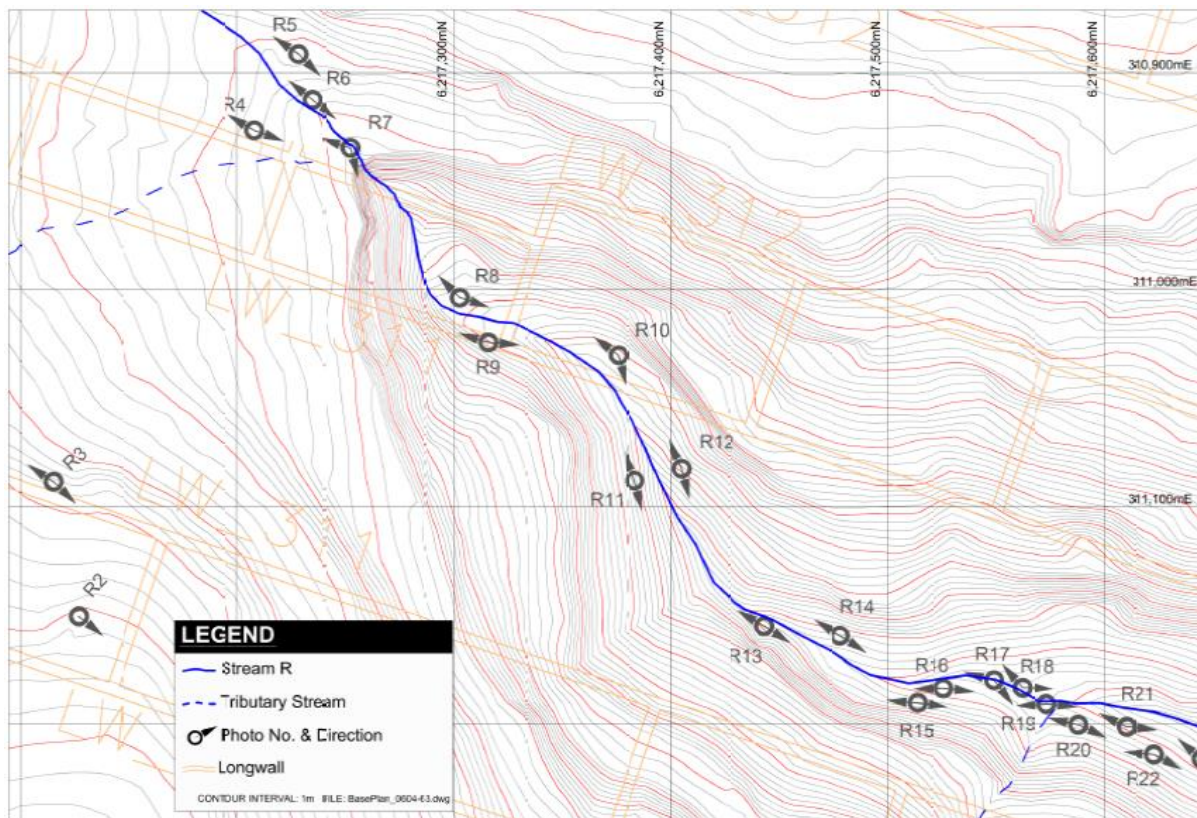


Photo R2 (Downstream)



Photo R3 (Downstream)



Photo R3 (Upstream)



Photo R4 (Downstream)



Photo R4 (Upstream)



Photo R6 (Downstream)



Photo R6 (Upstream)



Photo R7 (Downstream)



Photo R7 (Upstream)



Photo R8 (Downstream)



Photo R8 (Upstream)



Photo R9 (Downstream)



Photo R9 (Upstream)



Photo R10 (Downstream)



Photo R10 (Upstream)



Photo R11 (Downstream)



Photo R11 (Upstream)



Photo R12 (Downstream)

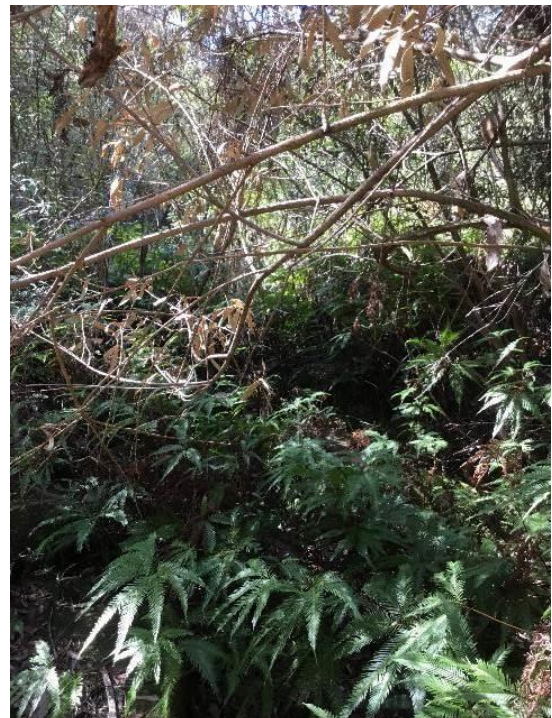


Photo R12 (Upstream)



Photo R13 (Downstream)

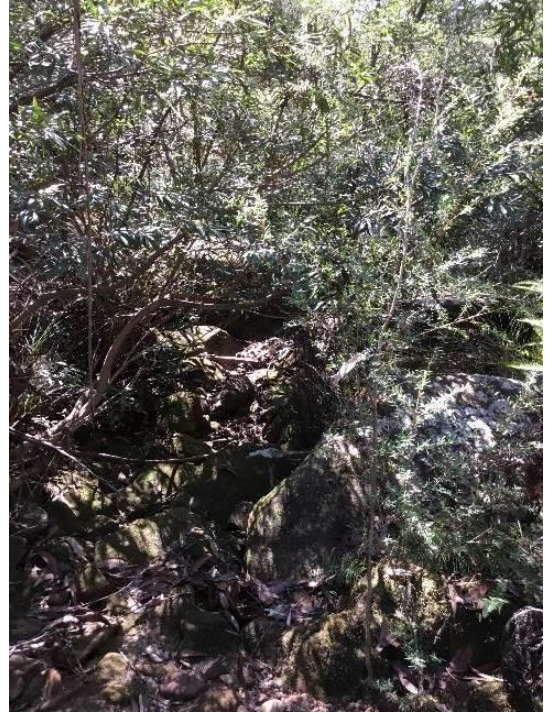


Photo R13 (Upstream)



Photo R14 (Downstream)



Photo R14 (Upstream)



Photo R15 (Downstream)

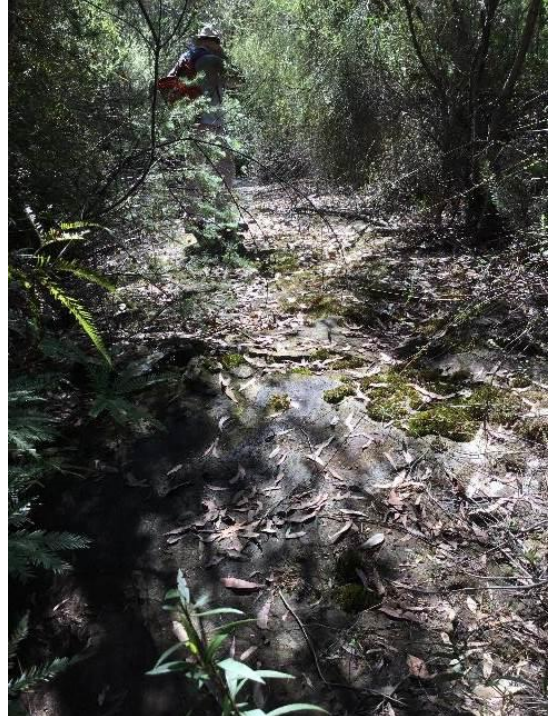


Photo R15 (Upstream)



Photo R16 (Downstream)



Photo R16 (Upstream)



Photo R17 (Downstream)



Photo R17 (Upstream)



Photo R18 (Downstream)

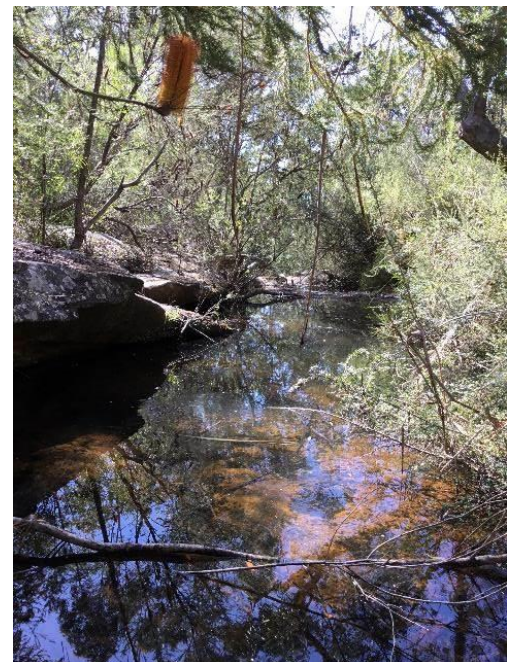


Photo R18 (Upstream)



Photo R19 (Downstream)



Photo R19 (Upstream)



Photo R20 (Downstream)



Photo R20 (Upstream)



Photo R21 (Downstream)



Photo R21 (Upstream)



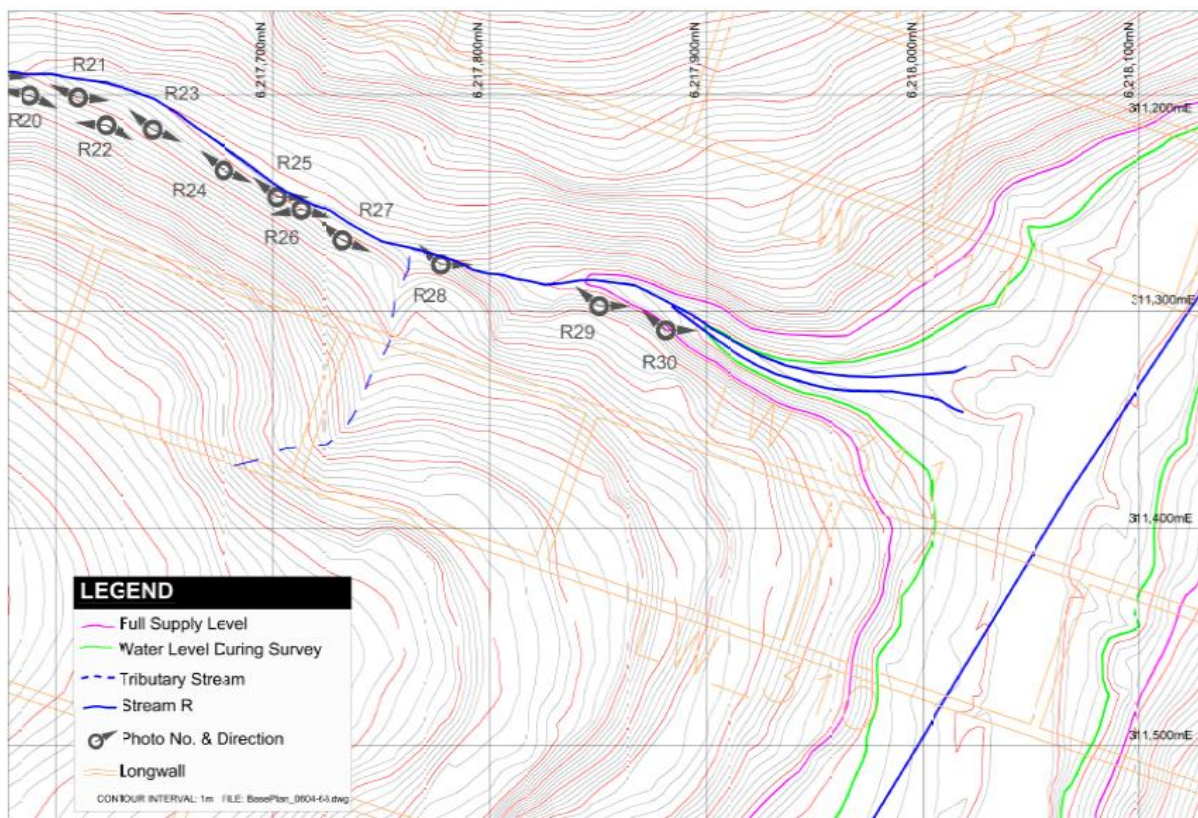


Photo R22 (Downstream)



Photo R22 (Upstream)



Photo R23 (Downstream)



Photo R23 (Upstream)



Photo R24 (Downstream)



Photo R24 (Upstream)



Photo R25 (Downstream)



Photo R25 (Upstream)

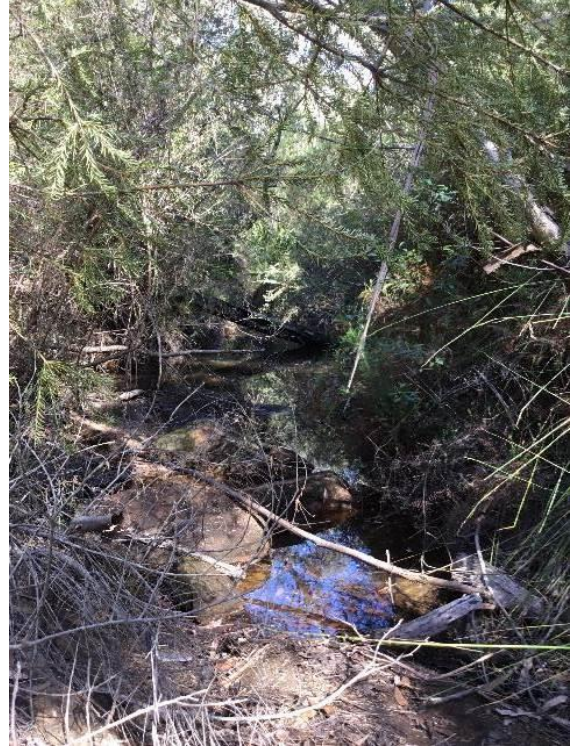


Photo R26 (Downstream)



Photo R26 (Upstream)



Photo R27 (Downstream)



Photo R27 (Upstream)



Photo R28 (Downstream)



Photo R28 (Upstream)



Photo R29 (Downstream)



Photo R29 (Upstream)

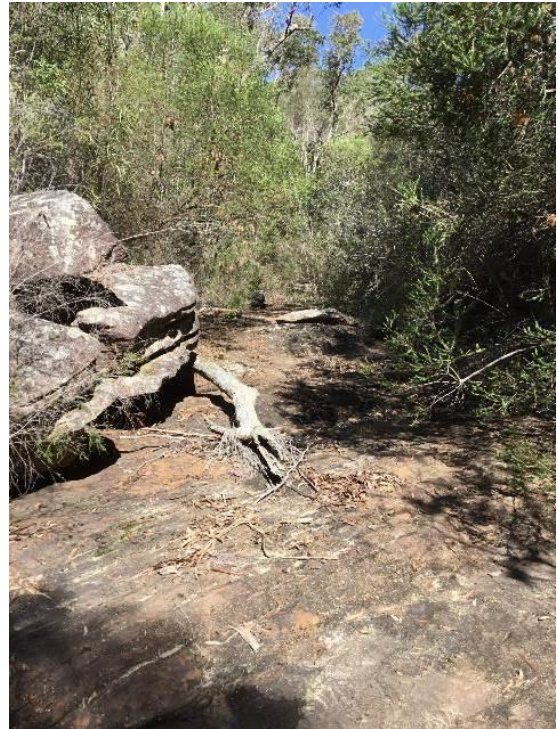


Photo R30 (Downstream)



Photo R30 (Upstream)



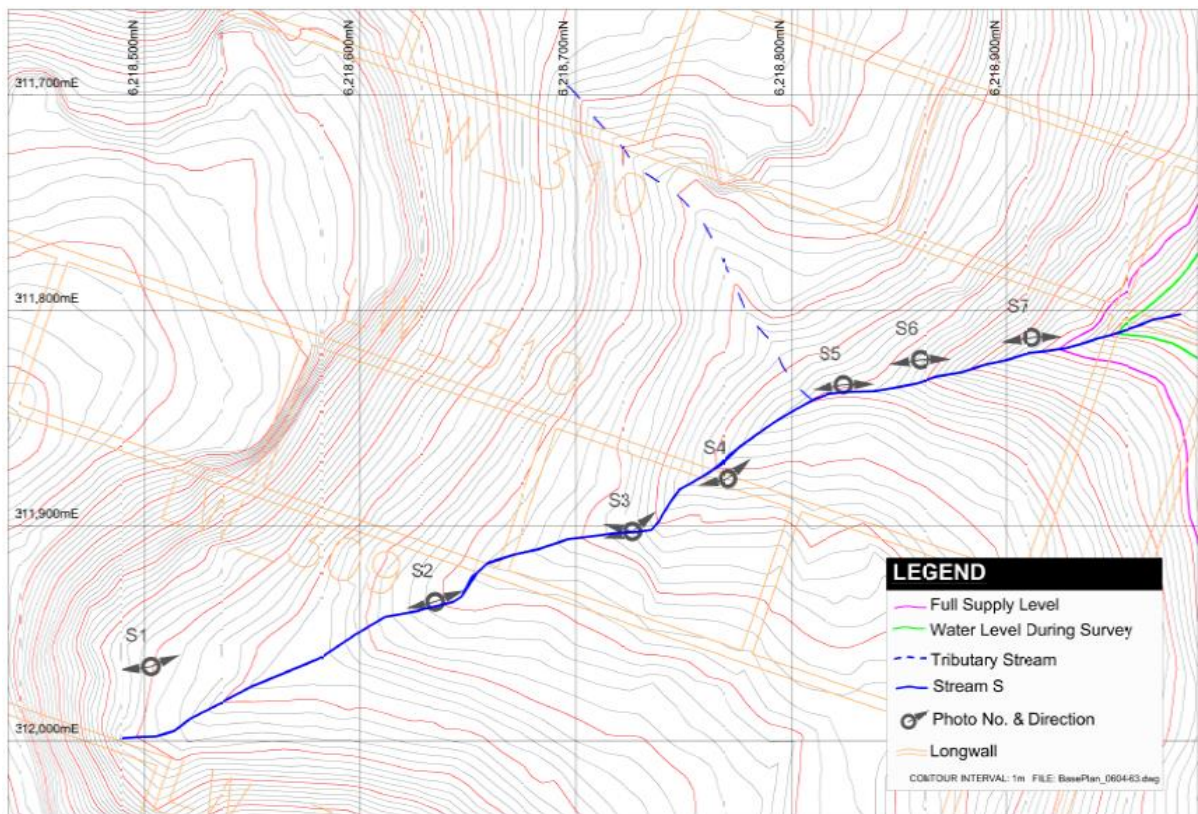


Photo S1 (Downstream)



Photo S1 (Upstream)



Photo S2 (Downstream)



Photo S2 (Upstream)



Photo S3 (Downstream)



Photo S3 (Upstream 1)



Photo S3 (Upstream 2)



Photo S4 (Downstream)



Photo (Upstream)



Photo S5 (Downstream)



Photo S5 (Upstream)



Photo S6 (Downstream)



Photo S6 (Upstream)



Photo S7 (Downstream)



Photo S7 (Upstream)



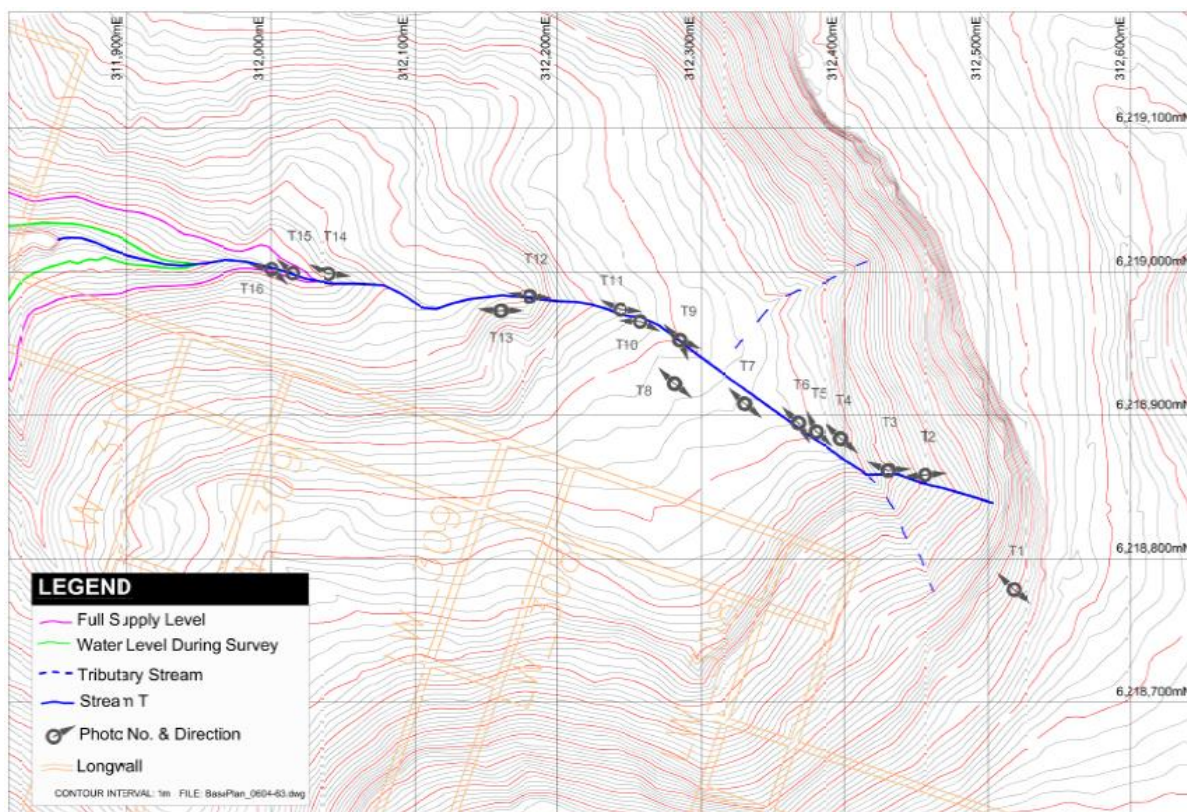


Photo T1 (Downstream)



Photo T1 (Upstream)



Photo T2 (Downstream)



Photo T2 (Upstream)



Photo T3 (Downstream)

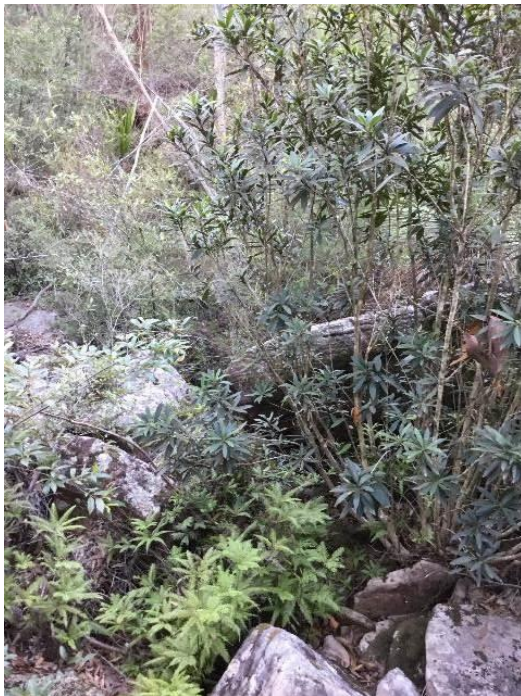


Photo T3 (Upstream)



Photo T4 (Downstream)



Photo T4 (Upstream)



Photo T5 (Downstream)



Photo T5 (Upstream)



Photo T6 (Downstream)



Photo T6 (Upstream)



Photo T7 (Downstream)



Photo T7 (Upstream)



Photo T8 (Downstream)



Photo T8 (Upstream)



Photo T9 (Downstream)



Photo T9 (Upstream 1)



Photo T9 (Upstream 2)



Photo T10 (Downstream)



Photo T10 (Upstream)



Photo T11 (Downstream)

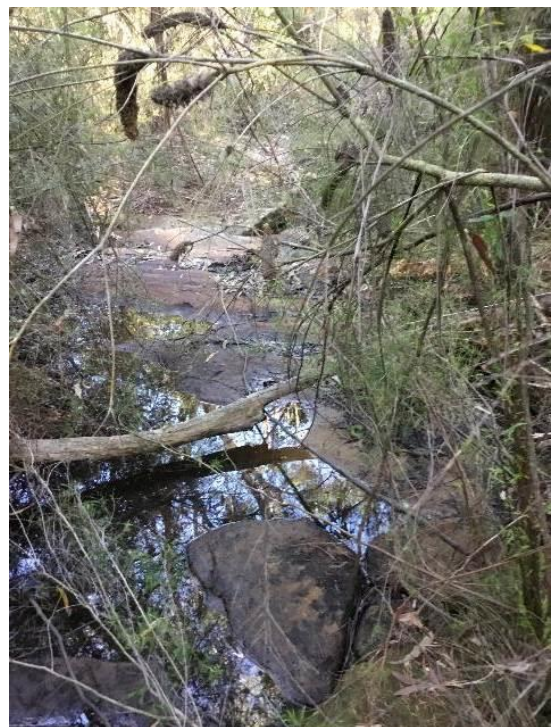


Photo T11 (Upstream)



Photo T12 (Downstream)



Photo T12 (Upstream)



Photo T13 (Downstream)



Photo T13 (Upstream)



Photo T14 (Downstream)



Photo T14 (Upstream)



Photo T15 (Downstream)



Photo T16 (Downstream)



Photo T16 (Upstream)

