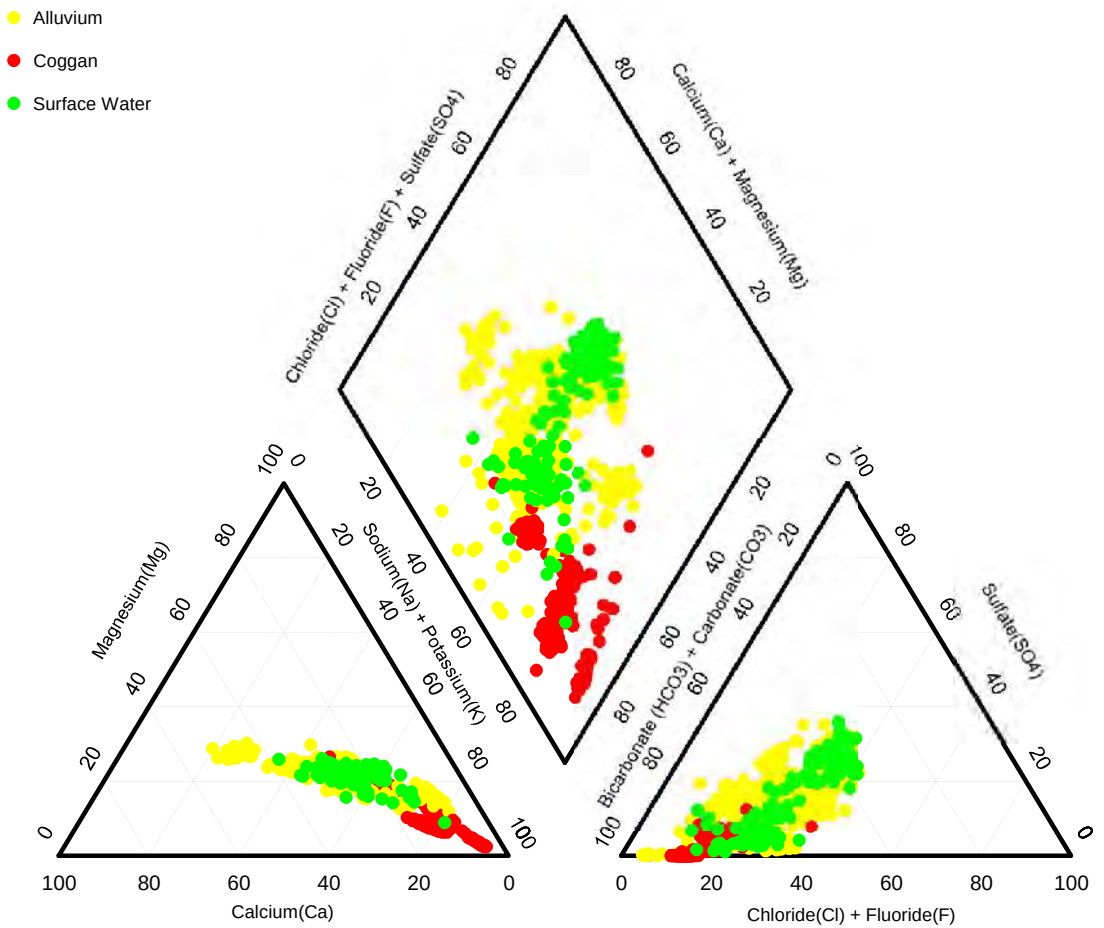
Appendix E
Summary of Monitoring Data

Appendix E2
Figure P1: Piper Diagram for Surface Water, Alluvium and Coggan Aquifers
(February 2012 to June 2017)



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd OFFICE: Newcastle DRAWN BY: DEW DATE: 3/10/2017	TITLE: Piper Diagram for Surface Water, Alluvium and Coggan Aquifers - February 2012 to June 2017 Bylong Coal Project Bylong NSW	PROJECT NO: 49761.04 FIGURE NO: P1 REPORT NO: 49761.04.R.014.Rev0 REVISION: 0

Appendix E
Summary of Monitoring Data

Appendix E3

- Daily Rainfall - Bylong Meteorological Weather Station (9 December 2011 to 31 June 2017)
- Cumulative Daily Rainfall Departure - Bylong Meteorological Weather Station (9 December 2011 to 31 June 2017)

DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
9/12/2011	1.0
10/12/2011	0.2
11/12/2011	0.0
12/12/2011	17.4
13/12/2011	0.0
14/12/2011	0.0
15/12/2011	0.0
16/12/2011	0.0
17/12/2011	0.0
18/12/2011	0.0
19/12/2011	0.0
20/12/2011	9.8
21/12/2011	0.0
22/12/2011	0.0
23/12/2011	2.0
24/12/2011	8.6
25/12/2011	0.0
26/12/2011	0.0
27/12/2011	4.8
28/12/2011	0.0
29/12/2011	0.0
30/12/2011	0.0
31/12/2011	0.0
1/01/2012	0.0
2/01/2012	0.0
3/01/2012	0.0
4/01/2012	0.0
5/01/2012	0.0
6/01/2012	7.0
7/01/2012	0.0
8/01/2012	0.0
9/01/2012	10.8
10/01/2012	0.0
11/01/2012	0.0
12/01/2012	0.0
13/01/2012	0.0
14/01/2012	0.0
15/01/2012	0.0
16/01/2012	15.8
17/01/2012	0.0
18/01/2012	0.0
19/01/2012	0.0
20/01/2012	0.0
21/01/2012	4.2
22/01/2012	1.2
23/01/2012	0.0
24/01/2012	0.0
25/01/2012	10.0
26/01/2012	11.6

Date	Rainfall (mm)
27/01/2012	0.8
28/01/2012	0.0
29/01/2012	0.0
30/01/2012	4.6
31/01/2012	9.4
1/02/2012	5.8
2/02/2012	6.0
3/02/2012	16.0
4/02/2012	15.0
5/02/2012	0.0
6/02/2012	0.0
7/02/2012	0.0
8/02/2012	0.0
9/02/2012	0.0
10/02/2012	2.2
11/02/2012	10.4
12/02/2012	0.0
13/02/2012	0.0
14/02/2012	1.2
15/02/2012	0.0
16/02/2012	0.0
17/02/2012	0.0
18/02/2012	10.6
19/02/2012	0.4
20/02/2012	34.4
21/02/2012	1.4
22/02/2012	1.0
23/02/2012	0.0
24/02/2012	0.0
25/02/2012	0.0
26/02/2012	0.0
27/02/2012	27.6
28/02/2012	0.0
29/02/2012	0.0
1/03/2012	4.2
2/03/2012	75.6
3/03/2012	35.4
4/03/2012	0.2
5/03/2012	5.0
6/03/2012	0.0
7/03/2012	1.6
8/03/2012	0.0
9/03/2012	0.0
10/03/2012	0.0
11/03/2012	0.0
12/03/2012	0.0
13/03/2012	0.0
14/03/2012	0.0
15/03/2012	0.4

Date	Rainfall (mm)
16/03/2012	0.0
17/03/2012	0.2
18/03/2012	0.0
19/03/2012	3.0
20/03/2012	21.4
21/03/2012	4.0
22/03/2012	12.8
23/03/2012	12.8
24/03/2012	0.0
25/03/2012	0.0
26/03/2012	0.0
27/03/2012	0.0
28/03/2012	0.0
29/03/2012	0.0
30/03/2012	0.0
31/03/2012	0.0
1/04/2012	0.0
2/04/2012	0.2
3/04/2012	0.0
4/04/2012	0.0
5/04/2012	0.0
6/04/2012	0.2
7/04/2012	0.0
8/04/2012	0.0
9/04/2012	0.0
10/04/2012	3.8
11/04/2012	0.0
12/04/2012	0.0
13/04/2012	0.0
14/04/2012	0.0
15/04/2012	0.2
16/04/2012	12.8
17/04/2012	0.0
18/04/2012	0.0
19/04/2012	0.0
20/04/2012	0.0
21/04/2012	0.0
22/04/2012	0.2
23/04/2012	0.0
24/04/2012	0.4
25/04/2012	1.8
26/04/2012	0.2
27/04/2012	No data
28/04/2012	No data
29/04/2012	No data
30/04/2012	No data
1/05/2012	No data
2/05/2012	No data
3/05/2012	0.4

Date	Rainfall (mm)
4/05/2012	0.4
5/05/2012	1.6
6/05/2012	11.6
7/05/2012	3.0
8/05/2012	0.0
9/05/2012	0.0
10/05/2012	0.0
11/05/2012	0.0
12/05/2012	0.0
13/05/2012	0.0
14/05/2012	5.8
15/05/2012	18.2
16/05/2012	8.8
17/05/2012	0.0
18/05/2012	0.0
19/05/2012	0.0
20/05/2012	0.0
21/05/2012	0.0
22/05/2012	0.0
23/05/2012	0.0
24/05/2012	0.0
25/05/2012	0.0
26/05/2012	0.0
27/05/2012	0.0
28/05/2012	0.0
29/05/2012	0.0
30/05/2012	0.0
31/05/2012	0.0
1/06/2012	0.0
2/06/2012	0.0
3/06/2012	0.0
4/06/2012	0.2
5/06/2012	0.2
6/06/2012	0.0
7/06/2012	0.0
8/06/2012	1.8
9/06/2012	7.6
10/06/2012	0.0
11/06/2012	0.0
12/06/2012	0.0
13/06/2012	0.0
14/06/2012	0.0
15/06/2012	0.0
16/06/2012	0.0
17/06/2012	0.0
18/06/2012	0.0
19/06/2012	0.0
20/06/2012	0.0
21/06/2012	0.0

Note: Data logged by automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
22/06/2012	0.0
23/06/2012	0.0
24/06/2012	10.6
25/06/2012	0.0
26/06/2012	0.0
27/06/2012	0.0
28/06/2012	0.0
29/06/2012	0.0
30/06/2012	0.2
1/07/2012	0.6
2/07/2012	0.2
3/07/2012	0.0
4/07/2012	0.0
5/07/2012	0.0
6/07/2012	0.0
7/07/2012	0.0
8/07/2012	0.0
9/07/2012	0.0
10/07/2012	0.0
11/07/2012	0.0
12/07/2012	0.0
13/07/2012	0.0
14/07/2012	0.0
15/07/2012	0.0
16/07/2012	16.2
17/07/2012	2.2
18/07/2012	0.0
19/07/2012	0.0
20/07/2012	0.0
21/07/2012	0.0
22/07/2012	0.0
23/07/2012	0.0
24/07/2012	0.0
25/07/2012	0.0
26/07/2012	0.2
27/07/2012	0.2
28/07/2012	0.0
29/07/2012	0.0
30/07/2012	0.0
31/07/2012	0.0
1/08/2012	0.0
2/08/2012	0.0
3/08/2012	0.0
4/08/2012	0.0
5/08/2012	0.0
6/08/2012	0.0
7/08/2012	0.0
8/08/2012	0.0
9/08/2012	0.2

Date	Rainfall (mm)
10/08/2012	0.0
11/08/2012	0.0
12/08/2012	0.0
13/08/2012	0.0
14/08/2012	0.0
15/08/2012	0.0
16/08/2012	0.0
17/08/2012	0.0
18/08/2012	0.0
19/08/2012	0.0
20/08/2012	0.0
21/08/2012	0.0
22/08/2012	0.0
23/08/2012	11.8
24/08/2012	0.0
25/08/2012	0.0
26/08/2012	0.0
27/08/2012	0.0
28/08/2012	0.0
29/08/2012	0.0
30/08/2012	0.0
31/08/2012	0.2
1/09/2012	0.0
2/09/2012	0.0
3/09/2012	0.0
4/09/2012	0.0
5/09/2012	0.0
6/09/2012	0.0
7/09/2012	0.0
8/09/2012	0.0
9/09/2012	0.0
10/09/2012	0.0
11/09/2012	0.0
12/09/2012	0.0
13/09/2012	0.0
14/09/2012	0.0
15/09/2012	0.0
16/09/2012	0.2
17/09/2012	0.4
18/09/2012	10.0
19/09/2012	0.8
20/09/2012	0.0
21/09/2012	0.0
22/09/2012	0.0
23/09/2012	0.0
24/09/2012	0.0
25/09/2012	0.0
26/09/2012	0.0
27/09/2012	0.0

Date	Rainfall (mm)
28/09/2012	0.8
29/09/2012	14.4
30/09/2012	0.0
1/10/2012	0.0
2/10/2012	0.0
3/10/2012	0.0
4/10/2012	0.0
5/10/2012	0.0
6/10/2012	0.0
7/10/2012	0.0
8/10/2012	0.0
9/10/2012	0.0
10/10/2012	0.0
11/10/2012	3.0
12/10/2012	2.4
13/10/2012	0.0
14/10/2012	0.0
15/10/2012	0.0
16/10/2012	0.0
17/10/2012	0.0
18/10/2012	0.0
19/10/2012	0.0
20/10/2012	0.0
21/10/2012	0.0
22/10/2012	0.0
23/10/2012	0.0
24/10/2012	0.0
25/10/2012	0.0
26/10/2012	0.0
27/10/2012	0.0
28/10/2012	0.0
29/10/2012	0.0
30/10/2012	3.4
31/10/2012	0.2
1/11/2012	0.0
2/11/2012	0.0
3/11/2012	0.0
4/11/2012	0.0
5/11/2012	0.0
6/11/2012	0.0
7/11/2012	2.0
8/11/2012	15.6
9/11/2012	0.0
10/11/2012	0.0
11/11/2012	0.0
12/11/2012	0.0
13/11/2012	1.0
14/11/2012	0.0
15/11/2012	No data

Date	Rainfall (mm)
16/11/2012	No data
17/11/2012	No data
18/11/2012	No data
19/11/2012	No data
20/11/2012	No data
21/11/2012	No data
22/11/2012	No data
23/11/2012	No data
24/11/2012	No data
25/11/2012	No data
26/11/2012	No data
27/11/2012	No data
28/11/2012	No data
29/11/2012	No data
30/11/2012	No data
1/12/2012	No data
2/12/2012	No data
3/12/2012	No data
4/12/2012	No data
5/12/2012	No data
6/12/2012	0.0
7/12/2012	0.0
8/12/2012	0.0
9/12/2012	3.4
10/12/2012	0.0
11/12/2012	0.0
12/12/2012	0.0
13/12/2012	0.0
14/12/2012	0.0
15/12/2012	0.0
16/12/2012	0.0
17/12/2012	0.0
18/12/2012	0.0
19/12/2012	0.0
20/12/2012	0.0
21/12/2012	0.0
22/12/2012	0.0
23/12/2012	1.8
24/12/2012	1.0
25/12/2012	30.6
26/12/2012	0.0
27/12/2012	0.0
28/12/2012	0.0
29/12/2012	0.0
30/12/2012	0.0
31/12/2012	0.0
1/01/2013	0.0
2/01/2013	0.0
3/01/2013	0.0

Note: Data logged by automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
4/01/2013	0.0
5/01/2013	0.0
6/01/2013	0.0
7/01/2013	0.0
8/01/2013	0.0
9/01/2013	0.0
10/01/2013	0.0
11/01/2013	0.0
12/01/2013	0.2
13/01/2013	0.0
14/01/2013	0.0
15/01/2013	0.0
16/01/2013	0.0
17/01/2013	0.0
18/01/2013	0.2
19/01/2013	4.2
20/01/2013	0.8
21/01/2013	0.0
22/01/2013	3.8
23/01/2013	1.8
24/01/2013	0.0
25/01/2013	0.0
26/01/2013	0.0
27/01/2013	0.2
28/01/2013	0.0
29/01/2013	0.4
30/01/2013	0.2
31/01/2013	0.0
1/02/2013	0.0
2/02/2013	0.0
3/02/2013	0.0
4/02/2013	0.0
5/02/2013	0.0
6/02/2013	0.0
7/02/2013	0.0
8/02/2013	0.0
9/02/2013	0.0
10/02/2013	0.0
11/02/2013	0.0
12/02/2013	0.0
13/02/2013	0.0
14/02/2013	0.0
15/02/2013	0.0
16/02/2013	0.0
17/02/2013	0.0
18/02/2013	0.0
19/02/2013	0.4
20/02/2013	0.0
21/02/2013	0.2

Date	Rainfall (mm)
22/02/2013	0.0
23/02/2013	No data
24/02/2013	No data
25/02/2013	No data
26/02/2013	No data
27/02/2013	No data
28/02/2013	No data
1/03/2013	No data
2/03/2013	No data
3/03/2013	No data
4/03/2013	No data
5/03/2013	No data
6/03/2013	No data
7/03/2013	No data
8/03/2013	No data
9/03/2013	No data
10/03/2013	No data
11/03/2013	No data
12/03/2013	No data
13/03/2013	0.0
14/03/2013	0.0
15/03/2013	0.0
16/03/2013	0.0
17/03/2013	0.0
18/03/2013	0.0
19/03/2013	0.0
20/03/2013	0.0
21/03/2013	0.0
22/03/2013	3.0
23/03/2013	3.0
24/03/2013	0.2
25/03/2013	0.0
26/03/2013	0.0
27/03/2013	0.0
28/03/2013	3.2
29/03/2013	0.0
30/03/2013	0.0
31/03/2013	0.4
1/04/2013	0.0
2/04/2013	0.0
3/04/2013	0.0
4/04/2013	0.0
5/04/2013	0.0
6/04/2013	0.0
7/04/2013	20.6
8/04/2013	0.2
9/04/2013	0.0
10/04/2013	0.0
11/04/2013	0.2

Date	Rainfall (mm)
12/04/2013	0.0
13/04/2013	0.0
14/04/2013	0.0
15/04/2013	0.0
16/04/2013	5.8
17/04/2013	0.0
18/04/2013	0.2
19/04/2013	0.0
20/04/2013	0.0
21/04/2013	0.2
22/04/2013	0.0
23/04/2013	0.0
24/04/2013	0.0
25/04/2013	0.0
26/04/2013	0.0
27/04/2013	0.0
28/04/2013	0.0
29/04/2013	0.0
30/04/2013	0.0
1/05/2013	0.0
2/05/2013	0.0
3/05/2013	0.0
4/05/2013	0.0
5/05/2013	0.0
6/05/2013	0.0
7/05/2013	0.0
8/05/2013	0.0
9/05/2013	0.0
10/05/2013	0.0
11/05/2013	0.0
12/05/2013	0.0
13/05/2013	4.4
14/05/2013	0.0
15/05/2013	0.0
16/05/2013	0.6
17/05/2013	0.2
18/05/2013	0.0
19/05/2013	0.0
20/05/2013	0.0
21/05/2013	0.0
22/05/2013	9.6
23/05/2013	0.4
24/05/2013	0.0
25/05/2013	0.0
26/05/2013	0.0
27/05/2013	0.0
28/05/2013	0.0
29/05/2013	0.0
30/05/2013	0.0

Date	Rainfall (mm)
31/05/2013	0.0
1/06/2013	5.2
2/06/2013	19.0
3/06/2013	0.2
4/06/2013	0.0
5/06/2013	0.0
6/06/2013	0.0
7/06/2013	6.2
8/06/2013	0.2
9/06/2013	0.0
10/06/2013	7.0
11/06/2013	0.0
12/06/2013	13.6
13/06/2013	2.8
14/06/2013	0.2
15/06/2013	0.0
16/06/2013	0.0
17/06/2013	0.2
18/06/2013	0.0
19/06/2013	0.0
20/06/2013	0.0
21/06/2013	0.0
22/06/2013	0.0
23/06/2013	0.0
24/06/2013	0.2
25/06/2013	1.0
26/06/2013	0.8
27/06/2013	6.2
28/06/2013	0.2
29/06/2013	8.8
30/06/2013	0.0
1/07/2013	0.2
2/07/2013	0.0
3/07/2013	0.2
4/07/2013	0.2
5/07/2013	0.0
6/07/2013	0.0
7/07/2013	0.0
8/07/2013	0.0
9/07/2013	0.0
10/07/2013	0.6
11/07/2013	0.2
12/07/2013	0.2
13/07/2013	0.0
14/07/2013	1.4
15/07/2013	0.2
16/07/2013	4.8
17/07/2013	0.2
18/07/2013	0.2

Note: Data logged by automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
19/07/2013	6.8
20/07/2013	1.0
21/07/2013	0.0
22/07/2013	0.0
23/07/2013	0.2
24/07/2013	0.0
25/07/2013	0.0
26/07/2013	0.0
27/07/2013	0.0
28/07/2013	0.0
29/07/2013	0.0
30/07/2013	1.4
31/07/2013	0.2
1/08/2013	0.0
2/08/2013	0.0
3/08/2013	0.0
4/08/2013	0.0
5/08/2013	0.0
6/08/2013	0.0
7/08/2013	1.8
8/08/2013	0.6
9/08/2013	0.0
10/08/2013	0.0
11/08/2013	0.0
12/08/2013	0.6
13/08/2013	0.0
14/08/2013	0.0
15/08/2013	0.2
16/08/2013	0.0
17/08/2013	1.2
18/08/2013	0.0
19/08/2013	0.0
20/08/2013	0.0
21/08/2013	0.0
22/08/2013	0.0
23/08/2013	0.0
24/08/2013	0.0
25/08/2013	0.0
26/08/2013	0.0
27/08/2013	0.0
28/08/2013	0.0
29/08/2013	0.0
30/08/2013	0.6
31/08/2013	0.0
1/09/2013	0.0
2/09/2013	0.0
3/09/2013	0.0
4/09/2013	0.0
5/09/2013	0.0

Date	Rainfall (mm)
6/09/2013	0.0
7/09/2013	0.0
8/09/2013	0.0
9/09/2013	0.0
10/09/2013	0.0
11/09/2013	0.0
12/09/2013	0.0
13/09/2013	0.0
14/09/2013	0.0
15/09/2013	0.0
16/09/2013	35.8
17/09/2013	2.6
18/09/2013	0.0
19/09/2013	0.0
20/09/2013	0.0
21/09/2013	0.0
22/09/2013	0.0
23/09/2013	0.0
24/09/2013	0.0
25/09/2013	0.0
26/09/2013	0.0
27/09/2013	0.0
28/09/2013	0.0
29/09/2013	0.0
30/09/2013	0.0
1/10/2013	1.0
2/10/2013	0.0
3/10/2013	1.0
4/10/2013	0.0
5/10/2013	0.0
6/10/2013	0.0
7/10/2013	0.0
8/10/2013	0.0
9/10/2013	0.0
10/10/2013	0.0
11/10/2013	0.0
12/10/2013	0.0
13/10/2013	1.4
14/10/2013	0.0
15/10/2013	0.0
16/10/2013	0.0
17/10/2013	0.0
18/10/2013	0.0
19/10/2013	0.0
20/10/2013	0.0
21/10/2013	0.0
22/10/2013	0.2
23/10/2013	0.8
24/10/2013	0.0

Date	Rainfall (mm)
25/10/2013	0.0
26/10/2013	0.0
27/10/2013	0.0
28/10/2013	0.0
29/10/2013	2.4
30/10/2013	0.0
31/10/2013	0.0
1/11/2013	0.0
2/11/2013	0.0
3/11/2013	0.0
4/11/2013	0.0
5/11/2013	0.0
6/11/2013	0.0
7/11/2013	0.0
8/11/2013	0.0
9/11/2013	0.2
10/11/2013	0.0
11/11/2013	0.4
12/11/2013	6.0
13/11/2013	0.0
14/11/2013	0.0
15/11/2013	0.0
16/11/2013	2.8
17/11/2013	0.4
18/11/2013	0.4
19/11/2013	0.0
20/11/2013	0.0
21/11/2013	0.0
22/11/2013	8.4
23/11/2013	4.4
24/11/2013	0.2
25/11/2013	0.0
26/11/2013	0.0
27/11/2013	0.0
28/11/2013	0.0
29/11/2013	0.4
30/11/2013	0.0
1/12/2013	0.0
2/12/2013	0.0
3/12/2013	0.0
4/12/2013	0.0
5/12/2013	1.2
6/12/2013	0.0
7/12/2013	0.0
8/12/2013	0.0
9/12/2013	0.0
10/12/2013	0.0
11/12/2013	0.0
12/12/2013	0.0

Date	Rainfall (mm)
13/12/2013	0.0
14/12/2013	0.0
15/12/2013	0.0
16/12/2013	0.8
17/12/2013	0.2
18/12/2013	0.0
19/12/2013	0.0
20/12/2013	0.0
21/12/2013	0.0
22/12/2013	0.0
23/12/2013	0.2
24/12/2013	0.0
25/12/2013	1.2
26/12/2013	0.2
27/12/2013	0.0
28/12/2013	0.0
29/12/2013	0.0
30/12/2013	0.0
31/12/2013	0.0
1/01/2014	0.0
2/01/2014	0.0
3/01/2014	0.0
4/01/2014	0.0
5/01/2014	0.0
6/01/2014	0.0
7/01/2014	0.0
8/01/2014	0.0
9/01/2014	0.0
10/01/2014	0.4
11/01/2014	0.0
12/01/2014	0.0
13/01/2014	0.0
14/01/2014	0.0
15/01/2014	0.0
16/01/2014	0.0
17/01/2014	0.0
18/01/2014	0.0
19/01/2014	0.2
20/01/2014	0.0
21/01/2014	0.0
22/01/2014	0.0
23/01/2014	0.0
24/01/2014	8.6
25/01/2014	0.0
26/01/2014	0.0
27/01/2014	0.0
28/01/2014	0.0
29/01/2014	0.0
30/01/2014	0.0

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
31/01/2014	0.0
1/02/2014	0.0
2/02/2014	0.0
3/02/2014	0.0
4/02/2014	0.0
5/02/2014	0.0
6/02/2014	0.0
7/02/2014	0.0
8/02/2014	0.0
9/02/2014	0.0
10/02/2014	0.0
11/02/2014	0.6
12/02/2014	0.0
13/02/2014	1.2
14/02/2014	3.4
15/02/2014	3.8
16/02/2014	19.6
17/02/2014	0.2
18/02/2014	0.0
19/02/2014	37.2
20/02/2014	0.0
21/02/2014	0.0
22/02/2014	0.0
23/02/2014	0.0
24/02/2014	0.0
25/02/2014	0.0
26/02/2014	0.0
27/02/2014	0.0
28/02/2014	40.6
1/03/2014	4.4
2/03/2014	0.0
3/03/2014	0.0
4/03/2014	0.0
5/03/2014	0.0
6/03/2014	0.0
7/03/2014	4.0
8/03/2014	0.2
9/03/2014	0.0
10/03/2014	0.0
11/03/2014	0.0
12/03/2014	0.0
13/03/2014	0.0
14/03/2014	1.8
15/03/2014	0.0
16/03/2014	0.6
17/03/2014	0.0
18/03/2014	0.0
19/03/2014	0.0
20/03/2014	0.0

Date	Rainfall (mm)
21/03/2014	1.4
22/03/2014	0.2
23/03/2014	0.0
24/03/2014	12.6
25/03/2014	0.0
26/03/2014	20.8
27/03/2014	21.2
28/03/2014	11.0
29/03/2014	0.0
30/03/2014	0.0
31/03/2014	0.0
1/04/2014	0.2
2/04/2014	0.0
3/04/2014	0.0
4/04/2014	7.2
5/04/2014	0.0
6/04/2014	0.0
7/04/2014	0.0
8/04/2014	0.0
9/04/2014	0.0
10/04/2014	0.2
11/04/2014	2.6
12/04/2014	0.2
13/04/2014	0.0
14/04/2014	0.0
15/04/2014	0.0
16/04/2014	0.0
17/04/2014	0.0
18/04/2014	0.0
19/04/2014	0.0
20/04/2014	0.0
21/04/2014	0.0
22/04/2014	0.0
23/04/2014	0.0
24/04/2014	0.0
25/04/2014	1.8
26/04/2014	0.2
27/04/2014	0.0
28/04/2014	0.0
29/04/2014	0.0
30/04/2014	1.0
1/05/2014	0.0
2/05/2014	0.0
3/05/2014	2.4
4/05/2014	0.2
5/05/2014	0.0
6/05/2014	0.0
7/05/2014	0.0
8/05/2014	0.0

Date	Rainfall (mm)
9/05/2014	0.0
10/05/2014	1.6
11/05/2014	3.6
12/05/2014	0.2
13/05/2014	0.2
14/05/2014	0.2
15/05/2014	0.0
16/05/2014	0.2
17/05/2014	0.0
18/05/2014	0.0
19/05/2014	0.0
20/05/2014	0.0
21/05/2014	0.0
22/05/2014	0.0
23/05/2014	0.0
24/05/2014	0.2
25/05/2014	0.0
26/05/2014	0.0
27/05/2014	1.4
28/05/2014	1.4
29/05/2014	0.2
30/05/2014	0.0
31/05/2014	0.0
1/06/2014	8.6
2/06/2014	0.8
3/06/2014	0.4
4/06/2014	0.0
5/06/2014	0.0
6/06/2014	0.0
7/06/2014	0.0
8/06/2014	0.2
9/06/2014	0.0
10/06/2014	0.0
11/06/2014	0.2
12/06/2014	0.0
13/06/2014	0.4
14/06/2014	7.4
15/06/2014	0.0
16/06/2014	0.0
17/06/2014	0.0
18/06/2014	0.0
19/06/2014	0.0
20/06/2014	2.4
21/06/2014	0.2
22/06/2014	0.0
23/06/2014	0.0
24/06/2014	0.0
25/06/2014	0.0
26/06/2014	0.0

Date	Rainfall (mm)
27/06/2014	0.0
28/06/2014	0.8
29/06/2014	0.2
30/06/2014	0.0
1/07/2014	0.0
2/07/2014	0.0
3/07/2014	0.2
4/07/2014	0.0
5/07/2014	0.0
6/07/2014	0.0
7/07/2014	0.0
8/07/2014	0.0
9/07/2014	0.0
10/07/2014	0.0
11/07/2014	0.0
12/07/2014	0.0
13/07/2014	0.0
14/07/2014	0.0
15/07/2014	2.0
16/07/2014	7.4
17/07/2014	0.0
18/07/2014	0.2
19/07/2014	0.0
20/07/2014	0.0
21/07/2014	0.0
22/07/2014	0.2
23/07/2014	0.2
24/07/2014	0.0
25/07/2014	3.2
26/07/2014	13.2
27/07/2014	0.2
28/07/2014	0.0
29/07/2014	0.2
30/07/2014	34.6
31/07/2014	0.0
1/08/2014	No data
2/08/2014	No data
3/08/2014	No data
4/08/2014	No data
5/08/2014	No data
6/08/2014	No data
7/08/2014	0.0
8/08/2014	0.0
9/08/2014	0.0
10/08/2014	0.0
11/08/2014	0.0
12/08/2014	0.0
13/08/2014	0.0
14/08/2014	0.0

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
15/08/2014	0.0
16/08/2014	5.0
17/08/2014	8.8
18/08/2014	1.4
19/08/2014	0.4
20/08/2014	0.0
21/08/2014	0.0
22/08/2014	0.0
23/08/2014	0.0
24/08/2014	0.0
25/08/2014	0.2
26/08/2014	0.6
27/08/2014	1.2
28/08/2014	0.0
29/08/2014	0.0
30/08/2014	0.4
31/08/2014	0.2
1/09/2014	0.2
2/09/2014	1.6
3/09/2014	0.0
4/09/2014	0.0
5/09/2014	0.0
6/09/2014	0.2
7/09/2014	0.0
8/09/2014	0.0
9/09/2014	0.0
10/09/2014	11.6
11/09/2014	0.0
12/09/2014	0.0
13/09/2014	0.0
14/09/2014	0.0
15/09/2014	0.0
16/09/2014	0.0
17/09/2014	0.0
18/09/2014	0.0
19/09/2014	0.0
20/09/2014	0.0
21/09/2014	0.0
22/09/2014	0.0
23/09/2014	0.0
24/09/2014	0.0
25/09/2014	2.8
26/09/2014	0.0
27/09/2014	0.0
28/09/2014	0.0
29/09/2014	0.0
30/09/2014	0.0
1/10/2014	0.0
2/10/2014	0.0

Date	Rainfall (mm)
3/10/2014	0.0
4/10/2014	0.0
5/10/2014	0.0
6/10/2014	0.0
7/10/2014	0.0
8/10/2014	0.0
9/10/2014	0.0
10/10/2014	0.0
11/10/2014	0.0
12/10/2014	0.0
13/10/2014	12.6
14/10/2014	1.2
15/10/2014	0.2
16/10/2014	0.0
17/10/2014	0.0
18/10/2014	0.0
19/10/2014	0.0
20/10/2014	0.0
21/10/2014	0.0
22/10/2014	0.0
23/10/2014	0.4
24/10/2014	0.6
25/10/2014	0.0
26/10/2014	0.0
27/10/2014	0.0
28/10/2014	0.0
29/10/2014	0.0
30/10/2014	0.0
31/10/2014	0.0
1/11/2014	0.0
2/11/2014	No data
3/11/2014	No data
4/11/2014	No data
5/11/2014	No data
6/11/2014	No data
7/11/2014	No data
8/11/2014	No data
9/11/2014	No data
10/11/2014	No data
11/11/2014	No data
12/11/2014	No data
13/11/2014	No data
14/11/2014	No data
15/11/2014	No data
16/11/2014	No data
17/11/2014	No data
18/11/2014	No data
19/11/2014	No data
20/11/2014	No data

Date	Rainfall (mm)
21/11/2014	No data
22/11/2014	No data
23/11/2014	No data
24/11/2014	No data
25/11/2014	No data
26/11/2014	No data
27/11/2014	No data
28/11/2014	No data
29/11/2014	No data
30/11/2014	No data
1/12/2014	No data
2/12/2014	No data
3/12/2014	9.2
4/12/2014	25.6
5/12/2014	4.6
6/12/2014	9.0
7/12/2014	0.0
8/12/2014	4.8
9/12/2014	0.0
10/12/2014	8.0
11/12/2014	1.4
12/12/2014	0.0
13/12/2014	0.0
14/12/2014	0.0
15/12/2014	0.0
16/12/2014	0.2
17/12/2014	0.0
18/12/2014	1.6
19/12/2014	0.0
20/12/2014	0.0
21/12/2014	0.0
22/12/2014	0.0
23/12/2014	3.4
24/12/2014	1.0
25/12/2014	8.0
26/12/2014	0.4
27/12/2014	0.0
28/12/2014	0.0
29/12/2014	0.0
30/12/2014	0.0
31/12/2014	0.0
1/01/2015	0.0
2/01/2015	0.0
3/01/2015	0.0
4/01/2015	1.8
5/01/2015	0.0
6/01/2015	0.0
7/01/2015	0.0
8/01/2015	0.0

Date	Rainfall (mm)
9/01/2015	0.0
10/01/2015	5.8
11/01/2015	10.6
12/01/2015	3.6
13/01/2015	0.2
14/01/2015	8.2
15/01/2015	0.0
16/01/2015	0.0
17/01/2015	0.0
18/01/2015	0.0
19/01/2015	4.4
20/01/2015	9.6
21/01/2015	0.0
22/01/2015	0.0
23/01/2015	0.0
24/01/2015	36.0
25/01/2015	0.2
26/01/2015	0.0
27/01/2015	39.8
28/01/2015	0.0
29/01/2015	0.0
30/01/2015	1.6
31/01/2015	0.0
1/02/2015	0.0
2/02/2015	0.0
3/02/2015	0.0
4/02/2015	0.0
5/02/2015	0.0
6/02/2015	0.0
7/02/2015	0.0
8/02/2015	0.0
9/02/2015	0.0
10/02/2015	0.4
11/02/2015	0.0
12/02/2015	0.0
13/02/2015	0.0
14/02/2015	2.6
15/02/2015	3.4
16/02/2015	0.0
17/02/2015	0.0
18/02/2015	0.0
19/02/2015	0.0
20/02/2015	0.0
21/02/2015	0.0
22/02/2015	0.0
23/02/2015	0.0
24/02/2015	0.0
25/02/2015	0.0
26/02/2015	2.8

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
27/02/2015	1.4
28/02/2015	0.0
1/03/2015	0.0
2/03/2015	0.0
3/03/2015	0.0
4/03/2015	0.0
5/03/2015	0.0
6/03/2015	0.0
7/03/2015	0.0
8/03/2015	0.0
9/03/2015	0.0
10/03/2015	0.0
11/03/2015	0.0
12/03/2015	0.6
13/03/2015	0.0
14/03/2015	0.0
15/03/2015	0.0
16/03/2015	0.0
17/03/2015	0.0
18/03/2015	0.0
19/03/2015	0.0
20/03/2015	0.0
21/03/2015	0.0
22/03/2015	0.0
23/03/2015	0.0
24/03/2015	0.0
25/03/2015	0.0
26/03/2015	0.0
27/03/2015	0.0
28/03/2015	0.0
29/03/2015	0.0
30/03/2015	0.0
31/03/2015	0.0
1/04/2015	0.0
2/04/2015	0.0
3/04/2015	0.0
4/04/2015	0.0
5/04/2015	0.0
6/04/2015	0.2
7/04/2015	0.0
8/04/2015	0.0
9/04/2015	0.2
10/04/2015	0.0
11/04/2015	0.0
12/04/2015	0.0
13/04/2015	0.0
14/04/2015	0.0
15/04/2015	0.0
16/04/2015	0.0

Date	Rainfall (mm)
17/04/2015	0.0
18/04/2015	0.0
19/04/2015	0.0
20/04/2015	0.0
21/04/2015	0.2
22/04/2015	0.0
23/04/2015	0.0
24/04/2015	0.2
25/04/2015	0.0
26/04/2015	0.0
27/04/2015	0.0
28/04/2015	0.0
29/04/2015	0.0
30/04/2015	0.0
1/05/2015	0.0
2/05/2015	0.0
3/05/2015	0.2
4/05/2015	0.0
5/05/2015	0.0
6/05/2015	0.0
7/05/2015	18.0
8/05/2015	0.0
9/05/2015	0.0
10/05/2015	0.0
11/05/2015	0.0
12/05/2015	0.0
13/05/2015	0.0
14/05/2015	0.0
15/05/2015	0.0
16/05/2015	0.0
17/05/2015	0.0
18/05/2015	0.0
19/05/2015	1.0
20/05/2015	13.6
21/05/2015	23.6
22/05/2015	7.8
23/05/2015	0.0
24/05/2015	0.0
25/05/2015	0.0
26/05/2015	0.0
27/05/2015	0.0
28/05/2015	0.0
29/05/2015	1.2
30/05/2015	0.0
31/05/2015	4.2
1/06/2015	0.0
2/06/2015	0.0
3/06/2015	0.0
4/06/2015	0.0

Date	Rainfall (mm)
5/06/2015	0.6
6/06/2015	0.0
7/06/2015	0.2
8/06/2015	0.2
9/06/2015	0.0
10/06/2015	0.0
11/06/2015	0.0
12/06/2015	0.0
13/06/2015	0.0
14/06/2015	0.0
15/06/2015	0.0
16/06/2015	22.2
17/06/2015	12.8
18/06/2015	0.0
19/06/2015	5.2
20/06/2015	0.4
21/06/2015	0.0
22/06/2015	0.2
23/06/2015	0.0
24/06/2015	0.6
25/06/2015	0.2
26/06/2015	0.0
27/06/2015	0.2
28/06/2015	0.2
29/06/2015	0.2
30/06/2015	0.2
1/07/2015	0.6
2/07/2015	0.2
3/07/2015	0.0
4/07/2015	0.0
5/07/2015	0.0
6/07/2015	0.0
7/07/2015	0.0
8/07/2015	0.0
9/07/2015	0.2
10/07/2015	5.2
11/07/2015	5.4
12/07/2015	3.2
13/07/2015	0.4
14/07/2015	0.0
15/07/2015	0.0
16/07/2015	8.8
17/07/2015	4.0
18/07/2015	0.0
19/07/2015	0.2
20/07/2015	0.0
21/07/2015	0.0
22/07/2015	0.2
23/07/2015	5.4

Date	Rainfall (mm)
24/07/2015	0.6
25/07/2015	0.0
26/07/2015	0.0
27/07/2015	0.0
28/07/2015	0.0
29/07/2015	0.0
30/07/2015	0.0
31/07/2015	0.0
1/08/2015	0.0
2/08/2015	0.0
3/08/2015	0.0
4/08/2015	0.0
5/08/2015	0.2
6/08/2015	0.0
7/08/2015	0.0
8/08/2015	0.0
9/08/2015	0.0
10/08/2015	0.0
11/08/2015	0.0
12/08/2015	0.2
13/08/2015	0.0
14/08/2015	0.0
15/08/2015	0.0
16/08/2015	0.0
17/08/2015	0.0
18/08/2015	0.0
19/08/2015	0.0
20/08/2015	0.0
21/08/2015	0.0
22/08/2015	0.0
23/08/2015	27.8
24/08/2015	15.2
25/08/2015	0.4
26/08/2015	0.0
27/08/2015	1.6
28/08/2015	0.2
29/08/2015	0.2
30/08/2015	0.0
31/08/2015	0.0
1/09/2015	0.0
2/09/2015	1.0
3/09/2015	2.0
4/09/2015	0.2
5/09/2015	0.0
6/09/2015	0.0
7/09/2015	0.2
8/09/2015	0.0
9/09/2015	0.0
10/09/2015	0.0

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
11/09/2015	0.0
12/09/2015	0.0
13/09/2015	0.0
14/09/2015	0.0
15/09/2015	0.0
16/09/2015	0.0
17/09/2015	0.0
18/09/2015	0.0
19/09/2015	0.0
20/09/2015	0.0
21/09/2015	0.0
22/09/2015	0.0
23/09/2015	0.0
24/09/2015	0.0
25/09/2015	0.0
26/09/2015	0.0
27/09/2015	0.0
28/09/2015	0.0
29/09/2015	0.0
30/09/2015	0.0
1/10/2015	0.0
2/10/2015	0.0
3/10/2015	0.0
4/10/2015	0.0
5/10/2015	0.0
6/10/2015	0.0
7/10/2015	0.0
8/10/2015	0.0
9/10/2015	0.0
10/10/2015	1.6
11/10/2015	0.6
12/10/2015	1.2
13/10/2015	1.4
14/10/2015	0.0
15/10/2015	0.0
16/10/2015	0.0
17/10/2015	0.0
18/10/2015	0.0
19/10/2015	0.0
20/10/2015	0.0
21/10/2015	0.6
22/10/2015	9.0
23/10/2015	0.0
24/10/2015	0.0
25/10/2015	0.6
26/10/2015	11.0
27/10/2015	0.8
28/10/2015	0.0
29/10/2015	0.0

Date	Rainfall (mm)
30/10/2015	0.0
31/10/2015	17.6
1/11/2015	0.6
2/11/2015	2.8
3/11/2015	5.4
4/11/2015	2.4
5/11/2015	22.8
6/11/2015	1.4
7/11/2015	0
8/11/2015	0
9/11/2015	0
10/11/2015	0
11/11/2015	0
12/11/2015	14.6
13/11/2015	7.2
14/11/2015	0
15/11/2015	0
16/11/2015	0
17/11/2015	0
18/11/2015	0
19/11/2015	0
20/11/2015	0
21/11/2015	0
22/11/2015	0
23/11/2015	0
24/11/2015	0
25/11/2015	0
26/11/2015	0
27/11/2015	0
28/11/2015	0
29/11/2015	0
30/11/2015	0
1/12/2015	0
2/12/2015	0
3/12/2015	0
4/12/2015	0
5/12/2015	0
6/12/2015	0
7/12/2015	0
8/12/2015	0.6
9/12/2015	1.4
10/12/2015	2.4
11/12/2015	0
12/12/2015	0
13/12/2015	0
14/12/2015	0
15/12/2015	0
16/12/2015	12.4
17/12/2015	0

Date	Rainfall (mm)
18/12/2015	0
19/12/2015	0
20/12/2015	0
21/12/2015	51.2
22/12/2015	75.0
23/12/2015	1.4
24/12/2015	0.0
25/12/2015	0.0
26/12/2015	8.0
27/12/2015	0.0
28/12/2015	0.0
29/12/2015	0.0
30/12/2015	0.0
31/12/2015	0.0
1/01/2016	0.0
2/01/2016	0.0
3/01/2016	11.0
4/01/2016	1.4
5/01/2016	52.4
6/01/2016	0.4
7/01/2016	0.0
8/01/2016	0.0
9/01/2016	0.0
10/01/2016	0.0
11/01/2016	0.0
12/01/2016	0.0
13/01/2016	0.0
14/01/2016	11.4
15/01/2016	49.6
16/01/2016	0.0
17/01/2016	0.0
18/01/2016	0.0
19/01/2016	0.0
20/01/2016	0.0
21/01/2016	3.8
22/01/2016	50.4
23/01/2016	0.2
24/01/2016	0.0
25/01/2016	1.4
26/01/2016	0.0
27/01/2016	1.8
28/01/2016	1.4
29/01/2016	4.2
30/01/2016	0.0
31/01/2016	0.0
1/02/2016	0.0
2/02/2016	0.0
3/02/2016	13.2
4/02/2016	0.0

Date	Rainfall (mm)
5/02/2016	0.0
6/02/2016	0.0
7/02/2016	0.0
8/02/2016	0.0
9/02/2016	0.0
10/02/2016	0.0
11/02/2016	16.2
12/02/2016	0.0
13/02/2016	0.0
14/02/2016	0.0
15/02/2016	0.4
16/02/2016	0.0
17/02/2016	0.0
18/02/2016	0.0
19/02/2016	0.0
20/02/2016	0.0
21/02/2016	0.0
22/02/2016	0.0
23/02/2016	0.0
24/02/2016	0.0
25/02/2016	0.0
26/02/2016	0.0
27/02/2016	0.0
28/02/2016	0.0
29/02/2016	0.0
1/03/2016	0.0
2/03/2016	0.0
3/03/2016	0.0
4/03/2016	0.0
5/03/2016	0.0
6/03/2016	0.0
7/03/2016	0.0
8/03/2016	0.0
9/03/2016	0.0
10/03/2016	0.0
11/03/2016	14.6
12/03/2016	4.2
13/03/2016	0.2
14/03/2016	0.0
15/03/2016	0.0
16/03/2016	0.0
17/03/2016	0.0
18/03/2016	8.2
19/03/2016	0.0
20/03/2016	0.0
21/03/2016	0.0
22/03/2016	0.0
23/03/2016	0.0
24/03/2016	0.0

Note: Data logged by automated Bylong weather station.
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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
25/03/2016	0.2
26/03/2016	0.0
27/03/2016	0.0
28/03/2016	0.0
29/03/2016	0.0
30/03/2016	0.0
31/03/2016	0.0
1/04/2016	0.0
2/04/2016	0.0
3/04/2016	0.0
4/04/2016	0.0
5/04/2016	0.0
6/04/2016	0.0
7/04/2016	0.0
8/04/2016	0.0
9/04/2016	0.2
10/04/2016	0.0
11/04/2016	0.0
12/04/2016	0.0
13/04/2016	0.0
14/04/2016	0.0
15/04/2016	0.0
16/04/2016	0.0
17/04/2016	0.0
18/04/2016	0.0
19/04/2016	0.0
20/04/2016	0.0
21/04/2016	0.0
22/04/2016	2.8
23/04/2016	0.2
24/04/2016	0.0
25/04/2016	0.0
26/04/2016	0.0
27/04/2016	0.0
28/04/2016	0.0
29/04/2016	0.0
30/04/2016	12.4
1/05/2016	18.2
2/05/2016	16.0
3/05/2016	2.2
4/05/2016	0.0
5/05/2016	0.0
6/05/2016	0.0
7/05/2016	0.0
8/05/2016	0.0
9/05/2016	14.6
10/05/2016	0.0
11/05/2016	0.0
12/05/2016	0.0

Date	Rainfall (mm)
13/05/2016	0.0
14/05/2016	0.0
15/05/2016	0.0
16/05/2016	0.0
17/05/2016	0.0
18/05/2016	0.0
19/05/2016	0.0
20/05/2016	0.0
21/05/2016	0.0
22/05/2016	0.0
23/05/2016	0.0
24/05/2016	0.0
25/05/2016	0.0
26/05/2016	8.0
27/05/2016	0.0
28/05/2016	3.2
29/05/2016	0.0
30/05/2016	0.0
31/05/2016	0.0
1/06/2016	0.0
2/06/2016	0.0
3/06/2016	0.6
4/06/2016	29.4
5/06/2016	2.2
6/06/2016	0.0
7/06/2016	0.4
8/06/2016	0.0
9/06/2016	7.2
10/06/2016	0.2
11/06/2016	0.0
12/06/2016	0.0
13/06/2016	0.0
14/06/2016	0.0
15/06/2016	0.2
16/06/2016	0.2
17/06/2016	2.8
18/06/2016	3.2
19/06/2016	27.4
20/06/2016	4.4
21/06/2016	0.4
22/06/2016	7.6
23/06/2016	1.4
24/06/2016	3.4
25/06/2016	0.0
26/06/2016	0.0
27/06/2016	0.8
28/06/2016	0.0
29/06/2016	0.0
30/06/2016	0.2

Date	Rainfall (mm)
1/07/2016	0.0
2/07/2016	0.0
3/07/2016	0.0
4/07/2016	0.2
5/07/2016	19.2
6/07/2016	0.4
7/07/2016	0.0
8/07/2016	7.0
9/07/2016	0.2
10/07/2016	0.2
11/07/2016	4.2
12/07/2016	0.0
13/07/2016	0.0
14/07/2016	0.0
15/07/2016	0.0
16/07/2016	0.0
17/07/2016	0.0
18/07/2016	0.0
19/07/2016	5.8
20/07/2016	32.0
21/07/2016	0.4
22/07/2016	0.6
23/07/2016	0.8
24/07/2016	0.0
25/07/2016	0.2
26/07/2016	0.0
27/07/2016	0.8
28/07/2016	0.0
29/07/2016	0.0
30/07/2016	0.0
31/07/2016	0.2
1/08/2016	0.0
2/08/2016	5.6
3/08/2016	2.4
4/08/2016	0.0
5/08/2016	0.0
6/08/2016	0.0
7/08/2016	0.0
8/08/2016	0.0
9/08/2016	0.0
10/08/2016	2.6
11/08/2016	0.2
12/08/2016	0.0
13/08/2016	0.0
14/08/2016	0.0
15/08/2016	0.0
16/08/2016	0.0
17/08/2016	0.0
18/08/2016	0.0

Date	Rainfall (mm)
19/08/2016	0.0
20/08/2016	1.6
21/08/2016	0.0
22/08/2016	9.0
23/08/2016	0.2
24/08/2016	4.2
25/08/2016	0.2
26/08/2016	0.0
27/08/2016	0.0
28/08/2016	0.0
29/08/2016	0.0
30/08/2016	0.0
31/08/2016	8.2
1/09/2016	10.2
2/09/2016	37.2
3/09/2016	5.4
4/09/2016	0.0
5/09/2016	0.2
6/09/2016	0.0
7/09/2016	0.0
8/09/2016	0.0
9/09/2016	4.2
10/09/2016	5.4
11/09/2016	0.0
12/09/2016	0.2
13/09/2016	3.8
14/09/2016	15.4
15/09/2016	0.0
16/09/2016	0.0
17/09/2016	0.2
18/09/2016	34.4
19/09/2016	0.0
20/09/2016	0.0
21/09/2016	11.8
22/09/2016	0.2
23/09/2016	0.0
24/09/2016	0.0
25/09/2016	11.2
26/09/2016	0.0
27/09/2016	0.0
28/09/2016	0.0
29/09/2016	16.8
30/09/2016	3.0
1/10/2016	0.4
2/10/2016	0.0
3/10/2016	1.4
4/10/2016	0.2
5/10/2016	0.0
6/10/2016	0.0

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
7/10/2016	0.0
8/10/2016	0.0
9/10/2016	0.0
10/10/2016	0.0
11/10/2016	0.6
12/10/2016	0.0
13/10/2016	0.0
14/10/2016	0.0
15/10/2016	0.0
16/10/2016	0.0
17/10/2016	10.6
18/10/2016	0.0
19/10/2016	0.0
20/10/2016	0.0
21/10/2016	5.6
22/10/2016	28.0
23/10/2016	0.0
24/10/2016	0.0
25/10/2016	0.0
26/10/2016	0.0
27/10/2016	0.0
28/10/2016	0.0
29/10/2016	0.0
30/10/2016	6.2
31/10/2016	0.2
1/11/2016	0.0
2/11/2016	0.0
3/11/2016	0.0
4/11/2016	0.0
5/11/2016	0.0
6/11/2016	0.0
7/11/2016	0.0
8/11/2016	0.2
9/11/2016	2.6
10/11/2016	0.2
11/11/2016	0.0
12/11/2016	37.0
13/11/2016	0.0
14/11/2016	0.0
15/11/2016	0.0
16/11/2016	0.0
17/11/2016	0.0
18/11/2016	0.0
19/11/2016	0.0
20/11/2016	0.0
21/11/2016	0.0
22/11/2016	0.0
23/11/2016	0.0
24/11/2016	0.0
25/11/2016	0.0

Date	Rainfall (mm)
26/11/2016	0.0
27/11/2016	0.0
28/11/2016	0.0
29/11/2016	2.4
30/11/2016	4.8
1/12/2016	0.2
2/12/2016	0.0
3/12/2016	0.0
4/12/2016	0.0
5/12/2016	0.0
6/12/2016	1.0
7/12/2016	0.6
8/12/2016	0.0
9/12/2016	0.0
10/12/2016	0.0
11/12/2016	0.0
12/12/2016	0.0
13/12/2016	0.0
14/12/2016	0.0
15/12/2016	5.4
16/12/2016	16.0
17/12/2016	0.0
18/12/2016	0.0
19/12/2016	0.0
20/12/2016	0.0
21/12/2016	0.0
22/12/2016	0.0
23/12/2016	0.0
24/12/2016	8.0
25/12/2016	0.2
26/12/2016	0.0
27/12/2016	0.0
28/12/2016	0.0
29/12/2016	0.0
30/12/2016	0.0
31/12/2016	0.0
1/01/2017	0.2
2/01/2017	0.0
3/01/2017	0.0
4/01/2017	0.0
5/01/2017	0.0
6/01/2017	0.0
7/01/2017	0.0
8/01/2017	0.0
9/01/2017	0.0
10/01/2017	0.0
11/01/2017	0.0
12/01/2017	0.0
13/01/2017	0.0
14/01/2017	0.0

Date	Rainfall (mm)
15/01/2017	0.0
16/01/2017	0.0
17/01/2017	1.8
18/01/2017	0.0
19/01/2017	0.0
20/01/2017	19.2
21/01/2017	0.0
22/01/2017	0.0
23/01/2017	0.0
24/01/2017	0.0
25/01/2017	0.4
26/01/2017	0.0
27/01/2017	0.0
28/01/2017	0.0
29/01/2017	0.0
30/01/2017	0.0
31/01/2017	0.0
1/02/2017	1.0
2/02/2017	0.2
3/02/2017	0.0
4/02/2017	12.0
5/02/2017	0.0
6/02/2017	0.0
7/02/2017	0.0
8/02/2017	0.0
9/02/2017	0.0
10/02/2017	0.0
11/02/2017	0.0
12/02/2017	0.0
13/02/2017	0.0
14/02/2017	0.0
15/02/2017	0.0
16/02/2017	0.0
17/02/2017	5.6
18/02/2017	0.2
19/02/2017	0.0
20/02/2017	0.0
21/02/2017	0.0
22/02/2017	0.0
23/02/2017	0.0
24/02/2017	1.4
25/02/2017	0.0
26/02/2017	0.0
27/02/2017	0.0
28/02/2017	1.0
1/03/2017	0.4
2/03/2017	2.8
3/03/2017	0.0
4/03/2017	13.2
5/03/2017	15.2

Date	Rainfall (mm)
6/03/2017	0.0
7/03/2017	0.0
8/03/2017	0.0
9/03/2017	0.0
10/03/2017	0.0
11/03/2017	0.0
12/03/2017	0.0
13/03/2017	8.2
14/03/2017	0.2
15/03/2017	0.4
16/03/2017	0.0
17/03/2017	0.0
18/03/2017	0.0
19/03/2017	0.0
20/03/2017	0.0
21/03/2017	0.0
22/03/2017	0.2
23/03/2017	0.2
24/03/2017	0.2
25/03/2017	0.2
26/03/2017	0.4
27/03/2017	0.2
28/03/2017	0.2
29/03/2017	0.0
30/03/2017	0.2
31/03/2017	0.2
1/04/2017	0.2
2/04/2017	0.2
3/04/2017	0.0
4/04/2017	0.2
5/04/2017	0.0
6/04/2017	0.2
7/04/2017	0.0
8/04/2017	0.2
9/04/2017	0.0
10/04/2017	0.0
11/04/2017	0.0
12/04/2017	0.2
13/04/2017	0.0
14/04/2017	0.0
15/04/2017	0.0
16/04/2017	0.0
17/04/2017	0.0
18/04/2017	0.0
19/04/2017	0.0
20/04/2017	0.0
21/04/2017	0.0
22/04/2017	0.2
23/04/2017	0.0
24/04/2017	0.0

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DAILY RAINFALL - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	Rainfall (mm)
25/04/2017	0.0
26/04/2017	0.0
27/04/2017	0.0
28/04/2017	0.0
29/04/2017	0.0
30/04/2017	0.0
1/05/2017	0.0
2/05/2017	0.0
3/05/2017	0.0
4/05/2017	0.0
5/05/2017	0.0
6/05/2017	0.0
7/05/2017	0.0
8/05/2017	2.0
9/05/2017	0.2
10/05/2017	0.0
11/05/2017	0.0
12/05/2017	0.0
13/05/2017	0.0
14/05/2017	0.0
15/05/2017	0.0
16/05/2017	0.0
17/05/2017	0.0
18/05/2017	0.0
19/05/2017	0.0
20/05/2017	19.6
21/05/2017	0.4
22/05/2017	0.0
23/05/2017	0.0
24/05/2017	0.0
25/05/2017	0.0
26/05/2017	0.0
27/05/2017	0.0
28/05/2017	1.2
29/05/2017	0.0
30/05/2017	0.0
31/05/2017	0.0
1/06/2017	0.0
2/06/2017	0.0
3/06/2017	0.0
4/06/2017	0.0
5/06/2017	0.0
6/06/2017	0.0
7/06/2017	0.0
8/06/2017	0.2
9/06/2017	0.0
10/06/2017	0.0
11/06/2017	3.6
12/06/2017	0.2
13/06/2017	0.0

Date	Rainfall (mm)
14/06/2017	0.0
15/06/2017	0.2
16/06/2017	0.0
17/06/2017	0.0
18/06/2017	0.2
19/06/2017	0.0
20/06/2017	0.0
21/06/2017	0.0
22/06/2017	0.2
23/06/2017	0.0
24/06/2017	0.0
25/06/2017	0.4
26/06/2017	0.0
27/06/2017	0.0
28/06/2017	3.6
29/06/2017	2.6
30/06/2017	0.2

Note: Data logged by automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
9/12/2011	-3.1
10/12/2011	-4.3
11/12/2011	-5.7
12/12/2011	10.3
13/12/2011	9.0
14/12/2011	7.6
15/12/2011	6.2
16/12/2011	4.8
17/12/2011	3.4
18/12/2011	2.1
19/12/2011	0.7
20/12/2011	9.1
21/12/2011	7.7
22/12/2011	6.3
23/12/2011	7.0
24/12/2011	14.2
25/12/2011	12.8
26/12/2011	11.4
27/12/2011	14.9
28/12/2011	13.5
29/12/2011	12.1
30/12/2011	10.7
31/12/2011	9.3
1/01/2012	8.0
2/01/2012	6.6
3/01/2012	5.2
4/01/2012	3.8
5/01/2012	2.4
6/01/2012	8.1
7/01/2012	6.7
8/01/2012	5.3
9/01/2012	14.7
10/01/2012	13.4
11/01/2012	12.0
12/01/2012	10.6
13/01/2012	9.2
14/01/2012	7.8
15/01/2012	6.5
16/01/2012	20.9
17/01/2012	19.5
18/01/2012	18.1
19/01/2012	16.8
20/01/2012	15.4
21/01/2012	18.2
22/01/2012	18.0
23/01/2012	16.6
24/01/2012	15.3
25/01/2012	23.9
26/01/2012	34.1

Date	CRD (mm)
27/01/2012	33.5
28/01/2012	32.1
29/01/2012	30.8
30/01/2012	34.0
31/01/2012	42.0
1/02/2012	46.4
2/02/2012	51.1
3/02/2012	65.7
4/02/2012	79.3
5/02/2012	77.9
6/02/2012	76.5
7/02/2012	75.2
8/02/2012	73.8
9/02/2012	72.4
10/02/2012	73.2
11/02/2012	82.2
12/02/2012	80.9
13/02/2012	79.5
14/02/2012	79.3
15/02/2012	77.9
16/02/2012	76.6
17/02/2012	75.2
18/02/2012	84.4
19/02/2012	83.4
20/02/2012	116.4
21/02/2012	116.5
22/02/2012	116.1
23/02/2012	114.7
24/02/2012	113.3
25/02/2012	112.0
26/02/2012	110.6
27/02/2012	136.8
28/02/2012	135.4
29/02/2012	134.0
1/03/2012	136.9
2/03/2012	211.1
3/03/2012	245.1
4/03/2012	243.9
5/03/2012	247.5
6/03/2012	246.2
7/03/2012	246.4
8/03/2012	245.0
9/03/2012	243.6
10/03/2012	242.3
11/03/2012	240.9
12/03/2012	239.5
13/03/2012	238.1
14/03/2012	236.7
15/03/2012	235.8

Date	CRD (mm)
16/03/2012	234.4
17/03/2012	233.2
18/03/2012	231.8
19/03/2012	233.4
20/03/2012	253.5
21/03/2012	256.1
22/03/2012	267.5
23/03/2012	278.9
24/03/2012	277.6
25/03/2012	276.2
26/03/2012	274.8
27/03/2012	273.4
28/03/2012	272.0
29/03/2012	270.7
30/03/2012	269.3
31/03/2012	267.9
1/04/2012	266.5
2/04/2012	265.3
3/04/2012	264.0
4/04/2012	262.6
5/04/2012	261.2
6/04/2012	260.0
7/04/2012	258.7
8/04/2012	257.3
9/04/2012	255.9
10/04/2012	258.3
11/04/2012	256.9
12/04/2012	255.6
13/04/2012	254.2
14/04/2012	252.8
15/04/2012	251.6
16/04/2012	263.1
17/04/2012	261.7
18/04/2012	260.3
19/04/2012	258.9
20/04/2012	257.5
21/04/2012	256.2
22/04/2012	255.0
23/04/2012	253.6
24/04/2012	252.6
25/04/2012	253.0
26/04/2012	251.9
27/04/2012	250.5
28/04/2012	249.1
29/04/2012	247.7
30/04/2012	246.4
1/05/2012	245.0
2/05/2012	243.6
3/05/2012	242.6

Date	CRD (mm)
4/05/2012	241.6
5/05/2012	241.9
6/05/2012	252.1
7/05/2012	253.7
8/05/2012	252.3
9/05/2012	250.9
10/05/2012	249.6
11/05/2012	248.2
12/05/2012	246.8
13/05/2012	245.4
14/05/2012	249.9
15/05/2012	266.7
16/05/2012	274.1
17/05/2012	272.7
18/05/2012	271.3
19/05/2012	270.0
20/05/2012	268.6
21/05/2012	267.2
22/05/2012	265.8
23/05/2012	264.5
24/05/2012	263.1
25/05/2012	261.7
26/05/2012	260.3
27/05/2012	258.9
28/05/2012	257.6
29/05/2012	256.2
30/05/2012	254.8
31/05/2012	253.4
1/06/2012	252.0
2/06/2012	250.7
3/06/2012	249.3
4/06/2012	248.1
5/06/2012	246.9
6/06/2012	245.6
7/06/2012	244.2
8/06/2012	244.6
9/06/2012	250.8
10/06/2012	249.4
11/06/2012	248.1
12/06/2012	246.7
13/06/2012	245.3
14/06/2012	243.9
15/06/2012	242.5
16/06/2012	241.2
17/06/2012	239.8
18/06/2012	238.4
19/06/2012	237.0
20/06/2012	235.7
21/06/2012	234.3

Note: CRD data calculated using data from automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

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Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
22/06/2012	232.9
23/06/2012	231.5
24/06/2012	240.7
25/06/2012	239.4
26/06/2012	238.0
27/06/2012	236.6
28/06/2012	235.2
29/06/2012	233.9
30/06/2012	232.7
1/07/2012	231.9
2/07/2012	230.7
3/07/2012	229.3
4/07/2012	228.0
5/07/2012	226.6
6/07/2012	225.2
7/07/2012	223.8
8/07/2012	222.4
9/07/2012	221.1
10/07/2012	219.7
11/07/2012	218.3
12/07/2012	216.9
13/07/2012	215.6
14/07/2012	214.2
15/07/2012	212.8
16/07/2012	227.6
17/07/2012	228.4
18/07/2012	227.1
19/07/2012	225.7
20/07/2012	224.3
21/07/2012	222.9
22/07/2012	221.5
23/07/2012	220.2
24/07/2012	218.8
25/07/2012	217.4
26/07/2012	216.2
27/07/2012	215.1
28/07/2012	213.7
29/07/2012	212.3
30/07/2012	210.9
31/07/2012	209.5
1/08/2012	208.2
2/08/2012	206.8
3/08/2012	205.4
4/08/2012	204.0
5/08/2012	202.7
6/08/2012	201.3
7/08/2012	199.9
8/08/2012	198.5
9/08/2012	197.3

Date	CRD (mm)
10/08/2012	196.0
11/08/2012	194.6
12/08/2012	193.2
13/08/2012	191.8
14/08/2012	190.4
15/08/2012	189.1
16/08/2012	187.7
17/08/2012	186.3
18/08/2012	184.9
19/08/2012	183.6
20/08/2012	182.2
21/08/2012	180.8
22/08/2012	179.4
23/08/2012	189.8
24/08/2012	188.5
25/08/2012	187.1
26/08/2012	185.7
27/08/2012	184.3
28/08/2012	182.9
29/08/2012	181.6
30/08/2012	180.2
31/08/2012	179.0
1/09/2012	177.6
2/09/2012	176.3
3/09/2012	174.9
4/09/2012	173.5
5/09/2012	172.1
6/09/2012	170.7
7/09/2012	169.4
8/09/2012	168.0
9/09/2012	166.6
10/09/2012	165.2
11/09/2012	163.8
12/09/2012	162.5
13/09/2012	161.1
14/09/2012	159.7
15/09/2012	158.3
16/09/2012	157.2
17/09/2012	156.2
18/09/2012	164.8
19/09/2012	164.2
20/09/2012	162.8
21/09/2012	161.5
22/09/2012	160.1
23/09/2012	158.7
24/09/2012	157.3
25/09/2012	156.0
26/09/2012	154.6
27/09/2012	153.2

Date	CRD (mm)
28/09/2012	152.6
29/09/2012	165.6
30/09/2012	164.3
1/10/2012	162.9
2/10/2012	161.5
3/10/2012	160.1
4/10/2012	158.7
5/10/2012	157.4
6/10/2012	156.0
7/10/2012	154.6
8/10/2012	153.2
9/10/2012	151.9
10/10/2012	150.5
11/10/2012	152.1
12/10/2012	153.1
13/10/2012	151.7
14/10/2012	150.4
15/10/2012	149.0
16/10/2012	147.6
17/10/2012	146.2
18/10/2012	144.8
19/10/2012	143.5
20/10/2012	142.1
21/10/2012	140.7
22/10/2012	139.3
23/10/2012	138.0
24/10/2012	136.6
25/10/2012	135.2
26/10/2012	133.8
27/10/2012	132.4
28/10/2012	131.1
29/10/2012	129.7
30/10/2012	131.7
31/10/2012	130.5
1/11/2012	129.2
2/11/2012	127.8
3/11/2012	126.4
4/11/2012	125.0
5/11/2012	123.6
6/11/2012	122.3
7/11/2012	122.9
8/11/2012	137.1
9/11/2012	135.7
10/11/2012	134.3
11/11/2012	133.0
12/11/2012	131.6
13/11/2012	131.2
14/11/2012	129.8
15/11/2012	128.5

Date	CRD (mm)
16/11/2012	127.1
17/11/2012	125.7
18/11/2012	124.3
19/11/2012	122.9
20/11/2012	121.6
21/11/2012	120.2
22/11/2012	118.8
23/11/2012	117.4
24/11/2012	116.0
25/11/2012	114.7
26/11/2012	113.3
27/11/2012	111.9
28/11/2012	110.5
29/11/2012	109.2
30/11/2012	107.8
1/12/2012	106.4
2/12/2012	105.0
3/12/2012	103.6
4/12/2012	102.3
5/12/2012	100.9
6/12/2012	99.5
7/12/2012	98.1
8/12/2012	96.8
9/12/2012	98.8
10/12/2012	97.4
11/12/2012	96.0
12/12/2012	94.6
13/12/2012	93.3
14/12/2012	91.9
15/12/2012	90.5
16/12/2012	89.1
17/12/2012	87.7
18/12/2012	86.4
19/12/2012	85.0
20/12/2012	83.6
21/12/2012	82.2
22/12/2012	80.9
23/12/2012	81.3
24/12/2012	80.9
25/12/2012	110.1
26/12/2012	108.7
27/12/2012	107.4
28/12/2012	106.0
29/12/2012	104.6
30/12/2012	103.2
31/12/2012	101.8
1/01/2013	100.5
2/01/2013	99.1
3/01/2013	97.7

Note: CRD data calculated using data from automated Bylong weather station.
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Date	CRD (mm)
4/01/2013	96.3
5/01/2013	95.0
6/01/2013	93.6
7/01/2013	92.2
8/01/2013	90.8
9/01/2013	89.4
10/01/2013	88.1
11/01/2013	86.7
12/01/2013	85.5
13/01/2013	84.1
14/01/2013	82.8
15/01/2013	81.4
16/01/2013	80.0
17/01/2013	78.6
18/01/2013	77.4
19/01/2013	80.3
20/01/2013	79.7
21/01/2013	78.3
22/01/2013	80.7
23/01/2013	81.1
24/01/2013	79.8
25/01/2013	78.4
26/01/2013	77.0
27/01/2013	75.8
28/01/2013	74.5
29/01/2013	73.5
30/01/2013	72.3
31/01/2013	70.9
1/02/2013	69.5
2/02/2013	68.2
3/02/2013	66.8
4/02/2013	65.4
5/02/2013	64.0
6/02/2013	62.6
7/02/2013	61.3
8/02/2013	59.9
9/02/2013	58.5
10/02/2013	57.1
11/02/2013	55.8
12/02/2013	54.4
13/02/2013	53.0
14/02/2013	51.6
15/02/2013	50.2
16/02/2013	48.9
17/02/2013	47.5
18/02/2013	46.1
19/02/2013	45.1
20/02/2013	43.7
21/02/2013	42.6

Date	CRD (mm)
22/02/2013	41.2
23/02/2013	39.8
24/02/2013	38.4
25/02/2013	37.1
26/02/2013	35.7
27/02/2013	34.3
28/02/2013	32.9
1/03/2013	31.5
2/03/2013	30.2
3/03/2013	28.8
4/03/2013	27.4
5/03/2013	26.0
6/03/2013	24.7
7/03/2013	23.3
8/03/2013	21.9
9/03/2013	20.5
10/03/2013	19.1
11/03/2013	17.8
12/03/2013	16.4
13/03/2013	15.0
14/03/2013	13.6
15/03/2013	12.2
16/03/2013	10.9
17/03/2013	9.5
18/03/2013	8.1
19/03/2013	6.7
20/03/2013	5.4
21/03/2013	4.0
22/03/2013	5.6
23/03/2013	7.2
24/03/2013	6.0
25/03/2013	4.7
26/03/2013	3.3
27/03/2013	1.9
28/03/2013	3.7
29/03/2013	2.3
30/03/2013	1.0
31/03/2013	0.0
1/04/2013	-1.4
2/04/2013	-2.8
3/04/2013	-4.1
4/04/2013	-5.5
5/04/2013	-6.9
6/04/2013	-8.3
7/04/2013	10.9
8/04/2013	9.8
9/04/2013	8.4
10/04/2013	7.0
11/04/2013	5.8

Date	CRD (mm)
12/04/2013	4.5
13/04/2013	3.1
14/04/2013	1.7
15/04/2013	0.3
16/04/2013	4.7
17/04/2013	3.4
18/04/2013	2.2
19/04/2013	0.8
20/04/2013	-0.6
21/04/2013	-1.8
22/04/2013	-3.1
23/04/2013	-4.5
24/04/2013	-5.9
25/04/2013	-7.3
26/04/2013	-8.6
27/04/2013	-10.0
28/04/2013	-11.4
29/04/2013	-12.8
30/04/2013	-14.2
1/05/2013	-15.5
2/05/2013	-16.9
3/05/2013	-18.3
4/05/2013	-19.7
5/05/2013	-21.1
6/05/2013	-22.4
7/05/2013	-23.8
8/05/2013	-25.2
9/05/2013	-26.6
10/05/2013	-27.9
11/05/2013	-29.3
12/05/2013	-30.7
13/05/2013	-27.7
14/05/2013	-29.1
15/05/2013	-30.4
16/05/2013	-31.2
17/05/2013	-32.4
18/05/2013	-33.8
19/05/2013	-35.1
20/05/2013	-36.5
21/05/2013	-37.9
22/05/2013	-29.7
23/05/2013	-30.7
24/05/2013	-32.0
25/05/2013	-33.4
26/05/2013	-34.8
27/05/2013	-36.2
28/05/2013	-37.6
29/05/2013	-38.9
30/05/2013	-40.3

Date	CRD (mm)
31/05/2013	-41.7
1/06/2013	-37.9
2/06/2013	-20.2
3/06/2013	-21.4
4/06/2013	-22.8
5/06/2013	-24.2
6/06/2013	-25.6
7/06/2013	-20.7
8/06/2013	-21.9
9/06/2013	-23.3
10/06/2013	-17.7
11/06/2013	-19.1
12/06/2013	-6.8
13/06/2013	-5.4
14/06/2013	-6.6
15/06/2013	-8.0
16/06/2013	-9.3
17/06/2013	-10.5
18/06/2013	-11.9
19/06/2013	-13.3
20/06/2013	-14.7
21/06/2013	-16.0
22/06/2013	-17.4
23/06/2013	-18.8
24/06/2013	-20.0
25/06/2013	-20.3
26/06/2013	-20.9
27/06/2013	-16.1
28/06/2013	-17.3
29/06/2013	-9.9
30/06/2013	-11.2
1/07/2013	-12.4
2/07/2013	-13.8
3/07/2013	-15.0
4/07/2013	-16.2
5/07/2013	-17.5
6/07/2013	-18.9
7/07/2013	-20.3
8/07/2013	-21.7
9/07/2013	-23.0
10/07/2013	-23.8
11/07/2013	-25.0
12/07/2013	-26.2
13/07/2013	-27.6
14/07/2013	-27.5
15/07/2013	-28.7
16/07/2013	-25.3
17/07/2013	-26.5
18/07/2013	-27.7

Note: CRD data calculated using data from automated Bylong weather station.
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Date	CRD (mm)
19/07/2013	-22.2
20/07/2013	-22.6
21/07/2013	-24.0
22/07/2013	-25.4
23/07/2013	-26.5
24/07/2013	-27.9
25/07/2013	-29.3
26/07/2013	-30.7
27/07/2013	-32.1
28/07/2013	-33.4
29/07/2013	-34.8
30/07/2013	-34.8
31/07/2013	-36.0
1/08/2013	-37.4
2/08/2013	-38.7
3/08/2013	-40.1
4/08/2013	-41.5
5/08/2013	-42.9
6/08/2013	-44.2
7/08/2013	-43.8
8/08/2013	-44.6
9/08/2013	-46.0
10/08/2013	-47.4
11/08/2013	-48.7
12/08/2013	-49.5
13/08/2013	-50.9
14/08/2013	-52.3
15/08/2013	-53.4
16/08/2013	-54.8
17/08/2013	-55.0
18/08/2013	-56.4
19/08/2013	-57.8
20/08/2013	-59.1
21/08/2013	-60.5
22/08/2013	-61.9
23/08/2013	-63.3
24/08/2013	-64.7
25/08/2013	-66.0
26/08/2013	-67.4
27/08/2013	-68.8
28/08/2013	-70.2
29/08/2013	-71.5
30/08/2013	-72.3
31/08/2013	-73.7
1/09/2013	-75.1
2/09/2013	-76.5
3/09/2013	-77.8
4/09/2013	-79.2
5/09/2013	-80.6
6/09/2013	-82.0
7/09/2013	-83.4
8/09/2013	-84.7
9/09/2013	-86.1
10/09/2013	-87.5
11/09/2013	-88.9
12/09/2013	-90.2
13/09/2013	-91.6
14/09/2013	-93.0
15/09/2013	-94.4
16/09/2013	-60.0
17/09/2013	-58.7
18/09/2013	-60.1
19/09/2013	-61.5
20/09/2013	-62.9
21/09/2013	-64.2
22/09/2013	-65.6
23/09/2013	-67.0
24/09/2013	-68.4
25/09/2013	-69.8
26/09/2013	-71.1
27/09/2013	-72.5
28/09/2013	-73.9
29/09/2013	-75.3
30/09/2013	-76.7
1/10/2013	-77.0
2/10/2013	-78.4
3/10/2013	-78.8
4/10/2013	-80.2
5/10/2013	-81.5
6/10/2013	-82.9
7/10/2013	-84.3
8/10/2013	-85.7
9/10/2013	-87.1
10/10/2013	-88.4
11/10/2013	-89.8
12/10/2013	-91.2
13/10/2013	-91.2
14/10/2013	-92.6
15/10/2013	-93.9
16/10/2013	-95.3
17/10/2013	-96.7
18/10/2013	-98.1
19/10/2013	-99.4
20/10/2013	-100.8
21/10/2013	-102.2
22/10/2013	-103.4
23/10/2013	-104.0
24/10/2013	-105.3
25/10/2013	-106.7
26/10/2013	-108.1
27/10/2013	-109.5
28/10/2013	-110.8
29/10/2013	-109.8
30/10/2013	-111.2
31/10/2013	-112.6
1/11/2013	-114.0
2/11/2013	-115.3
3/11/2013	-116.7
4/11/2013	-118.1
5/11/2013	-119.5
6/11/2013	-120.9
7/11/2013	-122.2
8/11/2013	-123.6
9/11/2013	-124.8
10/11/2013	-126.2
11/11/2013	-127.1
12/11/2013	-122.5
13/11/2013	-123.9
14/11/2013	-125.3
15/11/2013	-126.7
16/11/2013	-125.2
17/11/2013	-126.2
18/11/2013	-127.2
19/11/2013	-128.6
20/11/2013	-130.0
21/11/2013	-131.3
22/11/2013	-124.3
23/11/2013	-121.3
24/11/2013	-122.5
25/11/2013	-123.8
26/11/2013	-125.2
27/11/2013	-126.6
28/11/2013	-128.0
29/11/2013	-129.0
30/11/2013	-130.3
1/12/2013	-131.7
2/12/2013	-133.1
3/12/2013	-134.5
4/12/2013	-135.8
5/12/2013	-136.0
6/12/2013	-137.4
7/12/2013	-138.8
8/12/2013	-140.2
9/12/2013	-141.5
10/12/2013	-142.9
11/12/2013	-144.3
12/12/2013	-145.7
13/12/2013	-147.1
14/12/2013	-148.4
15/12/2013	-149.8
16/12/2013	-150.4
17/12/2013	-151.6
18/12/2013	-152.9
19/12/2013	-154.3
20/12/2013	-155.7
21/12/2013	-157.1
22/12/2013	-158.5
23/12/2013	-159.6
24/12/2013	-161.0
25/12/2013	-161.2
26/12/2013	-162.4
27/12/2013	-163.8
28/12/2013	-165.1
29/12/2013	-166.5
30/12/2013	-167.9
31/12/2013	-169.3
1/01/2014	-170.6
2/01/2014	-172.0
3/01/2014	-173.4
4/01/2014	-174.8
5/01/2014	-176.2
6/01/2014	-177.5
7/01/2014	-178.9
8/01/2014	-180.3
9/01/2014	-181.7
10/01/2014	-182.7
11/01/2014	-184.0
12/01/2014	-185.4
13/01/2014	-186.8
14/01/2014	-188.2
15/01/2014	-189.5
16/01/2014	-190.9
17/01/2014	-192.3
18/01/2014	-193.7
19/01/2014	-194.9
20/01/2014	-196.2
21/01/2014	-197.6
22/01/2014	-199.0
23/01/2014	-200.4
24/01/2014	-193.1
25/01/2014	-194.5
26/01/2014	-195.9
27/01/2014	-197.3
28/01/2014	-198.7
29/01/2014	-200.0
30/01/2014	-201.4

Note: CRD data calculated using data from automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
31/01/2014	-202.8
1/02/2014	-204.2
2/02/2014	-205.6
3/02/2014	-206.9
4/02/2014	-208.3
5/02/2014	-209.7
6/02/2014	-211.1
7/02/2014	-212.4
8/02/2014	-213.8
9/02/2014	-215.2
10/02/2014	-216.6
11/02/2014	-217.4
12/02/2014	-218.7
13/02/2014	-218.9
14/02/2014	-216.9
15/02/2014	-214.5
16/02/2014	-196.3
17/02/2014	-197.4
18/02/2014	-198.8
19/02/2014	-163.0
20/02/2014	-164.4
21/02/2014	-165.7
22/02/2014	-167.1
23/02/2014	-168.5
24/02/2014	-169.9
25/02/2014	-171.3
26/02/2014	-172.6
27/02/2014	-174.0
28/02/2014	-134.8
1/03/2014	-131.8
2/03/2014	-133.1
3/03/2014	-134.5
4/03/2014	-135.9
5/03/2014	-137.3
6/03/2014	-138.7
7/03/2014	-136.0
8/03/2014	-137.2
9/03/2014	-138.6
10/03/2014	-140.0
11/03/2014	-141.4
12/03/2014	-142.7
13/03/2014	-144.1
14/03/2014	-143.7
15/03/2014	-145.1
16/03/2014	-145.8
17/03/2014	-147.2
18/03/2014	-148.6
19/03/2014	-150.0
20/03/2014	-151.4

Date	CRD (mm)
21/03/2014	-151.3
22/03/2014	-152.5
23/03/2014	-153.9
24/03/2014	-142.7
25/03/2014	-144.1
26/03/2014	-124.6
27/03/2014	-104.8
28/03/2014	-95.2
29/03/2014	-96.6
30/03/2014	-97.9
31/03/2014	-99.3
1/04/2014	-100.5
2/04/2014	-101.9
3/04/2014	-103.3
4/04/2014	-97.4
5/04/2014	-98.8
6/04/2014	-100.2
7/04/2014	-101.6
8/04/2014	-102.9
9/04/2014	-104.3
10/04/2014	-105.5
11/04/2014	-104.3
12/04/2014	-105.5
13/04/2014	-106.8
14/04/2014	-108.2
15/04/2014	-109.6
16/04/2014	-111.0
17/04/2014	-112.4
18/04/2014	-113.7
19/04/2014	-115.1
20/04/2014	-116.5
21/04/2014	-117.9
22/04/2014	-119.2
23/04/2014	-120.6
24/04/2014	-122.0
25/04/2014	-121.6
26/04/2014	-122.8
27/04/2014	-124.1
28/04/2014	-125.5
29/04/2014	-126.9
30/04/2014	-127.3
1/05/2014	-128.7
2/05/2014	-130.0
3/05/2014	-129.0
4/05/2014	-130.2
5/05/2014	-131.6
6/05/2014	-132.9
7/05/2014	-134.3
8/05/2014	-135.7

Date	CRD (mm)
9/05/2014	-137.1
10/05/2014	-136.9
11/05/2014	-134.6
12/05/2014	-135.8
13/05/2014	-137.0
14/05/2014	-138.2
15/05/2014	-139.5
16/05/2014	-140.7
17/05/2014	-142.1
18/05/2014	-143.5
19/05/2014	-144.9
20/05/2014	-146.2
21/05/2014	-147.6
22/05/2014	-149.0
23/05/2014	-150.4
24/05/2014	-151.6
25/05/2014	-152.9
26/05/2014	-154.3
27/05/2014	-154.3
28/05/2014	-154.3
29/05/2014	-155.4
30/05/2014	-156.8
31/05/2014	-158.2
1/06/2014	-151.0
2/06/2014	-151.6
3/06/2014	-152.5
4/06/2014	-153.9
5/06/2014	-155.3
6/06/2014	-156.7
7/06/2014	-158.1
8/06/2014	-159.2
9/06/2014	-160.6
10/06/2014	-162.0
11/06/2014	-163.2
12/06/2014	-164.5
13/06/2014	-165.5
14/06/2014	-159.5
15/06/2014	-160.9
16/06/2014	-162.3
17/06/2014	-163.6
18/06/2014	-165.0
19/06/2014	-166.4
20/06/2014	-165.4
21/06/2014	-166.6
22/06/2014	-167.9
23/06/2014	-169.3
24/06/2014	-170.7
25/06/2014	-172.1
26/06/2014	-173.4

Date	CRD (mm)
27/06/2014	-174.8
28/06/2014	-175.4
29/06/2014	-176.6
30/06/2014	-178.0
1/07/2014	-179.3
2/07/2014	-180.7
3/07/2014	-181.9
4/07/2014	-183.3
5/07/2014	-184.6
6/07/2014	-186.0
7/07/2014	-187.4
8/07/2014	-188.8
9/07/2014	-190.2
10/07/2014	-191.5
11/07/2014	-192.9
12/07/2014	-194.3
13/07/2014	-195.7
14/07/2014	-197.1
15/07/2014	-196.4
16/07/2014	-190.4
17/07/2014	-191.8
18/07/2014	-193.0
19/07/2014	-194.3
20/07/2014	-195.7
21/07/2014	-197.1
22/07/2014	-198.3
23/07/2014	-199.5
24/07/2014	-200.8
25/07/2014	-199.0
26/07/2014	-187.2
27/07/2014	-188.4
28/07/2014	-189.8
29/07/2014	-190.9
30/07/2014	-157.7
31/07/2014	-159.1
1/08/2014	-159.1
2/08/2014	-159.1
3/08/2014	-159.1
4/08/2014	-159.1
5/08/2014	-159.1
6/08/2014	-159.1
7/08/2014	-160.5
8/08/2014	-161.8
9/08/2014	-163.2
10/08/2014	-164.6
11/08/2014	-166.0
12/08/2014	-167.4
13/08/2014	-168.7
14/08/2014	-170.1

Note: CRD data calculated using data from automated Bylong weather station.
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CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
15/08/2014	-171.5
16/08/2014	-167.9
17/08/2014	-160.4
18/08/2014	-160.4
19/08/2014	-161.4
20/08/2014	-162.8
21/08/2014	-164.2
22/08/2014	-165.5
23/08/2014	-166.9
24/08/2014	-168.3
25/08/2014	-169.5
26/08/2014	-170.3
27/08/2014	-170.4
28/08/2014	-171.8
29/08/2014	-173.2
30/08/2014	-174.2
31/08/2014	-175.3
1/09/2014	-176.5
2/09/2014	-176.3
3/09/2014	-177.7
4/09/2014	-179.1
5/09/2014	-180.4
6/09/2014	-181.6
7/09/2014	-183.0
8/09/2014	-184.4
9/09/2014	-185.8
10/09/2014	-175.5
11/09/2014	-176.9
12/09/2014	-178.3
13/09/2014	-179.7
14/09/2014	-181.0
15/09/2014	-182.4
16/09/2014	-183.8
17/09/2014	-185.2
18/09/2014	-186.6
19/09/2014	-187.9
20/09/2014	-189.3
21/09/2014	-190.7
22/09/2014	-192.1
23/09/2014	-193.4
24/09/2014	-194.8
25/09/2014	-193.4
26/09/2014	-194.8
27/09/2014	-196.2
28/09/2014	-197.5
29/09/2014	-198.9
30/09/2014	-200.3
1/10/2014	-201.7
2/10/2014	-203.1
3/10/2014	-204.4
4/10/2014	-205.8
5/10/2014	-207.2
6/10/2014	-208.6
7/10/2014	-209.9
8/10/2014	-211.3
9/10/2014	-212.7
10/10/2014	-214.1
11/10/2014	-215.5
12/10/2014	-216.8
13/10/2014	-205.6
14/10/2014	-205.8
15/10/2014	-207.0
16/10/2014	-208.4
17/10/2014	-209.7
18/10/2014	-211.1
19/10/2014	-212.5
20/10/2014	-213.9
21/10/2014	-215.2
22/10/2014	-216.6
23/10/2014	-217.6
24/10/2014	-218.4
25/10/2014	-219.8
26/10/2014	-221.1
27/10/2014	-222.5
28/10/2014	-223.9
29/10/2014	-225.3
30/10/2014	-226.6
31/10/2014	-228.0
1/11/2014	-229.4
2/11/2014	-229.4
3/11/2014	-229.4
4/11/2014	-229.4
5/11/2014	-229.4
6/11/2014	-229.4
7/11/2014	-229.4
8/11/2014	-229.4
9/11/2014	-229.4
10/11/2014	-229.4
11/11/2014	-229.4
12/11/2014	-229.4
13/11/2014	-229.4
14/11/2014	-229.4
15/11/2014	-229.4
16/11/2014	-229.4
17/11/2014	-229.4
18/11/2014	-229.4
19/11/2014	-229.4
20/11/2014	-229.4
21/11/2014	-229.4
22/11/2014	-229.4
23/11/2014	-229.4
24/11/2014	-229.4
25/11/2014	-229.4
26/11/2014	-229.4
27/11/2014	-229.4
28/11/2014	-229.4
29/11/2014	-229.4
30/11/2014	-229.4
1/12/2014	-229.4
2/12/2014	-229.4
3/12/2014	-221.6
4/12/2014	-197.4
5/12/2014	-194.1
6/12/2014	-186.5
7/12/2014	-187.9
8/12/2014	-184.5
9/12/2014	-185.9
10/12/2014	-179.2
11/12/2014	-179.2
12/12/2014	-180.6
13/12/2014	-182.0
14/12/2014	-183.3
15/12/2014	-184.7
16/12/2014	-185.9
17/12/2014	-187.3
18/12/2014	-187.1
19/12/2014	-188.4
20/12/2014	-189.8
21/12/2014	-191.2
22/12/2014	-192.6
23/12/2014	-190.6
24/12/2014	-190.9
25/12/2014	-184.3
26/12/2014	-185.3
27/12/2014	-186.7
28/12/2014	-188.0
29/12/2014	-189.4
30/12/2014	-190.8
31/12/2014	-192.2
1/01/2015	-193.6
2/01/2015	-194.9
3/01/2015	-196.3
4/01/2015	-195.9
5/01/2015	-197.3
6/01/2015	-198.7
7/01/2015	-200.0
8/01/2015	-201.4
9/01/2015	-202.8
10/01/2015	-198.4
11/01/2015	-189.1
12/01/2015	-186.9
13/01/2015	-188.1
14/01/2015	-181.3
15/01/2015	-182.7
16/01/2015	-184.0
17/01/2015	-185.4
18/01/2015	-186.8
19/01/2015	-188.2
20/01/2015	-189.5
21/01/2015	-190.9
22/01/2015	-192.3
23/01/2015	-193.7
24/01/2015	-195.1
25/01/2015	-196.4
26/01/2015	-197.8
27/01/2015	-199.2
28/01/2015	-200.6
29/01/2015	-202.0
30/01/2015	-203.3
31/01/2015	-204.7
1/02/2015	-206.1
2/02/2015	-207.5
3/02/2015	-208.8
4/02/2015	-210.2
5/02/2015	-211.6
6/02/2015	-213.0
7/02/2015	-214.4
8/02/2015	-215.7
9/02/2015	-217.1
10/02/2015	-218.1
11/02/2015	-219.5
12/02/2015	-220.9
13/02/2015	-222.2
14/02/2015	-221.0
15/02/2015	-219.0
16/02/2015	-220.4
17/02/2015	-221.7
18/02/2015	-223.1
19/02/2015	-224.5
20/02/2015	-225.9
21/02/2015	-227.3
22/02/2015	-228.6
23/02/2015	-230.0
24/02/2015	-231.4
25/02/2015	-232.8
26/02/2015	-231.3

Note: CRD data calculated using data from automated Bylong weather station.
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CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
27/02/2015	-231.3
28/02/2015	-232.7
1/03/2015	-234.1
2/03/2015	-235.5
3/03/2015	-236.8
4/03/2015	-238.2
5/03/2015	-239.6
6/03/2015	-241.0
7/03/2015	-242.4
8/03/2015	-243.7
9/03/2015	-245.1
10/03/2015	-246.5
11/03/2015	-247.9
12/03/2015	-248.6
13/03/2015	-250.0
14/03/2015	-251.4
15/03/2015	-252.8
16/03/2015	-254.2
17/03/2015	-255.5
18/03/2015	-256.9
19/03/2015	-258.3
20/03/2015	-259.7
21/03/2015	-261.1
22/03/2015	-262.4
23/03/2015	-263.8
24/03/2015	-265.2
25/03/2015	-266.6
26/03/2015	-267.9
27/03/2015	-269.3
28/03/2015	-270.7
29/03/2015	-272.1
30/03/2015	-273.5
31/03/2015	-274.8
1/04/2015	-276.2
2/04/2015	-277.6
3/04/2015	-279.0
4/04/2015	-280.3
5/04/2015	-281.7
6/04/2015	-282.9
7/04/2015	-284.3
8/04/2015	-285.7
9/04/2015	-286.8
10/04/2015	-288.2
11/04/2015	-289.6
12/04/2015	-291.0
13/04/2015	-292.4
14/04/2015	-293.7
15/04/2015	-295.1
16/04/2015	-296.5

Date	CRD (mm)
17/04/2015	-297.9
18/04/2015	-299.2
19/04/2015	-300.6
20/04/2015	-302.0
21/04/2015	-303.2
22/04/2015	-304.6
23/04/2015	-305.9
24/04/2015	-307.1
25/04/2015	-308.5
26/04/2015	-309.9
27/04/2015	-311.3
28/04/2015	-312.6
29/04/2015	-314.0
30/04/2015	-315.4
1/05/2015	-316.8
2/05/2015	-318.1
3/05/2015	-319.3
4/05/2015	-320.7
5/05/2015	-322.1
6/05/2015	-323.5
7/05/2015	-306.8
8/05/2015	-308.2
9/05/2015	-309.6
10/05/2015	-311.0
11/05/2015	-312.3
12/05/2015	-313.7
13/05/2015	-315.1
14/05/2015	-316.5
15/05/2015	-317.9
16/05/2015	-319.2
17/05/2015	-320.6
18/05/2015	-322.0
19/05/2015	-322.4
20/05/2015	-310.2
21/05/2015	-287.9
22/05/2015	-281.5
23/05/2015	-282.9
24/05/2015	-284.3
25/05/2015	-285.6
26/05/2015	-287.0
27/05/2015	-288.4
28/05/2015	-289.8
29/05/2015	-290.0
30/05/2015	-291.3
31/05/2015	-288.5
1/06/2015	-289.9
2/06/2015	-291.3
3/06/2015	-292.7
4/06/2015	-294.0

Date	CRD (mm)
5/06/2015	-294.8
6/06/2015	-296.2
7/06/2015	-297.4
8/06/2015	-298.5
9/06/2015	-299.9
10/06/2015	-301.3
11/06/2015	-302.7
12/06/2015	-304.1
13/06/2015	-305.4
14/06/2015	-306.8
15/06/2015	-308.2
16/06/2015	-287.4
17/06/2015	-276.0
18/06/2015	-277.3
19/06/2015	-273.5
20/06/2015	-274.5
21/06/2015	-275.9
22/06/2015	-277.0
23/06/2015	-278.4
24/06/2015	-279.2
25/06/2015	-280.4
26/06/2015	-281.8
27/06/2015	-282.9
28/06/2015	-284.1
29/06/2015	-285.3
30/06/2015	-286.5
1/07/2015	-287.2
2/07/2015	-288.4
3/07/2015	-289.8
4/07/2015	-291.2
5/07/2015	-292.6
6/07/2015	-293.9
7/07/2015	-295.3
8/07/2015	-296.7
9/07/2015	-297.9
10/07/2015	-294.1
11/07/2015	-290.0
12/07/2015	-288.2
13/07/2015	-289.2
14/07/2015	-290.6
15/07/2015	-291.9
16/07/2015	-284.5
17/07/2015	-281.9
18/07/2015	-283.3
19/07/2015	-284.5
20/07/2015	-285.8
21/07/2015	-287.2
22/07/2015	-288.4
23/07/2015	-284.4

Date	CRD (mm)
24/07/2015	-285.2
25/07/2015	-286.5
26/07/2015	-287.9
27/07/2015	-289.3
28/07/2015	-290.7
29/07/2015	-292.0
30/07/2015	-293.4
31/07/2015	-294.8
1/08/2015	-296.2
2/08/2015	-297.6
3/08/2015	-298.9
4/08/2015	-300.3
5/08/2015	-301.5
6/08/2015	-302.9
7/08/2015	-304.2
8/08/2015	-305.6
9/08/2015	-307.0
10/08/2015	-308.4
11/08/2015	-309.8
12/08/2015	-310.9
13/08/2015	-312.3
14/08/2015	-313.7
15/08/2015	-315.1
16/08/2015	-316.5
17/08/2015	-317.8
18/08/2015	-319.2
19/08/2015	-320.6
20/08/2015	-322.0
21/08/2015	-323.3
22/08/2015	-324.7
23/08/2015	-298.3
24/08/2015	-284.5
25/08/2015	-285.5
26/08/2015	-286.8
27/08/2015	-286.6
28/08/2015	-287.8
29/08/2015	-289.0
30/08/2015	-290.4
31/08/2015	-291.7
1/09/2015	-293.1
2/09/2015	-293.5
3/09/2015	-292.9
4/09/2015	-294.0
5/09/2015	-295.4
6/09/2015	-296.8
7/09/2015	-298.0
8/09/2015	-299.4
9/09/2015	-300.7
10/09/2015	-302.1

Note: CRD data calculated using data from automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
11/09/2015	-303.5
12/09/2015	-304.9
13/09/2015	-306.2
14/09/2015	-307.6
15/09/2015	-309.0
16/09/2015	-310.4
17/09/2015	-311.8
18/09/2015	-313.1
19/09/2015	-314.5
20/09/2015	-315.9
21/09/2015	-317.3
22/09/2015	-318.7
23/09/2015	-320.0
24/09/2015	-321.4
25/09/2015	-322.8
26/09/2015	-324.2
27/09/2015	-325.5
28/09/2015	-326.9
29/09/2015	-328.3
30/09/2015	-329.7
1/10/2015	-331.1
2/10/2015	-332.4
3/10/2015	-333.8
4/10/2015	-335.2
5/10/2015	-336.6
6/10/2015	-338.0
7/10/2015	-339.3
8/10/2015	-340.7
9/10/2015	-342.1
10/10/2015	-341.9
11/10/2015	-342.6
12/10/2015	-342.8
13/10/2015	-342.8
14/10/2015	-344.2
15/10/2015	-345.6
16/10/2015	-346.9
17/10/2015	-348.3
18/10/2015	-349.7
19/10/2015	-351.1
20/10/2015	-352.4
21/10/2015	-353.2
22/10/2015	-345.6
23/10/2015	-347.0
24/10/2015	-348.4
25/10/2015	-349.1
26/10/2015	-339.5
27/10/2015	-340.1
28/10/2015	-341.5
29/10/2015	-342.9

Date	CRD (mm)
30/10/2015	-344.2
31/10/2015	-328.0
1/11/2015	-328.8
2/11/2015	-327.4
3/11/2015	-323.3
4/11/2015	-322.3
5/11/2015	-300.9
6/11/2015	-300.9
7/11/2015	-302.3
8/11/2015	-303.6
9/11/2015	-305.0
10/11/2015	-306.4
11/11/2015	-307.8
12/11/2015	-294.6
13/11/2015	-288.7
14/11/2015	-290.1
15/11/2015	-291.5
16/11/2015	-292.9
17/11/2015	-294.2
18/11/2015	-295.6
19/11/2015	-297.0
20/11/2015	-298.4
21/11/2015	-299.8
22/11/2015	-301.1
23/11/2015	-302.5
24/11/2015	-303.9
25/11/2015	-305.3
26/11/2015	-306.7
27/11/2015	-308.0
28/11/2015	-309.4
29/11/2015	-310.8
30/11/2015	-312.2
1/12/2015	-313.5
2/12/2015	-314.9
3/12/2015	-316.3
4/12/2015	-317.7
5/12/2015	-319.1
6/12/2015	-320.4
7/12/2015	-321.8
8/12/2015	-322.6
9/12/2015	-322.6
10/12/2015	-321.5
11/12/2015	-322.9
12/12/2015	-324.3
13/12/2015	-325.7
14/12/2015	-327.1
15/12/2015	-328.4
16/12/2015	-317.4
17/12/2015	-318.8

Date	CRD (mm)
18/12/2015	-320.2
19/12/2015	-321.6
20/12/2015	-322.9
21/12/2015	-273.1
22/12/2015	-199.5
23/12/2015	-199.5
24/12/2015	-200.8
25/12/2015	-202.2
26/12/2015	-195.6
27/12/2015	-197.0
28/12/2015	-198.4
29/12/2015	-199.7
30/12/2015	-201.1
31/12/2015	-202.5
1/01/2016	-203.9
2/01/2016	-205.3
3/01/2016	-195.6
4/01/2016	-195.6
5/01/2016	-144.6
6/01/2016	-145.6
7/01/2016	-146.9
8/01/2016	-148.3
9/01/2016	-149.7
10/01/2016	-151.1
11/01/2016	-152.5
12/01/2016	-153.8
13/01/2016	-155.2
14/01/2016	-145.2
15/01/2016	-97.0
16/01/2016	-98.3
17/01/2016	-99.7
18/01/2016	-101.1
19/01/2016	-102.5
20/01/2016	-103.9
21/01/2016	-101.4
22/01/2016	-52.4
23/01/2016	-53.6
24/01/2016	-55.0
25/01/2016	-55.0
26/01/2016	-56.3
27/01/2016	-55.9
28/01/2016	-55.9
29/01/2016	-53.1
30/01/2016	-54.4
31/01/2016	-55.8
1/02/2016	-57.2
2/02/2016	-58.6
3/02/2016	-46.8
4/02/2016	-48.1

Date	CRD (mm)
5/02/2016	-49.5
6/02/2016	-50.9
7/02/2016	-52.3
8/02/2016	-53.7
9/02/2016	-55.0
10/02/2016	-56.4
11/02/2016	-41.6
12/02/2016	-43.0
13/02/2016	-44.3
14/02/2016	-45.7
15/02/2016	-46.7
16/02/2016	-48.1
17/02/2016	-49.5
18/02/2016	-50.8
19/02/2016	-52.2
20/02/2016	-53.6
21/02/2016	-55.0
22/02/2016	-56.3
23/02/2016	-57.7
24/02/2016	-59.1
25/02/2016	-60.5
26/02/2016	-61.9
27/02/2016	-63.2
28/02/2016	-64.6
29/02/2016	-66.0
1/03/2016	-67.4
2/03/2016	-68.8
3/03/2016	-70.1
4/03/2016	-71.5
5/03/2016	-72.9
6/03/2016	-74.3
7/03/2016	-75.6
8/03/2016	-77.0
9/03/2016	-78.4
10/03/2016	-79.8
11/03/2016	-66.6
12/03/2016	-63.7
13/03/2016	-64.9
14/03/2016	-66.3
15/03/2016	-67.7
16/03/2016	-69.1
17/03/2016	-70.4
18/03/2016	-63.6
19/03/2016	-65.0
20/03/2016	-66.4
21/03/2016	-67.7
22/03/2016	-69.1
23/03/2016	-70.5
24/03/2016	-71.9

Note: CRD data calculated using data from automated Bylong weather station.
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CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
25/03/2016	-73.1
26/03/2016	-74.4
27/03/2016	-75.8
28/03/2016	-77.2
29/03/2016	-78.6
30/03/2016	-79.9
31/03/2016	-81.3
1/04/2016	-82.7
2/04/2016	-84.1
3/04/2016	-85.5
4/04/2016	-86.8
5/04/2016	-88.2
6/04/2016	-89.6
7/04/2016	-91.0
8/04/2016	-92.4
9/04/2016	-93.5
10/04/2016	-94.9
11/04/2016	-96.3
12/04/2016	-97.7
13/04/2016	-99.0
14/04/2016	-100.4
15/04/2016	-101.8
16/04/2016	-103.2
17/04/2016	-104.6
18/04/2016	-105.9
19/04/2016	-107.3
20/04/2016	-108.7
21/04/2016	-110.1
22/04/2016	-108.7
23/04/2016	-109.8
24/04/2016	-111.2
25/04/2016	-112.6
26/04/2016	-114.0
27/04/2016	-115.3
28/04/2016	-116.7
29/04/2016	-118.1
30/04/2016	-107.1
1/05/2016	-90.3
2/05/2016	-75.6
3/05/2016	-74.8
4/05/2016	-76.2
5/05/2016	-77.6
6/05/2016	-79.0
7/05/2016	-80.3
8/05/2016	-81.7
9/05/2016	-68.5
10/05/2016	-69.9
11/05/2016	-71.2
12/05/2016	-72.6

Date	CRD (mm)
13/05/2016	-74.0
14/05/2016	-75.4
15/05/2016	-76.8
16/05/2016	-78.1
17/05/2016	-79.5
18/05/2016	-80.9
19/05/2016	-82.3
20/05/2016	-83.6
21/05/2016	-85.0
22/05/2016	-86.4
23/05/2016	-87.8
24/05/2016	-89.2
25/05/2016	-90.5
26/05/2016	-83.9
27/05/2016	-85.3
28/05/2016	-83.5
29/05/2016	-84.9
30/05/2016	-86.2
31/05/2016	-87.6
1/06/2016	-89.0
2/06/2016	-90.4
3/06/2016	-91.1
4/06/2016	-63.1
5/06/2016	-62.3
6/06/2016	-63.7
7/06/2016	-64.7
8/06/2016	-66.0
9/06/2016	-60.2
10/06/2016	-61.4
11/06/2016	-62.8
12/06/2016	-64.2
13/06/2016	-65.5
14/06/2016	-66.9
15/06/2016	-68.1
16/06/2016	-69.3
17/06/2016	-67.8
18/06/2016	-66.0
19/06/2016	-40.0
20/06/2016	-37.0
21/06/2016	-38.0
22/06/2016	-31.7
23/06/2016	-31.7
24/06/2016	-29.7
25/06/2016	-31.1
26/06/2016	-32.4
27/06/2016	-33.0
28/06/2016	-34.4
29/06/2016	-35.8
30/06/2016	-37.0

Date	CRD (mm)
1/07/2016	-38.3
2/07/2016	-39.7
3/07/2016	-41.1
4/07/2016	-42.3
5/07/2016	-24.5
6/07/2016	-25.4
7/07/2016	-26.8
8/07/2016	-21.2
9/07/2016	-22.4
10/07/2016	-23.5
11/07/2016	-20.7
12/07/2016	-22.1
13/07/2016	-23.5
14/07/2016	-24.9
15/07/2016	-26.2
16/07/2016	-27.6
17/07/2016	-29.0
18/07/2016	-30.4
19/07/2016	-26.0
20/07/2016	4.7
21/07/2016	3.7
22/07/2016	2.9
23/07/2016	2.3
24/07/2016	1.0
25/07/2016	-0.2
26/07/2016	-1.6
27/07/2016	-2.2
28/07/2016	-3.6
29/07/2016	-4.9
30/07/2016	-6.3
31/07/2016	-7.5
1/08/2016	-8.9
2/08/2016	-4.6
3/08/2016	-3.6
4/08/2016	-5.0
5/08/2016	-6.4
6/08/2016	-7.8
7/08/2016	-9.1
8/08/2016	-10.5
9/08/2016	-11.9
10/08/2016	-10.7
11/08/2016	-11.9
12/08/2016	-13.2
13/08/2016	-14.6
14/08/2016	-16.0
15/08/2016	-17.4
16/08/2016	-18.7
17/08/2016	-20.1
18/08/2016	-21.5

Date	CRD (mm)
19/08/2016	-22.9
20/08/2016	-22.7
21/08/2016	-24.0
22/08/2016	-16.4
23/08/2016	-17.6
24/08/2016	-14.8
25/08/2016	-16.0
26/08/2016	-17.3
27/08/2016	-18.7
28/08/2016	-20.1
29/08/2016	-21.5
30/08/2016	-22.8
31/08/2016	-16.0
1/09/2016	-7.2
2/09/2016	28.6
3/09/2016	32.6
4/09/2016	31.3
5/09/2016	30.1
6/09/2016	28.7
7/09/2016	27.3
8/09/2016	26.0
9/09/2016	28.8
10/09/2016	32.8
11/09/2016	31.4
12/09/2016	30.2
13/09/2016	32.7
14/09/2016	46.7
15/09/2016	45.3
16/09/2016	43.9
17/09/2016	42.7
18/09/2016	75.8
19/09/2016	74.4
20/09/2016	73.0
21/09/2016	83.4
22/09/2016	82.3
23/09/2016	80.9
24/09/2016	79.5
25/09/2016	89.3
26/09/2016	87.9
27/09/2016	86.6
28/09/2016	85.2
29/09/2016	100.6
30/09/2016	102.2
1/10/2016	101.2
2/10/2016	99.9
3/10/2016	99.9
4/10/2016	98.7
5/10/2016	97.3
6/10/2016	96.0

Note: CRD data calculated using data from automated Bylong weather station.
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CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
7/10/2016	94.6
8/10/2016	93.2
9/10/2016	91.8
10/10/2016	90.4
11/10/2016	89.7
12/10/2016	88.3
13/10/2016	86.9
14/10/2016	85.5
15/10/2016	84.1
16/10/2016	82.8
17/10/2016	92.0
18/10/2016	90.6
19/10/2016	89.2
20/10/2016	87.9
21/10/2016	92.1
22/10/2016	118.7
23/10/2016	117.3
24/10/2016	115.9
25/10/2016	114.6
26/10/2016	113.2
27/10/2016	111.8
28/10/2016	110.4
29/10/2016	109.1
30/10/2016	113.9
31/10/2016	112.7
1/11/2016	111.3
2/11/2016	109.9
3/11/2016	108.6
4/11/2016	107.2
5/11/2016	105.8
6/11/2016	104.4
7/11/2016	103.0
8/11/2016	101.9
9/11/2016	103.1
10/11/2016	101.9
11/11/2016	100.5
12/11/2016	136.2
13/11/2016	134.8
14/11/2016	133.4
15/11/2016	132.0
16/11/2016	130.6
17/11/2016	129.3
18/11/2016	127.9
19/11/2016	126.5
20/11/2016	125.1
21/11/2016	123.7
22/11/2016	122.4
23/11/2016	121.0
24/11/2016	119.6
25/11/2016	118.2

Date	CRD (mm)
26/11/2016	116.9
27/11/2016	115.5
28/11/2016	114.1
29/11/2016	115.1
30/11/2016	118.5
1/12/2016	117.4
2/12/2016	116.0
3/12/2016	114.6
4/12/2016	113.2
5/12/2016	111.9
6/12/2016	111.5
7/12/2016	110.7
8/12/2016	109.3
9/12/2016	107.9
10/12/2016	106.6
11/12/2016	105.2
12/12/2016	103.8
13/12/2016	102.4
14/12/2016	101.0
15/12/2016	105.1
16/12/2016	119.7
17/12/2016	118.3
18/12/2016	116.9
19/12/2016	115.6
20/12/2016	114.2
21/12/2016	112.8
22/12/2016	111.4
23/12/2016	110.0
24/12/2016	116.7
25/12/2016	115.5
26/12/2016	114.1
27/12/2016	112.7
28/12/2016	111.3
29/12/2016	110.0
30/12/2016	108.6
31/12/2016	107.2
1/01/2017	106.0
2/01/2017	104.7
3/01/2017	103.3
4/01/2017	101.9
5/01/2017	100.5
6/01/2017	99.1
7/01/2017	97.8
8/01/2017	96.4
9/01/2017	95.0
10/01/2017	93.6
11/01/2017	92.3
12/01/2017	90.9
13/01/2017	89.5
14/01/2017	88.1

Date	CRD (mm)
15/01/2017	86.7
16/01/2017	85.4
17/01/2017	85.8
18/01/2017	84.4
19/01/2017	83.0
20/01/2017	100.8
21/01/2017	99.5
22/01/2017	98.1
23/01/2017	96.7
24/01/2017	95.3
25/01/2017	94.4
26/01/2017	93.0
27/01/2017	91.6
28/01/2017	90.2
29/01/2017	88.8
30/01/2017	87.5
31/01/2017	86.1
1/02/2017	85.7
2/02/2017	84.5
3/02/2017	83.1
4/02/2017	93.8
5/02/2017	92.4
6/02/2017	91.0
7/02/2017	89.6
8/02/2017	88.3
9/02/2017	86.9
10/02/2017	85.5
11/02/2017	84.1
12/02/2017	82.7
13/02/2017	81.4
14/02/2017	80.0
15/02/2017	78.6
16/02/2017	77.2
17/02/2017	81.5
18/02/2017	80.3
19/02/2017	78.9
20/02/2017	77.5
21/02/2017	76.1
22/02/2017	74.8
23/02/2017	73.4
24/02/2017	73.4
25/02/2017	72.0
26/02/2017	70.6
27/02/2017	69.3
28/02/2017	68.9
1/03/2017	67.9
2/03/2017	69.3
3/03/2017	68.0
4/03/2017	79.8
5/03/2017	93.6

Date	CRD (mm)
6/03/2017	92.2
7/03/2017	90.8
8/03/2017	89.5
9/03/2017	88.1
10/03/2017	86.7
11/03/2017	85.3
12/03/2017	83.9
13/03/2017	90.8
14/03/2017	89.6
15/03/2017	88.6
16/03/2017	87.2
17/03/2017	85.9
18/03/2017	84.5
19/03/2017	83.1
20/03/2017	81.7
21/03/2017	80.3
22/03/2017	79.2
23/03/2017	78.0
24/03/2017	76.8
25/03/2017	75.6
26/03/2017	74.6
27/03/2017	73.5
28/03/2017	72.3
29/03/2017	70.9
30/03/2017	69.7
31/03/2017	68.6
1/04/2017	67.4
2/04/2017	66.2
3/04/2017	64.8
4/04/2017	63.6
5/04/2017	62.3
6/04/2017	61.1
7/04/2017	59.7
8/04/2017	58.5
9/04/2017	57.2
10/04/2017	55.8
11/04/2017	54.4
12/04/2017	53.2
13/04/2017	51.8
14/04/2017	50.5
15/04/2017	49.1
16/04/2017	47.7
17/04/2017	46.3
18/04/2017	44.9
19/04/2017	43.6
20/04/2017	42.2
21/04/2017	40.8
22/04/2017	39.6
23/04/2017	38.3
24/04/2017	36.9

Note: CRD data calculated using data from automated Bylong weather station.
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CUMULATIVE DAILY RAINFALL DEPARTURE - Bylong Weather Station

Bylong Coal Project, Bylong NSW

Period: 9 December 2011 to 30 June 2017 **Project No:** 49761.04

Client: WorleyParsons Services Pty Ltd

Date	CRD (mm)
25/04/2017	35.5
26/04/2017	34.1
27/04/2017	32.7
28/04/2017	31.4
29/04/2017	30.0
30/04/2017	28.6
1/05/2017	27.2
2/05/2017	25.8
3/05/2017	24.5
4/05/2017	23.1
5/05/2017	21.7
6/05/2017	20.3
7/05/2017	19.0
8/05/2017	19.6
9/05/2017	18.4
10/05/2017	17.0
11/05/2017	15.6
12/05/2017	14.3
13/05/2017	12.9
14/05/2017	11.5
15/05/2017	10.1
16/05/2017	8.8
17/05/2017	7.4
18/05/2017	6.0
19/05/2017	4.6
20/05/2017	22.8
21/05/2017	21.9
22/05/2017	20.5
23/05/2017	19.1
24/05/2017	17.7
25/05/2017	16.3
26/05/2017	15.0
27/05/2017	13.6
28/05/2017	13.4
29/05/2017	12.0
30/05/2017	10.7
31/05/2017	9.3
1/06/2017	7.9
2/06/2017	6.5
3/06/2017	5.1
4/06/2017	3.8
5/06/2017	2.4
6/06/2017	1.0
7/06/2017	-0.4
8/06/2017	-1.6
9/06/2017	-2.9
10/06/2017	-4.3
11/06/2017	-2.1
12/06/2017	-3.3
13/06/2017	-4.6
14/06/2017	-6.0
15/06/2017	-7.2
16/06/2017	-8.6
17/06/2017	-10.0
18/06/2017	-11.1
19/06/2017	-12.5
20/06/2017	-13.9
21/06/2017	-15.3
22/06/2017	-16.4
23/06/2017	-17.8
24/06/2017	-19.2
25/06/2017	-20.2
26/06/2017	-21.6
27/06/2017	-22.9
28/06/2017	-20.7
29/06/2017	-19.5
30/06/2017	-20.7

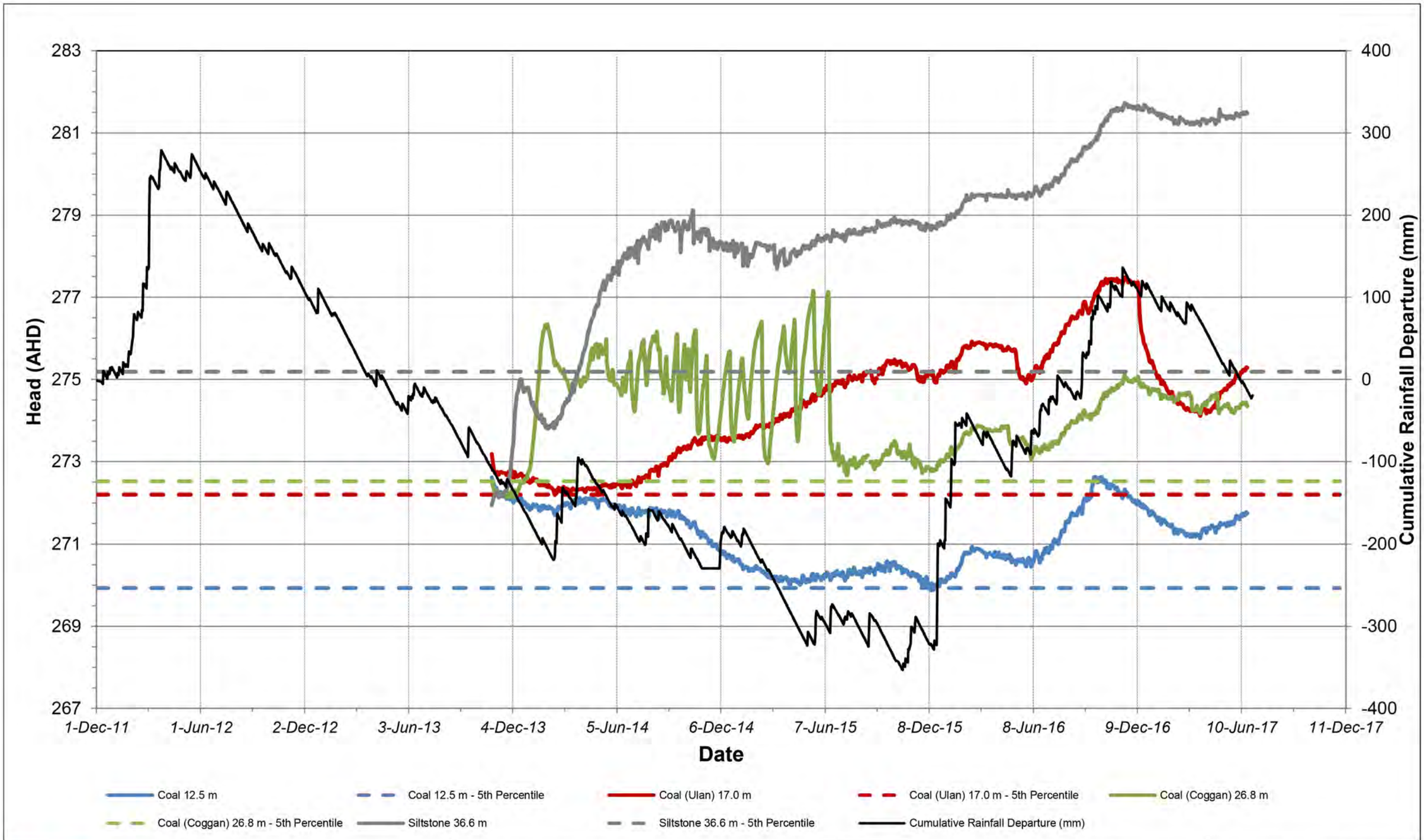
Note: CRD data calculated using data from automated Bylong weather station.
The Bylong weather station is managed by WorleyParsons Services Pty Ltd site representatives.

Appendix E
Summary of Monitoring Data

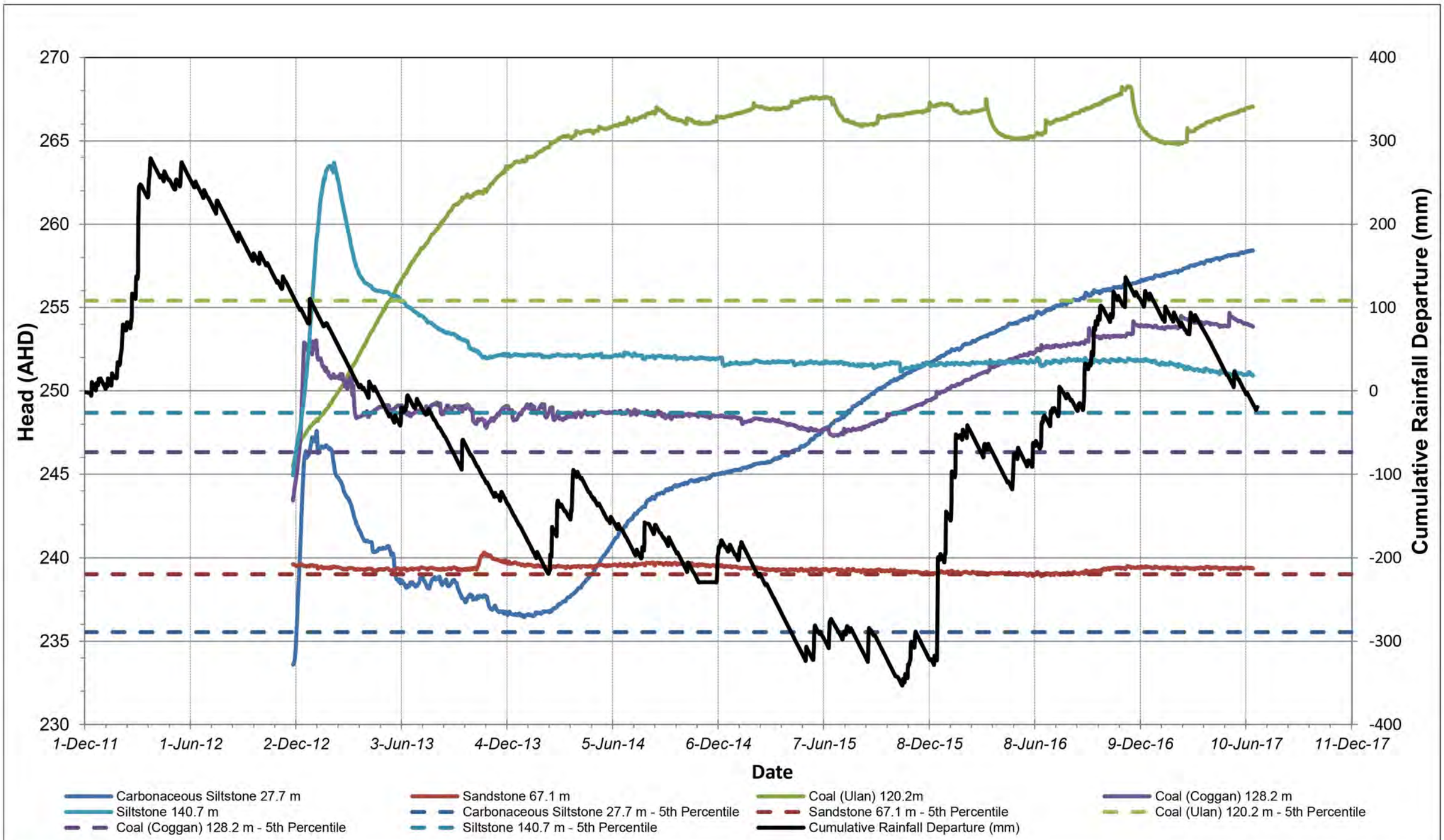
Appendix E4

Head in Vibrating Wires Piezometers:

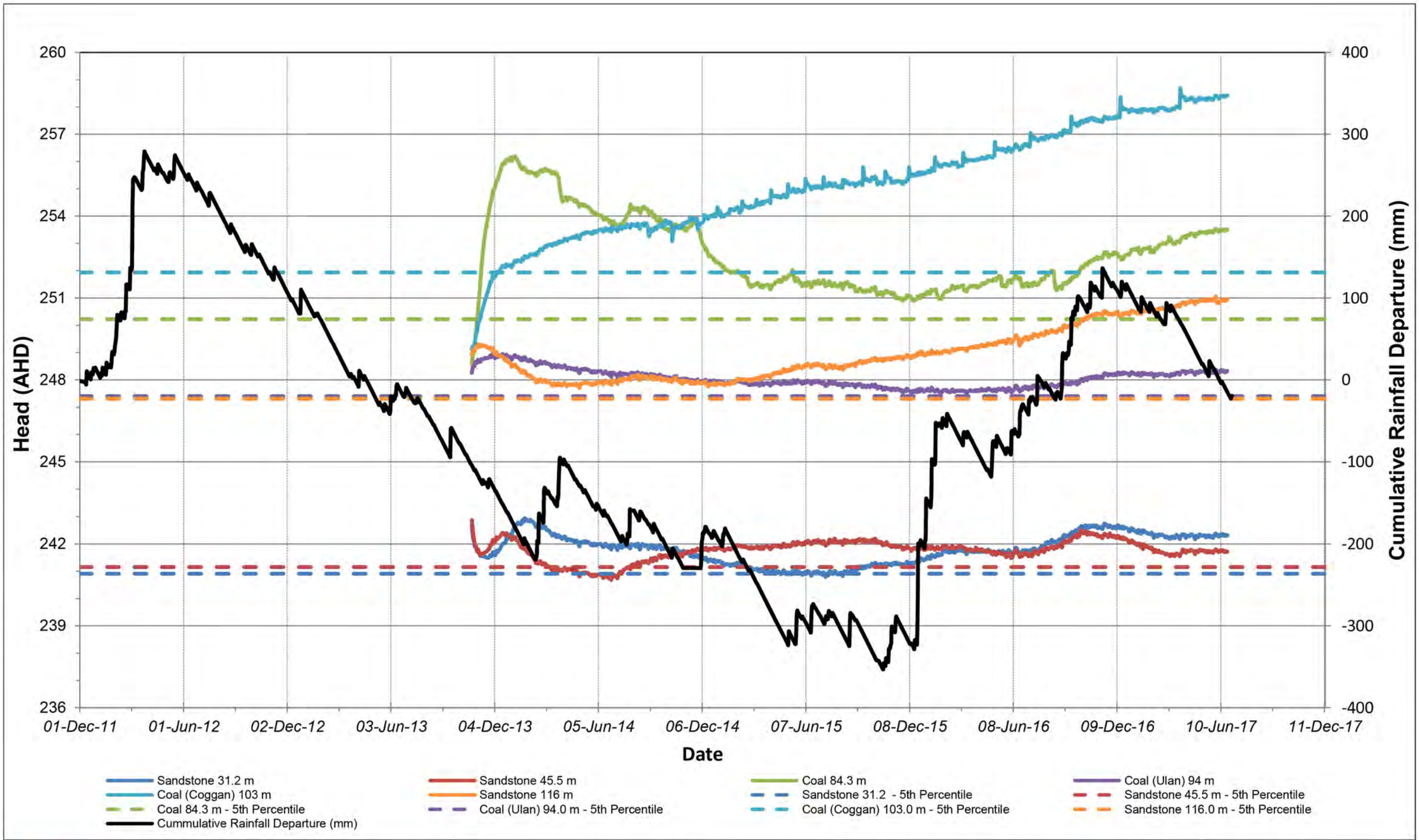
- Figure VWP-A06: Piezometric Head in Vibrating Wire A06
- Figure VWP-AGE01: Piezometric Head in Vibrating Wire AGE01
- Figure VWP-AGE02: Piezometric Head in Vibrating Wire AGE02
- Figure VWP-AGE03W: Piezometric Head in Vibrating Wire AGE03W
- Figure VWP-B3: Piezometric Head in Vibrating Wire B3
- Figure VWP-BY0011: Piezometric Head in Vibrating Wire BY0011
- Figure VWP-BY0077: Piezometric Head in Vibrating Wire BY0077CH
- Figure VWP-BY0080: Piezometric Head in Vibrating Wire BY0080CH
- Figure VWP-BY0091: Piezometric Head in Vibrating Wire BY0091CH
- Figure VWP-BY0208: Piezometric Head in Vibrating Wire BY0208CH
- Figure VWP-CPT18: Piezometric Head in Vibrating Wire CPT18
- Figure VWP-CPT36: Piezometric Head in Vibrating Wire CPT36
- Figure VWP-CPT39: Piezometric Head in Vibrating Wire CPT39



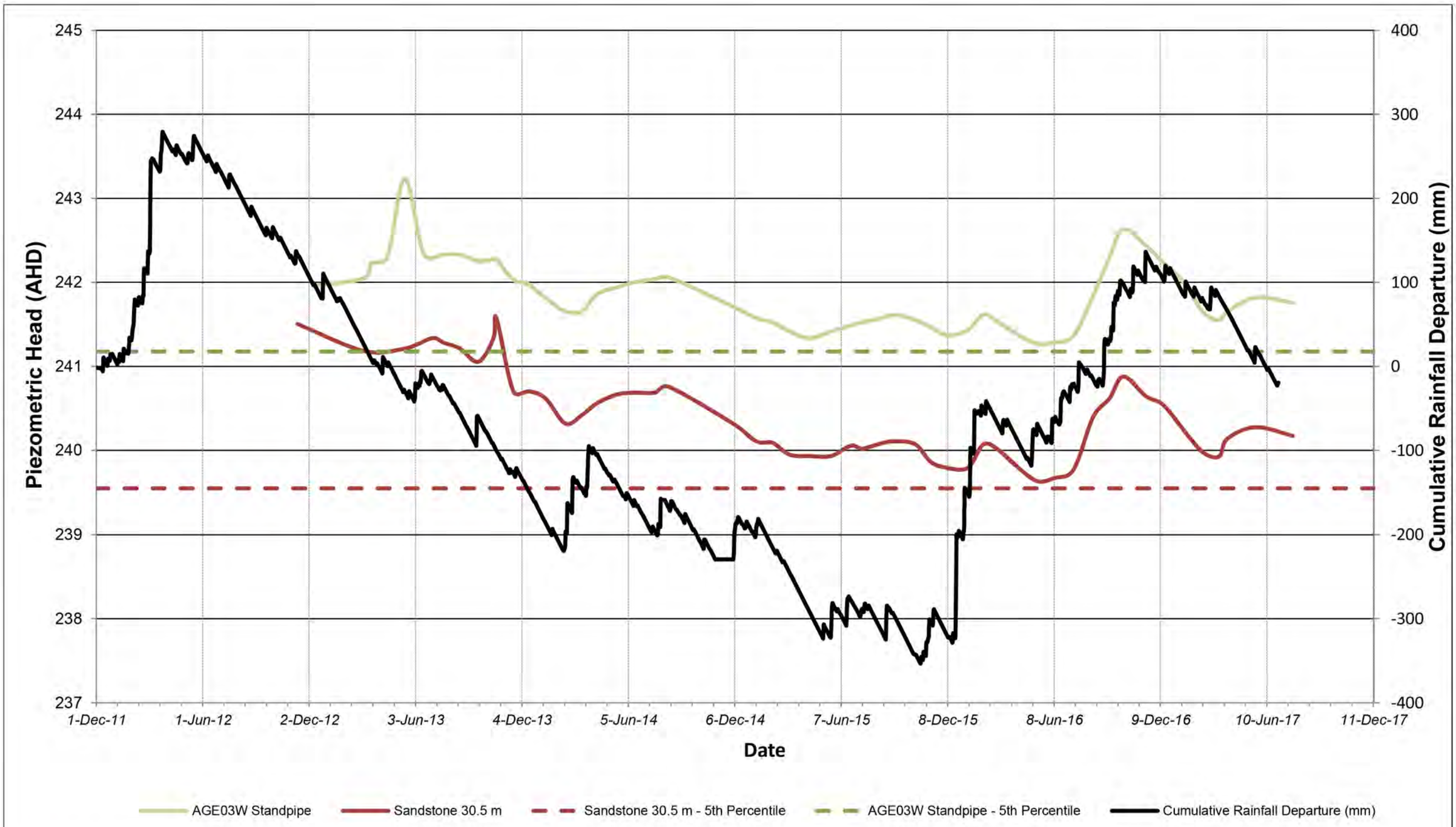
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire A06 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: KMF		FIGURE NO: VWP-A06
	SCALE: N/A / DATE: 10.10.2017		REVISION: 5



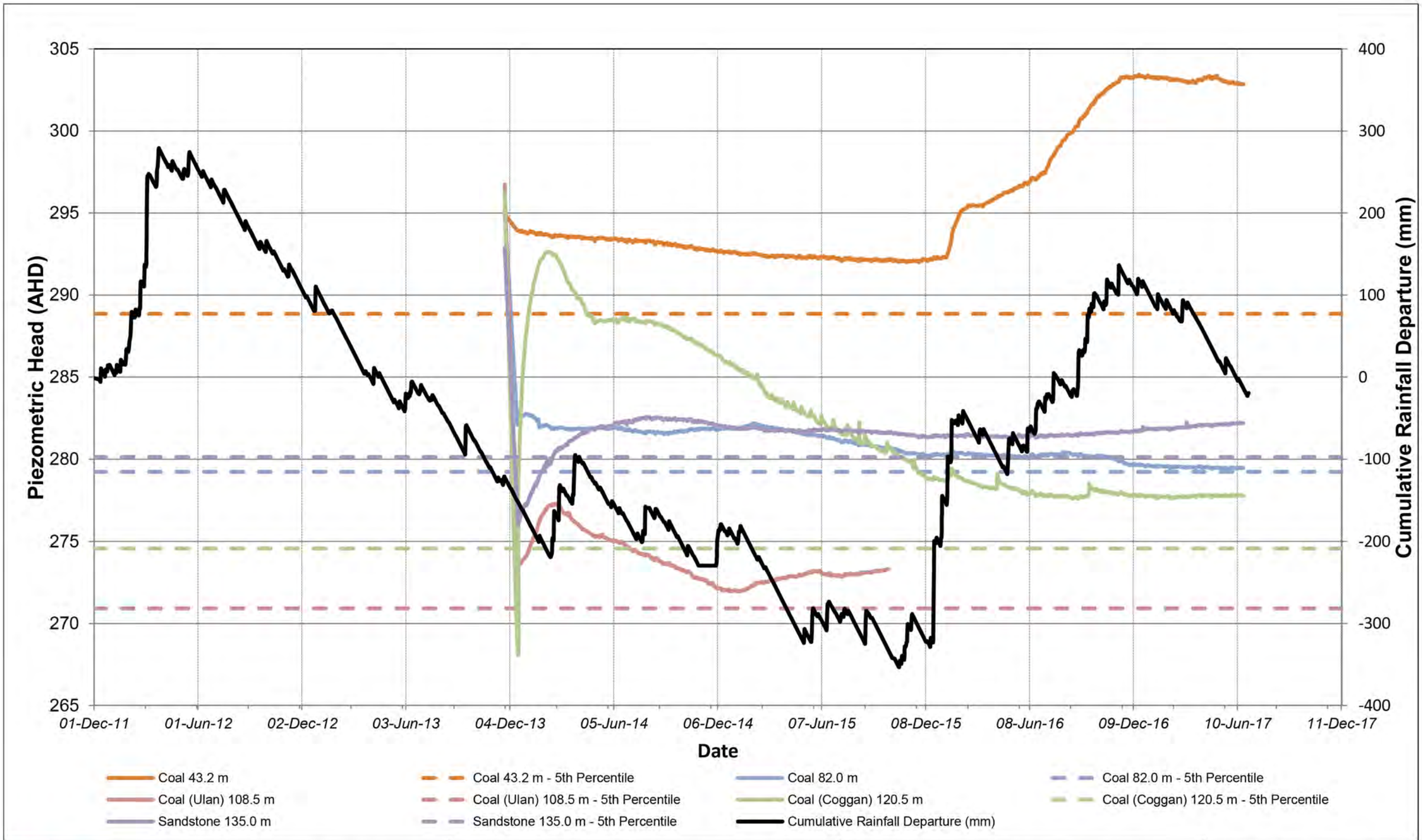
Douglas Partners Geotechnics I Environment I Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire AGE01 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: KMF		FIGURE NO: VWP-AGE01
	SCALE: N/A / DATE 10.10.2017		REVISION: 5



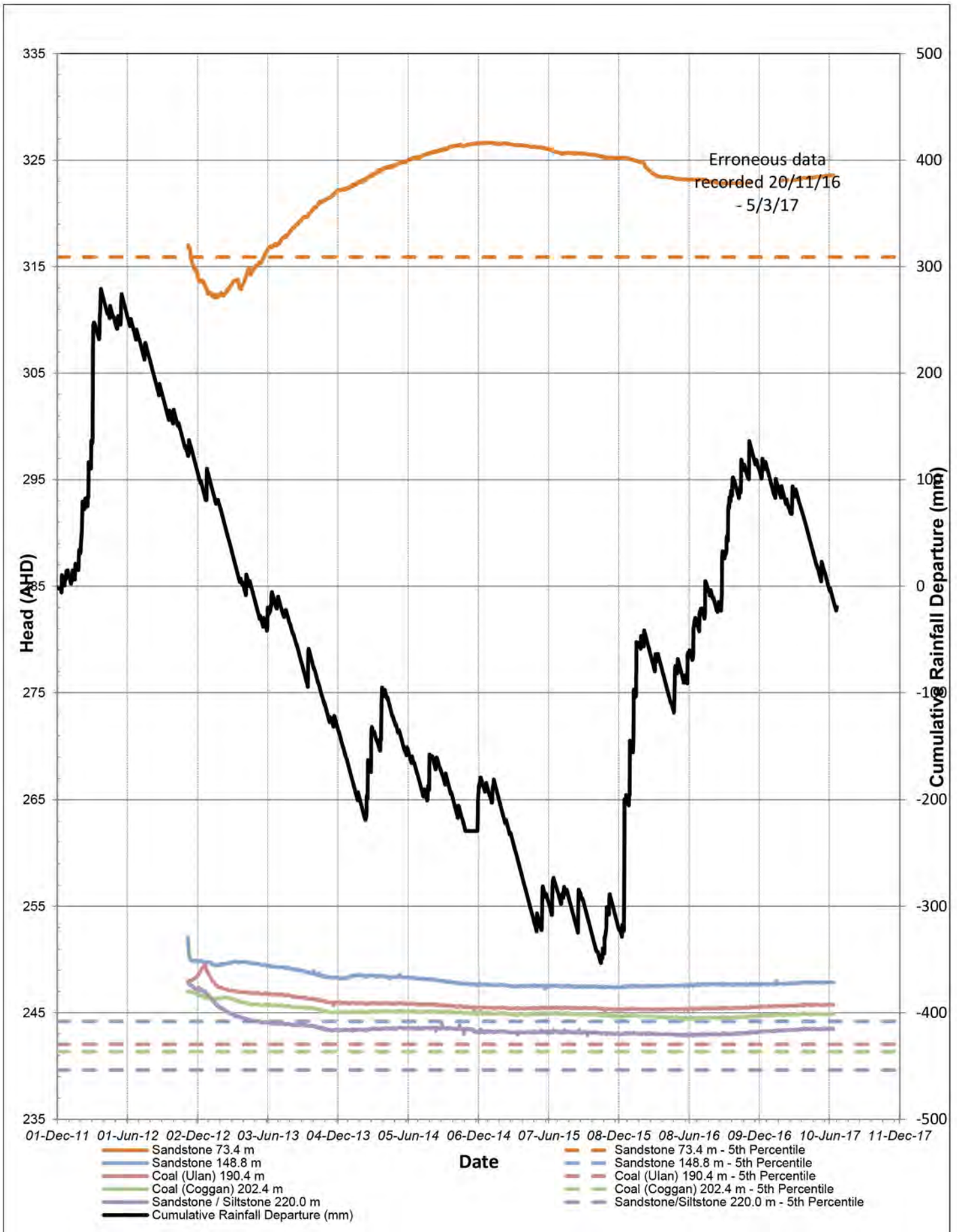
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire AGE02 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-AGE02
	SCALE: N/A / DATE: 06.10.2017		REVISION: 5



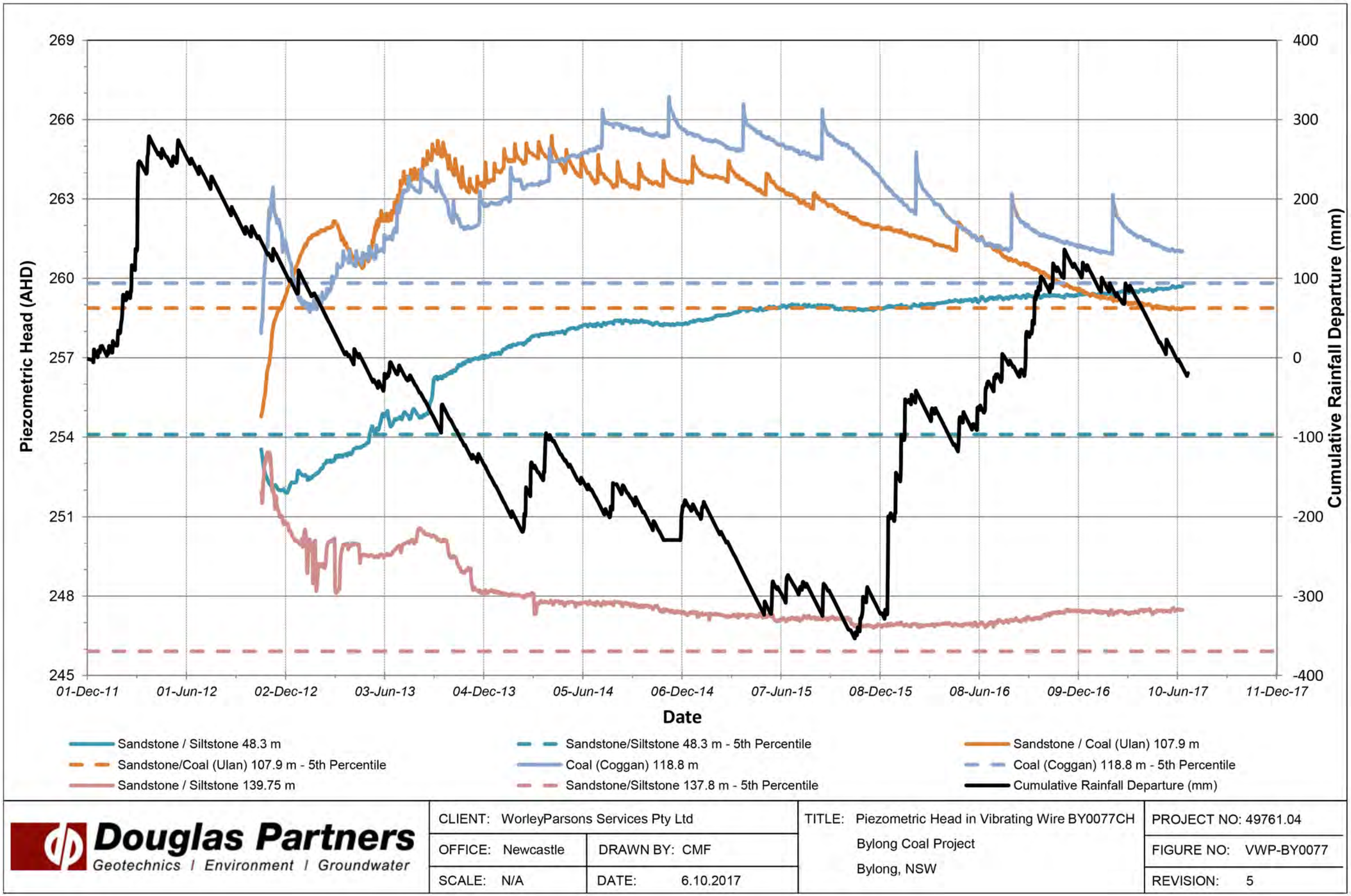
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire AGE03W Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-AGE03W
	SCALE: N/A / DATE: 6.10.2017		REVISION: 5



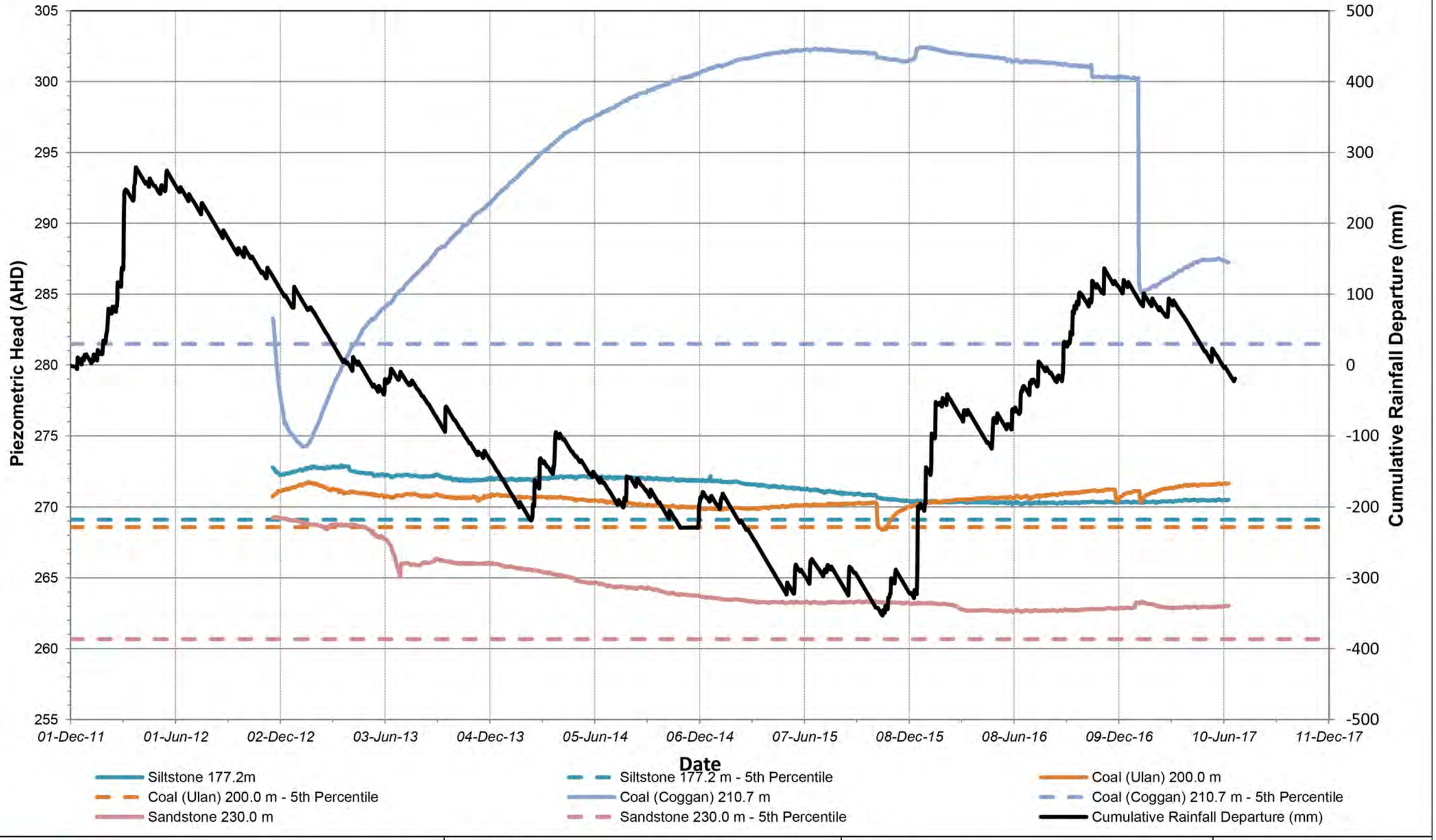
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire B3 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-B3
	SCALE: N/A / DATE: 6.10.2017		REVISION: 5



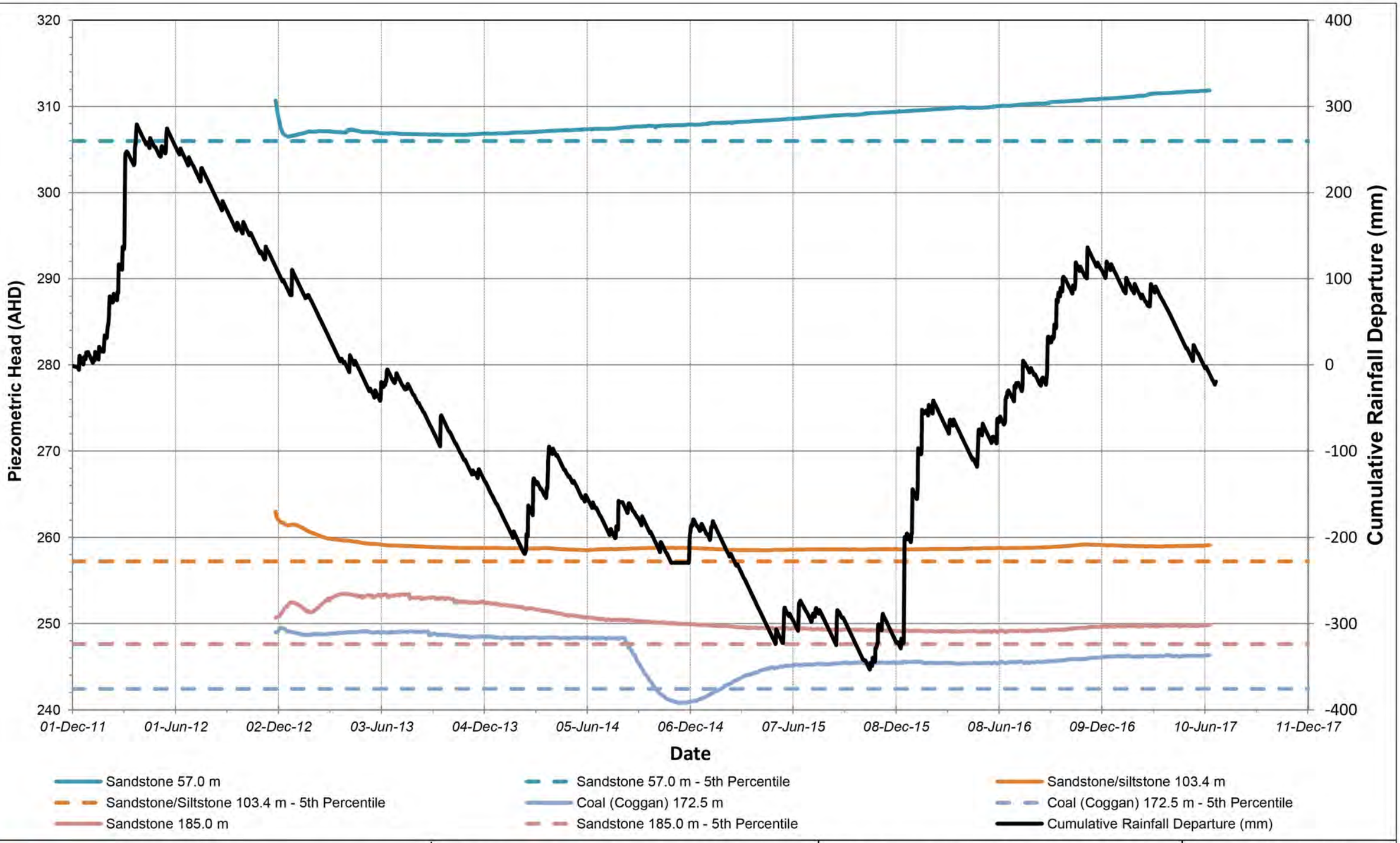
Douglas Partners Geotechnics | Environment | Groundwater	CLIENT: WorleyParsons Services Pty Ltd		TITLE: Piezometric Head in Vibrating Wire BY0011 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle	DRAWN BY: CMF		FIGURE NO: VWP-BY0011
	SCALE: N/A	DATE: 6.10.2017		



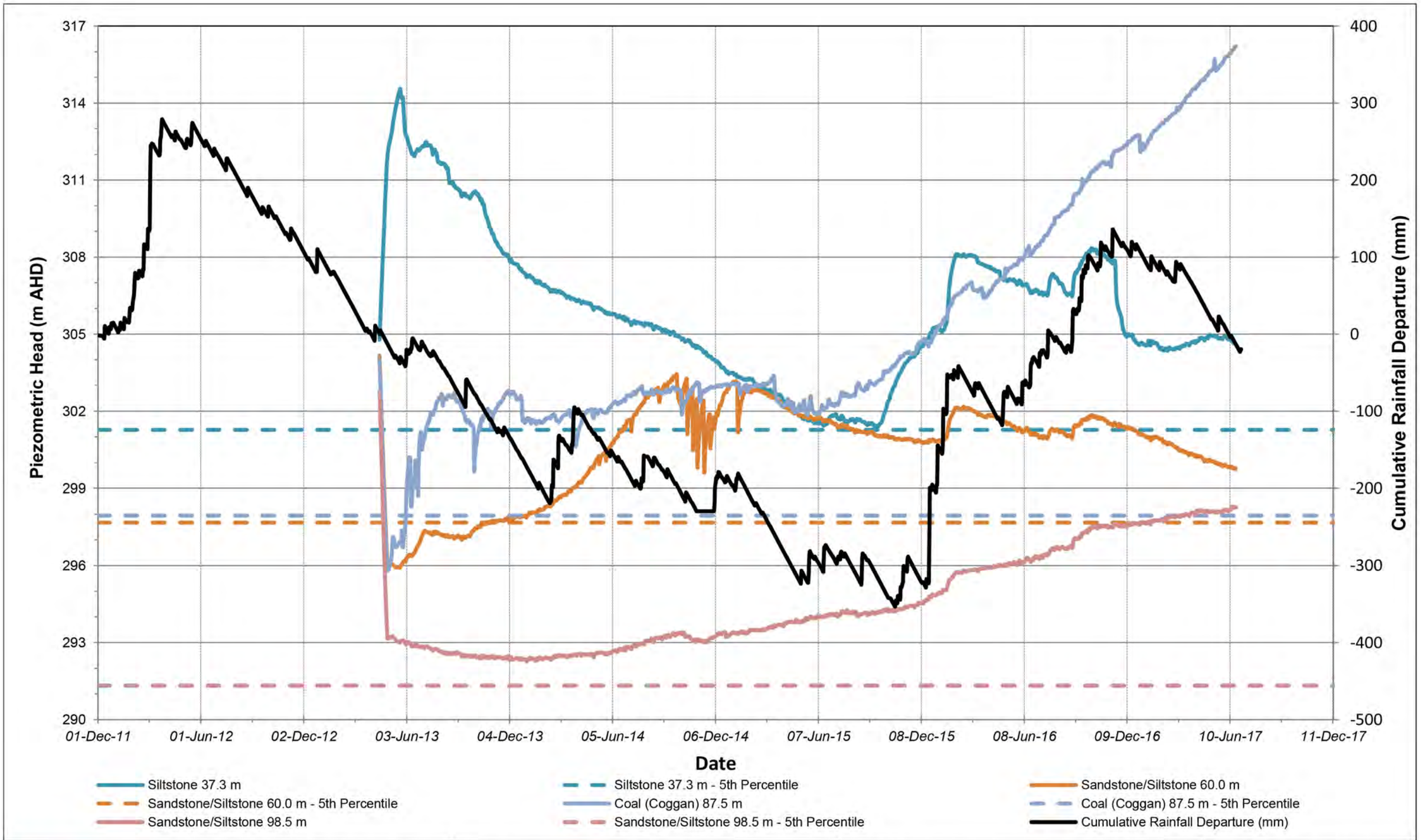
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire BY0077CH Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle DRAWN BY: CMF		FIGURE NO: VWP-BY0077
	SCALE: N/A DATE: 6.10.2017		REVISION: 5



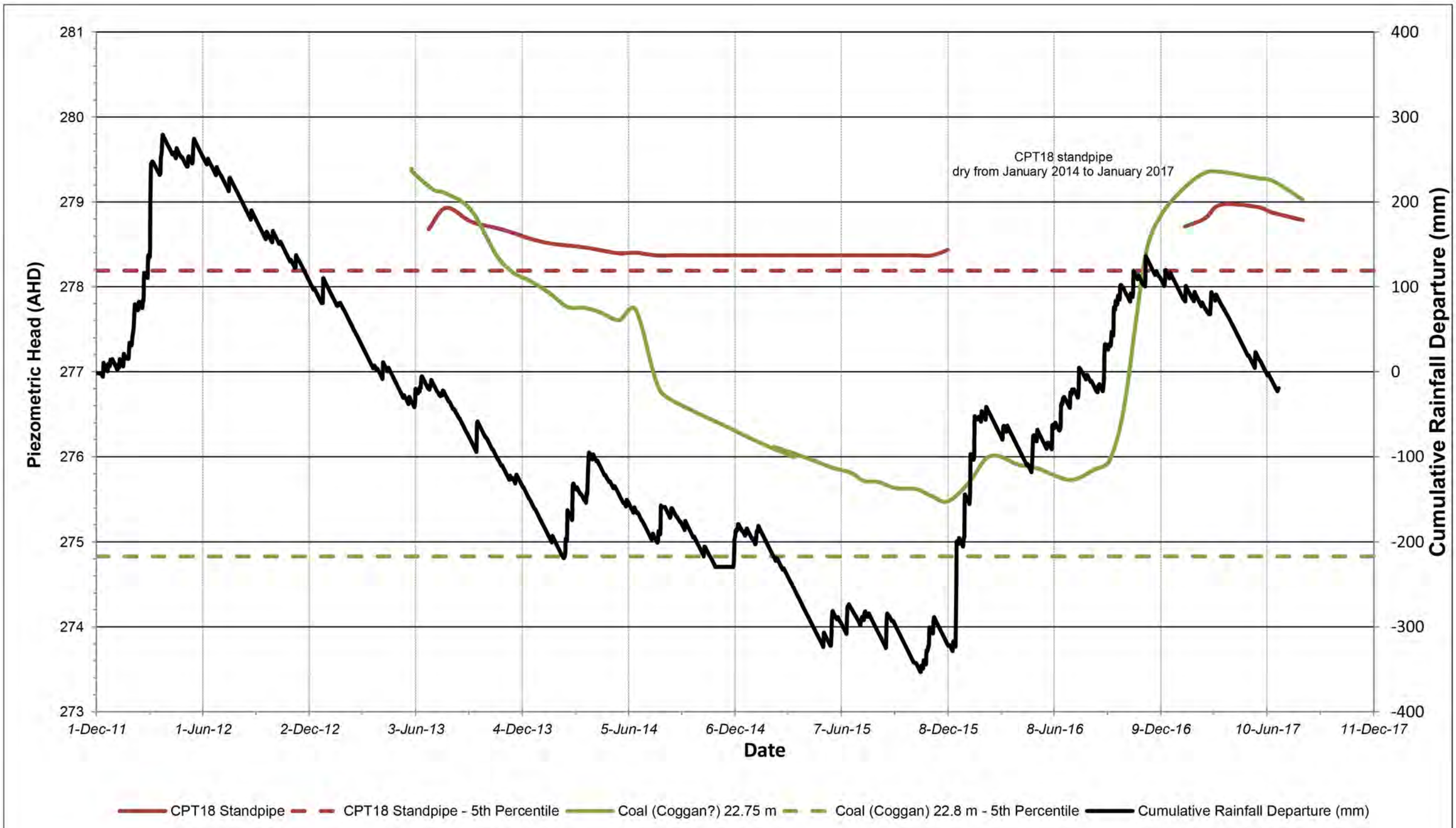
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire BY0080CH Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-BY0080
	SCALE: N/A / DATE: 6.10.2017		REVISION: 5



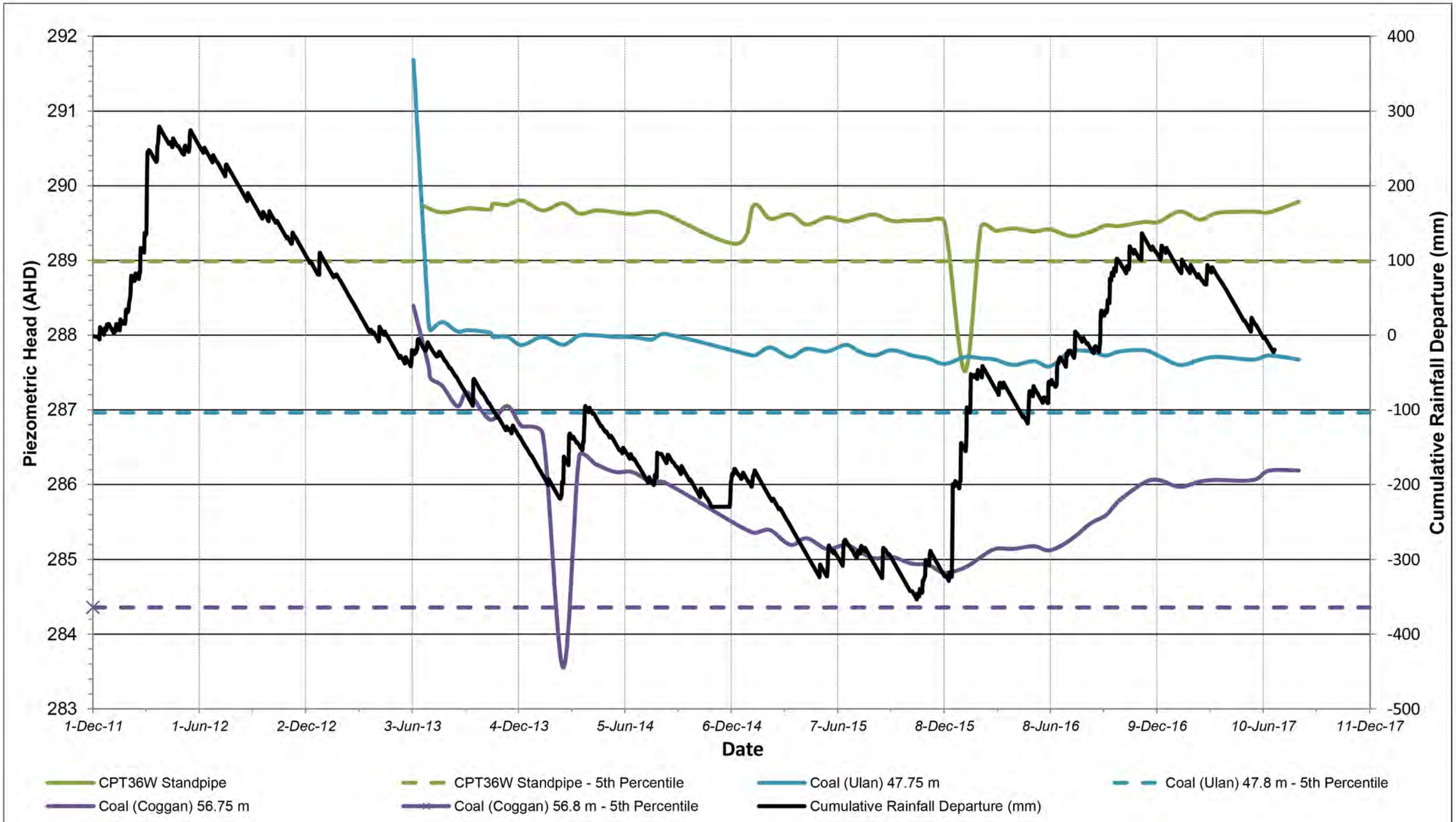
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire BY0091CH Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle DRAWN BY: CMF		FIGURE NO: VWP-BY0091
	SCALE: N/A DATE: 6.10.2017		REVISION: 5



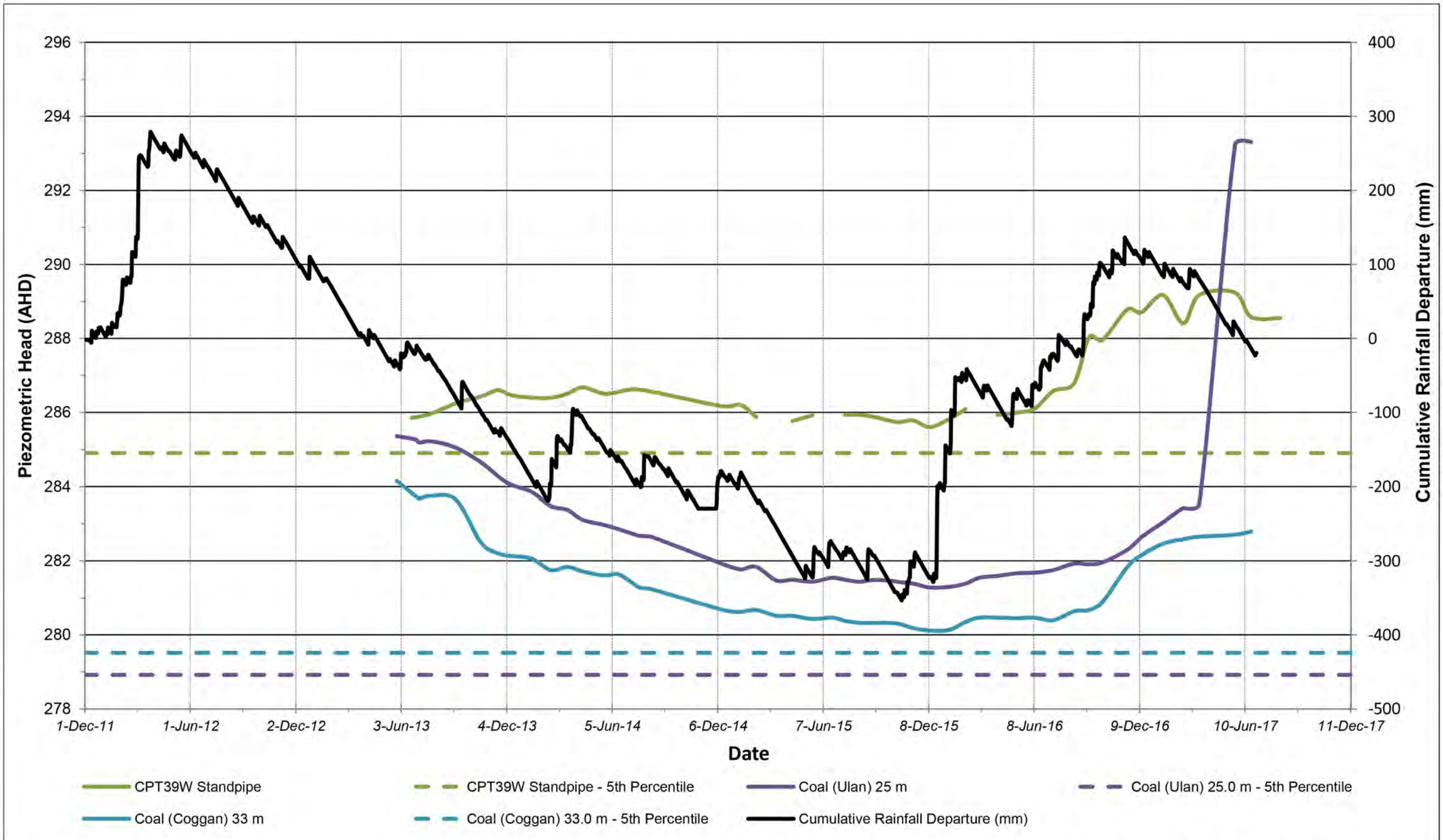
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire BY0208 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-BY0208
	SCALE: N/A / DATE: 6.10.2017		REVISION: 5



Douglas Partners Geotechnics I Environment I Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire CPT18 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle DRAWN BY: CMF		FIGURE NO: VWP-CPT18
	SCALE: N/A DATE: 6.10.2017		REVISION: 5



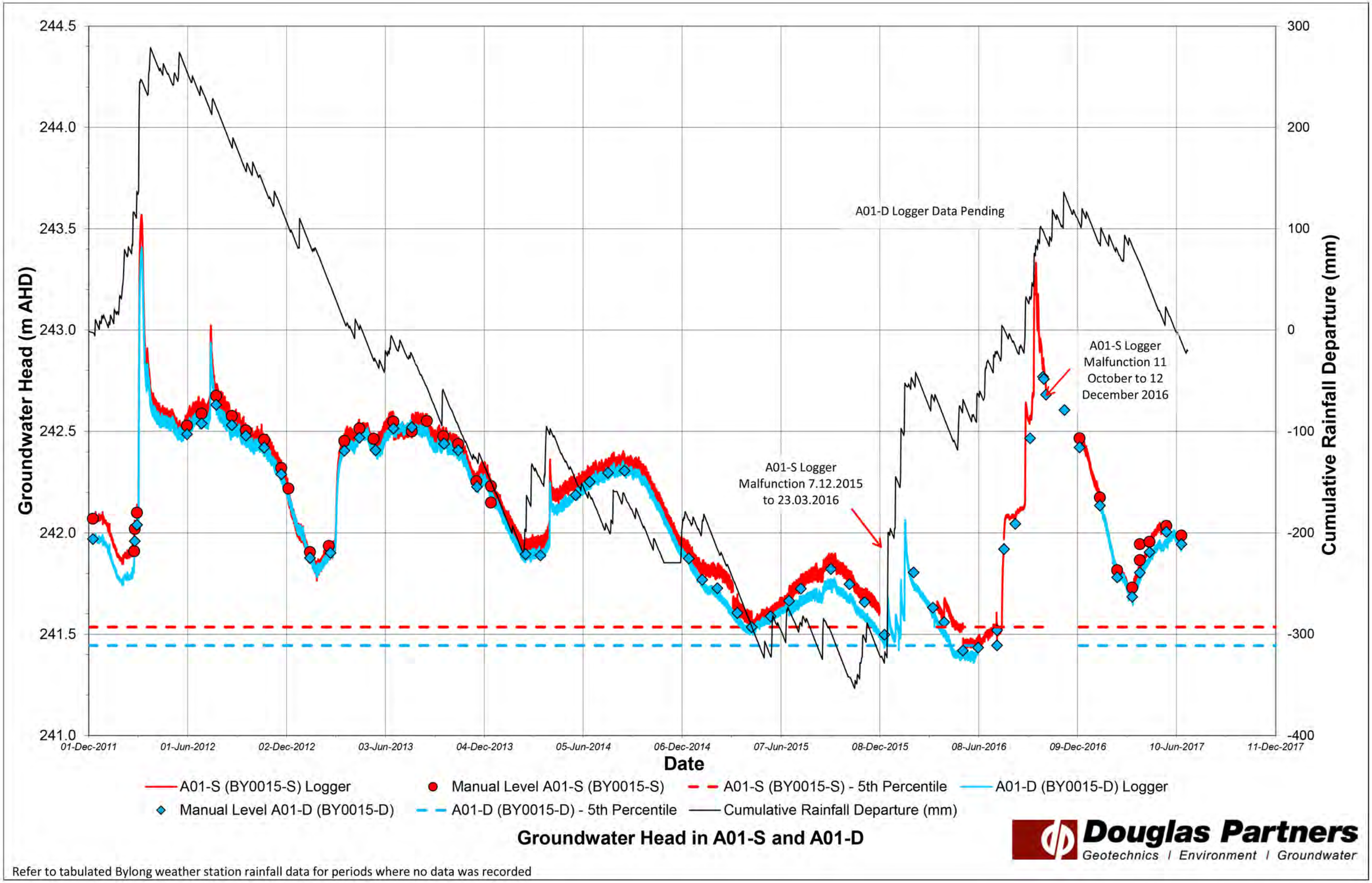
Douglas Partners Geotechnics I Environment I Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire CPT36 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: KMF		FIGURE NO: VWP-CPT36
	SCALE: N/A / DATE: 10.10.2017		REVISION: 5



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: Piezometric Head in Vibrating Wire CPT39 Bylong Coal Project Bylong, NSW	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: CMF		FIGURE NO: VWP-CPT39
	SCALE: N/A / DATE: 6.10.2017		REVISION: 5

Appendix E
Summary of Monitoring Data

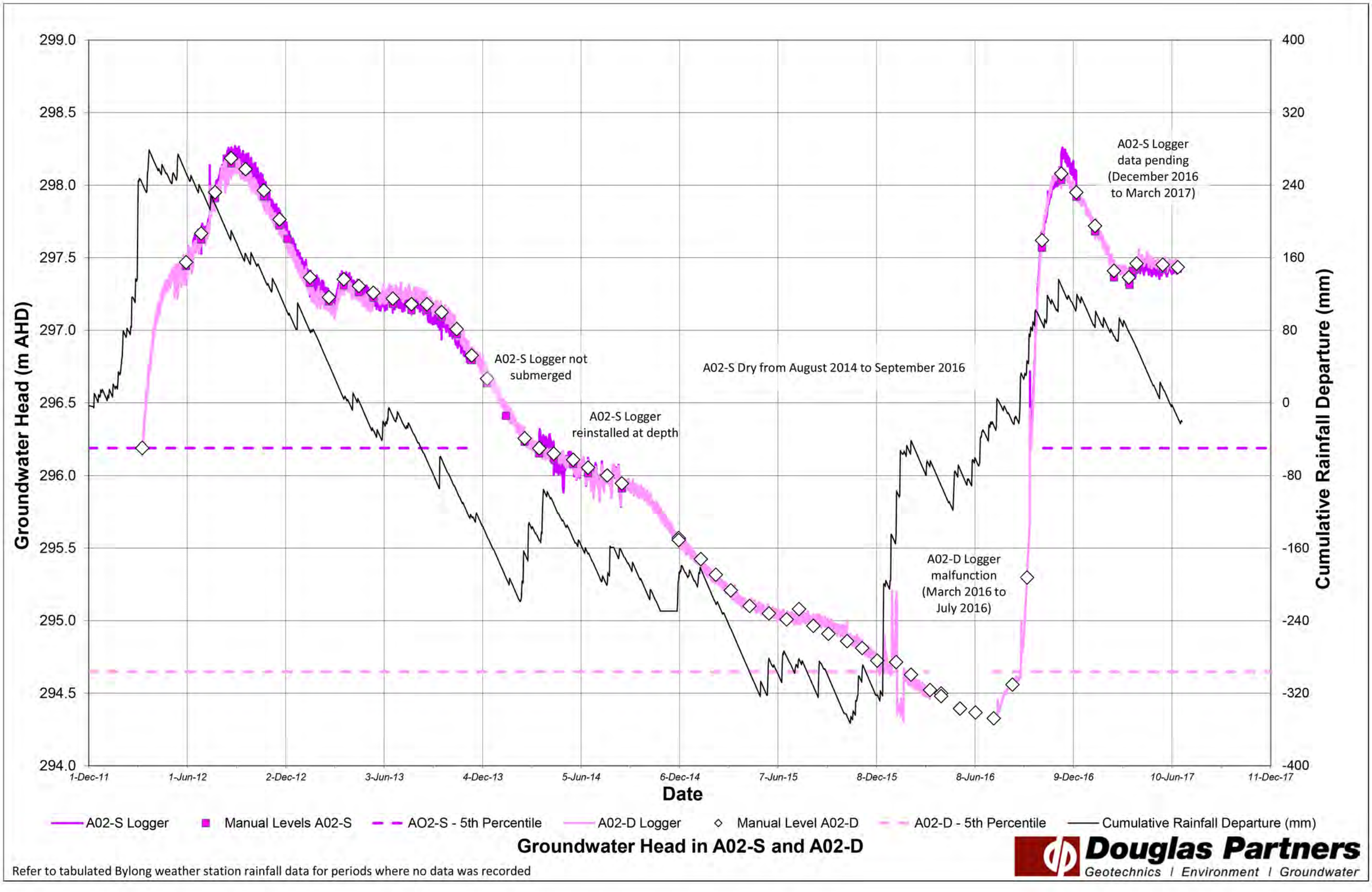
Appendix E5
Groundwater Head Plots (Datalogger Water Level Plots)



Groundwater Head in A01-S and A01-D

Douglas Partners
Geotechnics / Environment / Groundwater

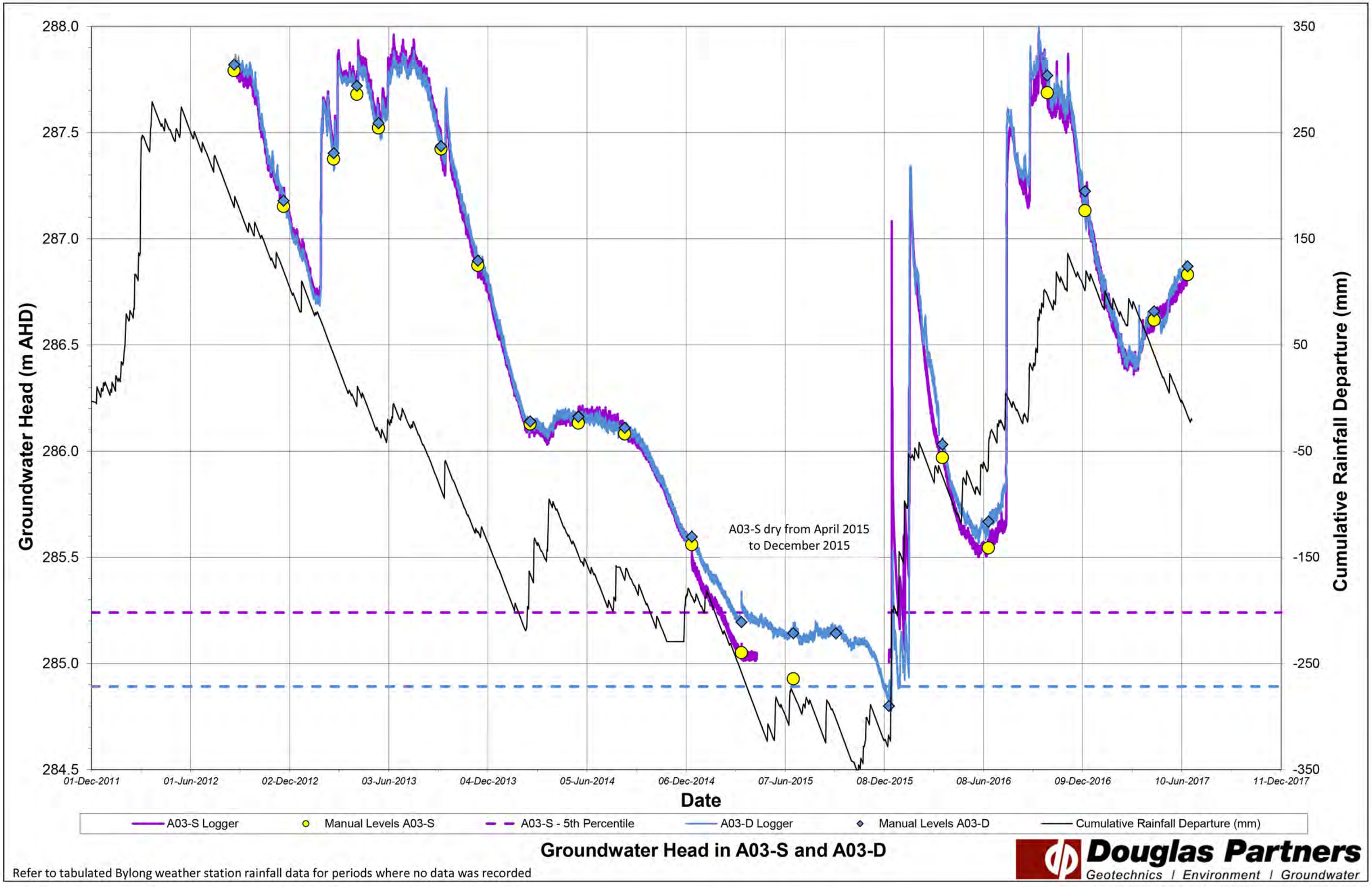
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in A02-S and A02-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A03-S and A03-D

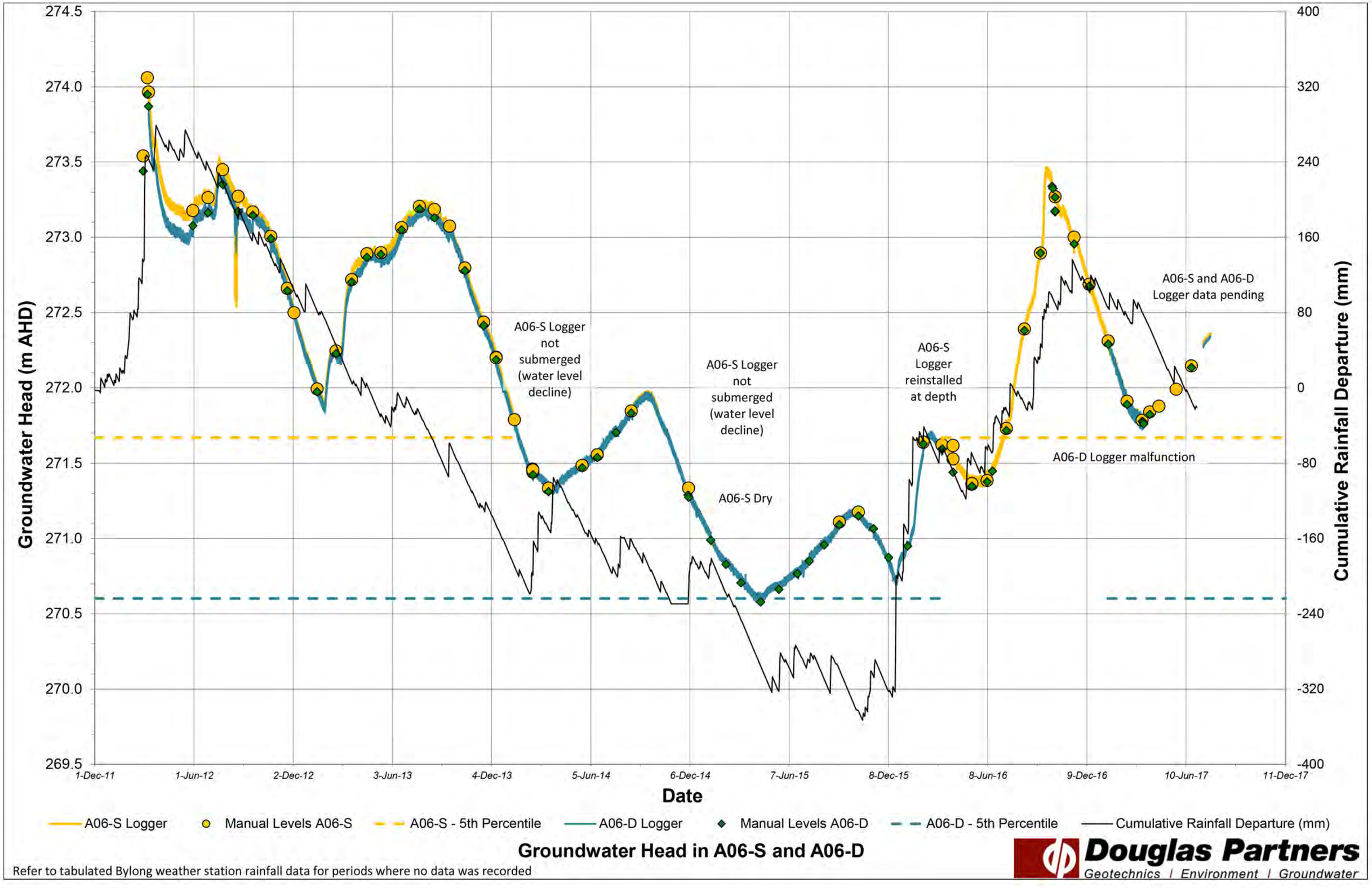
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater

Groundwater Head in A04

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

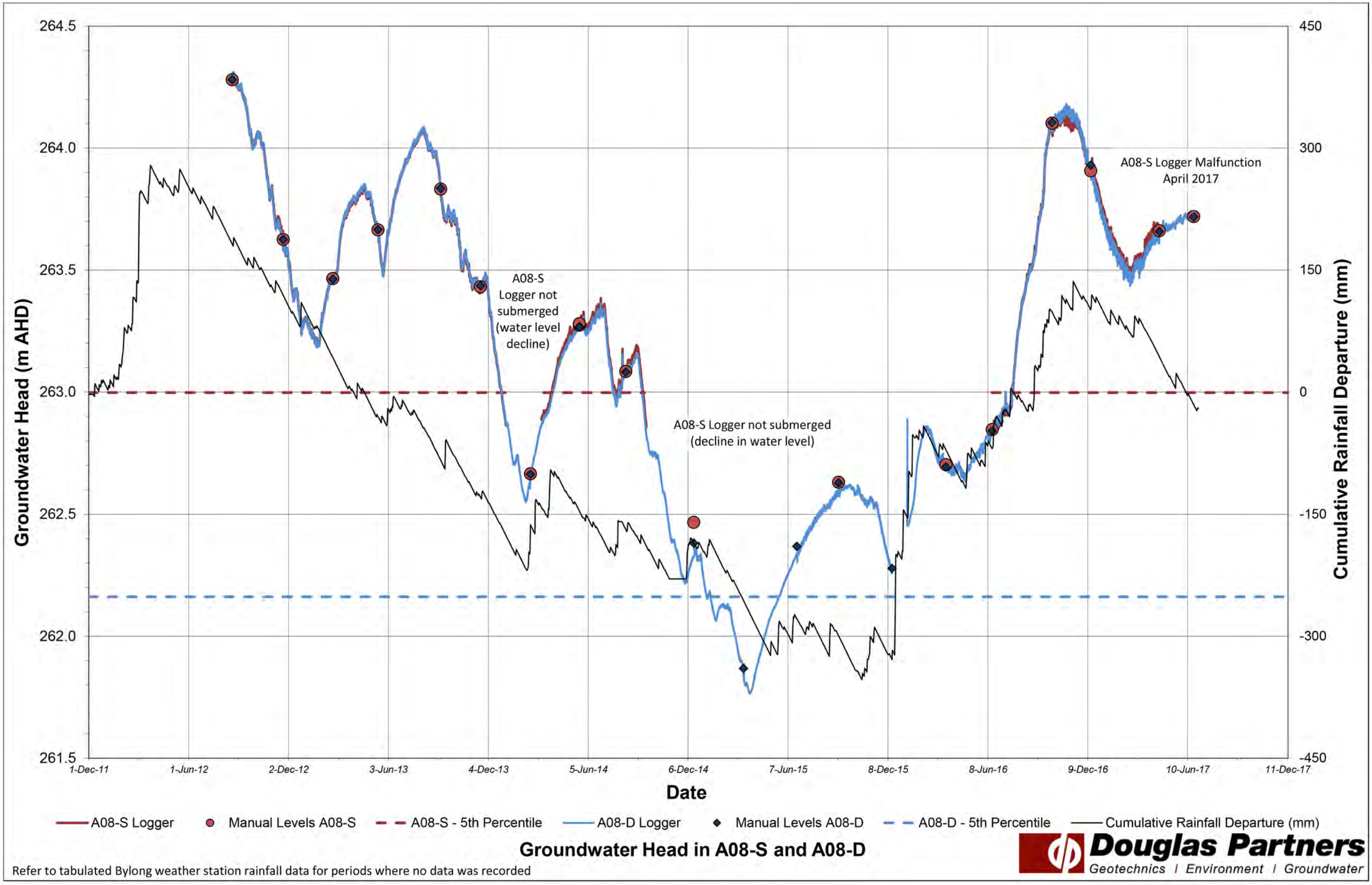
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A06-S and A06-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

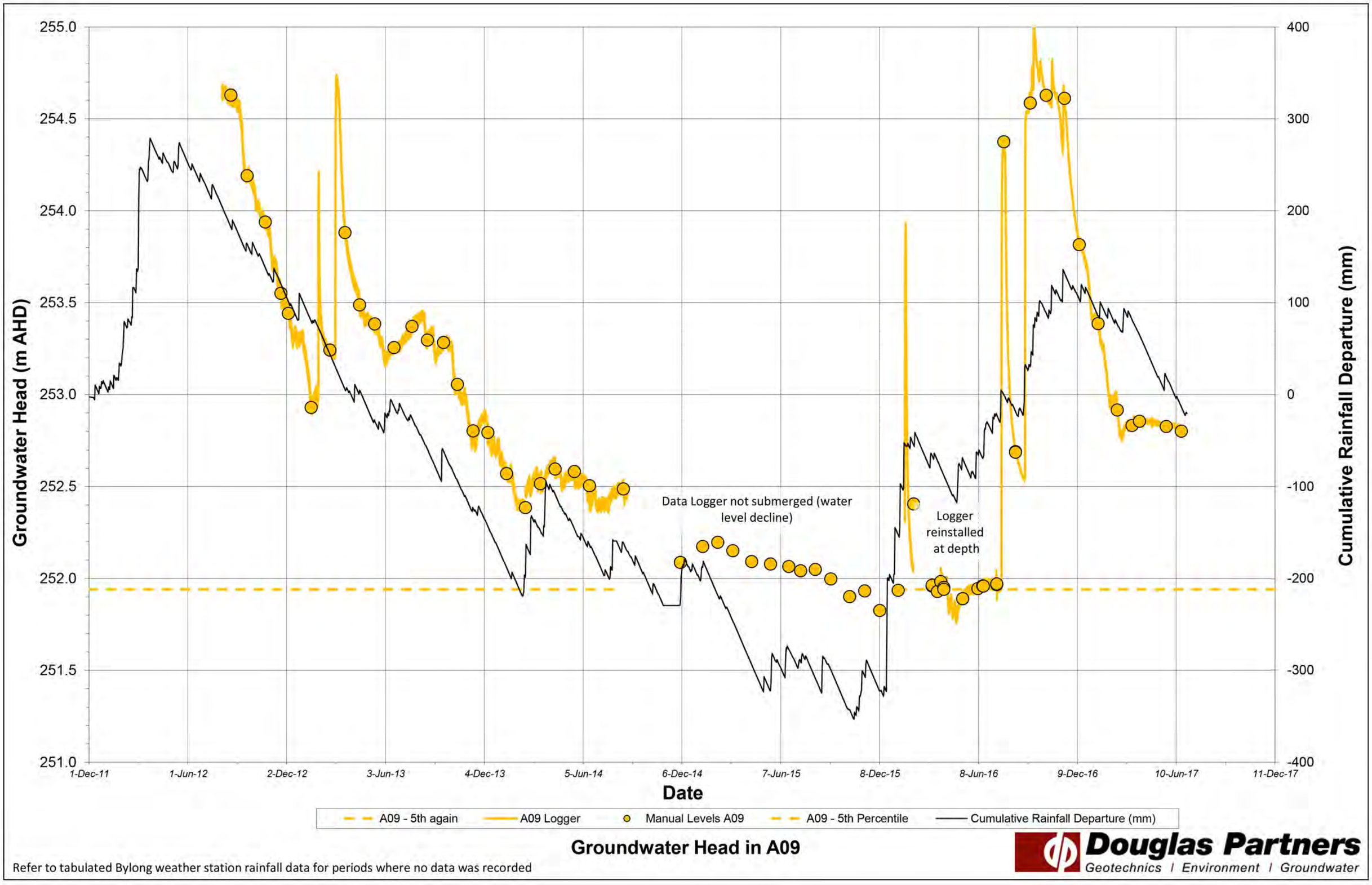
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A08-S and A08-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

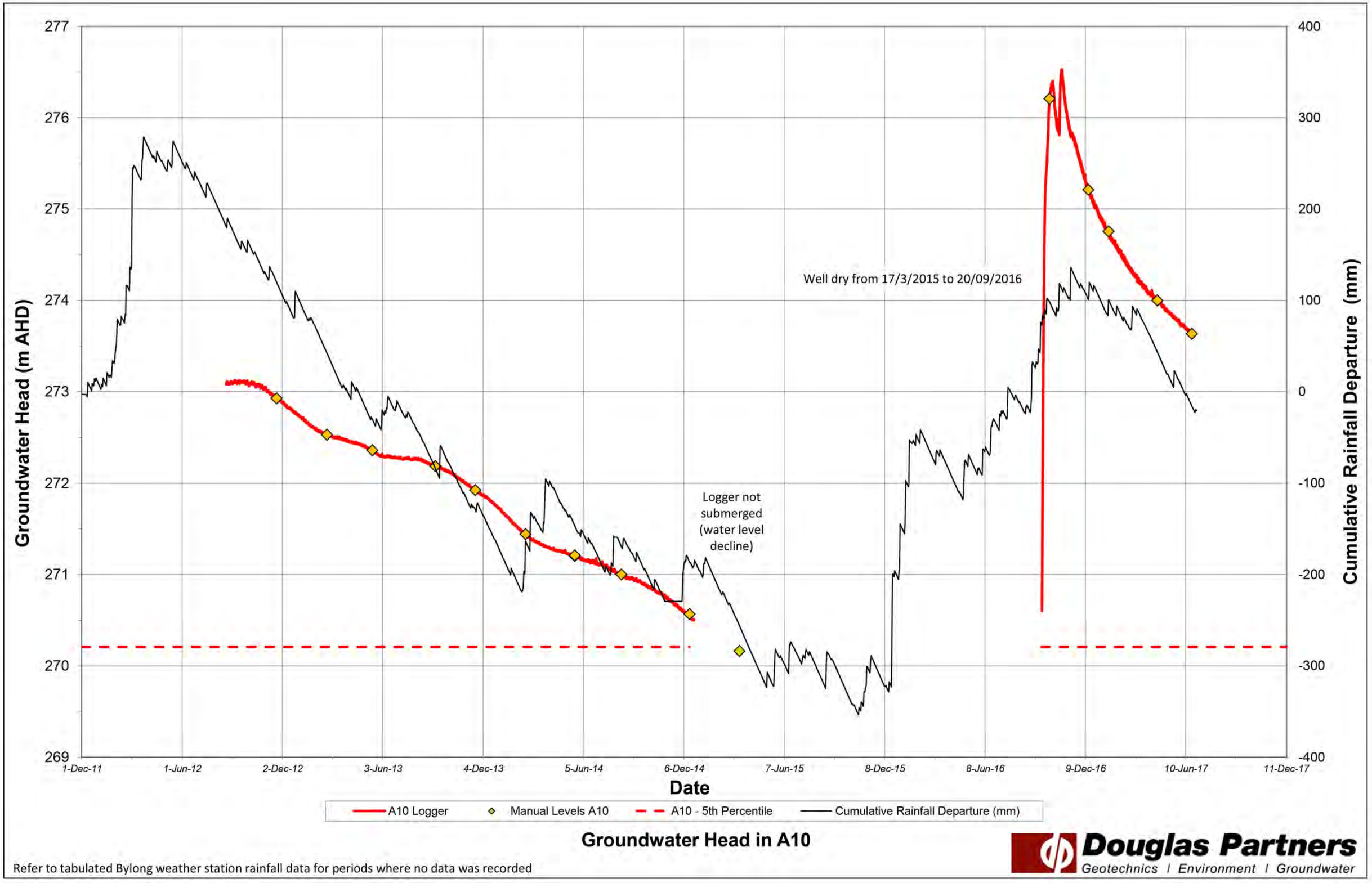
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A09

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

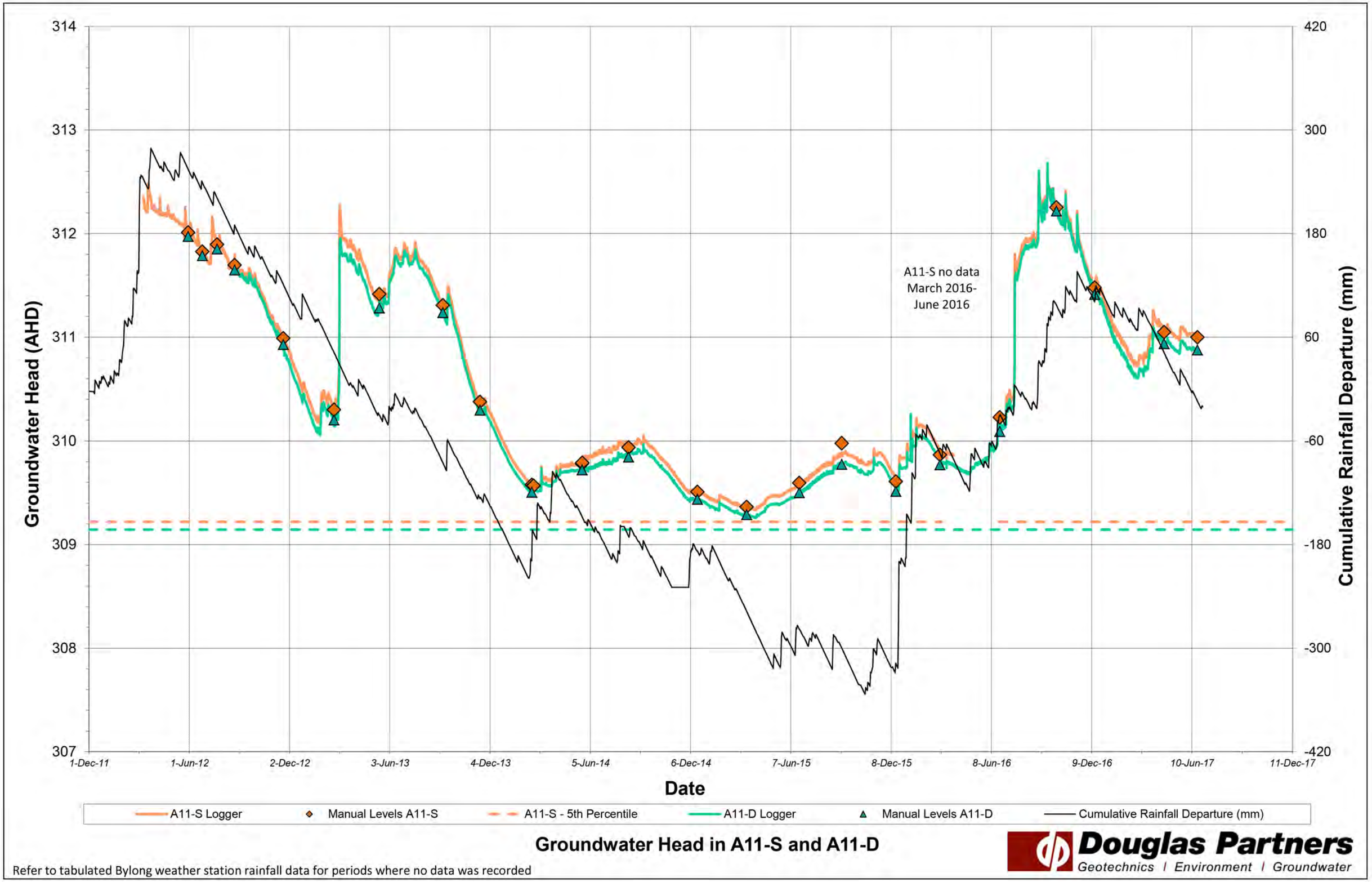
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A10

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

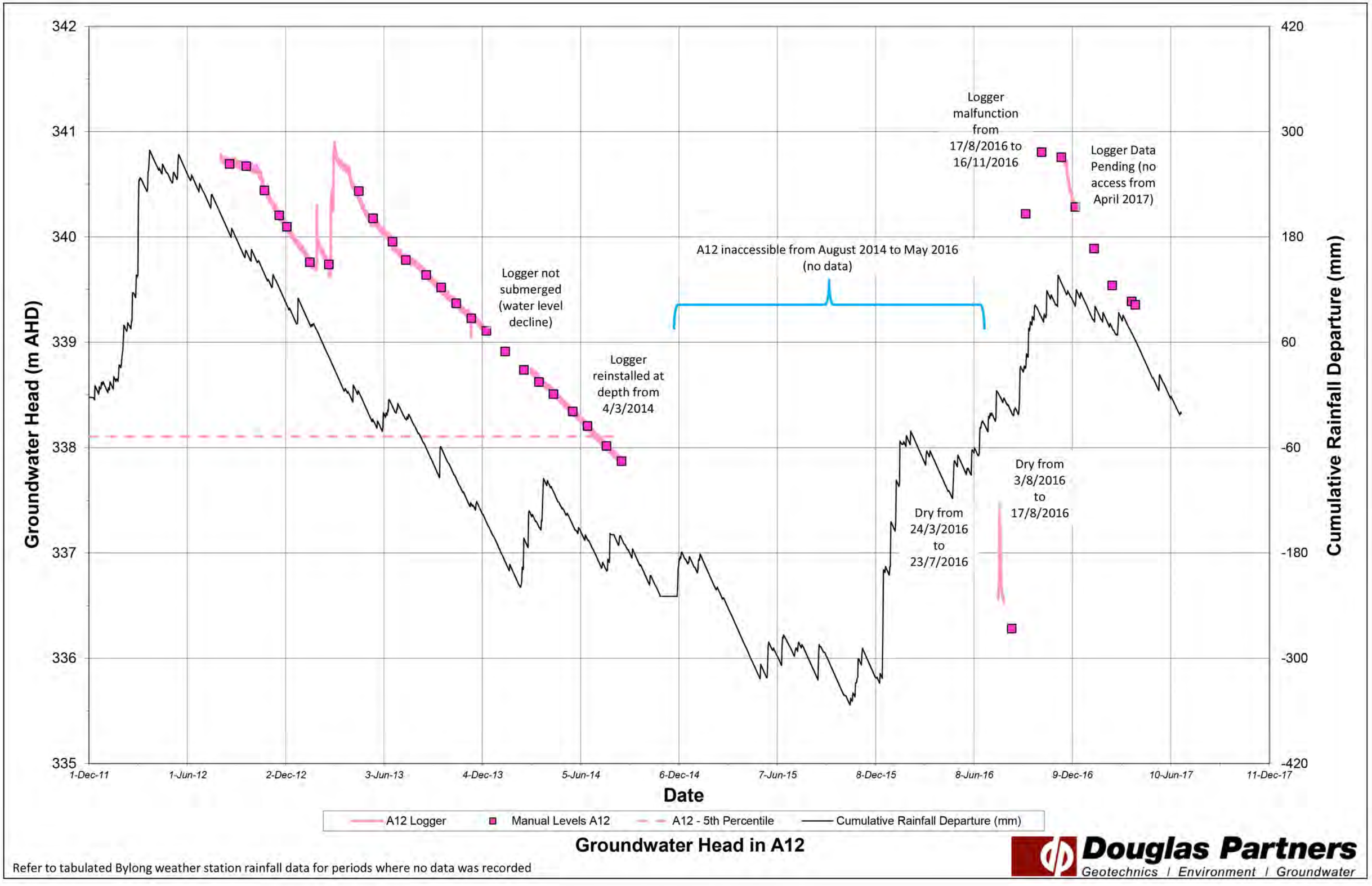
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A11-S and A11-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

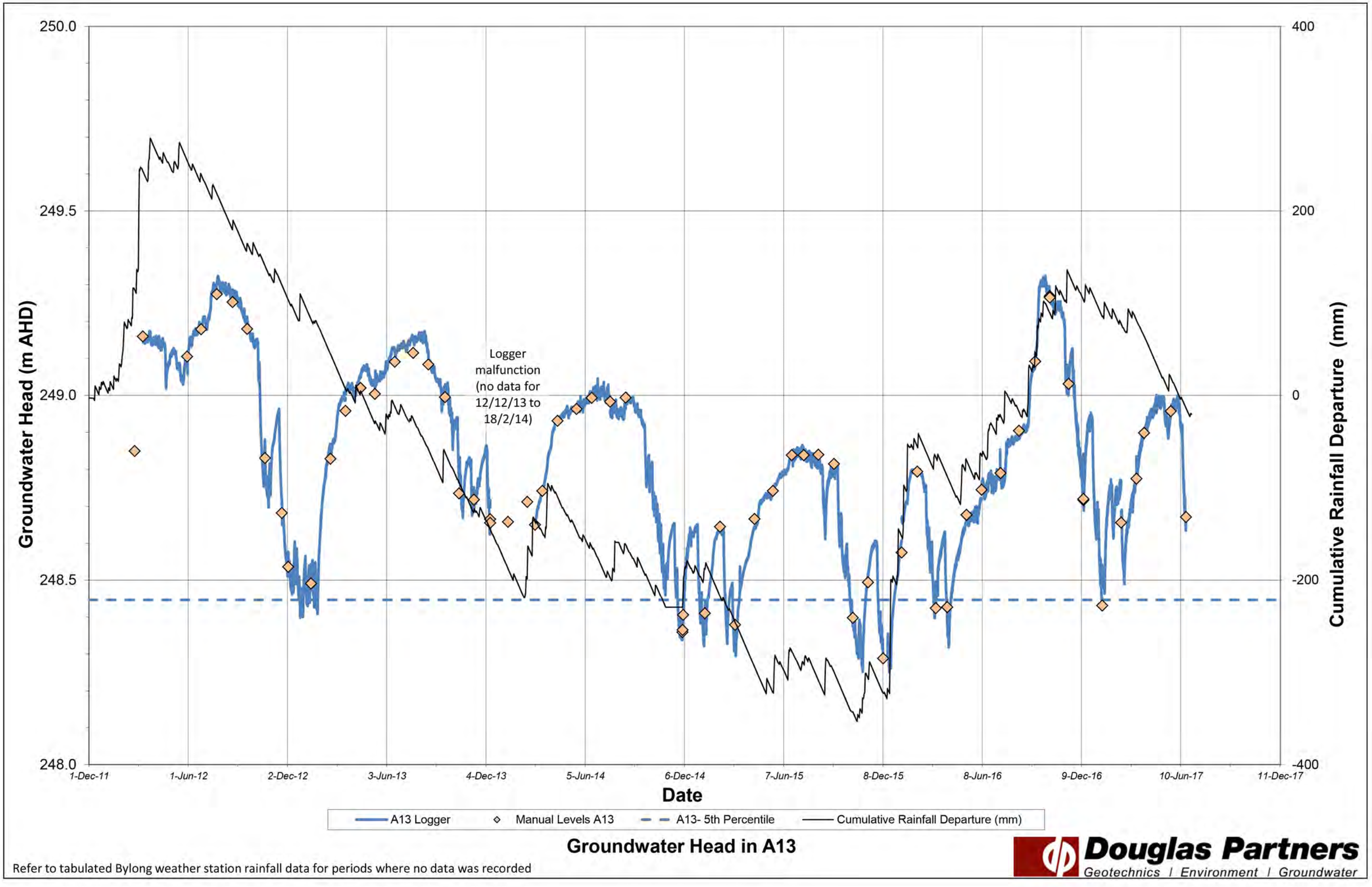
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A12

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

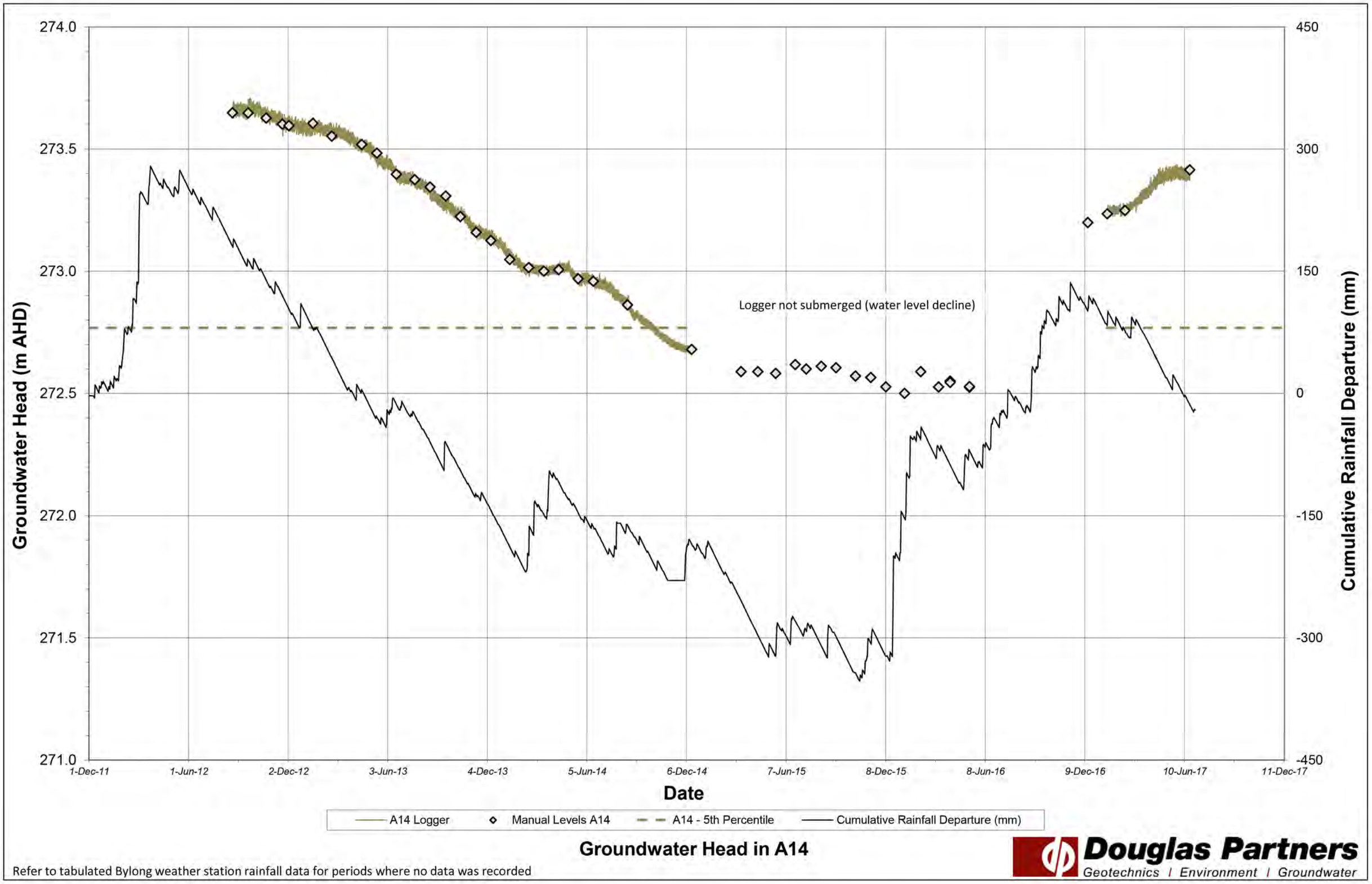
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A13

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

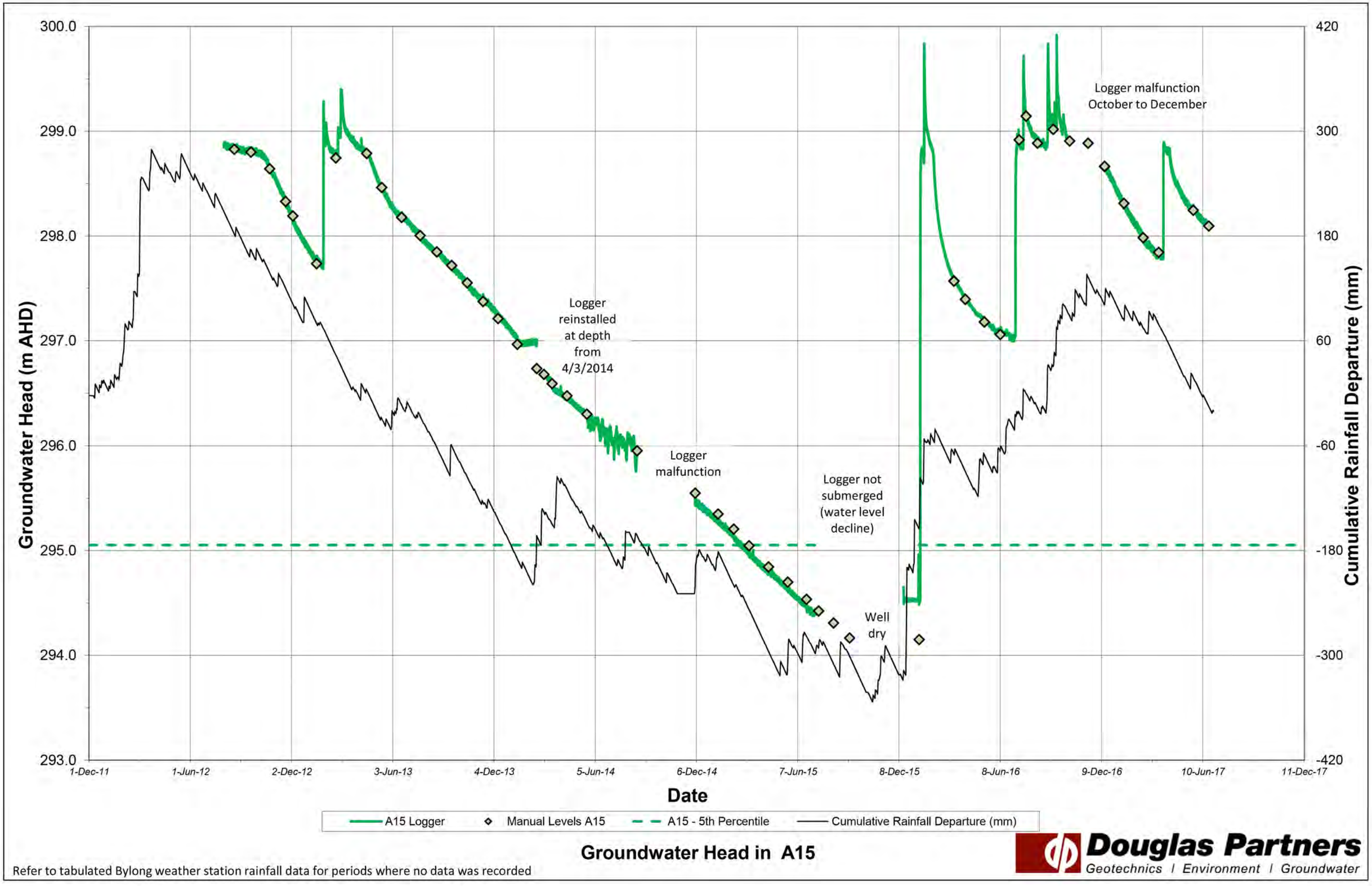
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A14

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

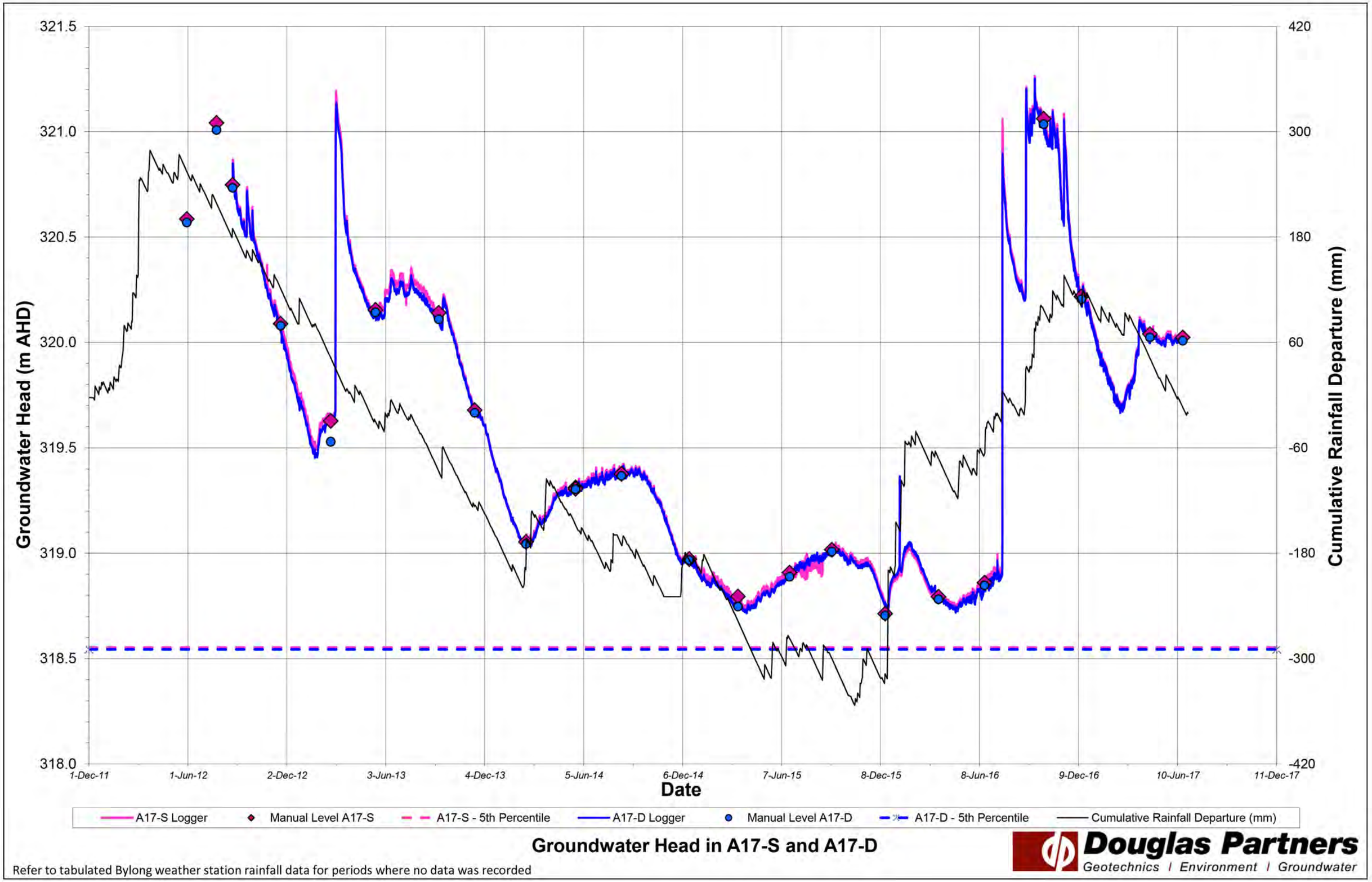
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A15

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

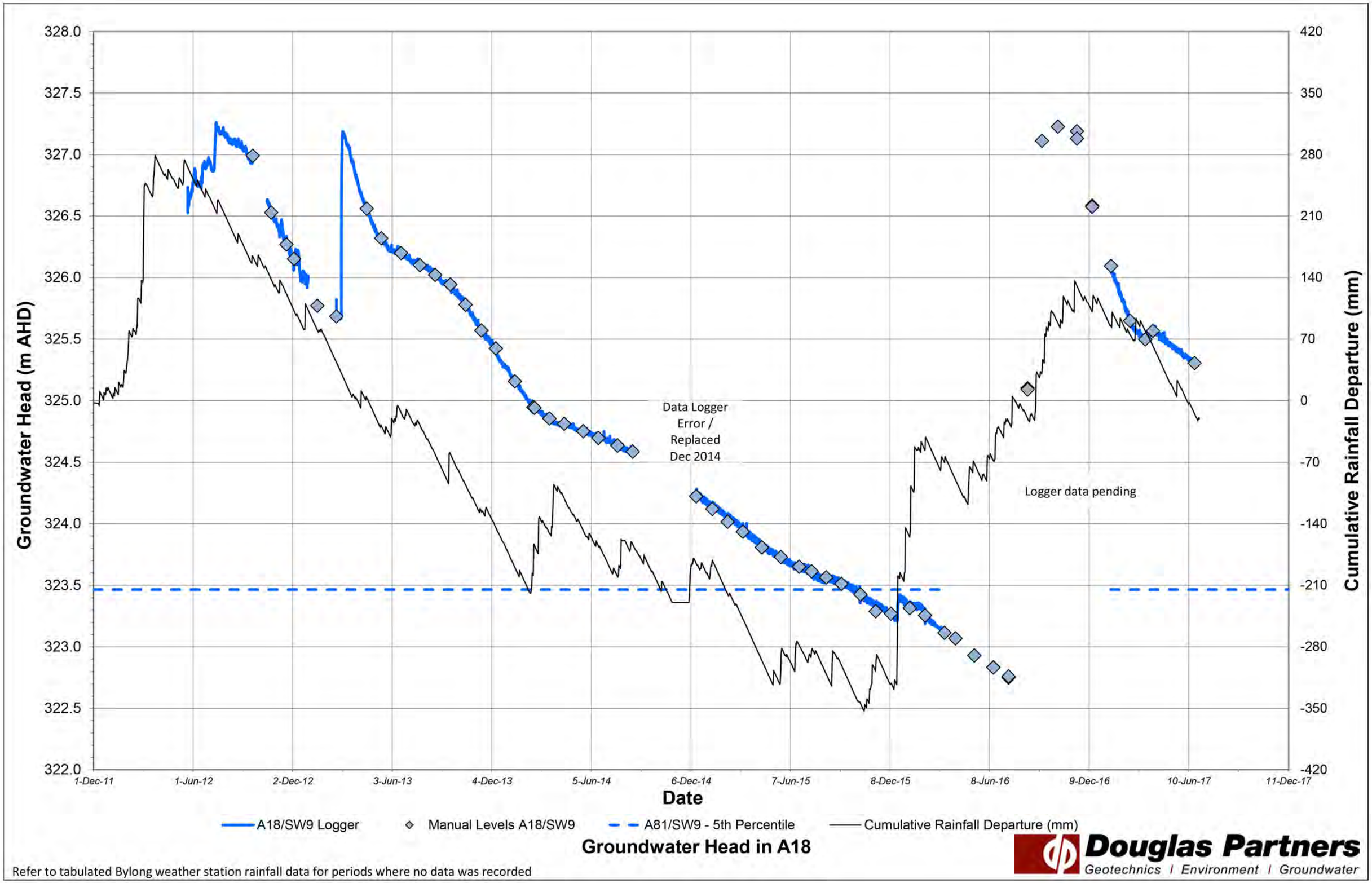
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A17-S and A17-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

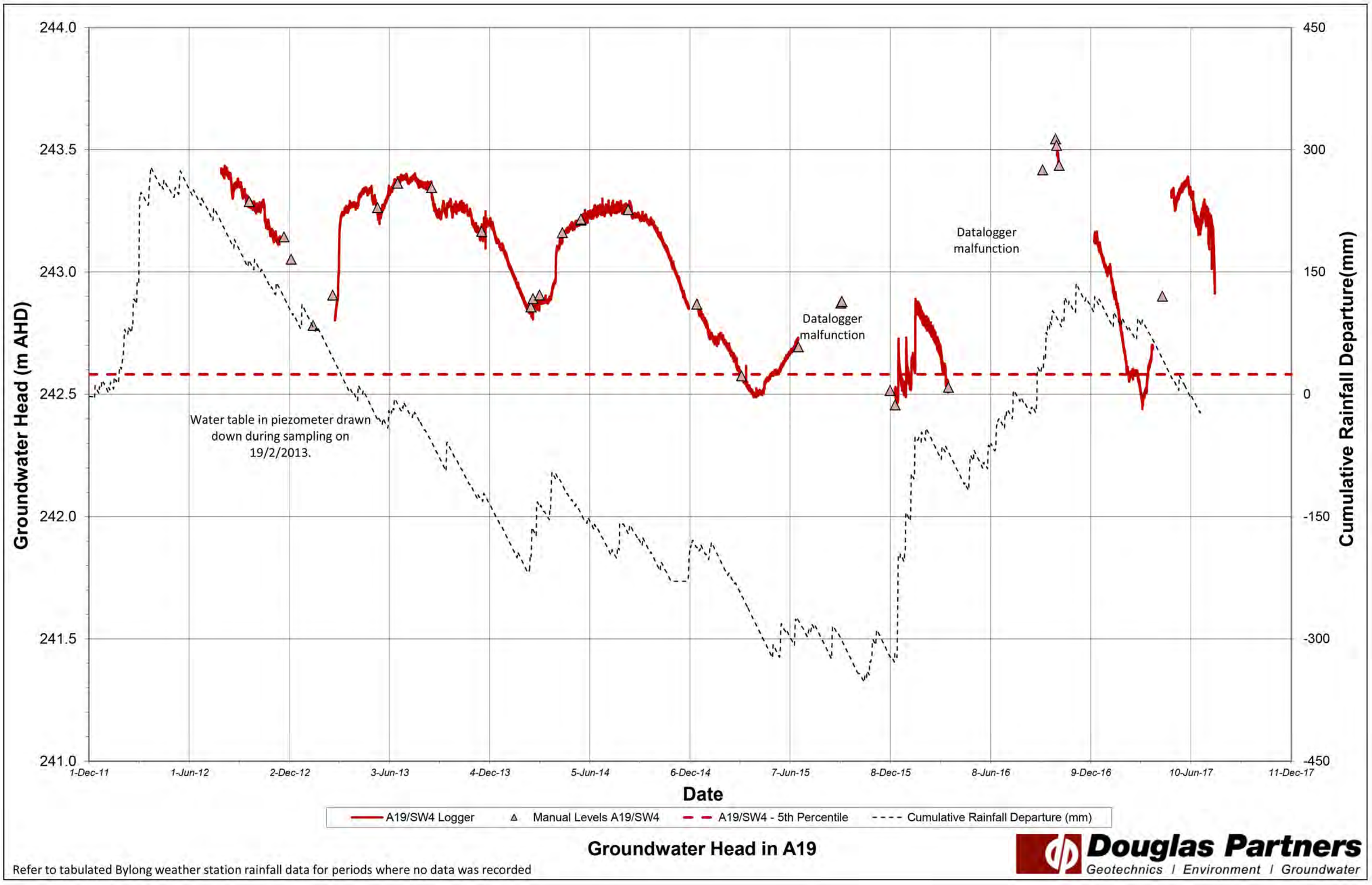
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A18

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

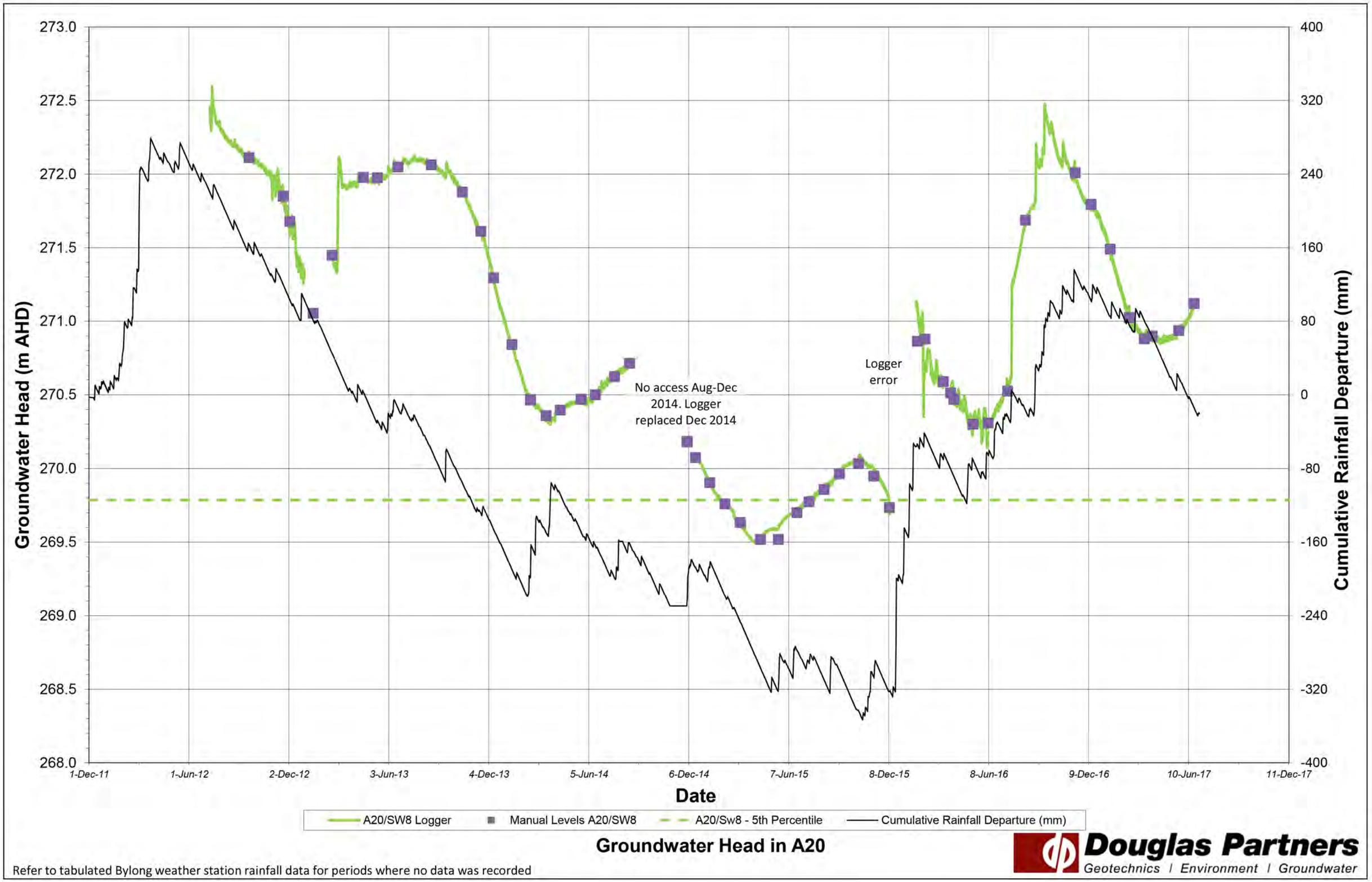
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A19

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

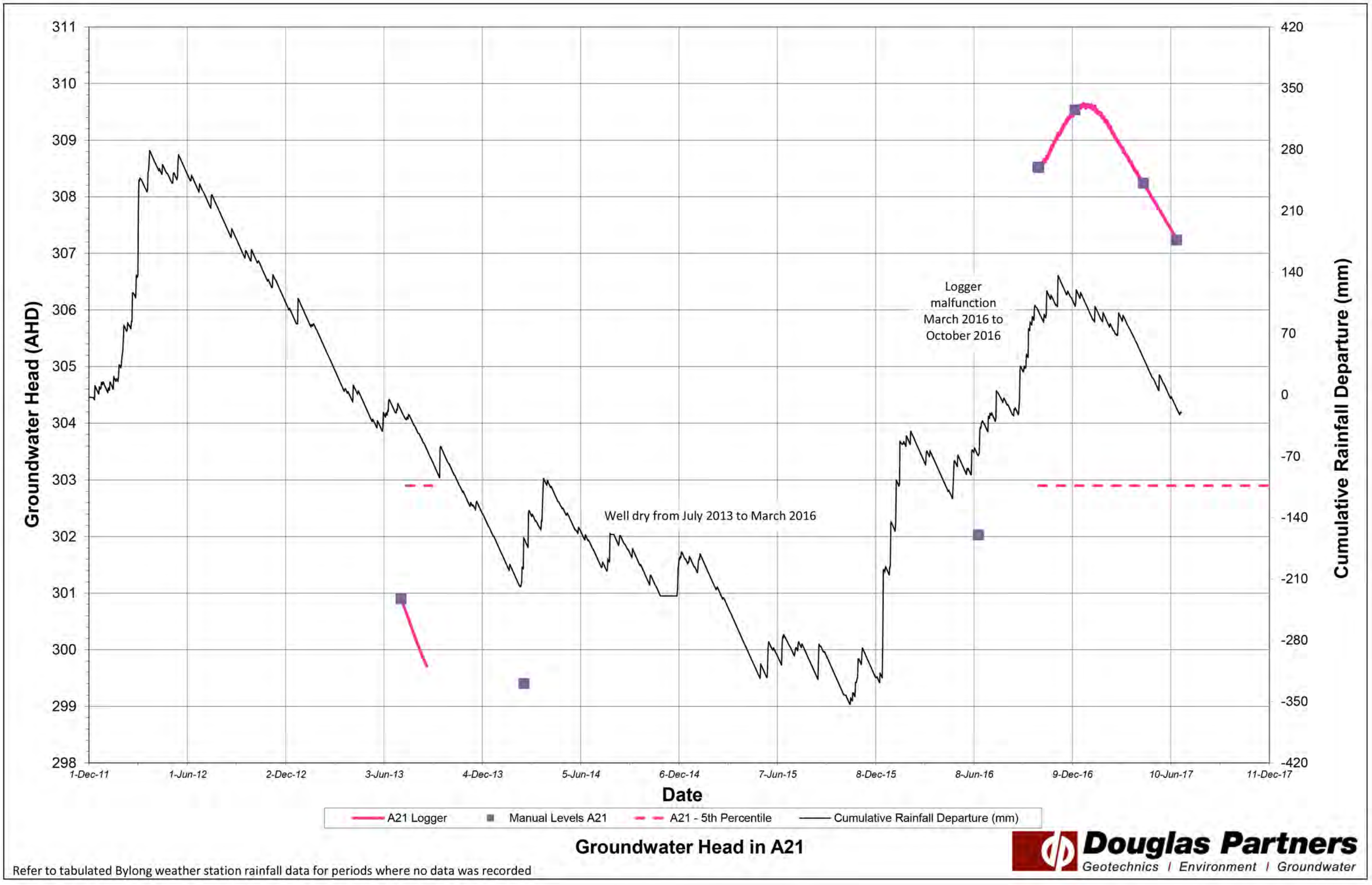
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A20

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

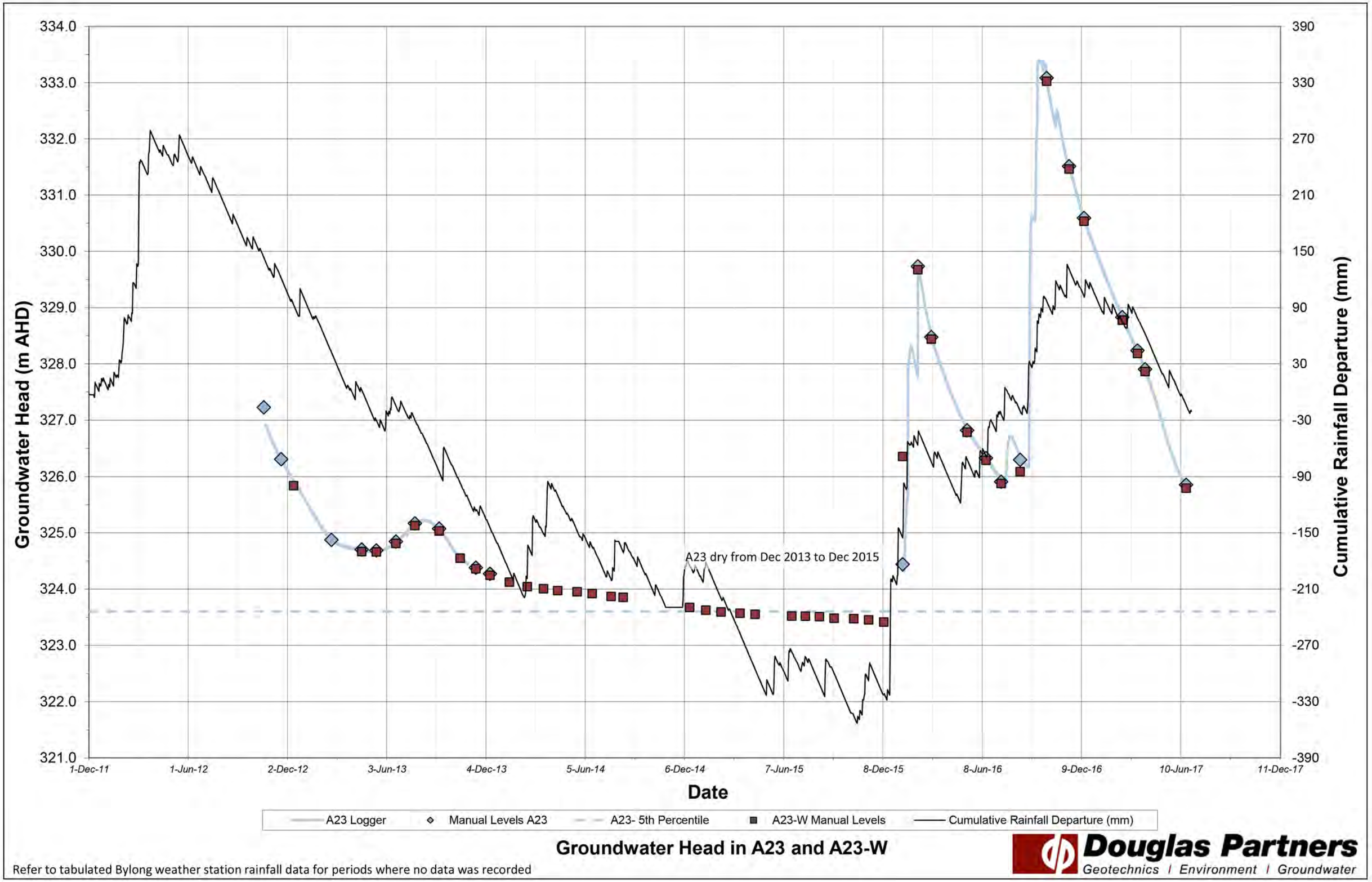
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A21

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

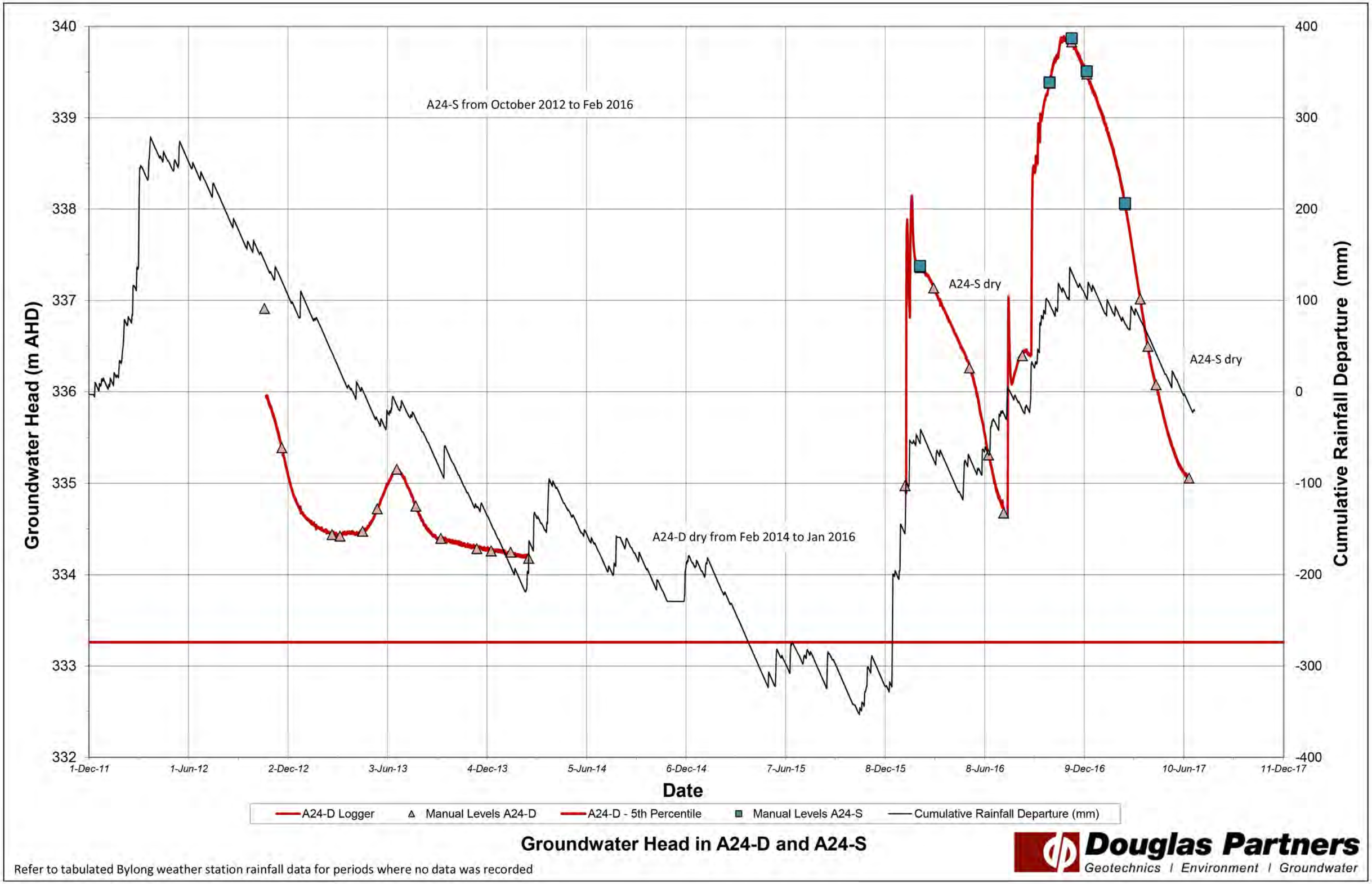
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A23 and A23-W

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

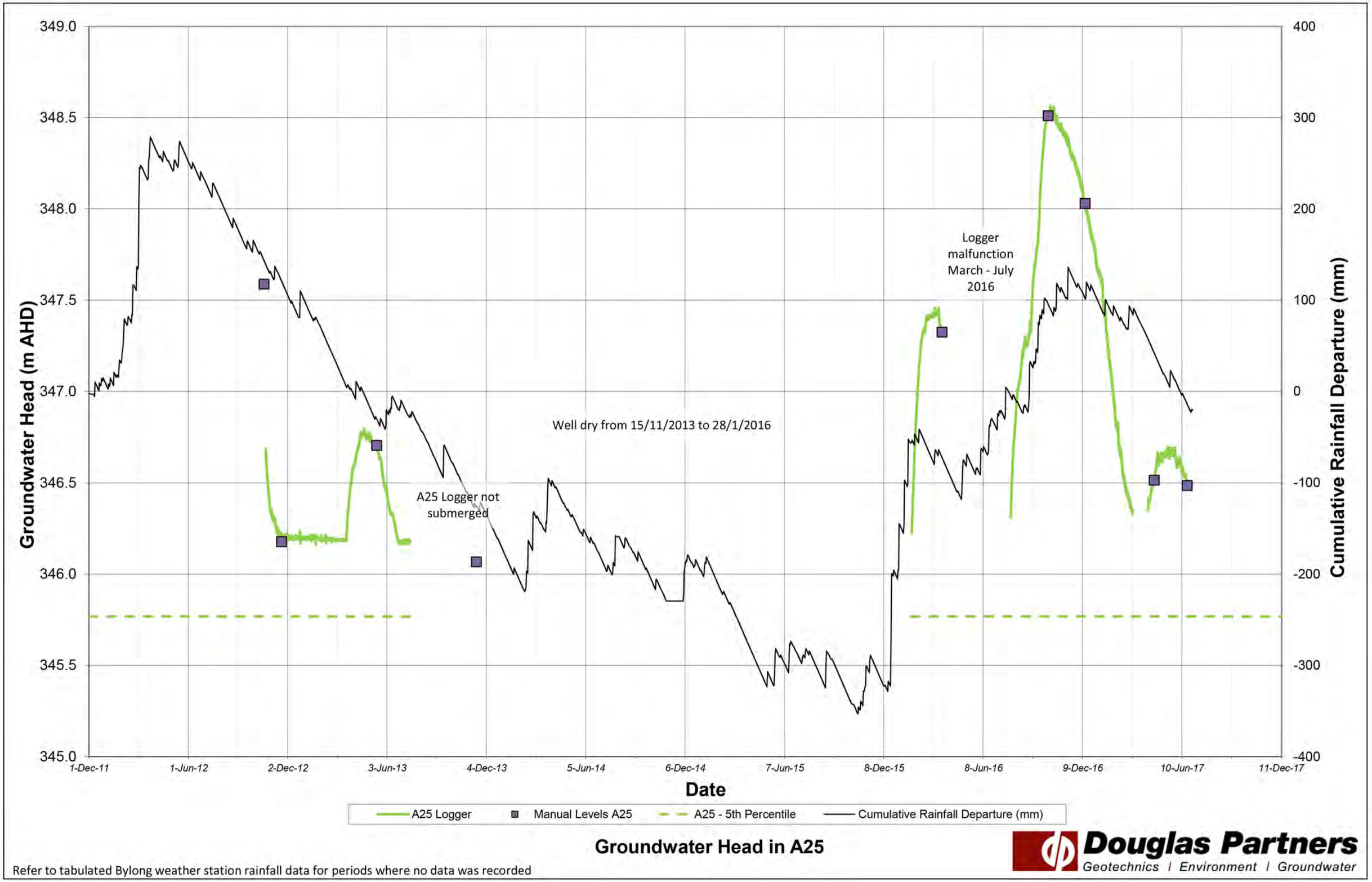
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in A24-D and A24-S

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in A25

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater

AGE01-S Logger
Manual Level AGE01-S
AGE01-S Logger - 5th Percentile
AGE01-D Logger
Manual Level AGE01-D
AGE01-D Logger - 5th Percentile
AGE01-W Logger
Manual Level AGE01-W
AGE01-W Logger - 5th Percentile
Cumulative Rainfall Departure (mm)

Groundwater Head (m AHD)
235.6
235.4
235.2
235.0
234.8
234.6
234.4
234.2
234.0

Cumulative Rainfall Departure (mm)
400
300
200
100
0
-100
-200
-300
-400

1-Dec-11
1-Jun-12
2-Dec-12
3-Jun-13
4-Dec-13
5-Jun-14
6-Dec-14
7-Jun-15
8-Dec-15
8-Jun-16
9-Dec-16
10-Jun-17
11-Dec-17

Date

Groundwater Head in AGE01-S, AGE01-D and AGE01-W

Douglas Partners
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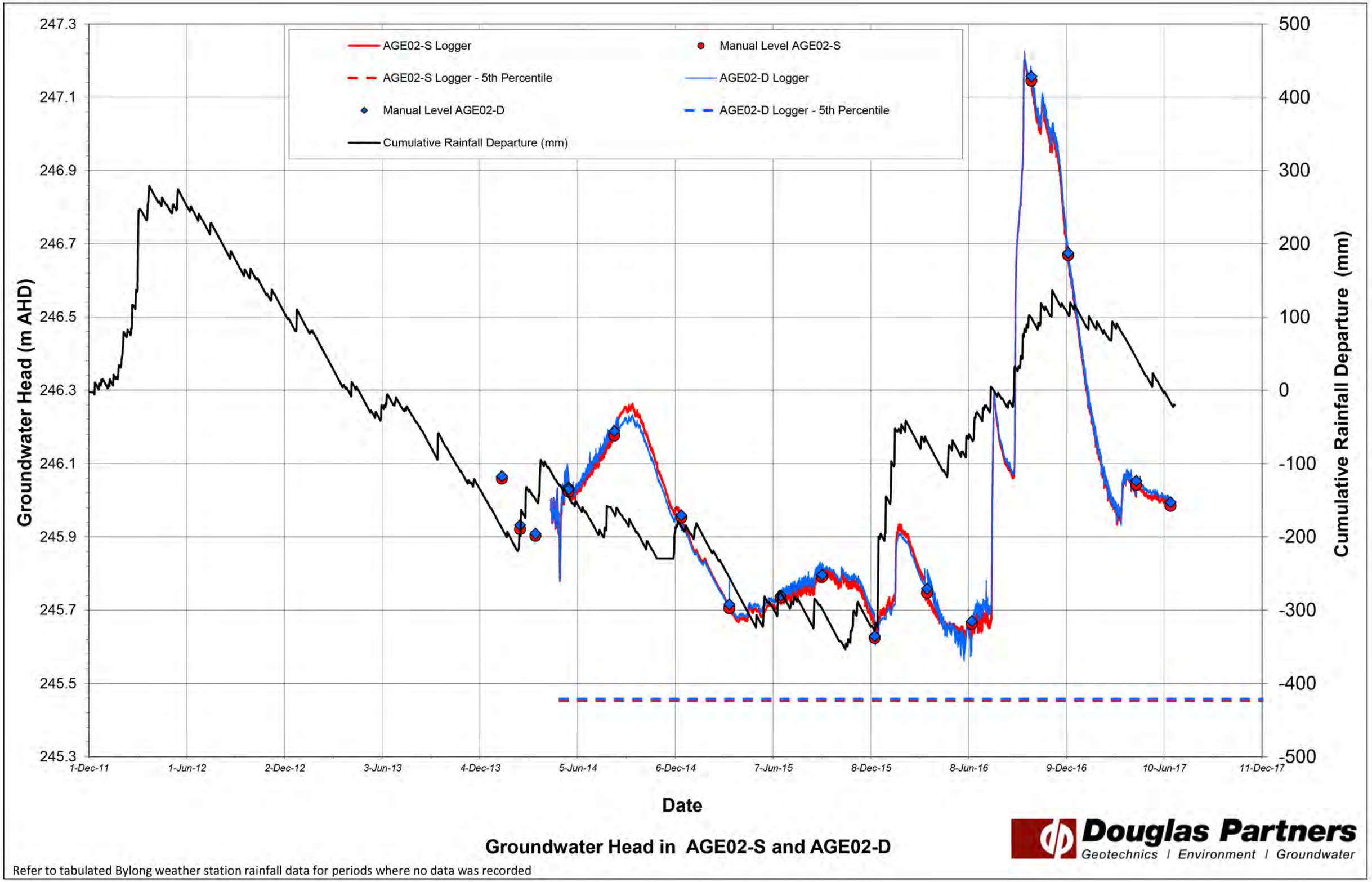
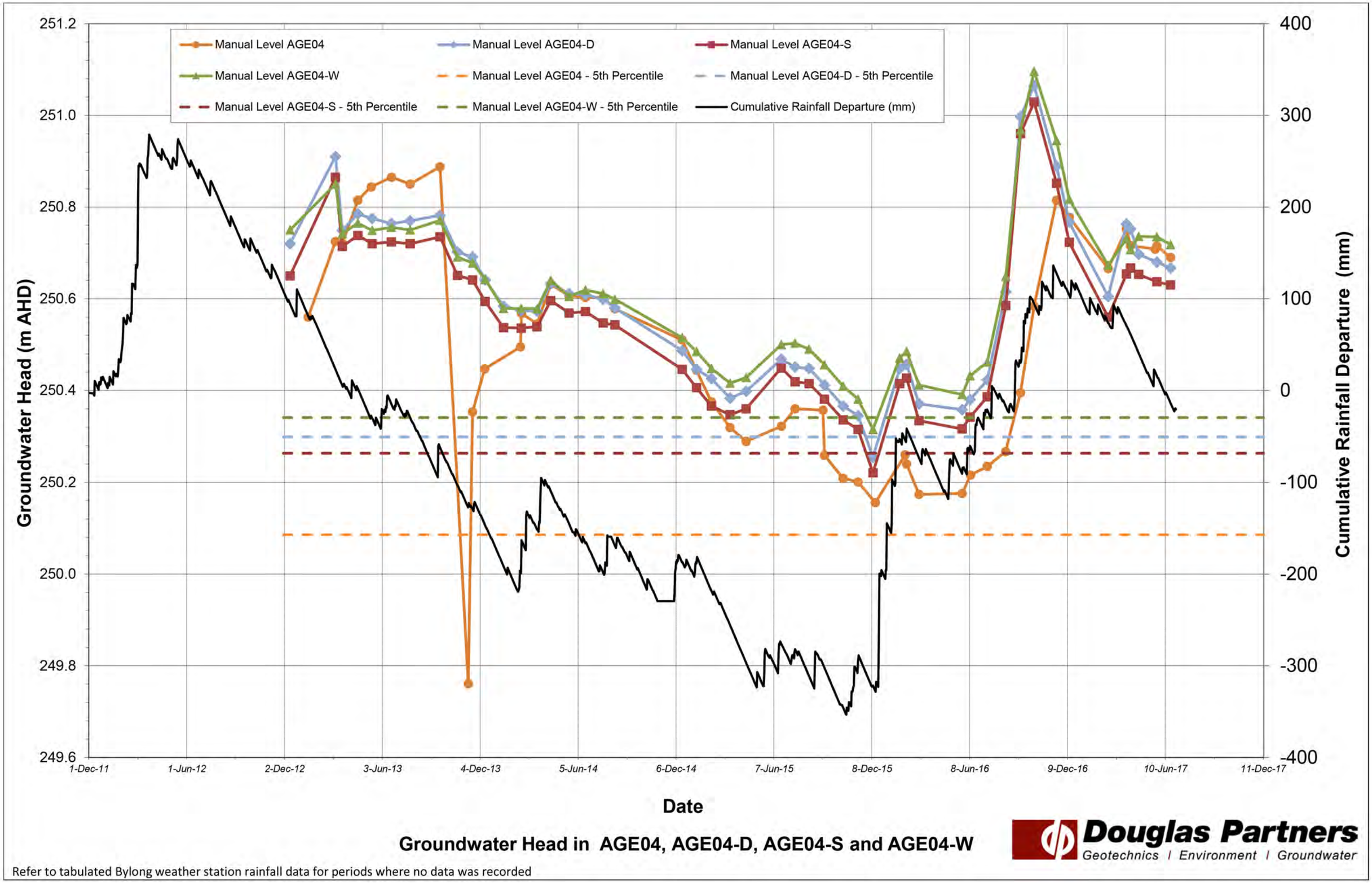
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in AGE02-S and AGE02-D

Douglas Partners
Geotechnics | Environment | Groundwater

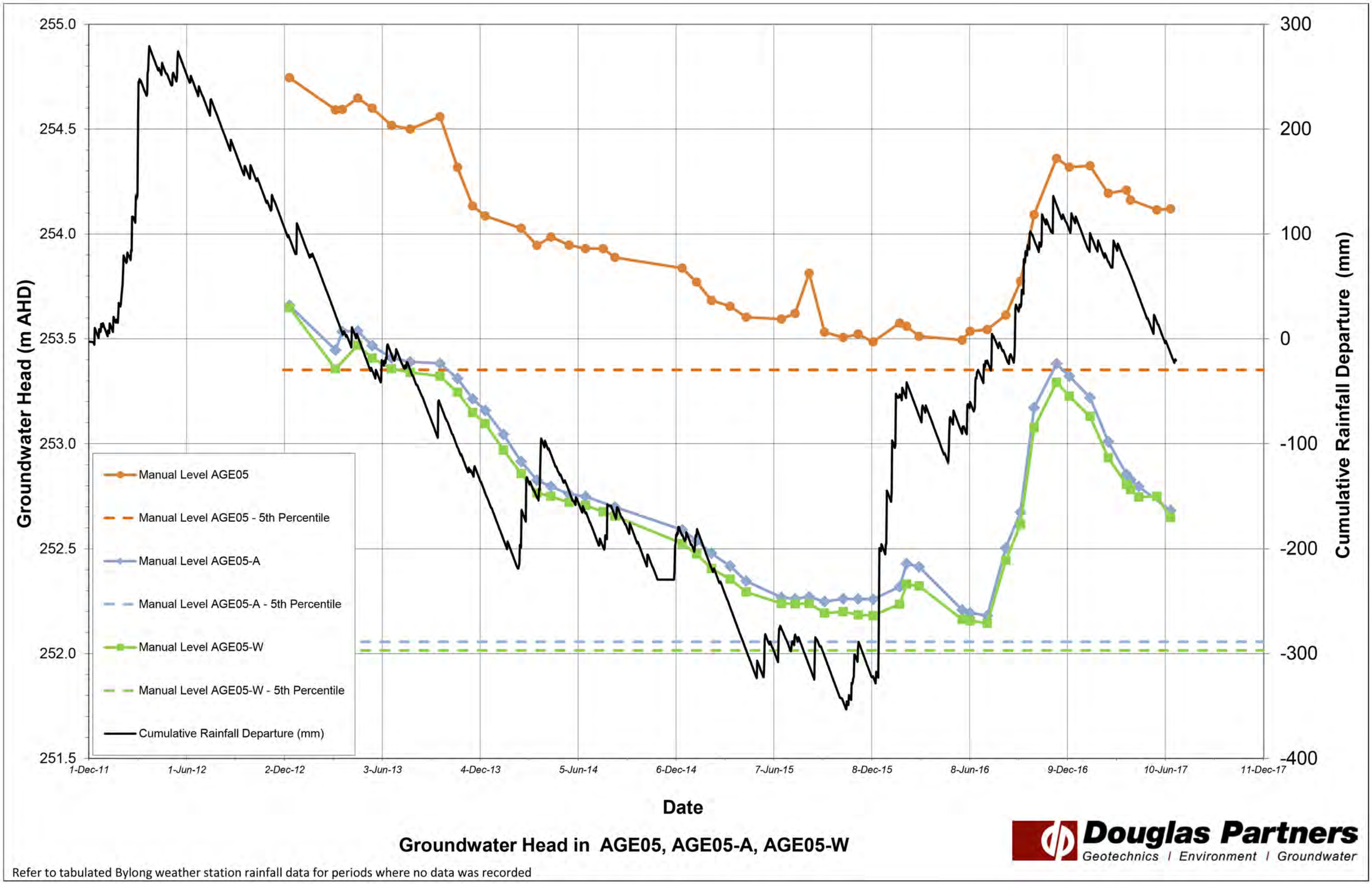
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in AGE04, AGE04-D, AGE04-S and AGE04-W

Douglas Partners
Geotechnics / Environment / Groundwater

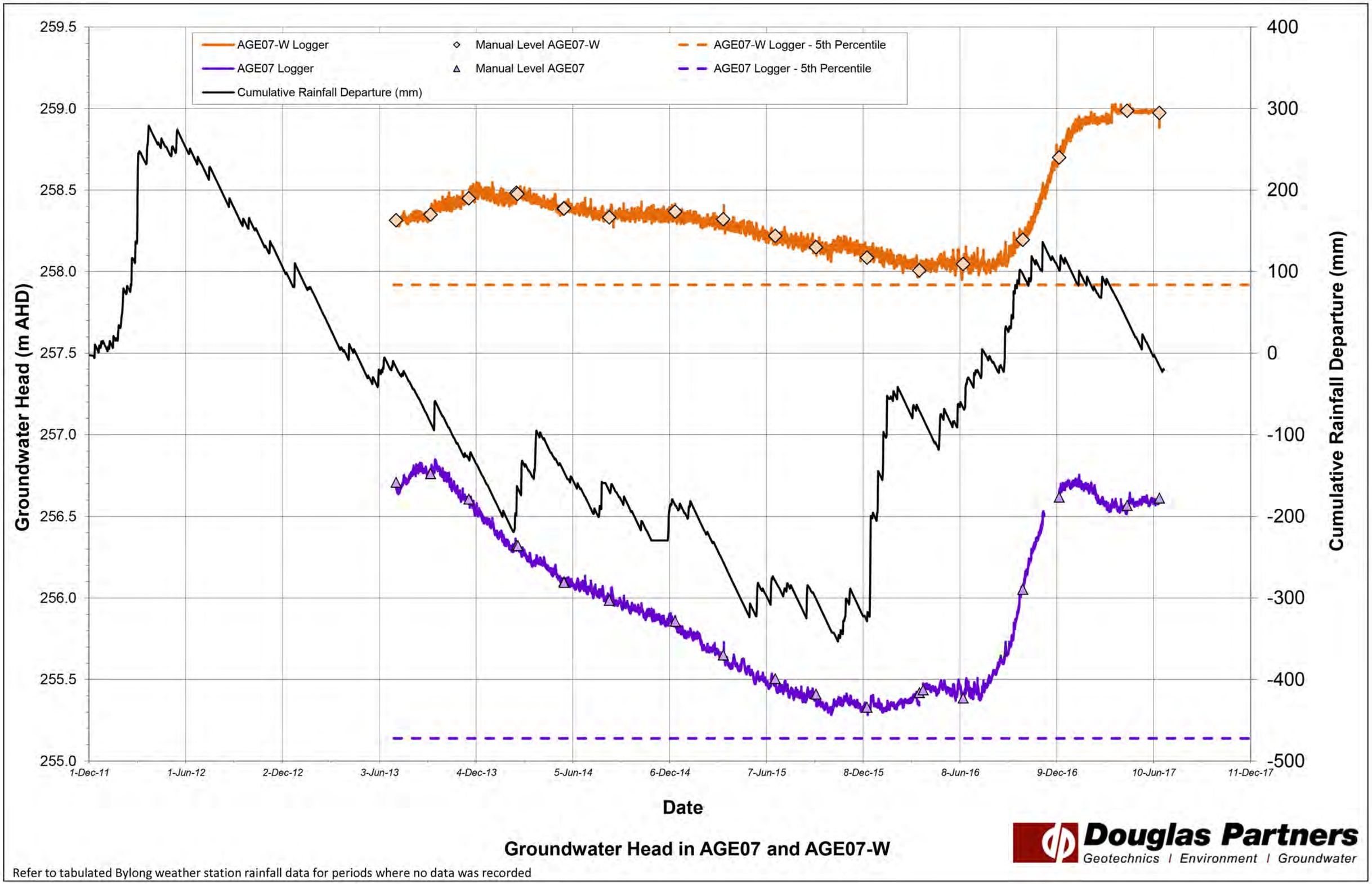
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in AGE05, AGE05-A, AGE05-W

Douglas Partners
Geotechnics | Environment | Groundwater

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in AGE07 and AGE07-W

Douglas Partners
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Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

277
276
275
274
273
272
271
400
200
0
-200
-400
-600
-800
Groundwater Head (m AHD)
Cumulative Rainfall Departure (mm)
AGE08 logger malfunction
September 16 to May 17
1-Dec-11
1-Jun-12
2-Dec-12
3-Jun-13
4-Dec-13
5-Jun-14
6-Dec-14
7-Jun-15
8-Dec-15
8-Jun-16
9-Dec-16
10-Jun-17
11-Dec-17
Date
AGE08 Logger
Manual Levels AGE08
AGE08 Logger - 5th Percentile
AGE08W Logger
Manual Levels AGE08W
AGE08W Logger - 5th Percentile
Cumulative Rainfall Departure (mm)
Groundwater Head in AGE08 and AGE08W
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded
Douglas Partners
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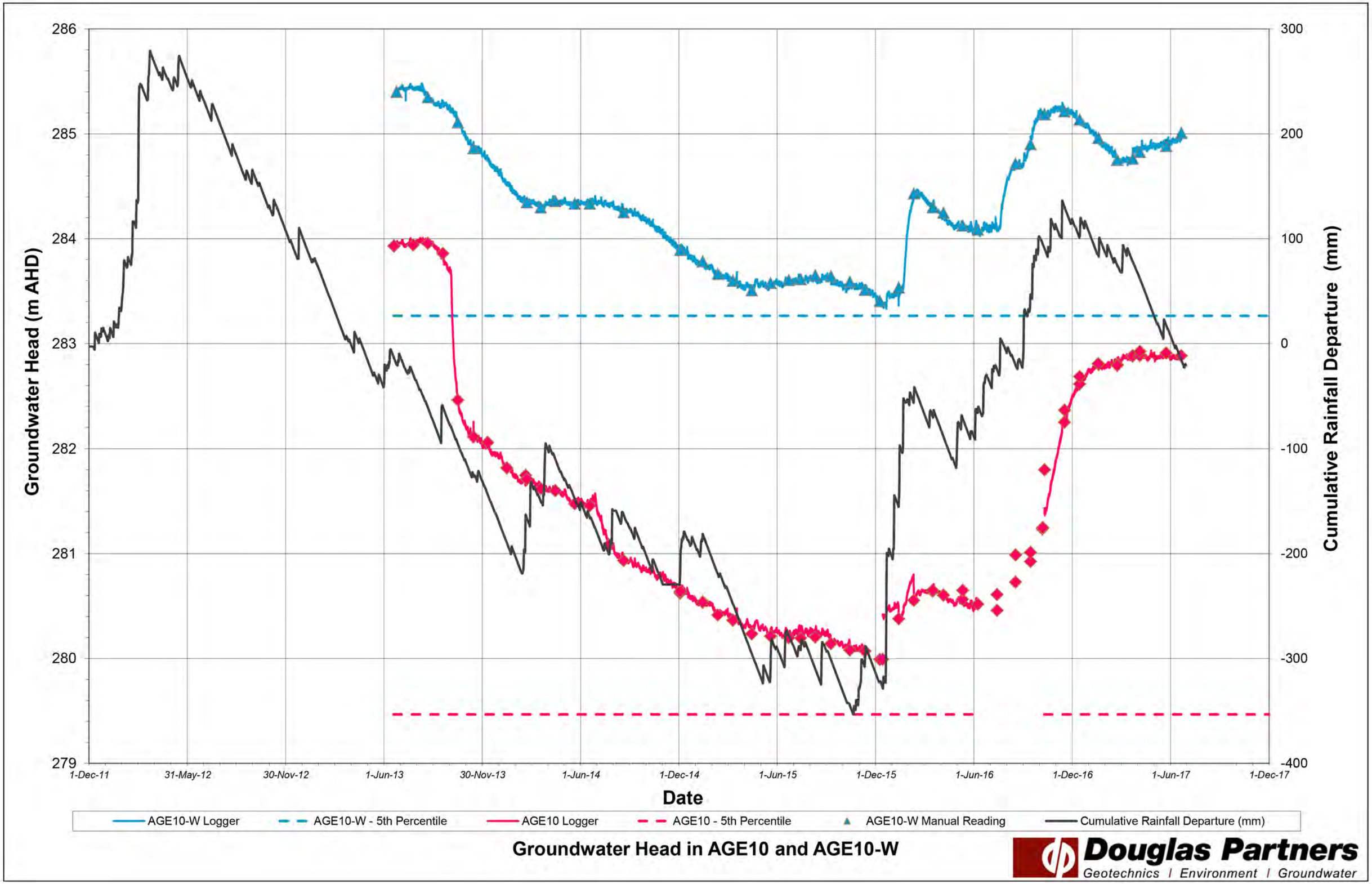
Groundwater Head in AGE09 and AGE09-W

Douglas Partners
Geotechnics / Environment / Groundwater

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Groundwater Head in AGE10 and AGE10-W

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Logger malfunction from October 2016 to April 2017

Groundwater Head (m AHD)

320.5
320.0
319.5
319.0
318.5
318.0
317.5
317.0
316.5

Cumulative Rainfall Departure (mm)

400
300
200
100
0
-100
-200
-300
-400

1-Dec-11
1-Jun-12
2-Dec-12
3-Jun-13
4-Dec-13
5-Jun-14
6-Dec-14
7-Jun-15
8-Dec-15
8-Jun-16
9-Dec-16
10-Jun-17
11-Dec-17

Date

AGE11-W Logger
AGE-W Logger - 5th Percentile
Manual Levels AGE11-W
Cumulative Rainfall Departure (mm)

Groundwater Head in AGE11-W

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

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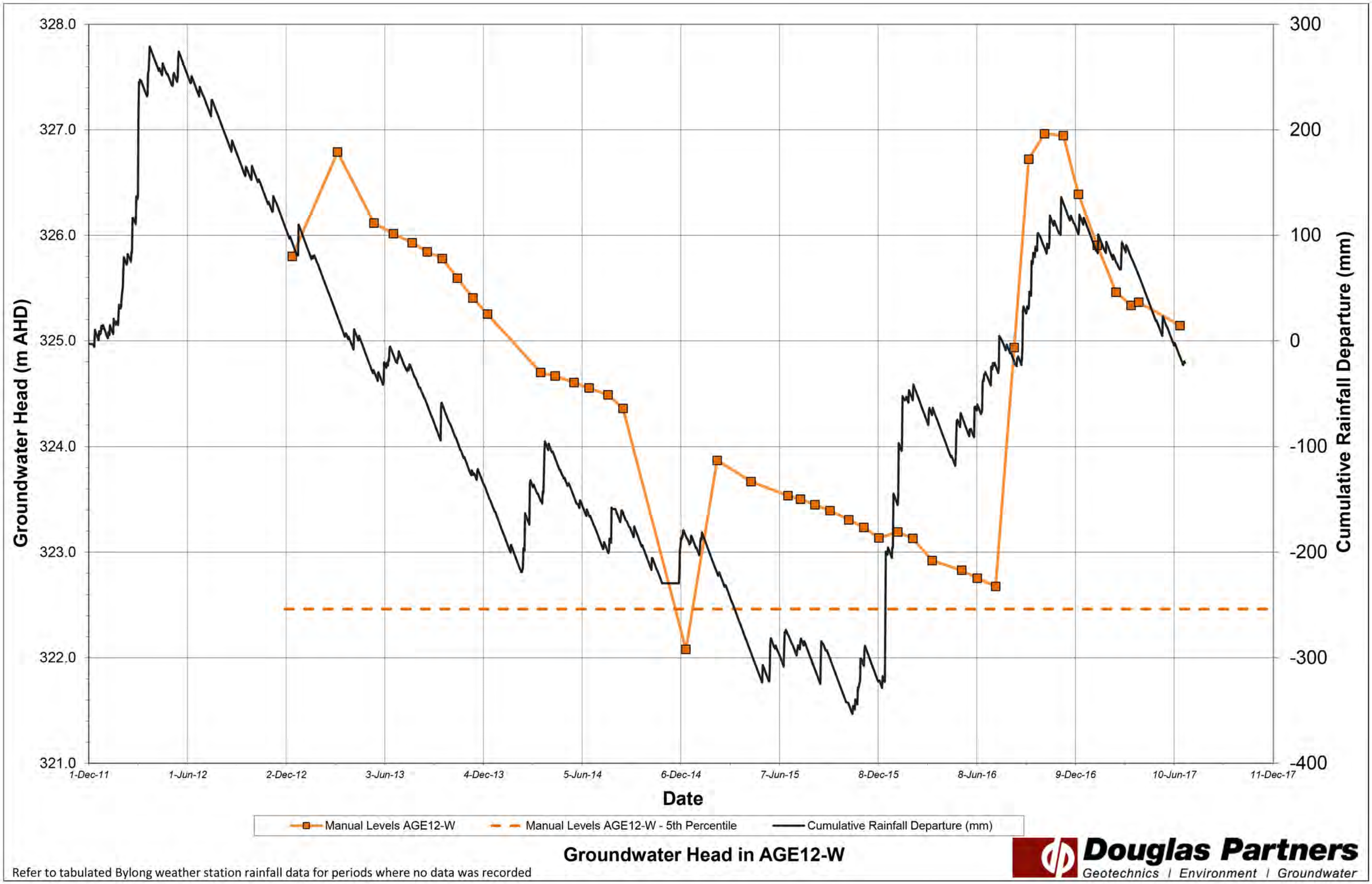

Groundwater Head in AGE12-W

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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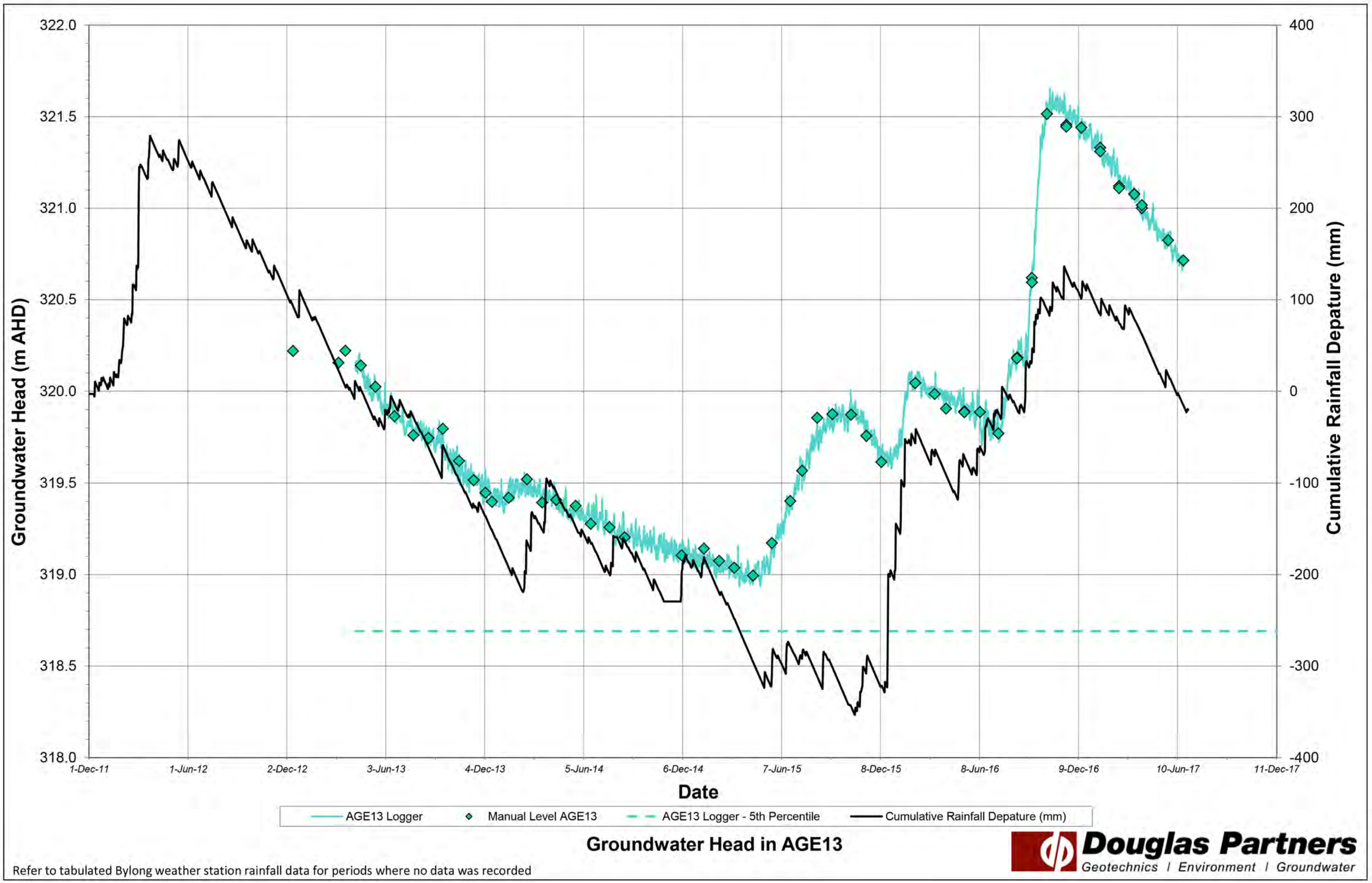
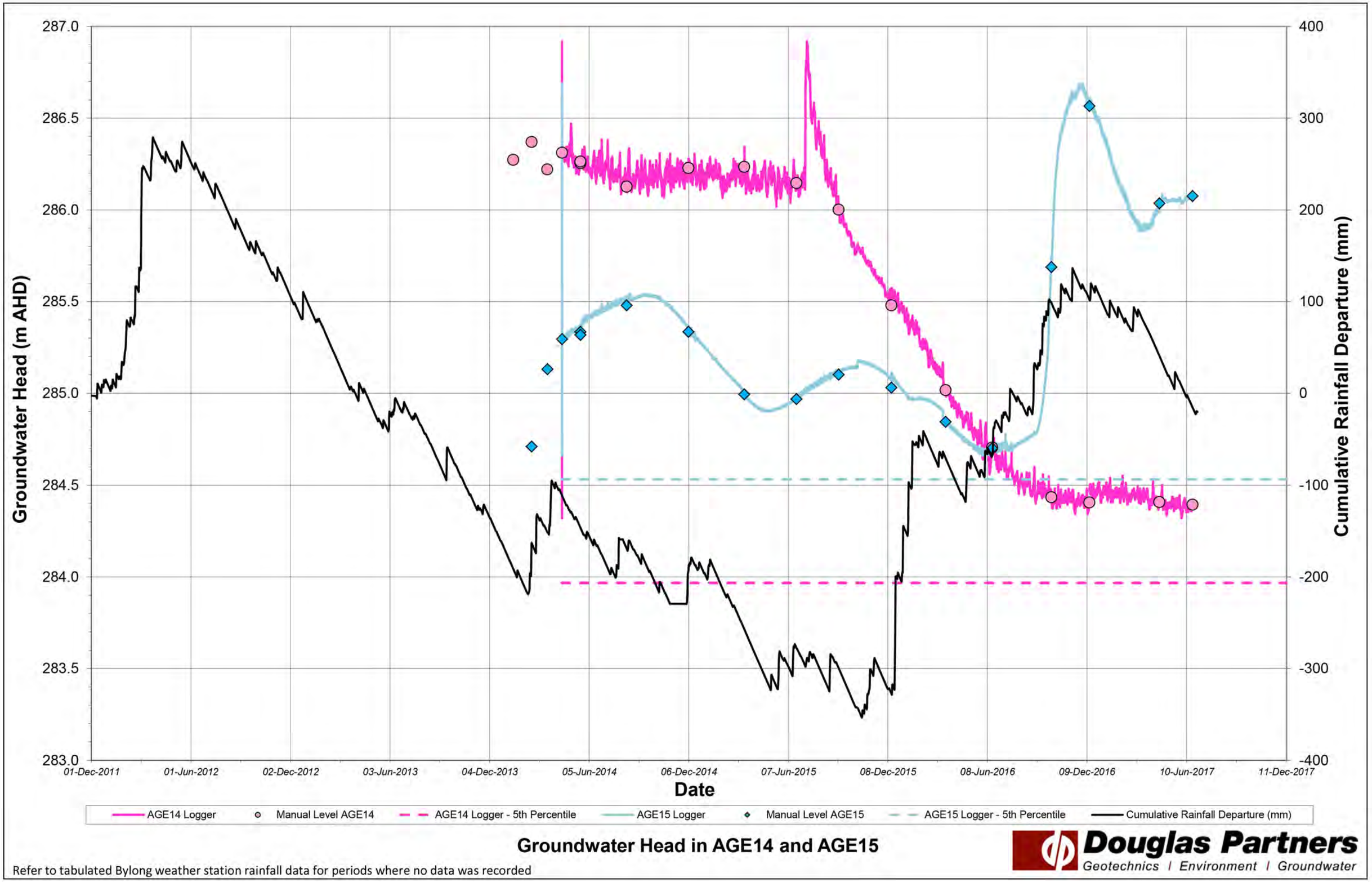


Groundwater Head in AGE13

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in AGE14 and AGE15

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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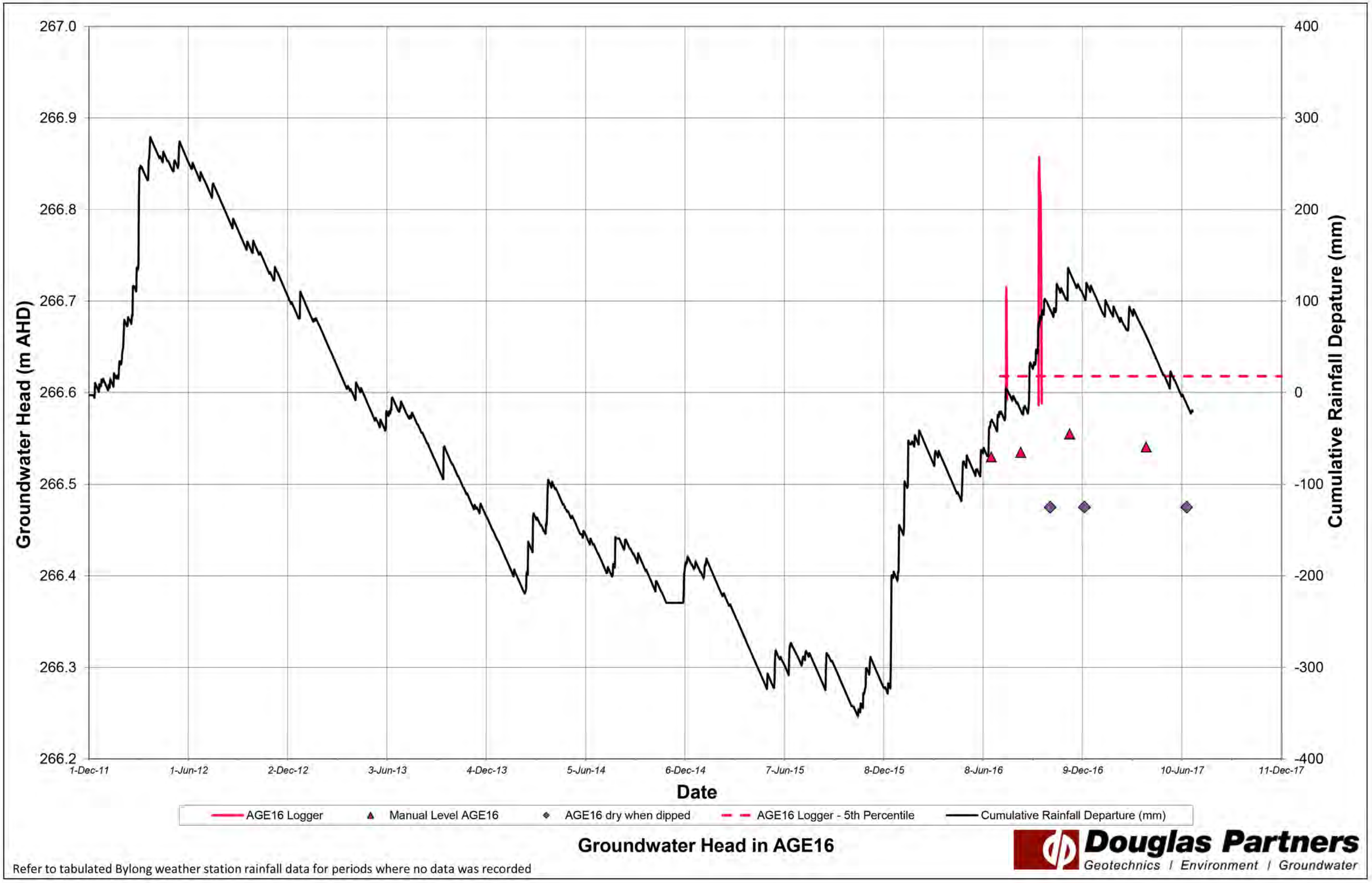
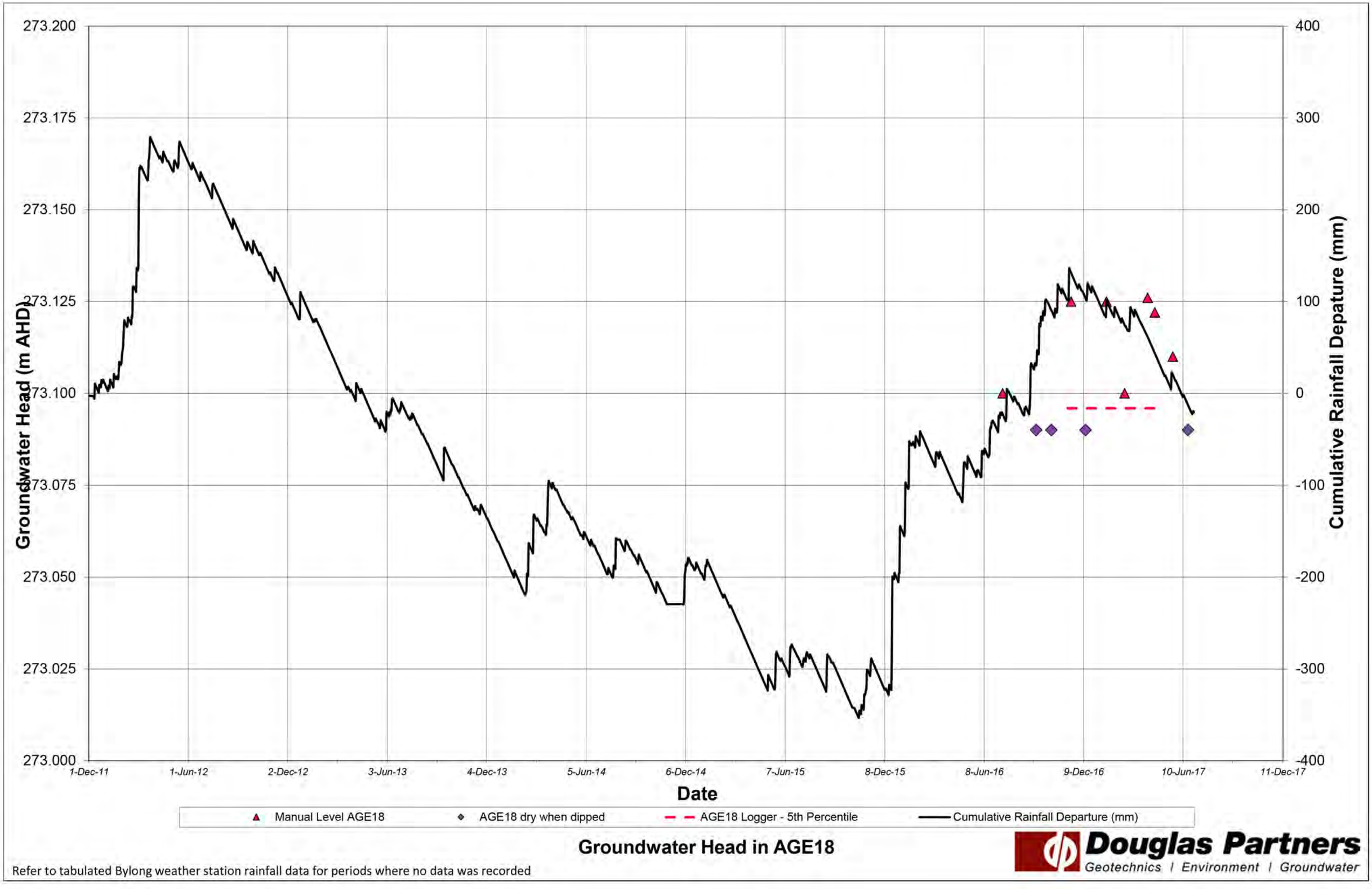


Groundwater Head in AGE16

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in AGE18

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

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283.6
283.4
283.2
283.0
282.8
282.6
282.4
282.2
282.0

Groundwater Head (m AHD)

400
300
200
100
0
-100
-200
-300
-400

Cumulative Rainfall Departure (mm)

1-Dec-11
1-Jun-12
2-Dec-12
3-Jun-13
4-Dec-13
5-Jun-14
6-Dec-14
7-Jun-15
8-Dec-15
8-Jun-16
9-Dec-16
10-Jun-17
11-Dec-17

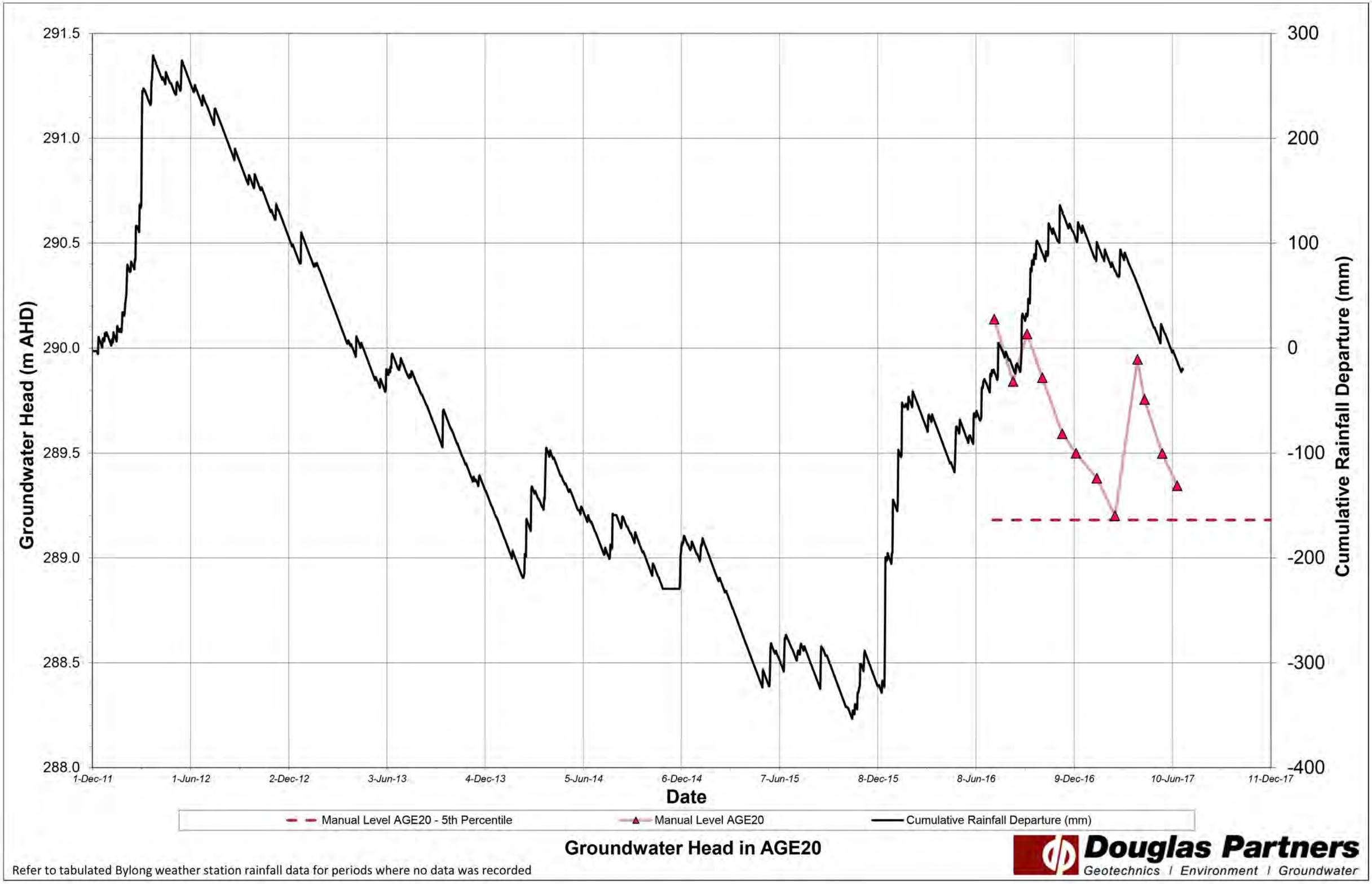
Date

AGE19 Logger
Manual Level AGE19
AGE19 dry when dipped
AGE19 Logger - 5th Percentile
Cumulative Rainfall Departure (mm)

Groundwater Head in AGE19

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in AGE20

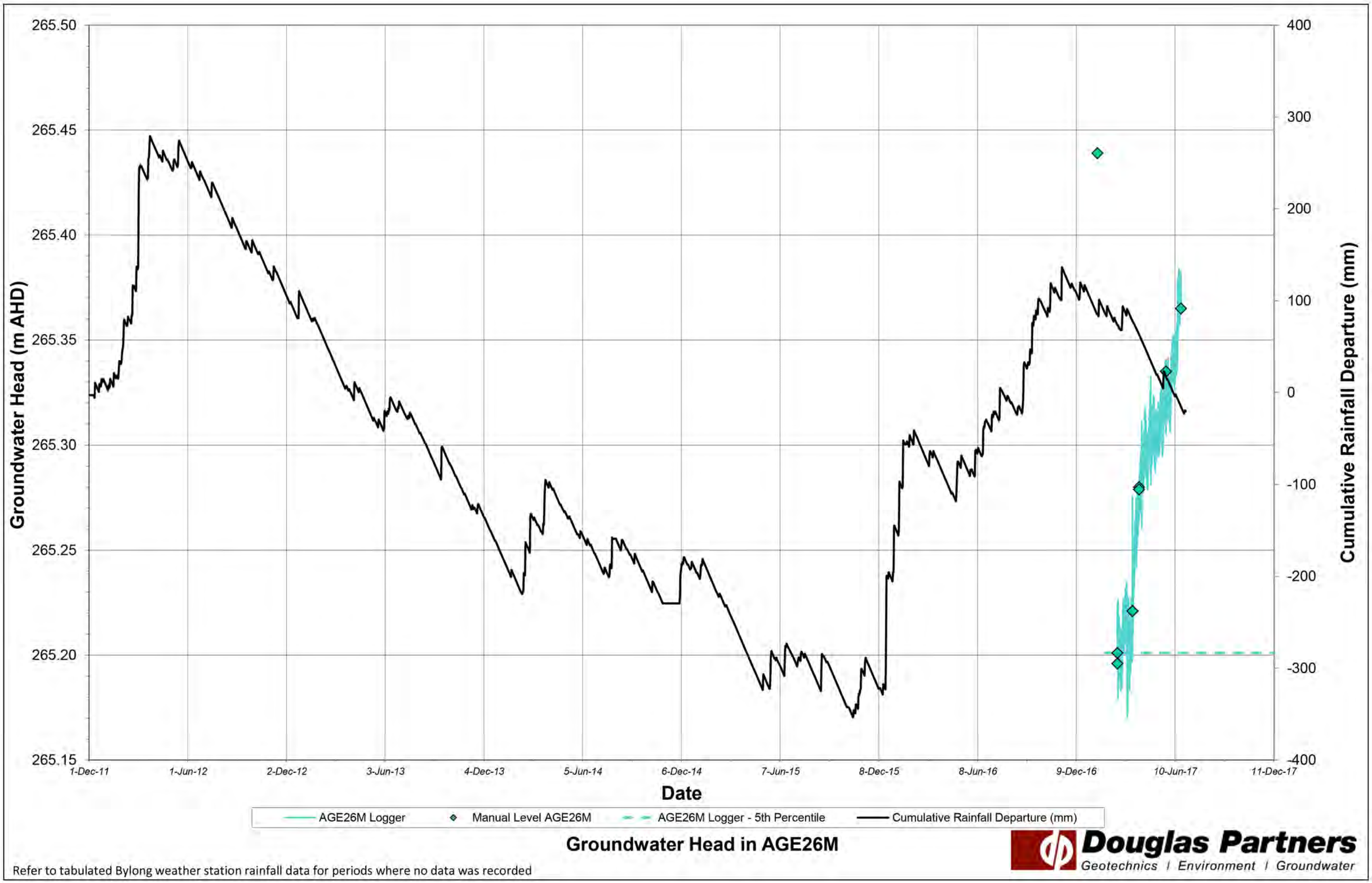
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater

Groundwater Head in AGE22M

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

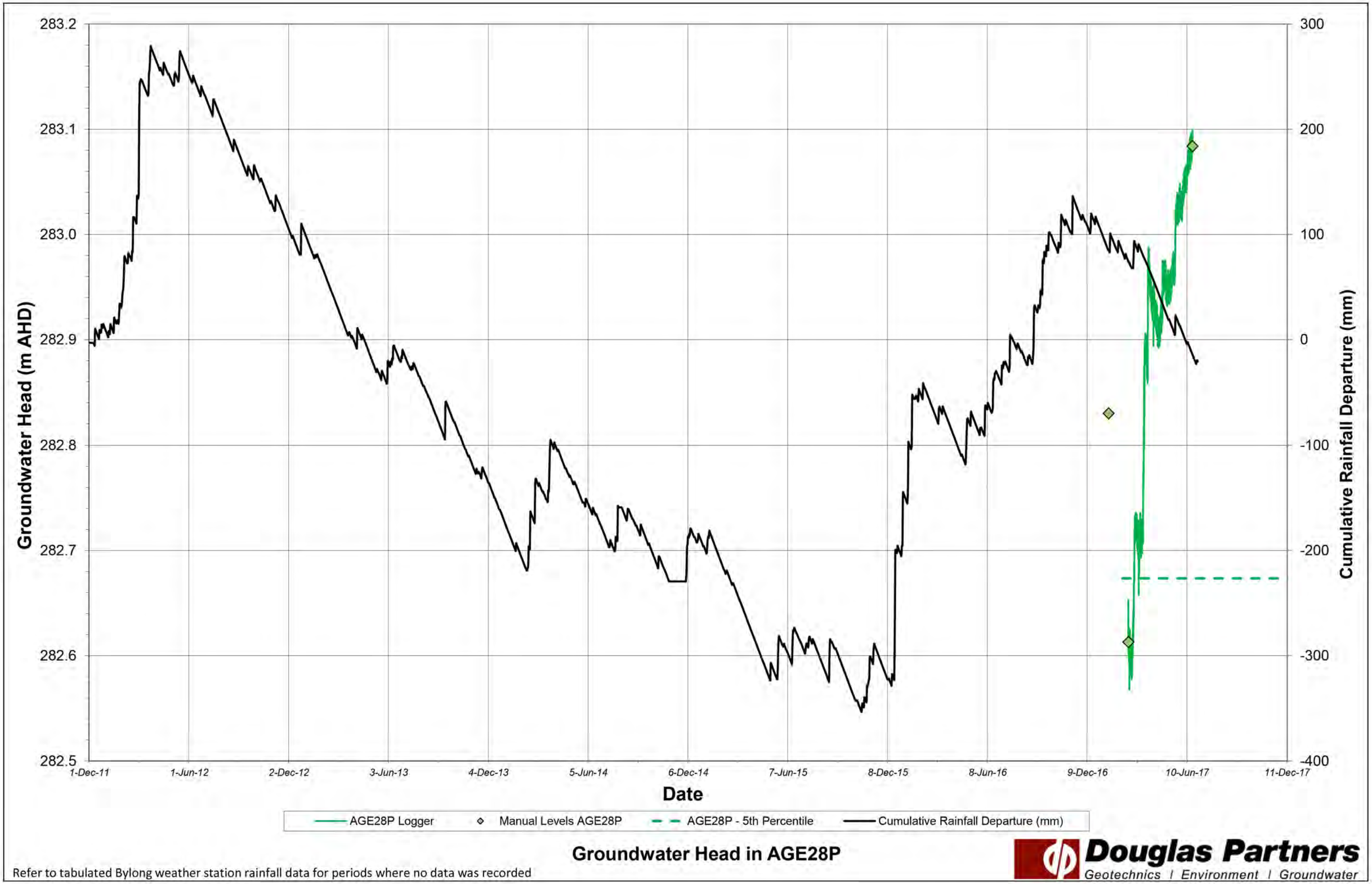
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in AGE26M

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in AGE28P

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

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Groundwater Head in AGE33M

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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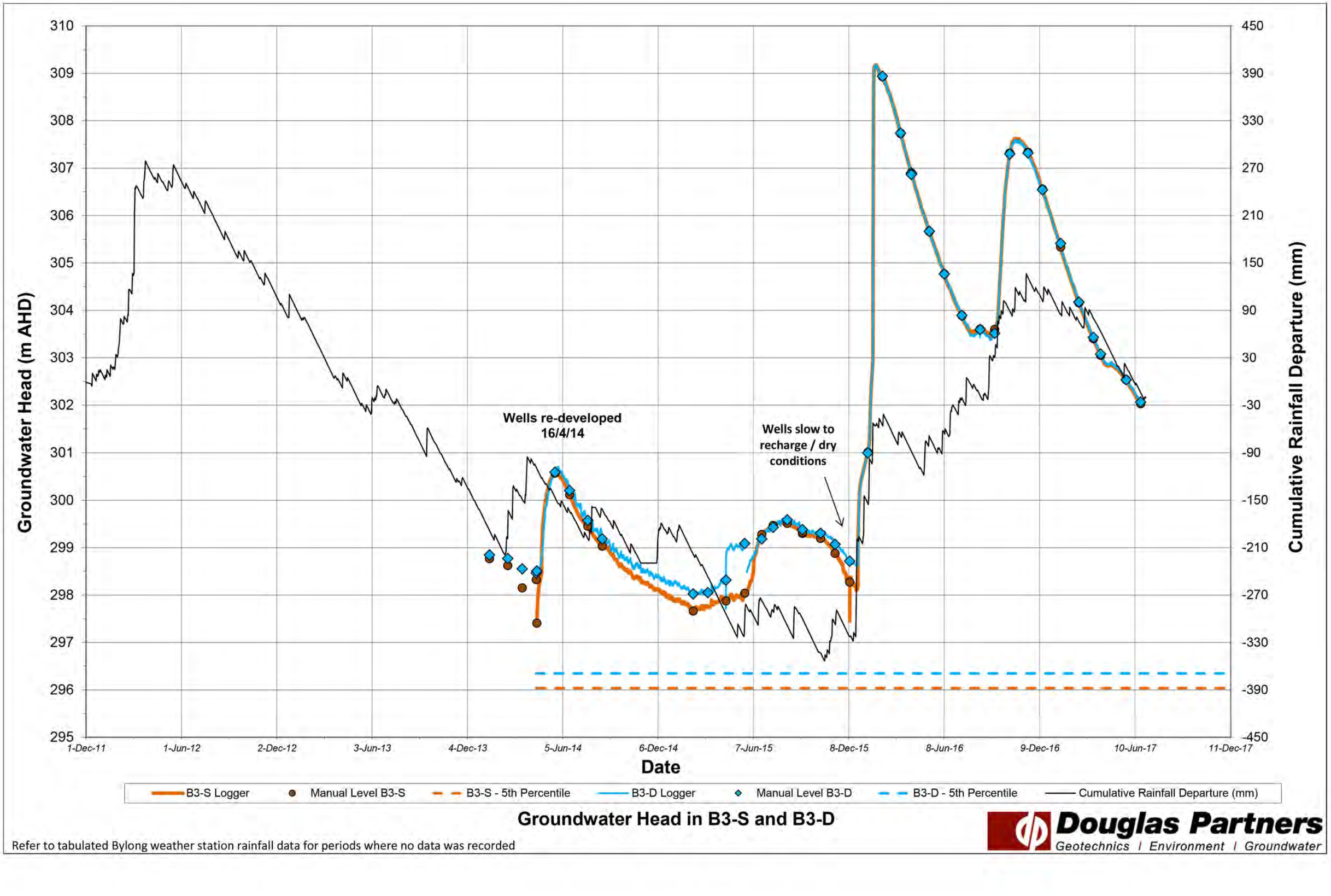
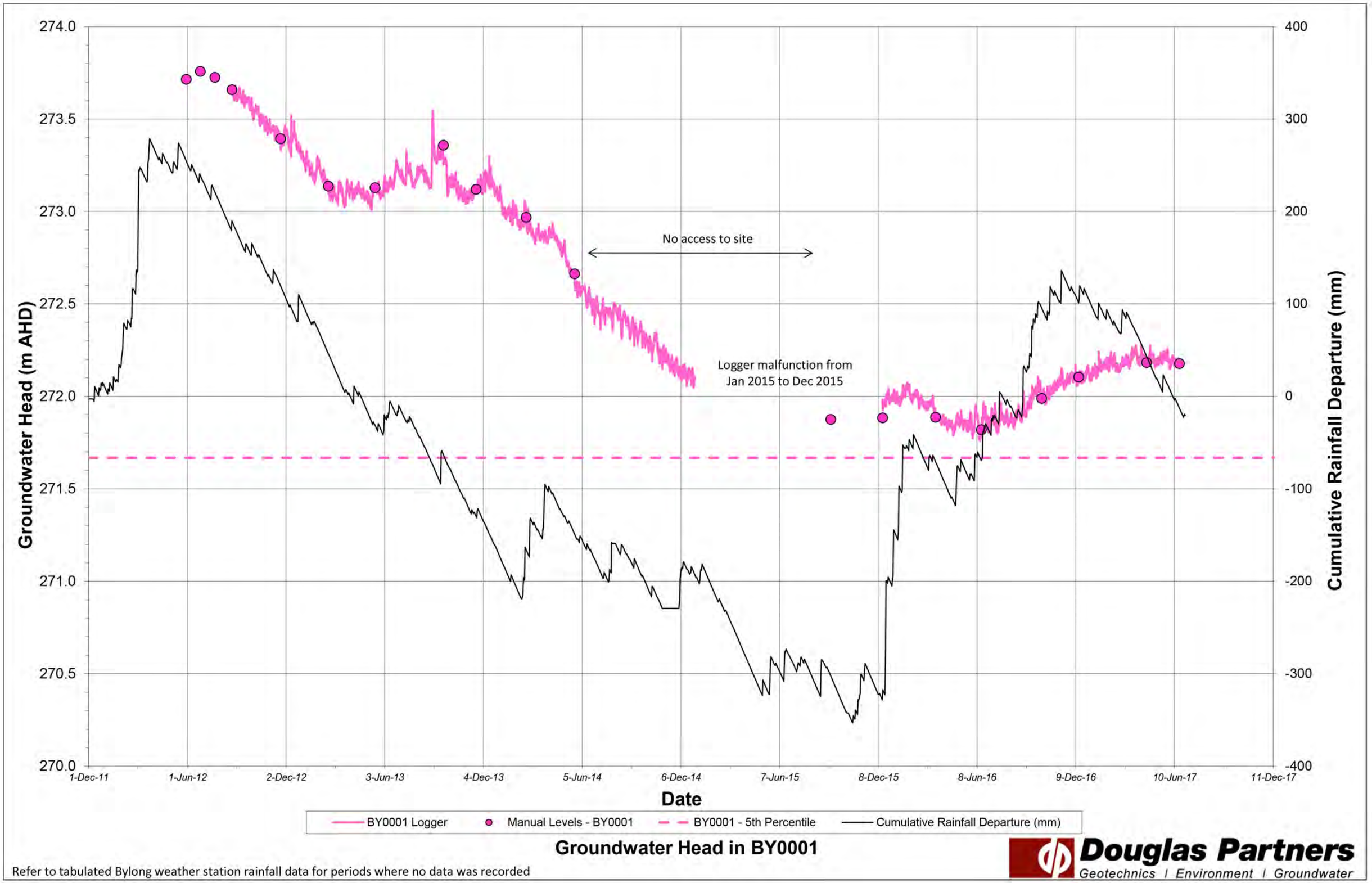


Groundwater Head in B3-S and B3-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

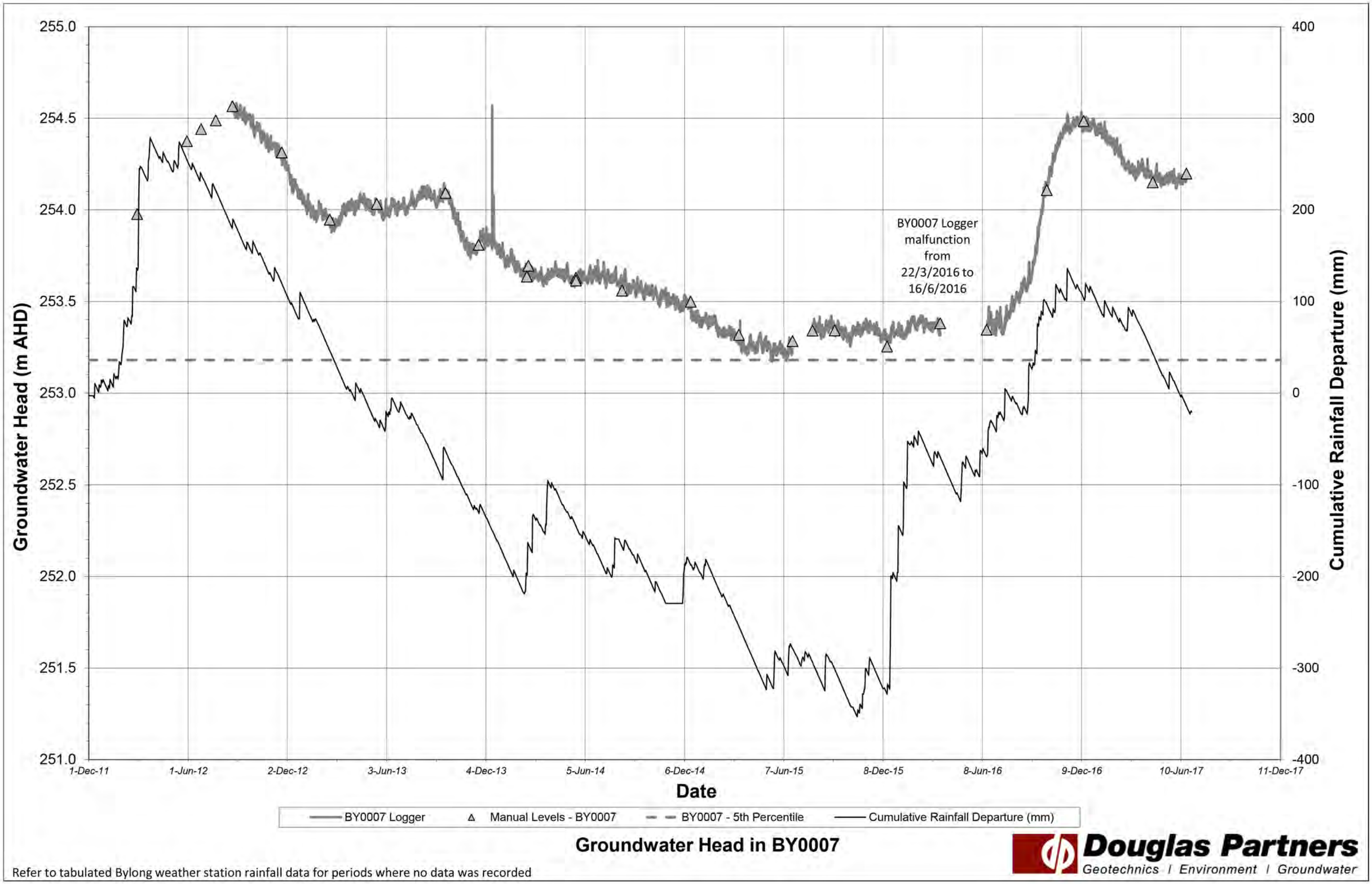
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0001

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0007

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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BY0010 Logger malfunction
June 2012 to August 2012

Groundwater Head (m AHD)

252.5
252.0
251.5
251.0
250.5
250.0
249.5
249.0

Cumulative Rainfall Departure (mm)

420
300
180
60
-60
-180
-300
-420

1-Dec-11
1-Jun-12
2-Dec-12
3-Jun-13
4-Dec-13
5-Jun-14
6-Dec-14
7-Jun-15
8-Dec-15
8-Jun-16
9-Dec-16
10-Jun-17
11-Dec-17

Date

BY0010 Logger
Manual Levels - BY0010
BY0010 - 5th Percentile
Cumulative Rainfall Departure (mm)

Groundwater Head in BY0010

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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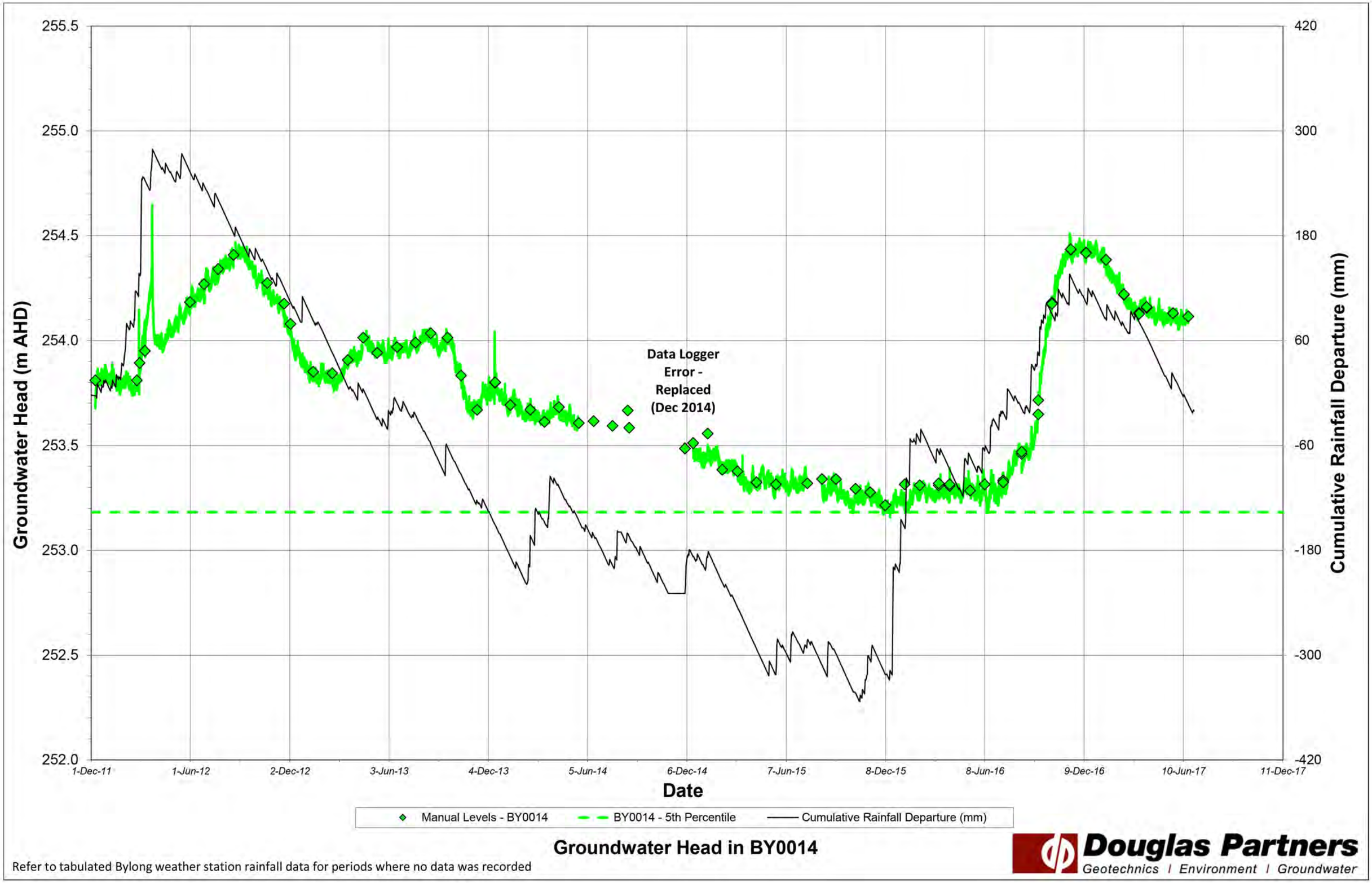
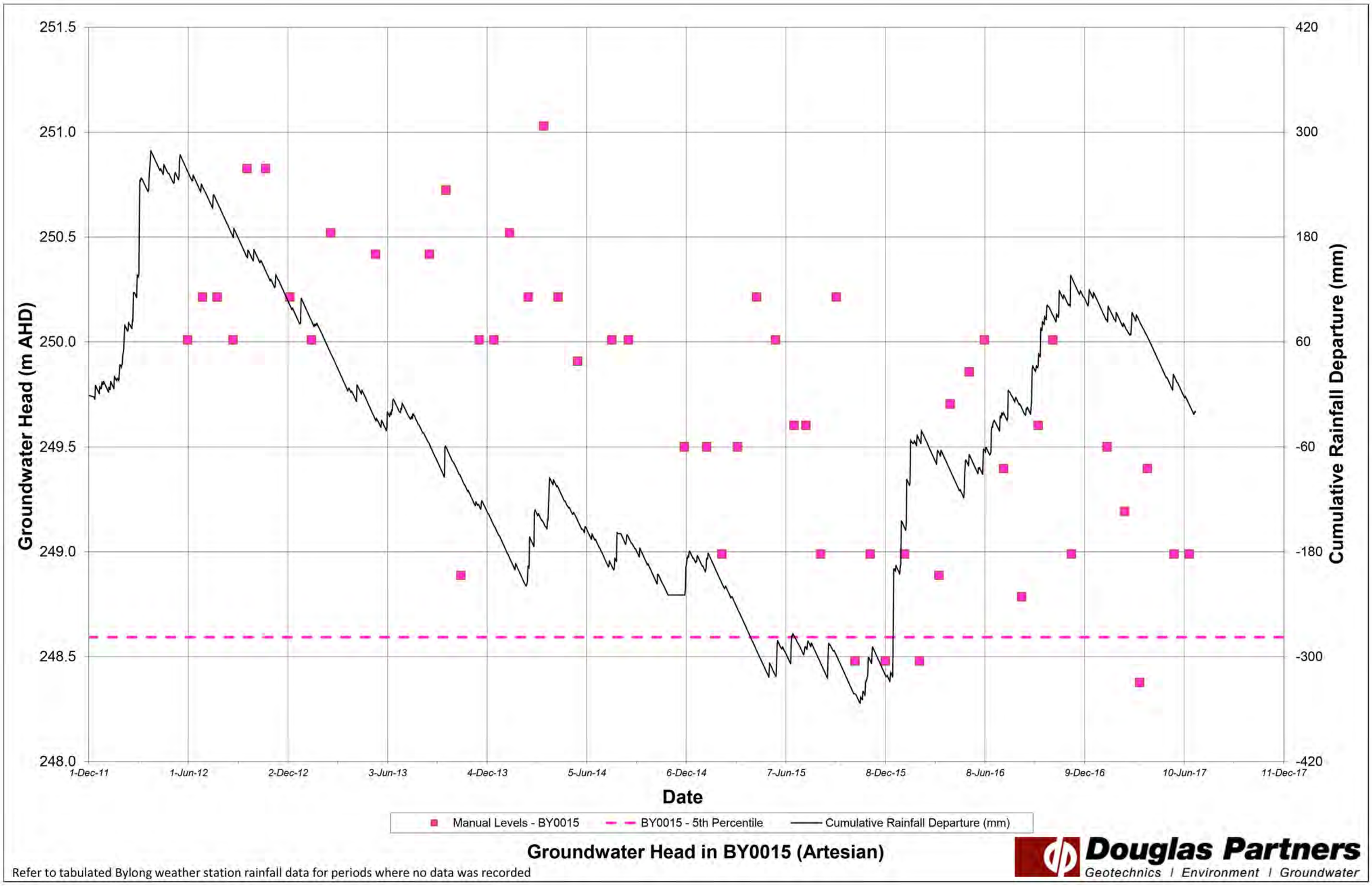


Groundwater Head in BY0014

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

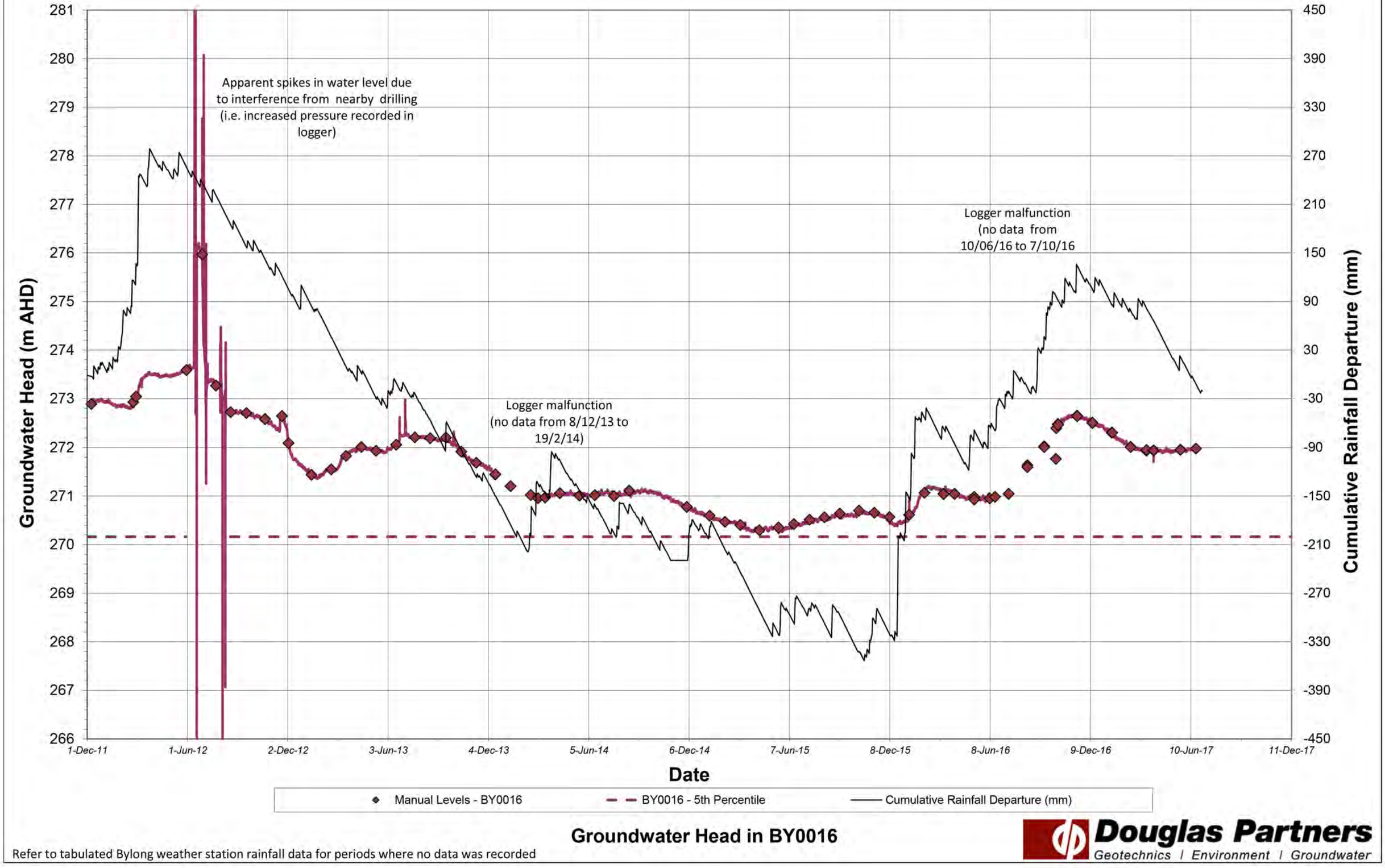
Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in BY0015 (Artesian)

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

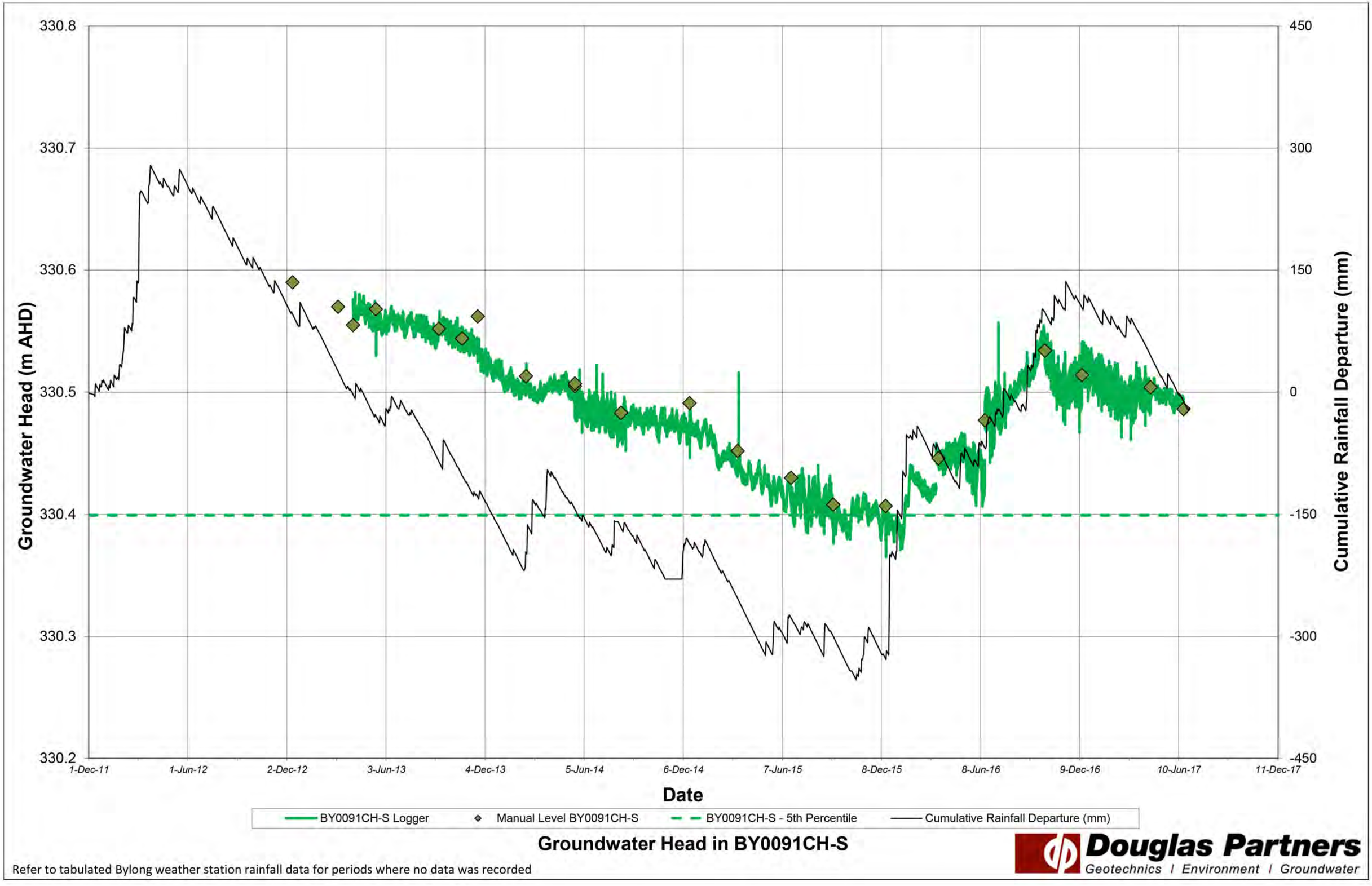
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0016

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

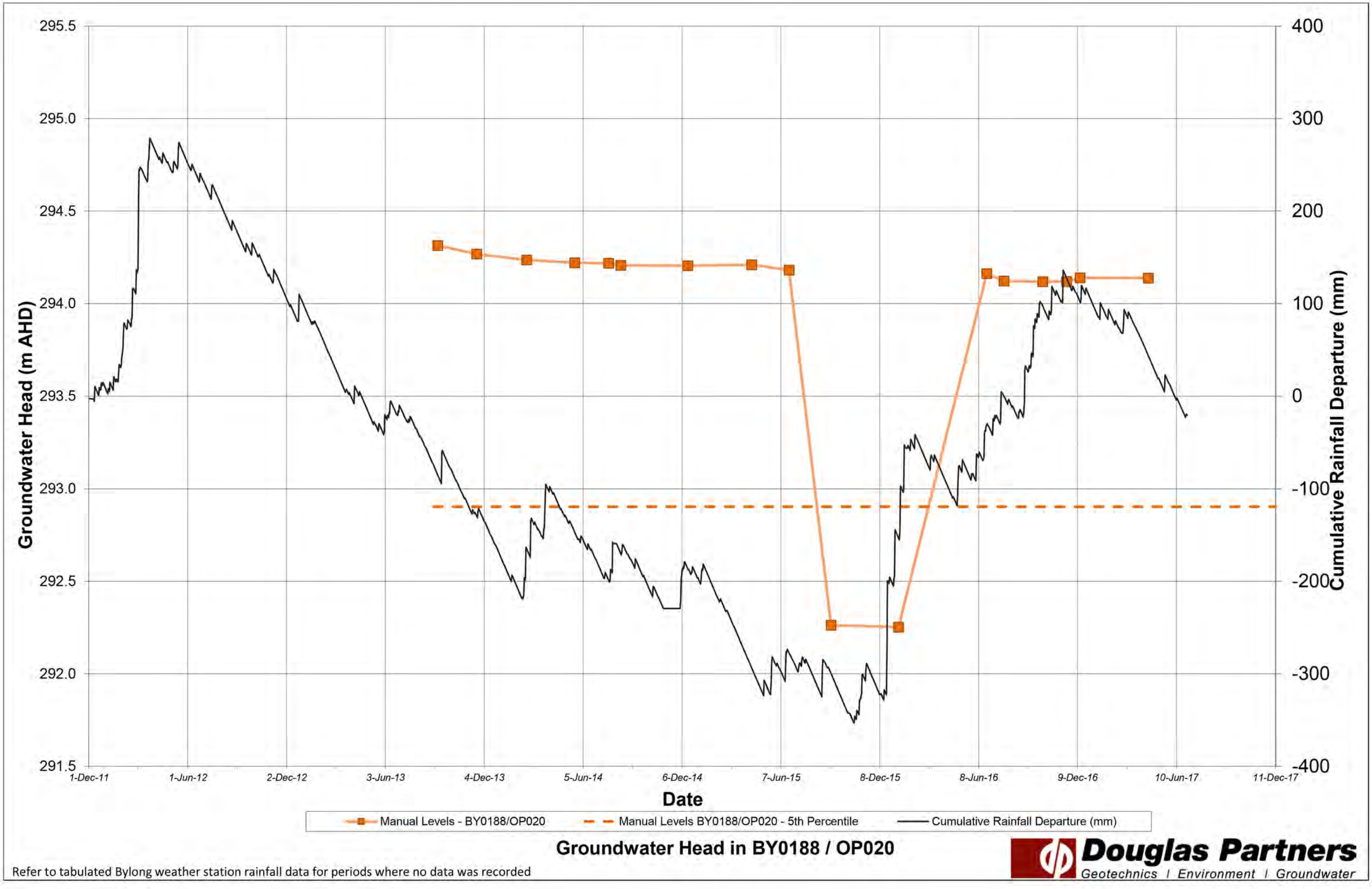
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0091CH-S

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

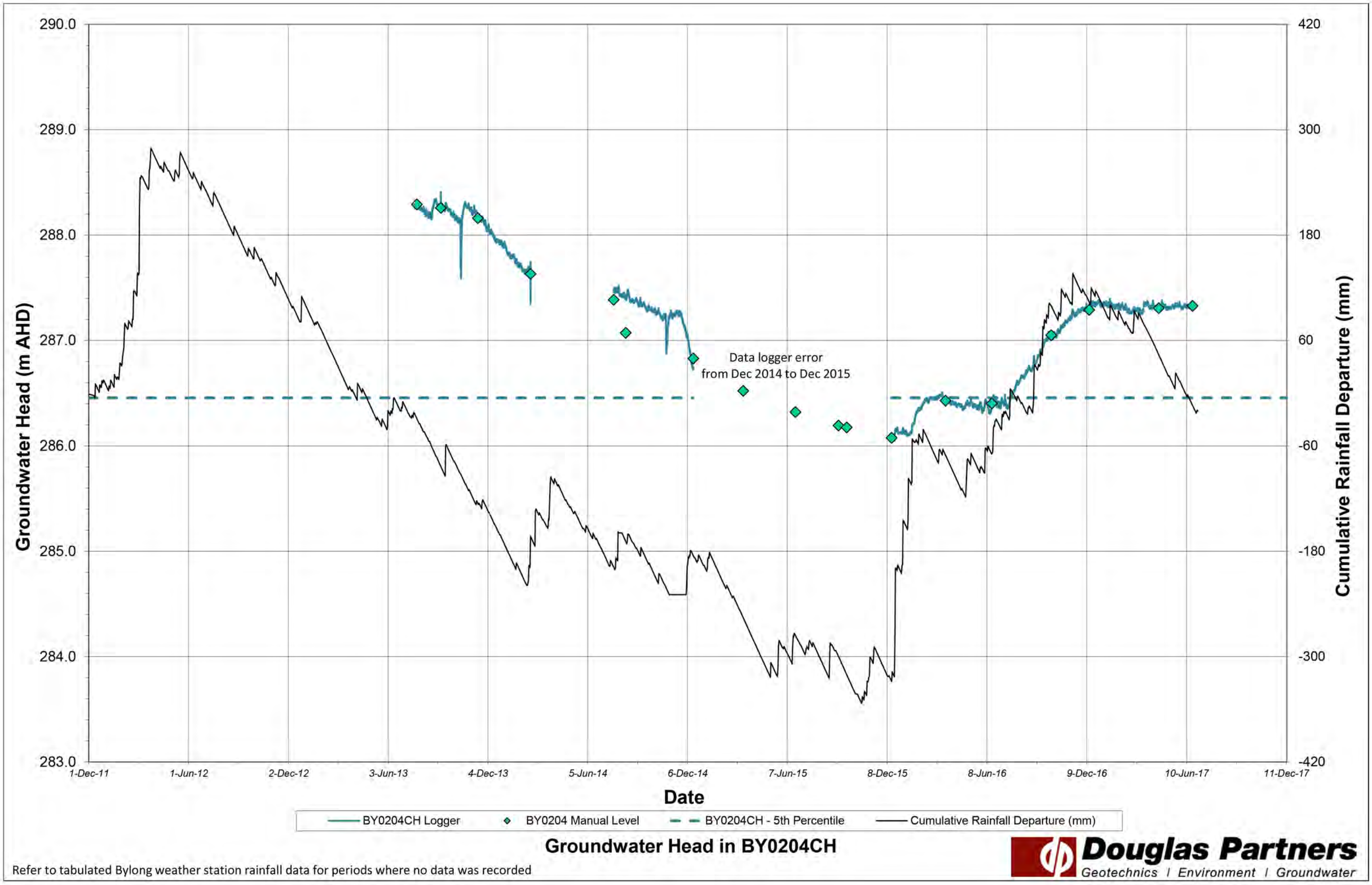
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0188 / OP020

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

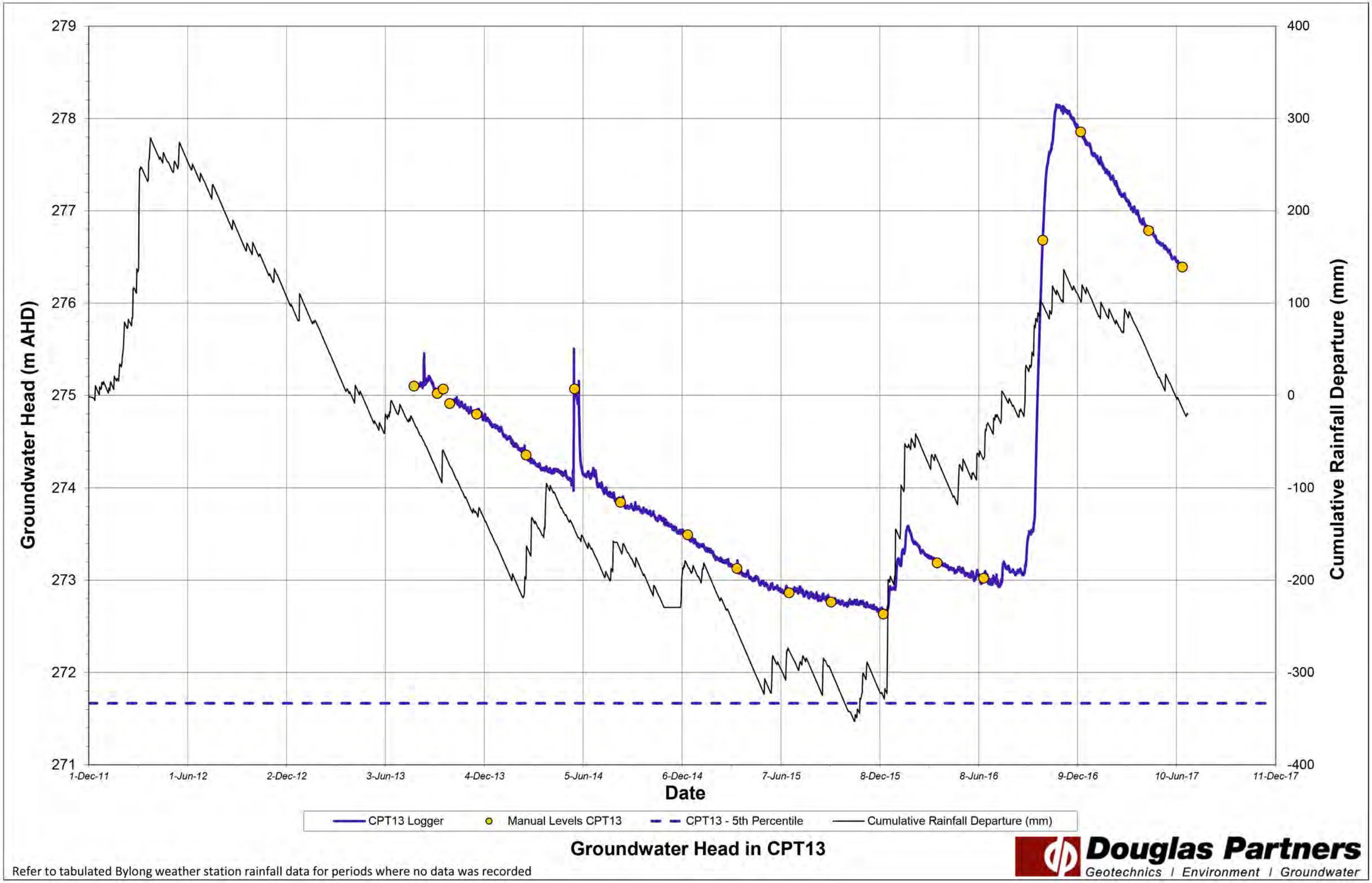
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in BY0204CH

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

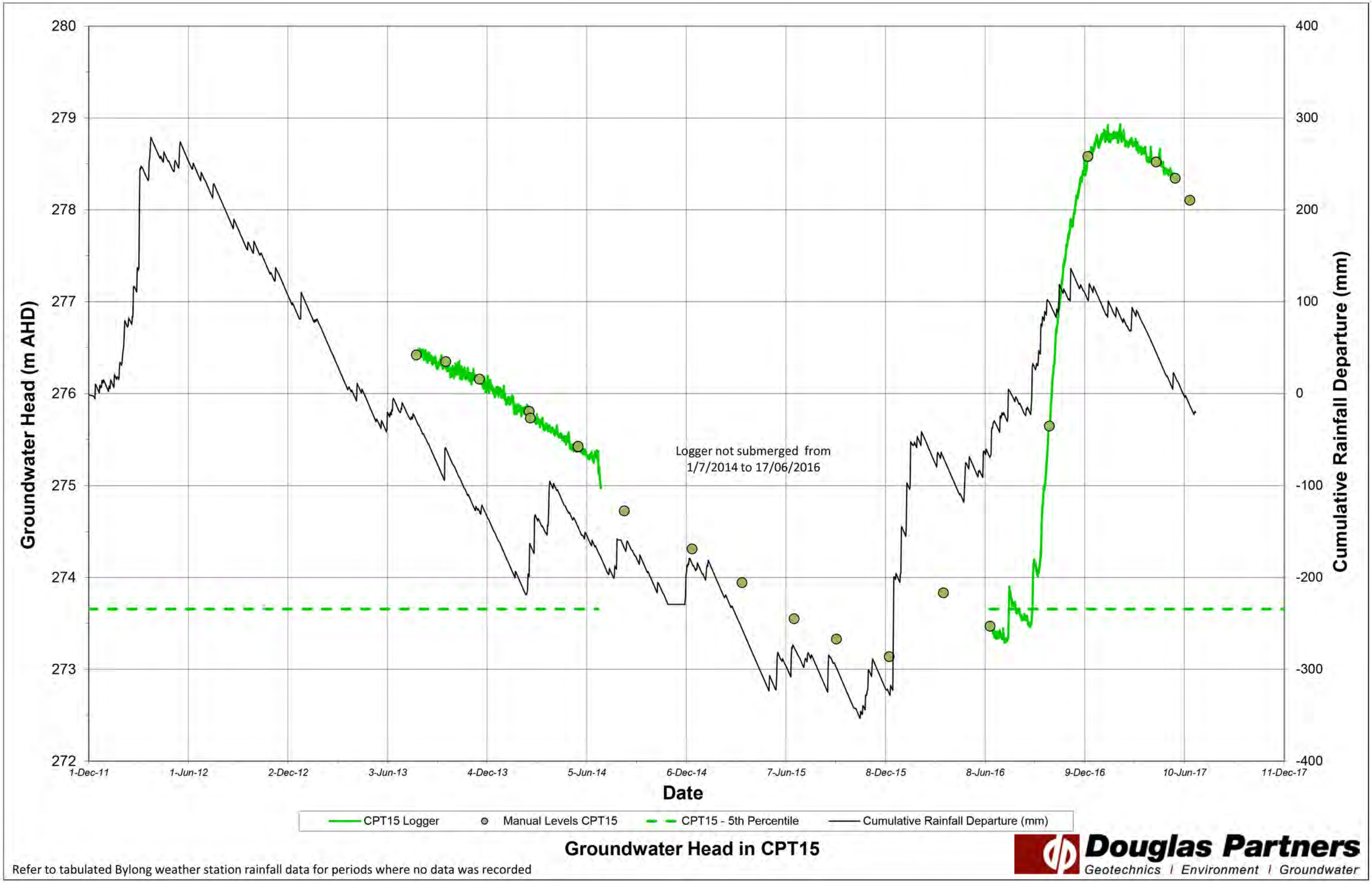
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in CPT13

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

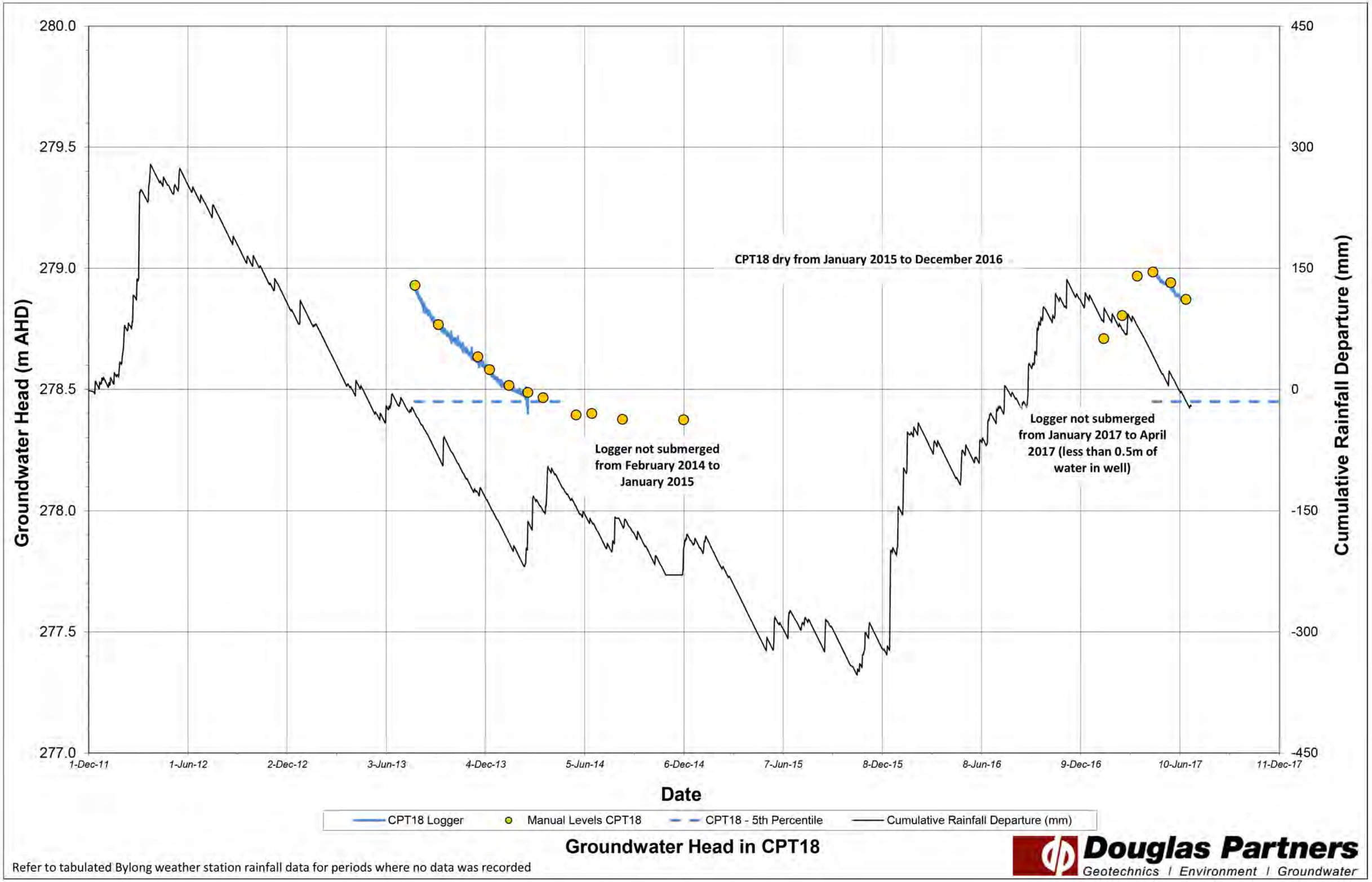
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in CPT15

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

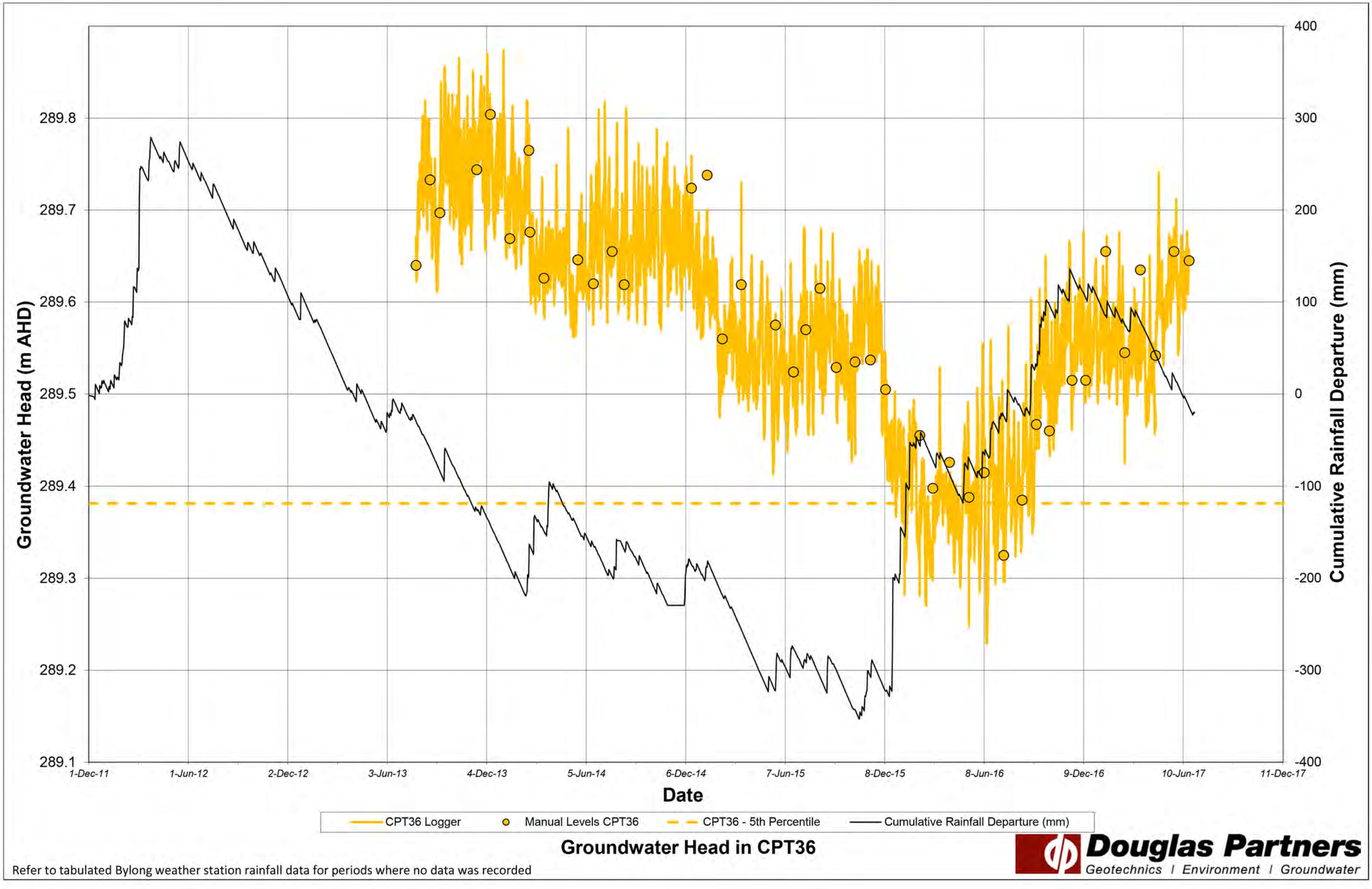
Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in CPT18

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics | Environment | Groundwater



Groundwater Head in CPT36

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

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Groundwater Head (m AHD)

291.0
290.5
290.0
289.5
289.0
288.5
288.0
287.5
287.0
286.5
286.0
285.5
285.0

Cumulative Rainfall Departure (mm)

360
300
240
180
120
60
0
-60
-120
-180
-240
-300
-360

01-Dec-2011
01-Jun-2012
02-Dec-2012
03-Jun-2013
04-Dec-2013
05-Jun-2014
06-Dec-2014
07-Jun-2015
08-Dec-2015
08-Jun-2016
09-Dec-2016
10-Jun-2017
11-Dec-2017

Date

Logger not submerged

CPT39-W Logger
Manual Levels CPT39-W
CPT39-W - 5th Percentile
Cumulative Rainfall Departure (mm)

Groundwater Head in CPT39W

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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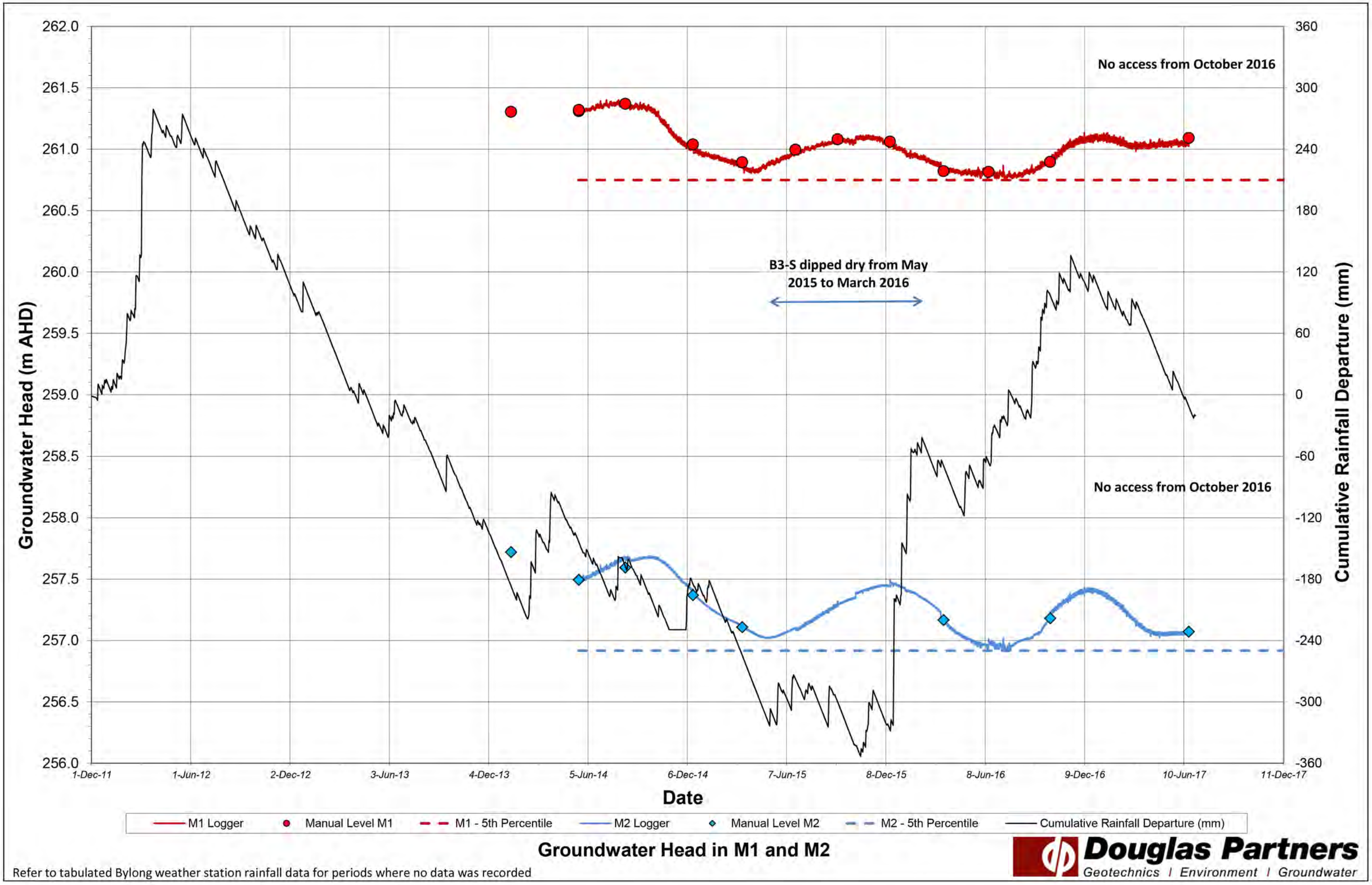
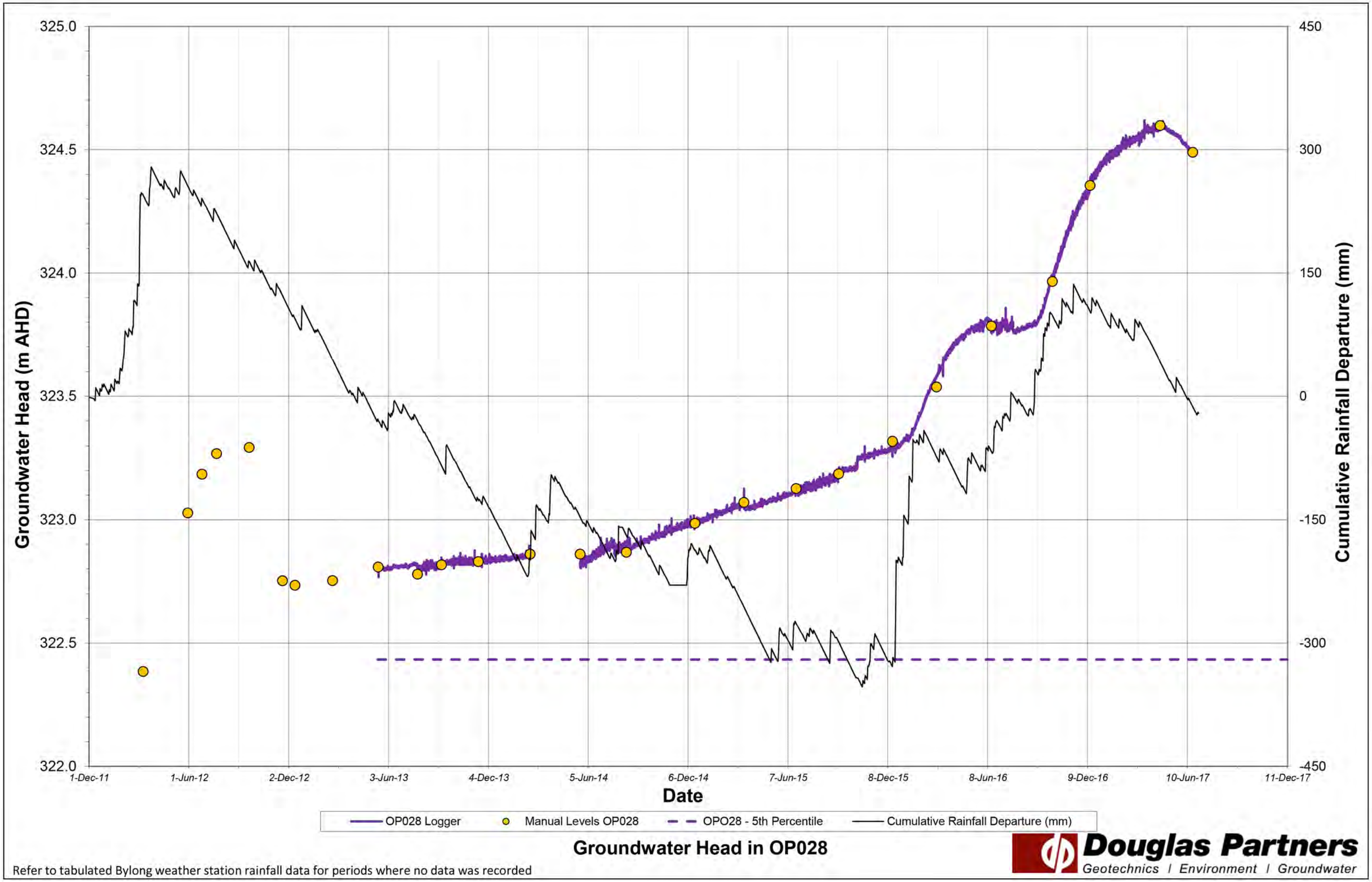


Groundwater Head in M1 and M2

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Groundwater Head in OP028

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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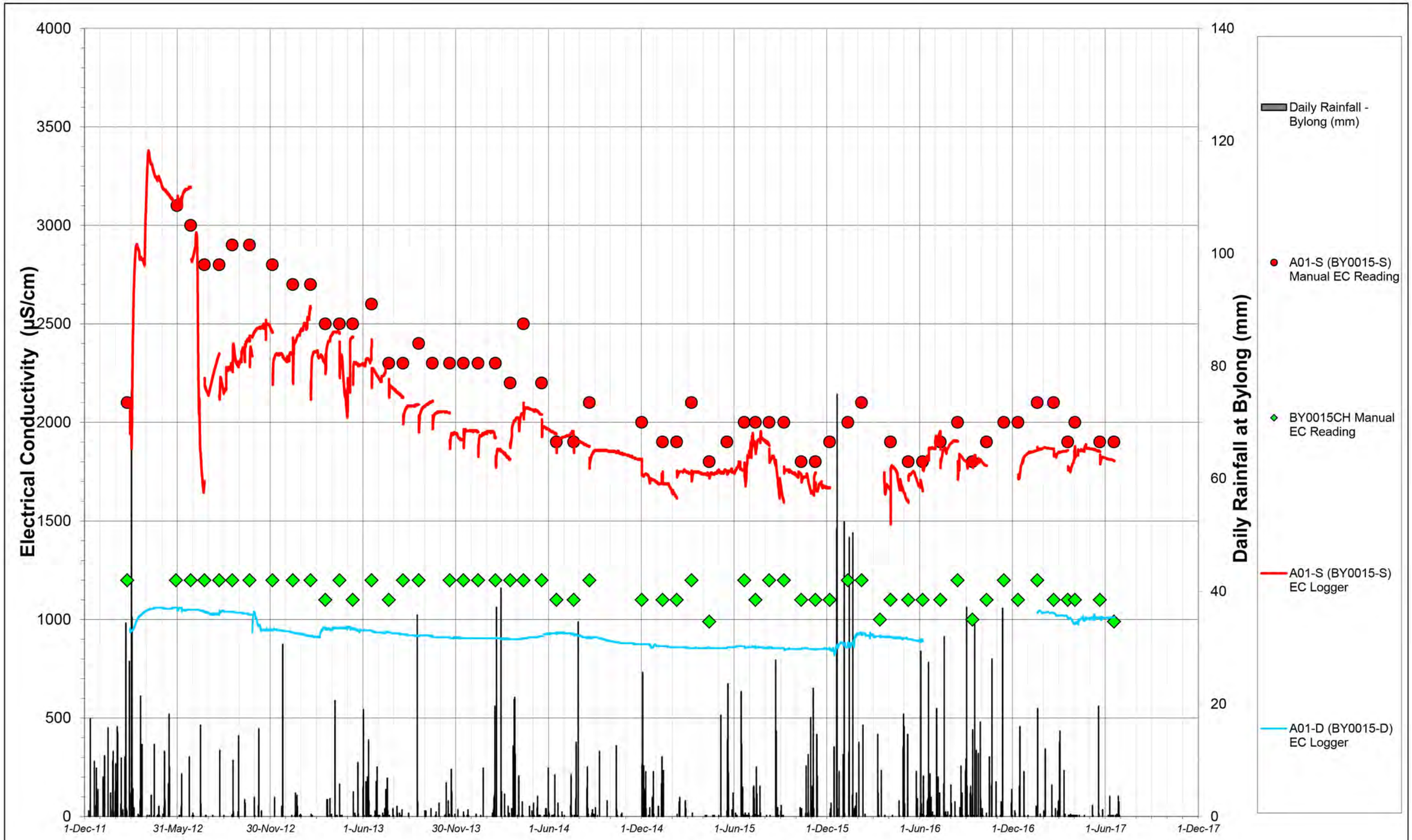
Appendix E
Summary of Monitoring Data

Appendix E6
Electrical Conductivity Plots (Salinity Datalogger Plots)



Electrical Conductivity in A01-S and A01-D

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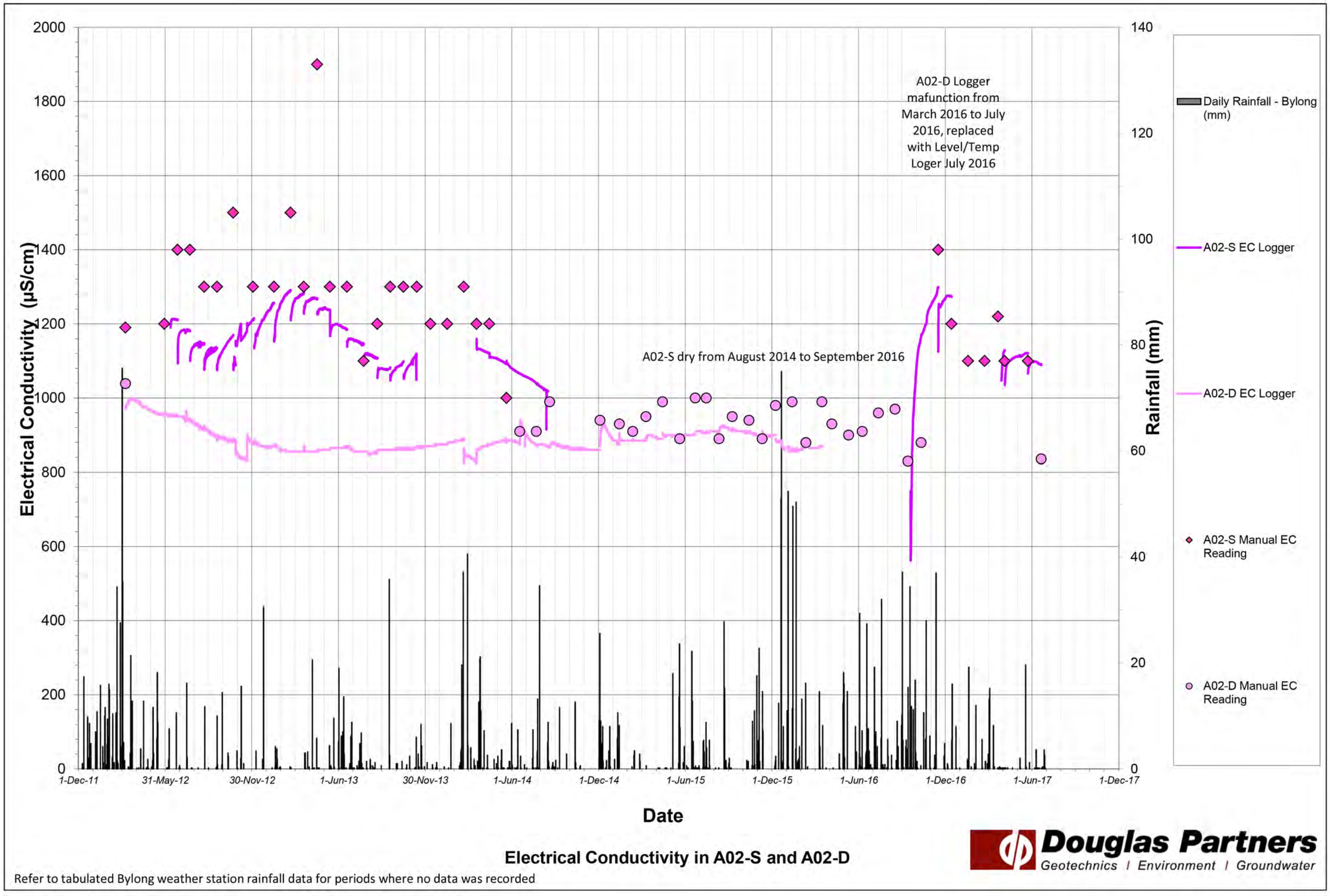
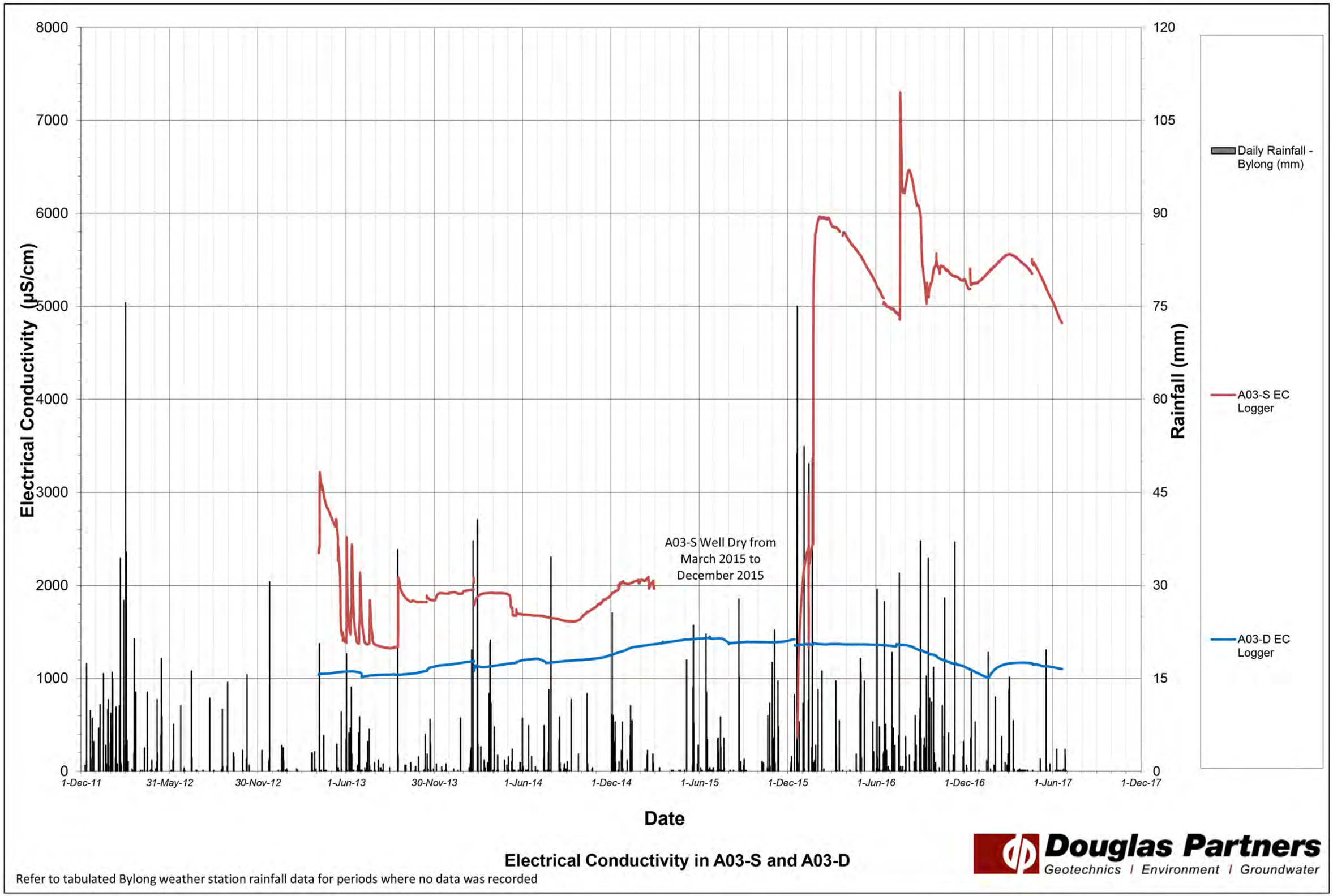
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Electrical Conductivity in A02-S and A02-D

Douglas Partners
Geotechnics / Environment / Groundwater

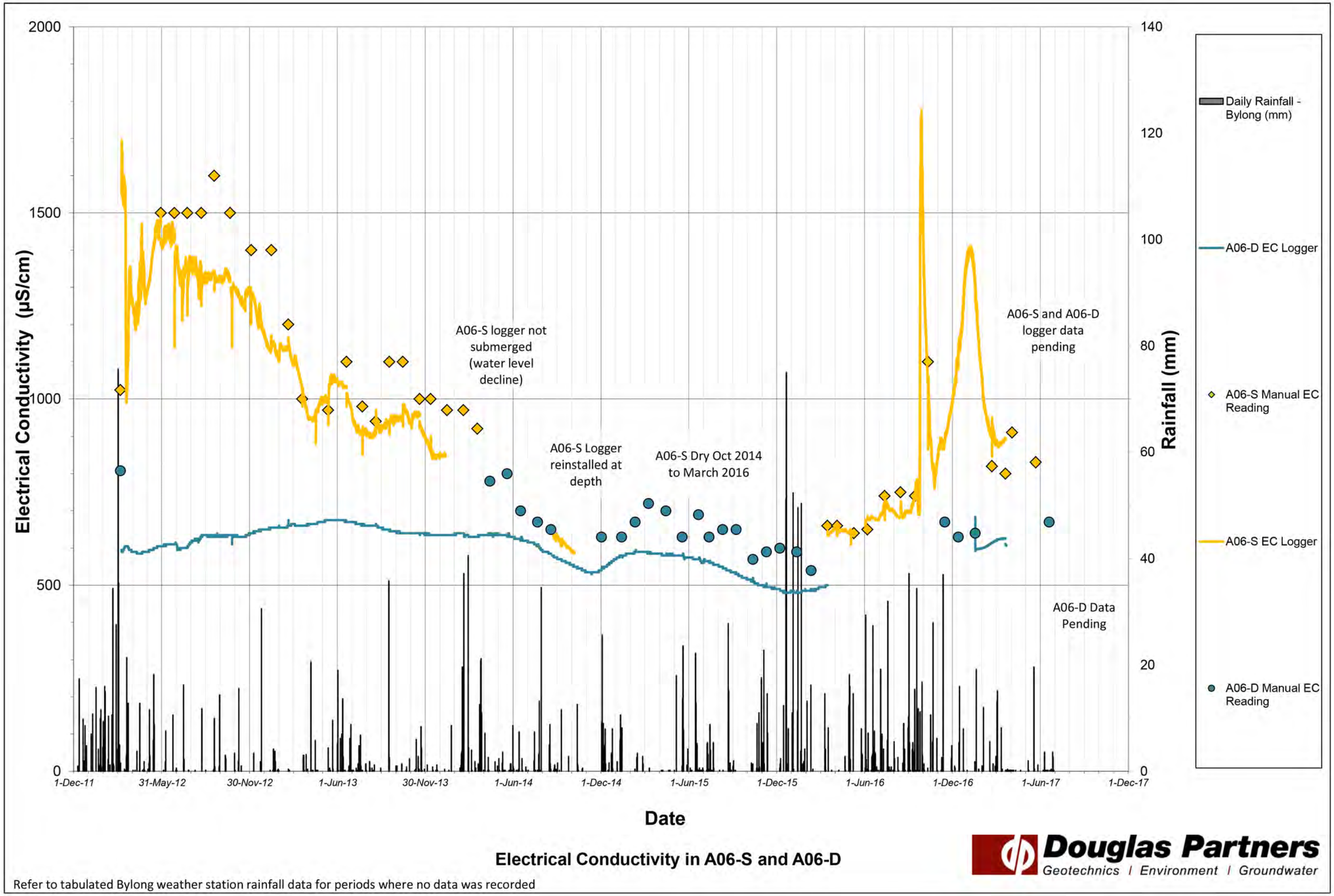
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Electrical Conductivity in A03-S and A03-D

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

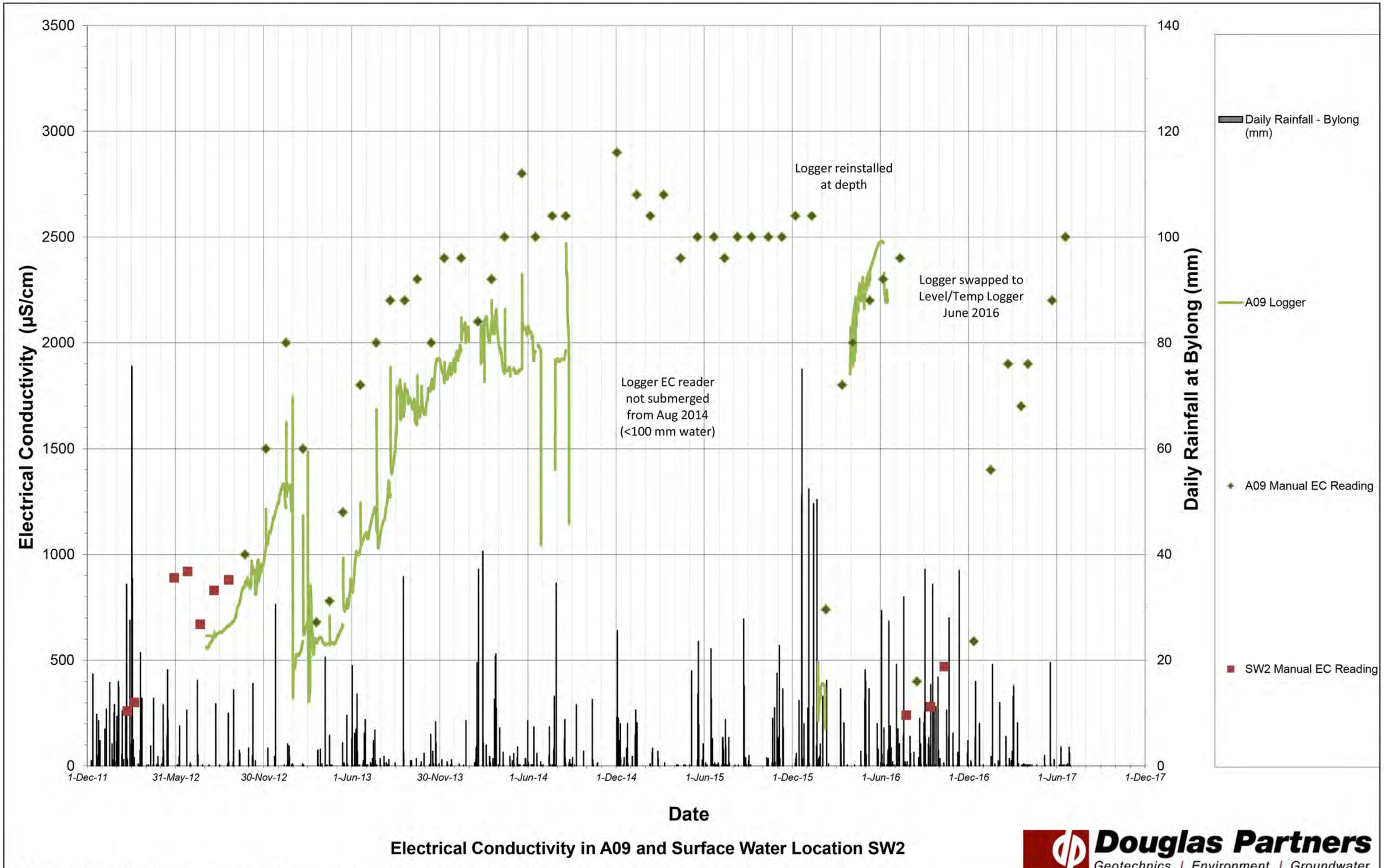
Douglas Partners
Geotechnics / Environment / Groundwater



Electrical Conductivity in A06-S and A06-D

Douglas Partners
Geotechnics / Environment / Groundwater

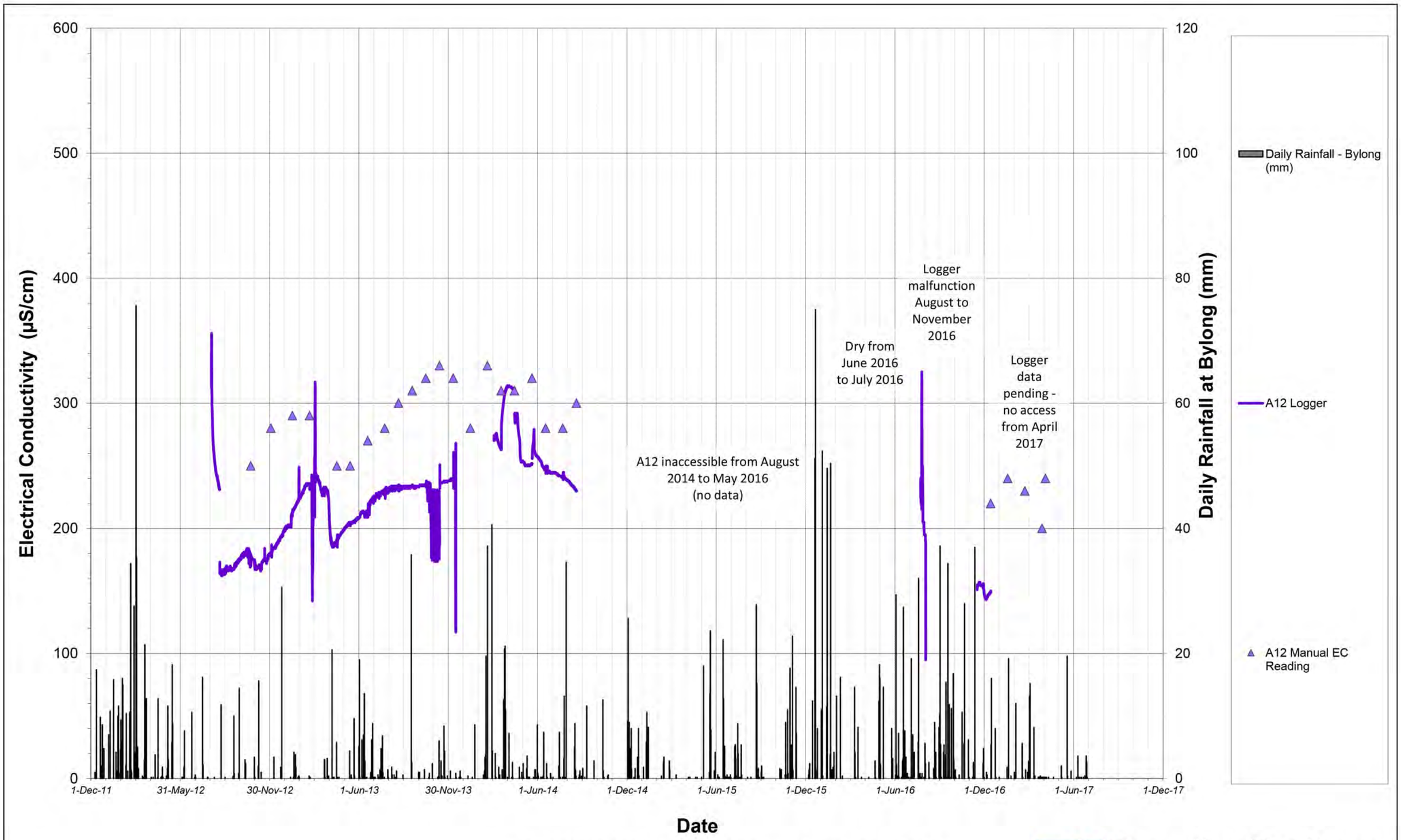
Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded



Electrical Conductivity in A09 and Surface Water Location SW2

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

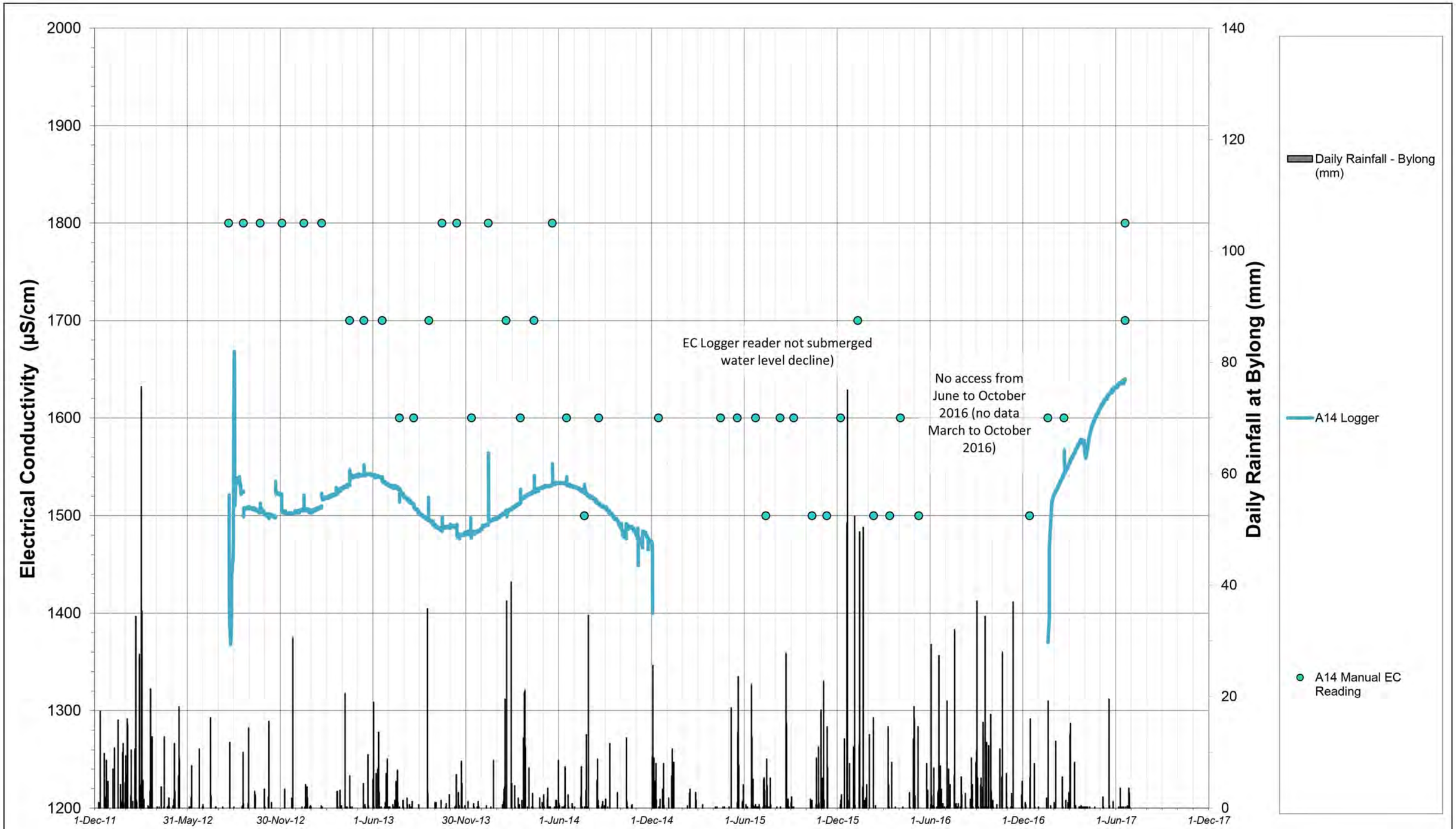
Douglas Partners
Geotechnics | Environment | Groundwater



Electrical Conductivity in Shallow Piezometers A12

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

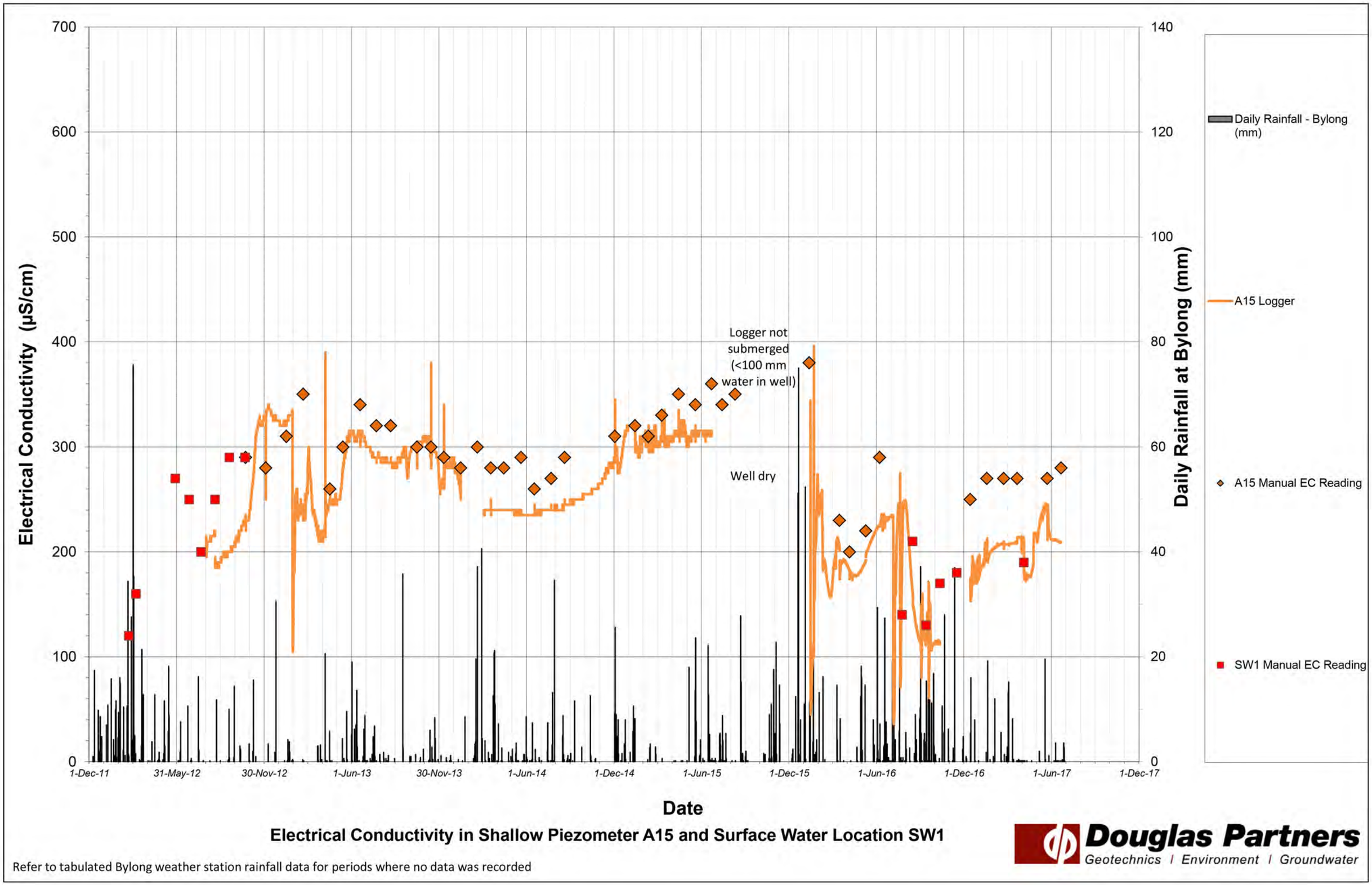
Douglas Partners
Geotechnics / Environment / Groundwater



Electrical Conductivity in Shallow Piezometer A14

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
Geotechnics / Environment / Groundwater



Electrical Conductivity in Shallow Piezometer A15 and Surface Water Location SW1

Refer to tabulated Bylong weather station rainfall data for periods where no data was recorded

Douglas Partners
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Appendix E
Summary of Monitoring Data

Appendix E7
Surface Water Flow and Depth Plots:

- Figure SW4: Surface Water Flow and Depth at SW4
- Figure SW8: Surface Water Flow and Depth at SW8
- Figure SW9: Surface Water Flow and Depth at SW9

Note: Accuracy of flow readings is limited for low water depths - average readings are considered more representative than individual readings.

The flow event of 19/09/2016 washed 0.3m of sediment from the channel floor. Estimation of depth from new channel base

Peak flow on 25/05/2013

Peak flow on 10/09/2013

01/03/2013 to 02/04/2013 Equipment malfunction (no flow data recorded)

Estimated water depth of 0.2 m on 03/03/2013 (weekly photo)

18/10/2012 to 01/03/2013 No flow recorded by flow meter. No surface water present (verified by daily photos)

No depth data

No depth data

Peak Flow 19/09/16 (inferred from daily photos)

Meter malfunction. No flow data available. Limited flow from May to October 2014 (generally water <0.08 m depth). Refer to SW4 photoplates.

No flow from October 2014 to July 2016 (refer photoplates)

Telemetry System Malfunction (no photos 30/01/17 to 20/4/17

Approximate Flow (m^3/s)

Approximate Surface Water Depth (m)

Depth of Water in Ajacent Well A19 (m)

7.00 6.00 5.00 4.00 3.00 2.00 1.00 0.00

2.80 2.40 2.00 1.60 1.20 0.80 0.40 0.00

1-Jul-12 30-Dec-12 1-Jul-13 31-Dec-13 1-Jul-14 31-Dec-14 2-Jul-15 31-Dec-15 1-Jul-16 31-Dec-16 2-Jul-17

Date

Estimated Flow at SW4 (m3/s)
Estimated Surface Water Depth at SW4 (m)
Depth of Water in Adjacent Well
255 per. Mov. Avg. (Estimated Flow at SW4 (m3/s))
Estimated Flow at SW4 (m3/s, depth <= 0.08 m)
Estimated Surface Water Depth During Malfunction as Determined from Photos (m)
SW4 - 2
255 per. Mov. Avg. (Estimated Flow at SW4 (m3/s, depth <= 0.08 m))

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Geotechnics | Environment | Groundwater

CLIENT: WorleyParsons Services Pty Ltd		
OFFICE: Newcastle	DRAWN BY: KMF	
SCALE: N/A	DATE: 21.07.2017	

TITLE: **Surface Water Flow and Depth at SW4**
Bylong Coal Project
Bylong, NSW

PROJECT NO: 49761.04
FIGURE NO: SW4
REVISION: 0

Note: Accuracy of flow readings is limited for low water depths - average readings are considered more representative than individual readings.

Erroneous reported flows on 10/7/2013 (confirmed by diagnostic output)

Peak flow on 13/11/2013

Peak flow on 26/09/2013

17/12/2012 to 29/01/2013
No flow recorded by flow meter.
No surface water present (as verified by weekly photos)

No depth data

No depth data

12/12/2012

Peak depth of 1.24 m on 03/03/2013

Peak depth of 1.24 m on 29/01/2013

Zero surface water depths/spikes due to logger removal / manual download

Peak depth of 0.59 m on 17/09/2013

Erroneous reported flows on 27/01/2015 (confirmed by diagnostic output)

Peak depth of 0.5 m on 21/07/2016

Peak depth of 0.6 m on 26/06/2017

Meter malfunction. No flow data available. No/limited surface water flows as verified by daily photos (less than 0.08 m depth). Refer to SW8 photoplates.

No surface flow from October 2014 to July 2016 (refer photoplates)

Telemetry system malfunction (no photos from 5/9/2016 to 20/4/2017)

Approximate Flow (m^3/s)

Approximate Surface Water Depth (m)

Depth of Water in Well A20 (m)

7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00

1-Jul-12 | 30-Dec-12 | 1-Jul-13 | 31-Dec-13 | 1-Jul-14 | 31-Dec-14 | 2-Jul-15 | 31-Dec-15 | 1-Jul-16 | 31-Dec-16 | 2-Jul-17

Date

Estimated Flow at SW8 (m3/s)
Depth of Water in adjacent Well A20 (m)
255 per. Mov. Avg. (Estimated Flow at SW8 (m3/s))
Estimated Surface Water Depth at SW8 (m)
Surface Water Depth During Malfunction as Determined from Photos (m)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: WorleyParsons Services Pty Ltd		TITLE: **Surface Water Flow and Depth at SW8** **Bylong Coal Project** **Bylong, NSW**
OFFICE: Newcastle	DRAWN BY: KMF	
SCALE: N/A	DATE: 19.07.2017	

PROJECT NO:	49761.04
FIGURE NO:	SW8
REVISION:	0

Note: Accuracy of flow readings is limited for low water depths - average readings are considered more representative than individual readings.

Peak flow and depth on 01/03/2013
Probable over-estimate for recorded flow due to partial flow meter burial and diagnostic report

Flow meter buried by sediments during the significant flow event observed on 01/03/2013

No depth data

No depth data

02/03/2013 to 16/03/2013
No flow data recorded due to flow meter burial. Surface flow present during this period (verified by weekly photos)

08/10/2012 to 28/02/2013
No flow recorded by flow meter.
No surface water present (verified by weekly photos)

Erroneous surface water depth on 09/08/2013 as indicated by diagnostic report (no surface water present)

17/03/2013 to 30/06/2016: No flow recorded by flow meter. No surface water present (Refer to SW9 photoplates)

Approximate Flow (m^3/s)

Approximate Surface Water Depth (m)

Depth of Water at Adjacent Well A18 (m)

7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00

7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0

1-Jul-12 | 30-Dec-12 | 1-Jul-13 | 31-Dec-13 | 1-Jul-14 | 31-Dec-14 | 2-Jul-15 | 31-Dec-15 | 1-Jul-16 | 31-Dec-16 | 2-Jul-17

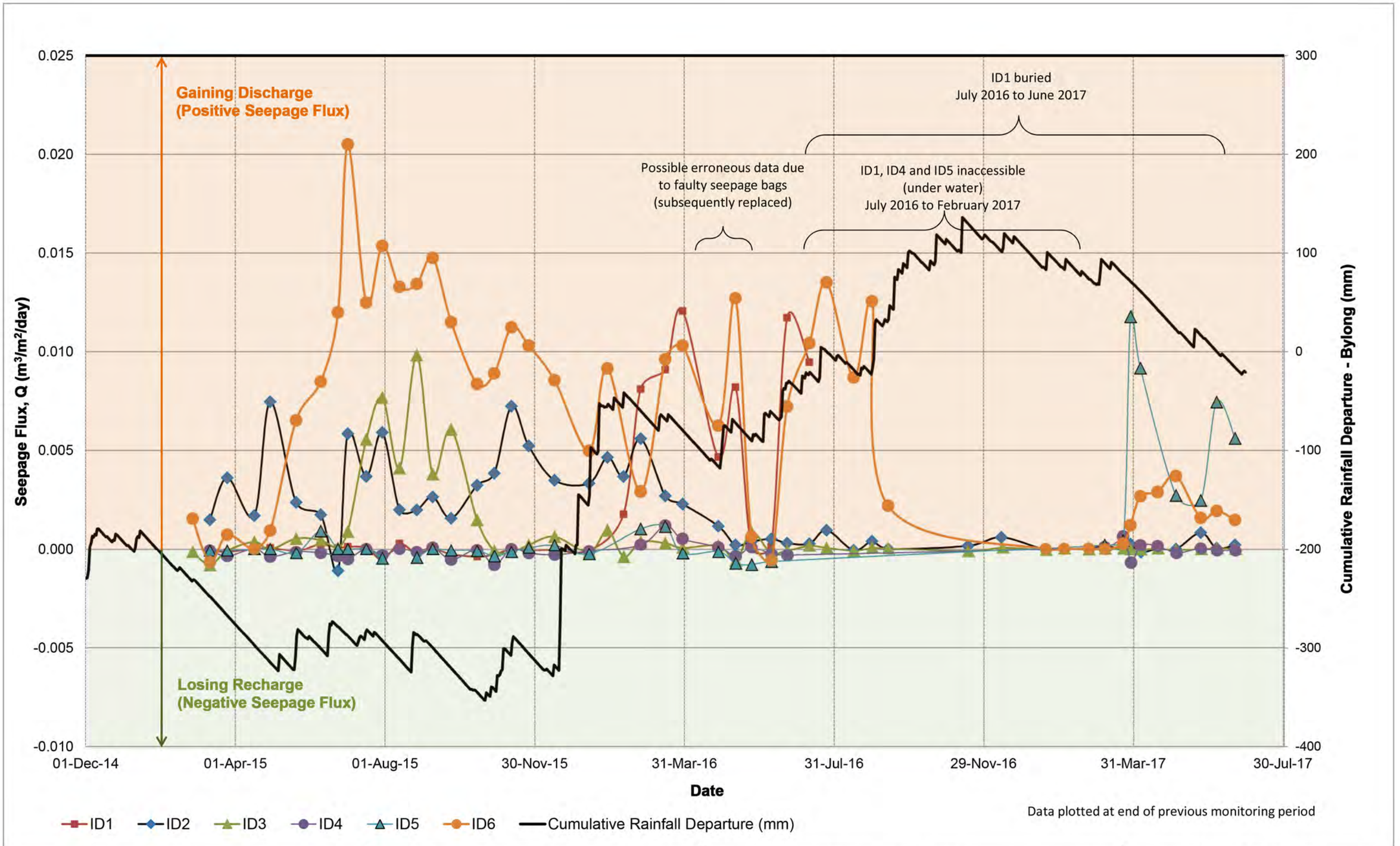
Date

Estimated Flow at SW9 (m3/s)
Estimated Surface Water Depth During Malfunction as determined from photos (m)
100 per. Mov. Avg. (Estimated Flow at SW9 (m3/s))
Estimated Surface Water Depth at SW9 (m)
Depth of Water in Adjacent Well A18

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd	TITLE: **Surface Water Flow and Depth at SW9** **Bylong Coal Project** **Bylong, NSW**	PROJECT NO: 49761.04
	OFFICE: Newcastle / DRAWN BY: KMF		FIGURE NO: SW9
	SCALE: N/A / DATE: 19/07/2017		REVISION: 0

Appendix E
Summary of Monitoring Data

Appendix E8
Figure SM1: Seepage Meter Flux vs Rainfall
(January 2015 to June 2017)



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: WorleyParsons Services Pty Ltd		PROJECT NO: 49761.04
	OFFICE: Newcastle	DRAWN BY: KMF	FIGURE NO: SM1
	SCALE: N/A	DATE: 9.10.2017	REVISION: 5
	TITLE: **Seepage Meter Flux vs Rainfall** **Bylong Coal Project** **Bylong, NSW**		

Appendix F

Table F1: Summary of Estimated Hydraulic Conductivity from Packer Testing
Table F2: Summary of Estimated Permeability from Rising Head Testing
Table F3: Summary of Estimated Permeability from Falling Head Testing

Table F1: Summary of Estimated Hydraulic Conductivity from Packer Testing

Bylong Coal Project, Bylong NSW

Bore ID	Depth (m)		Estimated K		K washed Out		Description
	From	To	(m/s)	(m/d)	(m/s)	(m/d)	
BY0011							Water at 33 m
	34.06	40.73	$5.2x10^{-10}$	$4.5x10^{-5}$			Basalt
	70.06	76.73	$4.6x10^{-7}$	$4.0x10^{-2}$			Sandstone
	97.06	103.73	$2.2x10^{-10}$	$1.9x10^{-5}$			Mudstone, coal
	100.03	106.7	$9.7x10^{-9}$	$8.4x10^{-4}$			Coal/tuff
	106.06	112.73	$6.9x10^{-10}$	$6.0x10^{-5}$			Tuff, Sandstone
	112.06	118.73	$5.2x10^{-10}$	$4.5x10^{-5}$			Sandstone, coal
	127.06	133.73	$1.6x10^{-9}$	$1.4x10^{-4}$			Sandstone
	133.56	140.23	$1.5x10^{-9}$	$1.3x10^{-4}$			Sandstone, coal
	139.06	145.73	$5.5x10^{-9}$	$4.8x10^{-4}$			Siltstone
	145.06	151.73	$5.7x10^{-9}$	$4.9x10^{-4}$			Sandstone
	154.06	160.73	$1.5x10^{-9}$	$1.3x10^{-4}$			Siltstone, coal
	169.06	157.73	$3.8x10^{-9}$	$3.3x10^{-4}$			Sandstone/siltstone
	175.06	181.73	$9.6x10^{-9}$	$8.3x10^{-4}$			Siltstone, coal
	181.06	187.73	$8.4x10^{-9}$	$7.3x10^{-4}$			Sandstone
	187.06	193.73	$3.6x10^{-8}$	$3.1x10^{-3}$	$2.6x10^{-7}$	$2.2x10^{-2}$	Sandstone, minor coal
	193.06	199.73	$1.6x10^{-8}$	$1.4x10^{-3}$	$7.6x10^{-8}$	$6.6x10^{-3}$	Ulan
	199.06	205.73	$6.4x10^{-9}$	$5.5x10^{-4}$			Coggan
	205.56	212.23	$4.0x10^{-9}$	$3.5x10^{-4}$			Sandstone
	214.16	220.83	$1.9x10^{-9}$	$1.6x10^{-4}$			Sandstone
	220.16	226.83	$1.9x10^{-9}$	$1.6x10^{-4}$			Sandstone
	226.26	232.83	$1.4x10^{-9}$	$1.2x10^{-4}$			Sandstone
	232.16	238.16	$8.3x10^{-9}$	$7.2x10^{-4}$			Sandstone
BY0014							
	16.58	23.25	$7.0x10^{-9}$	$6.0x10^{-4}$			Siltstone, coal, carbonaceous shale
	21.58	28.25	$4.0x10^{-9}$	$3.5x10^{-4}$			Siltstone, coal, sandstone
	27.58	34.25	$4.0x10^{-6}$	$3.5x10^{-1}$			Sandstone, coal, carb shale
	33.58	40.25	$2.0x10^{-6}$	$1.7x10^{-1}$			Sandstone, coal, carb shale, siltstone
	39.58	46.25	$3.0x10^{-6}$	$2.6x10^{-1}$			Shale, tuff, coal
	43.58	50.25	$1.0x10^{-6}$	$8.6x10^{-2}$			Siltstone, sandstone
	49.58	56.25	$5.0x10^{-6}$	$4.3x10^{-1}$			Coal, siltstone, sandstone, conglomerate
	55.58	62.25	$2.0x10^{-6}$	$1.7x10^{-1}$			
BY0015							
	28	34.7	$1.0x10^{-5}$	$8.6x10^{-1}$			Sandstone, conglomerate, siltstone
	34	40.7	$1.0x10^{-5}$	$8.6x10^{-1}$			Sandstone, coal, carbonaceous shale, siltstone
	40	46.7	$3.0x10^{-8}$	$2.6x10^{-3}$			Siltstone, shale, siderite, carbonaceous shale, tuff
	46	52.7	$7.0x10^{-8}$	$6.0x10^{-3}$			Siltstone, tuff carbonaceous shale, coal, sandstone, mudstone
	52	58.7	$2.0x10^{-7}$	$1.7x10^{-2}$			Siltstone, shale, carbonaceous shale, tuff, coal
	58	64.7	$7.0x10^{-8}$	$6.0x10^{-3}$			Carbonaceous shale
	64	70.7	$2.0x10^{-8}$	$1.7x10^{-3}$			Mudstone, coal, carbonaceous shale, siltstone, tuff
	70	76.7	$3.0x10^{-7}$	$2.6x10^{-2}$			Carbonaceous shale, siltstone, sandstone, coal
	76	82.7	$8.0x10^{-7}$	$6.9x10^{-2}$			Mudstone
	82	88.7	$3.0x10^{-7}$	$2.6x10^{-2}$			Mudstone, coal, carbonaceous shale, sandstone, tuff
	85	91.7	$5.0x10^{-7}$	$4.3x10^{-2}$			Sandstone, coal, tuff
	90.5	97.2	$2.0x10^{-6}$	$1.7x10^{-1}$			Sandstone, coal, carbonaceous shale
BY0077							Water at 46 m
	25.18	31.86	$2.0x10^{-9}$	$1.7x10^{-4}$	$5x10^{-9}$	$4.3x10^{-4}$	Conglomerate
	45.53	51.19	$3.7x10^{-9}$	$3.2x10^{-4}$			Sandstone/siltstone
	99.03	105.71	$6.8x10^{-9}$	$5.9x10^{-4}$			Sandstone/coal
	105.03	110.69	$1.4x10^{-7}$	$1.2x10^{-2}$			Sandstone/coal
	111.03	113.63	$5.8x10^{-8}$	$5.0x10^{-3}$			Ulan
	114.03	116.63	$4.8x10^{-7}$	$4.1x10^{-2}$			Sandstone
	117.03	120.65	$1.5x10^{-6}$	$1.3x10^{-1}$			Coggan
	123.03	124.61	$9.5x10^{-9}$	$8.2x10^{-4}$			Sandstone/siltstone
	126.47	132	$5.4x10^{-10}$	$4.7x10^{-5}$			Mudstone
	135.5	141	$1.0x10^{-9}$	$8.6x10^{-5}$			Sandstone
	142.5	147.7	$1.0x10^{-9}$	$8.6x10^{-5}$			Sandstone

Table F1: Summary of Estimated Hydraulic Conductivity from Packer Testing

Bylong Coal Project, Bylong NSW

Bore ID	Depth (m)		Estimated K		K washed Out		Description
	From	To	(m/s)	(m/d)	(m/s)	(m/d)	
BY0080							Water at about 130 m
	174.85	179.49	$2.4x10^{-9}$	$2.1x10^{-4}$			Siltstone/sandstone
	178.68	185.36	$2.1x10^{-9}$	$1.8x10^{-4}$			Mudstone/coal
	187.18	193.86	$4.8x10^{-9}$	$4.1x10^{-4}$			Sandstone
	196.68	203.32	$1.7x10^{-8}$	$1.5x10^{-3}$	$9x10^{-8}$	$7.8x10^{-3}$	Ulan
	204.85	207.45	$5.0x10^{-9}$	$4.3x10^{-4}$			Siltstone/sandstone
	207.85	213.51	$2.9x10^{-7}$	$2.5x10^{-2}$	$4.5x10^{-7}$	$3.9x10^{-2}$	Coggan
	213.85	215.43	$4.5x10^{-9}$	$3.9x10^{-4}$			Sandstone
	213.5	239	$1.2x10^{-9}$	$3.9x10^{-4}$			Sandstone
BY0091							Water at about 36 m
	16.58	23.26	$2.6x10^{-6}$	$2.2x10^{-1}$			Basalt
	30.95	36.88	$4.6x10^{-6}$	$4.0x10^{-1}$	$6.3x10^{-6}$	$5.4x10^{-1}$	Sandstone
	46.18	52.86	$1.7x10^{-8}$	$1.5x10^{-3}$	$3.5x10^{-6}$	$3.0x10^{-1}$	Sandstone
	100.53	106.19	$4.2x10^{-9}$	$3.6x10^{-4}$			Sandstone/siltstone
	156.53	163.86	$2.9x10^{-8}$	$2.5x10^{-3}$	$5.7x10^{-8}$	$4.9x10^{-3}$	Ulan
	165.85	168.78	$2.8x10^{-9}$	$2.4x10^{-4}$			Siltstone/sandstone
	169.18	175.86	$1.2x10^{-6}$	$1.0x10^{-1}$	$2.2x10^{-6}$	$1.9x10^{-1}$	Coggan
	174.7	179.37	$3.3x10^{-9}$	$2.9x10^{-4}$			Sandstone
	178.55	231.31	$3.5x10^{-10}$	$3.0x10^{-6}$			Sandstone
	193.55	231.31	$3.3x10^{-10}$	$2.9x10^{-6}$			Sandstone
BY0207							Water at 12.48 m depth
	18.95	25.64	$1.4x10^{-6}$	$1.2x10^{-1}$	$5.4x10^{-6}$	$4.7x10^{-1}$	Coal/Sandstone/Siltstone
	25.45	32.14					Coal
	31.45	38.14	$1.9x10^{-8}$	$1.6x10^{-3}$			Coal/Sandstone/Siltstone
	43.45	50.14	$3.1x10^{-10}$	$2.6x10^{-5}$	$6.5x10^{-9}$	$5.6x10^{-4}$	Coal/Sandstone/Siltstone
	52.42	59.14	$9.3x10^{-9}$	$8.0x10^{-4}$	$1.1x10^{-7}$	$9.7x10^{-3}$	Coal/Carb Shale/Tuff
	61.45	68.14	$5.3x10^{-9}$	$4.6x10^{-4}$	$2.2x10^{-8}$	$1.9x10^{-3}$	Overburden – Sandstone/Siltstone
	70.45	76.12	$4.5x10^{-9}$	$3.9x10^{-4}$	$3.2x10^{-7}$	$2.7x10^{-2}$	Ulan Upper
	75.95	81.62	$2.7x10^{-3}$	$2.3x10^{-8}$	$1.8x10^{-7}$	$1.5x10^{-2}$	Ulan Seam
	82.45	85.06	$1.4x10^{-7}$	$1.2x10^{-2}$			Interburden – Sandstone/Siltstone
	84.95	91.64	$2.4x10^{-6}$	$2.1x10^{-1}$	$3.9x10^{-6}$	$3.4x10^{-1}$	Coggan Seam
	91.45	102.4	$2.1x10^{-8}$	$1.8x10^{-3}$			Floor – Sandstone/Siltstone
BY0208							Water at 21.89 m depth
	19.39	26.07	$1.6x10^{-7}$	$1.4x10^{-2}$	$4.4x10^{-8}$	$3.8x10^{-3}$	Carb. Shale/Siltstone/Tuff
	26.38	33.07	$4.0x10^{-8}$	$3.5x10^{-3}$	$2.1x10^{-8}$	$1.9x10^{-3}$	Igneous Intrusion/Coal /Sandstone/Siltstone
	34.34	41.07	$1.6x10^{-7}$	$1.4x10^{-2}$			Igneous Intrusion/Carb. Shale/Sandstone/Siltstone
	42.88	49.57	$7.7x10^{-9}$	$6.7x10^{-4}$			Carb. Siltstone/Igneous Intrusion
	49.38	56.07	$7.0x10^{-9}$	$6.0x10^{-4}$			Sandstone/Siltstone/Coal
	58.38	65.07	$7.5x10^{-7}$	$6.4x10^{-2}$			Sandstone/Siltstone
	67.88	74.57	$3.0x10^{-8}$	$2.6x10^{-3}$			Overburden – Sandstone/Siltstone/coal
	75.88	82.57	$8.0x10^{-8}$	$6.9x10^{-3}$			Ulan Seam
	82.38	84.99	$4.4x10^{-8}$	$3.8x10^{-3}$			Interburden – Sandstone/Siltstone
	85.38	90.03	$3.4x10^{-8}$	$2.9x10^{-3}$			Coggan Seam
	90.88	97.57	$3.2x10^{-8}$	$2.7x10^{-3}$			Floor – Sandstone/Siltstone
	97.38	108.34	$1.8x10^{-8}$	$1.5x10^{-3}$			Floor – Sandstone/Siltstone
AGE01	16.23	22.92	$1.3x10^{-6}$	$1.1x10^{-1}$			Sandstone
	26.53	33.22	$8.3x10^{-6}$	$7.2x10^{-1}$			Carbonaceous Siltstone with interbedded tuff
	32.53	39.22	$9.6x10^{-6}$	$8.3x10^{-1}$			Carbonaceous Siltstone with interbedded tuff
	41.53	48.22	$5.7x10^{-7}$	$4.9x10^{-2}$			Carbonaceous Siltstone/Coal
	56.53	63.22	$8.5x10^{-8}$	$7.3x10^{-3}$			Sandstone
	62.53	69.22	$5.1x10^{-6}$	$4.4x10^{-1}$			Sandstone
	74.53	81.22	$3.2x10^{-7}$	$2.8x10^{-2}$			Carbonaceous Siltstone
	86.03	92.72	$4.1x10^{-8}$	$3.5x10^{-3}$			Sandstone
	94.03	100.72	$5.1x10^{-8}$	$4.4x10^{-3}$			Sandstone / Siltstone
	101.53	108.22	$2.6x10^{-7}$	$2.3x10^{-2}$			Sandstone / Siltstone / Coal
	110.53	117.22	$4.1x10^{-7}$	$3.5x10^{-2}$			Coal / Sandstone
	116.53	123.22	$1.0x10^{-6}$	$8.6x10^{-2}$			Coal / Sandstone / Siltstone / Ulan Seam
	122.53	126.16	$5.7x10^{-8}$	$4.9x10^{-3}$			Coal / Interburden
	124.03	130.72	$5.7x10^{-7}$	$4.9x10^{-2}$			Interburden/Coggan Seam

Table F1: Summary of Estimated Hydraulic Conductivity from Packer Testing

Bylong Coal Project, Bylong NSW

Bore ID	Depth (m)		Estimated K		K washed Out		Description
	From	To	(m/s)	(m/d)	(m/s)	(m/d)	
AGE01	130.03	136.72	$1.0x10^{-6}$	$8.6x10^{-2}$			Sandstone / Siltstone
	136.03	142.72	$4.1x10^{-6}$	$3.5x10^{-1}$			Sandstone / Siltstone
	145.03	156.1	$2.2x10^{-6}$	$1.9x10^{-1}$			Sandstone / Siltstone
CPT18							Water at 10.55 m depth
	20.51	23.53	$4.4x10^{-8}$	$3.8x10^{-3}$	$6.8x10^{-6}$	$5.8x10^{-1}$	Coal
CPT36							Water at 10.50 m depth
	28.32	31	$7.7x10^{-8}$	$6.7x10^{-3}$	$1.8x10^{-6}$	$1.6x10^{-1}$	Coal
	44.47	59.11	$7.7x10^{-7}$	$6.6x10^{-2}$			Ulan, Interburden & Coggan
	54.47	59.11	$1.4x10^{-7}$	$1.2x10^{-2}$	$2.5x10^{-6}$	$2.1x10^{-1}$	Coggan
CPT39							Water at 19.66 m depth
	23.1	29.42	$3.2x10^{-6}$	$2.8x10^{-1}$			Ulan Seam
	30	31.43	$1.3x10^{-6}$	$1.1x10^{-1}$			Interburden
	31.22	34.5	$4.9x10^{-6}$	$4.2x10^{-1}$	$2.0x10^{-5}$	$1.7x10^{0}$	Coggan
	34.72	41.96	$7.5x10^{-8}$	$6.5x10^{-3}$	$4x10^{-7}$	$3.4x10^{-2}$	Floor
A06							Water at 1.9 m depth
	11.89	14.5	$4.2x10^{-5}$	3.63	-	-	Coal/Siltstone
	13.89	19.56	$6.9x10^{-6}$	$6.0x10^{-1}$	-	-	Ulan Seam/Tuff
	19.89	24.54	$5.3x10^{-8}$	$4.6x10^{-3}$	-	-	Interburden
	24.89	28.52	$1.0x10^{-5}$	$8.6x10^{-1}$	$3.6x10^{-5}$	3.11	Coggan Seam
	28.89	33.54	$7.6x10^{-9}$	$6.6x10^{-4}$	-	-	Floor - Sandstone
	33.89	40.58	$9.7x10^{-9}$	$8.4x10^{-4}$	$2.4x10^{-8}$	$2.1x10^{-3}$	Floor - Sandstone/Siltstone
	40.39	47.08	$1.7x10^{-8}$	$1.5x10^{-3}$	-	-	Floor - Sandstone/Mudstone
	47.39	53.86	$2.3x10^{-8}$	$2.0x10^{-3}$	$3.5x10^{-8}$	$3.0x10^{-3}$	Floor - Mudstone
AGE02							Artesian flow from bore encountered from 78.4 m depth, estimated at 11.5 m above ground level at Coggan coal seam
	29.68	35.35	$9.6x10^{-5}$	8.3	-	-	Sandstone
	35.48	41.15	$1.4x10^{-6}$	$1.2x10^{-1}$	-	-	Sandstone
	39.05	45.7	$9.8x10^{-7}$	$8.5x10^{-2}$	-	-	Sandstone
	44.16	50.83	$1.3\ x10^{-6}$	$1.1x10^{-1}$	-	-	Sandstone (test terminated at second stage, 330 kPa, due to blown packer membrane)
	45.08	48.66	$9.6x10^{-7}$	$8.3x10^{-2}$	-	-	Sandstone
	62.18	68.87	$3.3x10^{-7}$	$2.8x10^{-2}$	-	-	Sandstone/Siltstone/Mudstone
	68.03	74.72	$2.8x10^{-7}$	$2.4x10^{-2}$	-	-	Carbonaceous Mudstone
	74.53	81.22	$5.6x10^{-7}$	$4.4x10^{-2}$	-	-	Coal/Mudstone
	80.53	86.2	$3.1x10^{-6}$	$2.7x10^{-1}$	-	-	Siltstone/Sandstone/Coal
	85.63	91.3	$6.6x10^{-7}$	$5.7x10^{-2}$	-	-	Sandstone
	91.18	97.87	$2.7x10^{-6}$	$2.3x10^{-1}$	-	-	Ulan Seam/Tuff
	98.03	99.62	$4.3x10^{-7}$	$3.7x10^{-2}$	-	-	Interburden
	100.18	106.88	$2.2x10^{-5}$	1.9	-	-	Coggan Seam
	107.05	112.7	$6.6x10^{-6}$	$5.22x10^{-1}$	-	-	Floor – Sandstone/Siltstone
	112.05	118.75	$8.2x10^{-6}$	$7.1x10^{-1}$	-	-	Floor – Sandstone/Siltstone
	120.03	132.1	$6.3x10^{-8}$	$5.4x10^{-3}$	-	-	Floor – Sandstone/Siltstone
B3							Water at 14.13 m depth[(2)]
	22.08	28.77	$1.2x10^{-6}$	$1.0x10^{-1}$	-	-	Sandstone/Mudstone/Coal/Tuff
	28.03	34.72	$2.2x10^{-7}$	$1.9x10^{-2}$	-	-	Siltstone/Carb.Siltstone/Sandstone
	34.03	40.72	$4.4x10^{-6}$	$3.8x10^{-1}$	-	-	Sandstone
	40.03	46.72	$8.3x10^{-6}$	$7.2x10^{-1}$	-	-	Coal/Sandstone/Tuff
	46.03	52.72	$1.4x10^{-7}$	$1.2x10^{-2}$	-	-	Laminite/Carb Mudstone
							Water at 37.2 m depth[(1)]
	52.03	58.72	$2.9x10^{-9}$	$2.5x10^{-4}$	-	-	Laminite/Siltstone
	58.03	64.72	$5.1x10^{-9}$	$4.4x10^{-4}$	-	-	Sandstone/Siltstone
	64.03	70.72	$3.7x10^{-9}$	$3.2x10^{-4}$	$4.7x10^{-9}$	$4.0x10^{-4}$	Sandstone/Siltstone/Carb. Mud
	70.03	76.72	$5.9x10^{-9}$	$5.1x10^{-4}$	-	-	Sandstone/Siltstone/Carb. Mud
	76.03	82.72	$6.7x10^{-9}$	$5.8x10^{-4}$	-	-	Siltstone/Sandstone/Tuff/Coal
	82.03	88.72	$6.6x10^{-9}$	$5.7x10^{-4}$	$9.8x10^{-9}$	$8.5x10^{-4}$	Sandstone/Conglomerate
	88.03	94.72	$6.5x10^{-9}$	$5.6x10^{-4}$	$9.9x10^{-9}$	$8.6x10^{-4}$	Conglomerate/Sandstone
	94.03	100.72	$9.3x10^{-9}$	$8.1x10^{-4}$	-	-	Sandstone/Coal
	100.03	106.72	$2.1x10^{-8}$	$1.8x10^{-3}$	$5.8x10^{-8}$	$5.0x10^{-3}$	Siltstone/Sandstone/Coal
	106.03	112.72	$1.9x10^{-7}$	$1.6x10^{-2}$	-	-	Ulan Seam
	112.03	117.68	$8.4x10^{-8}$	$7.2x10^{-3}$	-	-	Interburden

Table F1: Summary of Estimated Hydraulic Conductivity from Packer Testing

Bylong Coal Project, Bylong NSW

Bore ID	Depth (m)		Estimated K		K washed Out		Description
	From	To	(m/s)	(m/d)	(m/s)	(m/d)	
B3	117.93	124.62	$3.8x10^{-6}$	$3.3x10^{-1}$	-	-	Coggan Seam
	124.53	131.22	$4.0x10^{-9}$	$3.4x10^{-4}$	-	-	Floor – Sandstone
	130.03	136.72	$4.2x10^{-9}$	$3.6x10^{-4}$	-	-	Floor – Sandstone
	136.03	145.26	$2.7x10^{-9}$	$2.3x10^{-4}$	$1.7x10^{-8}$	$1.5x10^{-3}$	Floor - Sandstone/Mudstone
BY0514							
	28.12	34.84	$3.9x10^{-8}$	$3.3x10^{-3}$	-	-	Mudstone/Siltstone/Sandstone
	37.12	43.84	$1.2x10^{-8}$	$1.0x10^{-3}$	-	-	Sandstone
	43.12	49.84	$7.4x10^{-8}$	$6.3x10^{-3}$	$1.7x10^{-7}$	$1.4x10^{-2}$	Mudstone/Siltstone/Sandstone
	50.62	57.34	$2.0x10^{-8}$	$1.7x10^{-3}$	-	-	Sitlstone/Sandstone
	58.12	64.84	$3.3x10^{-8}$	$2.8x10^{-3}$	-	-	Sitlstone/Sandstone
	64.62	71.34	$7.7x10^{-7}$	$6.6x10^{-2}$	$2.0x10^{-6}$	$1.7x10^{-1}$	Ulan Seam
	71.12	75.84	$4.3x10^{-8}$	$3.7x10^{-3}$	-	-	Interburden - Sandstone
	76.02	82.74	$1.6x10^{-6}$	$1.4x10^{-1}$	-	-	Coggan Seam
	82.13	93.2	$5.2x10^{-9}$	$4.4x10^{-4}$	-	-	Floor - Sandstone
BY0516							
	90.81	97.53	$1.0x10^{-8}$	$8.9x10^{-4}$	$3.5x10^{-8}$	$3.0x10^{-3}$	Sandstone/Siltstone minor coal (GOG)
	99.91	106.63	$3.7x10^{-7}$	$3.2x10^{-2}$	$6.5x10^{-7}$	$5.6x10^{-2}$	Sandstone/Siltstone and Coal (GDA)
	130.11	136.83	$3.4x10^{-8}$	$2.9x10^{-3}$	-	-	Sandstone/Siltstone/Conglomerate
	136.11	142.83	$2.4x10^{-8}$	$2.0x10^{-3}$	$3.5x10^{-8}$	$3.0x10^{-3}$	Sandstone/Siltstone and Coal (GDI, GD, ULNB, ULNC)
	142.11	148.83	$4.2x10^{-9}$	$3.6x10^{-4}$	-	-	Sandstone/Siltstone/Conglomerate
	151.11	157.83	$1.2x10^{-8}$	$1.1x10^{-3}$	-	-	Sandstone/Siltstone and Coal (ULNG)
	157.11	163.83	$1.6x10^{-8}$	$1.4x10^{-3}$	$3.4x10^{-8}$	$2.9x10^{-3}$	Ulan (H,L,M)
	166.13	172.85	$2.6x10^{-8}$	$2.2x10^{-3}$	-	-	Interburden (Sandstone) and Coggan Seam
	162.98	169.7	$4.8x10^{-9}$	$4.2x10^{-4}$	$1.8x10^{-8}$	$1.6x10^{-3}$	Coggan Seam
	168.98	175.7	$1.3x10^{-8}$	$1.1x10^{-3}$	$2.0x10^{-8}$	$1.7x10^{-3}$	Coggan Seam and Floor (Sandstone)
BY0527							
	112.16	118.88	$8.0x10^{-9}$	$6.9x10^{-4}$	$1.3x10^{-8}$	$1.1x10^{-3}$	Sandstone/Siltstone/Mudstone
	118.16	124.88	$3.4x10^{-9}$	$3.0x10^{-4}$	$8.4x10^{-9}$	$7.3x10^{-4}$	Sandstone
	124.16	130.88	$2.0x10^{-9}$	$1.7x10^{-4}$	-	-	Sandstone/Siltstone/Mudstone
	130.16	136.88	$5.3x10^{-9}$	$4.6x10^{-4}$	$2.8x10^{-8}$	$2.4x10^{-3}$	Sandstone and Coal
	137.66	144.38	$2.6x10^{-9}$	$2.2x10^{-4}$	-	-	Sandstone/Siltstone/Mudstone and Coal (ULNG)
	143.66	151.38	$9.9x10^{-9}$	$8.6x10^{-4}$	-	-	Siltstone/Mudstone, Coal (ULNG) and Ulan Seam
	146.81	154.53	$4.0x10^{-9}$	$3.5x10^{-4}$	$1.7x10^{-8}$	$1.5x10^{-3}$	Ulan Seam and Interburden (Siltstone)
	154.31	161.03	$1.4x10^{-8}$	$1.2x10^{-3}$	-	-	Interburden (Siltstone/Sandstone) and Coggan Seam
	157.3	164.02	$7.3x10^{-9}$	$6.3x10^{-4}$	-	-	Coggan Seam and Floor (Sandstone)
	161.16	167.88	$5.2x10^{-8}$	$4.5x10^{-3}$	$9.1x10^{-8}$	$7.8x10^{-3}$	Floor - Sandstone

Notes to Table F1:

(1) Water level whilst HQ casing at 40 m depth.

(2) Water level whilst HQ casing at 20 m depth

Table F2: Summary of Estimated Permeability from Rising Head Testing

Piezometer ID	RL (AHD)	Screen Interval (Depth, m)	Screened Stratum	Test Date	Average Permeability, K	
					(m/s)	(m/d)
December 2011 to August 2012						
A01-S	247.24	1.9-7.9	Clay and Gravel/Sand	15/11/11	$1.0x10^{-5}$	0.86
A01-D	247.24	15.6-18.6	Gravel/Sand and Residual Clay	15/11/11	$5.0x10^{-7}$	0.043
A02-S	299.5	0.8-3.8	Silty Clay/Clayey Silt	9/3/12	$1.0x10^{-4}$	8.6
A02-D	299.5	5.5-8.5	Soil/Sandy Clay	9/3/12	$9.1x10^{-6}$	0.79
A06-S	275.25	1.5-4.5	Silty Clay and Silty Sand and Sand	7/3/12	$1.3x10^{-4}$	11
A06-D	275.25	7.0-10.0	Sandy Clay and Gravelly Clay	7/3/12	$1.4x10^{-6}$	0.12
A11-D	312.75	6.2-12.2	Silty Clay and Sand and Sandy Gravel	7/3/12	$6.9x10^{-5}$	6.0
A11-S	312.75	0.9-3.9	Sand and Sandy Clay/Clayey Sand	7/3/12	$1.6x10^{-4}$	14
A13	251.75	1.2-7.2	Clay and Sand and Sand/Gravel	9/3/12	$1.4x10^{-4}$	12
A03-D	288.00	6.4 to 9.4	Clay/Silty Clay/Clayey Silt	2/8/12	$8.9x10^{-6}$	0.77
A03-S	288.00	0.5 to 3.5	Sandy Clay/Clayey Sand	2/8/12	$4.7x10^{-6}$	0.41
A04	294.75	0.2 to 5.2	Sand	4/8/12	$4.0x10^{-6}$	0.35
A08-D	267.35	5.6 to 8.6	Clay/Sand	2/8/12	$6.8x10^{-5}$	5.9
A08-S	267.35	2.0 to 5.0	Clay/Sand	1/8/12	$4.1x10^{-6}$	0.35
A09	255.35	0.6 to 6.6	Sand/Gravelly Sand/Sandy Gravel	4/8/12	$1.5x10^{-4}$	13
A10	278.25	3.0 to 9.0	Sand/Clay/Sandy Clay	1/8/12	$9.7x10^{-5}$	8.4
A12	341.50	0.2 to 6.2	Sand/Clay/Sandy Clay/Clayey Sand	3/8/12	$5.3x10^{-5}$	4.6
A13	251.75	1.2 to 7.2	Clay and sand and Sand/Gravel	9/3/12	$1.4x10^{-4}$	12
A14	280.20	2.3 to 8.3	Clay/Clayey Sand/Gravelly Clay/Gravelly Sand	4/8/12	$6.1x10^{-6}$	0.53
A15	229.30	0.3 to 6.3	Sand	1/8/12	$1.2x10^{-4}$	10
A18	327.50	0.2 to 6.2	Sandy Silt/Silty Clay/Sand/Sandy Clay/Gravelly Sand	3/8/12	$3.0x10^{-5}$	2.6
A19	246.25	2.2 to 5.2	Clay/Clayey Sand/Gravelly Sand	5/8/12	$6.8x10^{-5}$	5.9
A20	273.50	1.2 to 7.2	Sandy Clay/Clay/Silty Clay	3/8/12	$2.4x10^{-5}$	2.1
BY0001	375.4	185-191	Coggan Seam	7/12/11	$7.0x10^{-7}$	0.060
BY0007	368.69	161-167	Coggan Seam	9/3/12	$3.0x10^{-6}$	0.26
BY0010	301.35	133-139	Coggan Seam	6/12/11	$1.0x10^{-6}$	0.086
BY0014	259.47	50.2-56.2	Coggan Seam	9/3/12	$6.9x10^{-6}$	0.60
BY0015	247.24	90-96	Coggan Seam	8/3/12	$2.4x10^{-6}$	0.21
BY0016	292.89	39.8 to 45.8	Coggan Seam	9/3/12	$2.4x10^{-5}$	2.1

Table F2: Summary of Estimated Permeability from Rising Head Testing (continued)

Piezometer ID	RL (AHD)	Screen Interval (Depth, m)	Screened Stratum	Test Date	Average Permeability, K	
August 2012 to December 2012						
A23	334.05	3.4-9.4	Sandy Clay/Sand/Gravelly Sand/Sandy Gravel	19/10/12	$3.8x10^{-5}$	3.27
A23W	334.05	10.4-16.4	Sandstone/Siltstone	13/12/12	$5.7x10^{-6}$	0.50
A24D	342.7	5.6-8.6	Clayey Sand/Sandstone/Basalt	13/12/12	$6.7x10^{-6}$	0.58
A25	351.6	2.5-5.5	Sand/Gravelly Sand/Sandy Clay	19/10/12	$3.1x10^{-6}$	0.27
AGE01A-S	237.25	1.8-4.8	Sandy Gravel/Gravelly Sand	20/10/12	$2.0x10^{-6}$	0.17
AGE01A-D	237.25	6.4-9.4	Sandy Gravel/Clayey Gravelly Sand	20/10/12	$1.3x10^{-4}$	11.62
AGE01W	237.25	14.45-20.45	Sandstone/Laminite/Siltstone	13/12/12	$4.6x10^{-7}$	0.04
AGE03W	247.65	18.0-24.15	Tuff/Sandstone/Laminite/Siltstone/Coal	13/12/12	$1.6x10^{-5}$	1.40
AGE04	258.95	57.17-63.17	Coggan Seam	12/12/12	$1.0x10^{-5}$	0.88
AGE04W	258.95	19.95-25.95	Siltstone/Coal	12/12/12	$1.7x10^{-6}$	0.14
AGE04A-S	258.95	5.3-11.3	Silty Sand/Sand	12/12/12	$6.9x10^{-5}$	5.97
AGE04A-D	258.95	14.3-17.3	Sand	12/12/12	$8.0x10^{-6}$	0.69
AGE05	259.8	41.9-47.9	Coggan Seam	11/12/12	$6.5x10^{-6}$	0.56
AGE05W	259.8	9.7-15.7	Sandstone/Siltstone/Tuff/Mudstone/Coal	11/12/12	$2.3x10^{-6}$	0.19
AGE05A	259.8	5.4-8.4	Sand/Gravelly Sand	11/12/12	$3.2x10^{-5}$	2.79
AGE08	282.1	29.4-33.9	Coggan Seam	14/12/12	$8.4x10^{-6}$	0.73
AGE08W	282.1	7.8-13.8	Sandstone/Siltstone/Coal	14/12/12	$7.8x10^{-7}$	0.07
AGE11W	326.1	5.2-14.2	Sandstone	14/12/12	$1.7x10^{-5}$	1.46
AGE12W	327.6	13.4-22.6	Siltstone	13/12/12	$1.0x10^{-5}$	0.88
AGE13	357.25	37.6-43.6	Coggan Seam	13/12/13	$1.7x10^{-5}$	1.48

Table F3: Summary of Estimated Permeability from Rising Head Testing

Piezometer ID	RL (AHD)	Screen Interval (Depth, m)	Screened Stratum	Test Date	Average Permeability, K	
					(m/s)	(m/d)
B3-S	TBC	10.15 to 13.65	Sand, gravelly clay and sandy clay	17/12/13 to 18/12/13	6.2×10^{-8}	0.054
B3-D	TBC	15.7 to 18.0	Gravel with some clay	17/12/13 to 18/12/13	3.8×10^{-7}	0.033
AGE02-S	TBC	1.8 to 4.8	Gravel, clay and clayey gravel	21/12/2013	1.8×10^{-4}	16
AGE02-D	TBC	5.5 to 11.5	Gravel	18/12/2013	3.8×10^{-5}	3.3
AGE14	TBC	22.7 to 25.7	Coal	18/12/2013	1.3×10^{-6}	0.12
AGE15	TBC	13.9 to 30.4	Coal, sandstone, mudstone and siltstone	19/12/13 to 20/12/13	7.4×10^{-7}	0.064
M1	TBC	15.5 to 23.0	Sandstone and siltstone	20/12/2013	7.6×10^{-7}	0.066
M2	TBC	2.9 to 5.9	Gravel with clay	19/12/13 to 20/12/2013	5.4×10^{-6}	0.46
A21	313.68	8.3 - 14.3	Clayey sand, sand, clayey sand	4/7/2013	2.5×10^{-6}	0.22
CPT18	297.37	11.5 - 19.0	Sand, sandy gravel, silty sand and siltstone	3/07/2013 & 4/7/2013	5.3×10^{-7}	0.046
OP020 / BY0188	326.48	26.5 - 32.5	Tuff and sandstone	3/07/2013 & 4/7/2013	2.0×10^{-6}	0.17

Appendix G

Table G1: Surface Water Statistical Analysis and Percentiles
Table G2: Groundwater Level (Well) Statistical Analysis and Percentiles
Table G3: Groundwater Level (VWP) Statistical Analysis and Percentiles
Calculation Output – Coal Measures, Alluvium, Surface Water

SURFACE WATER STATISTICAL SUMMARY (February 2012 to June 2017)

Table G1: Surface Water Statistical Analysis and Percentiles

Water Quality Parameter		Sampling Site							
		Bylong River					Lee Creek		Dry Creek
		SW1	SW2	SW4	SW6	SW8	SW7	SW9	SW3
pH (field)	Min	6.8	7.3	6.2	7.2	6.8	7.0	7.0	7.4
	20%ile	7.0	7.5	7.3	7.7	7.3	7.3	7.1	7.7
	Median	7.5	7.9	7.6	8.0	7.6	7.6	7.4	8.1
	80%ile	7.9	8.3	8.0	8.3	8.0	8.0	7.7	8.5
	Max	8.5	8.5	8.3	8.6	8.2	8.3	7.8	8.6
	No. Samples	18	12	62	26	18	7	5	9
EC (field)	Min	120	240	380	480	240	160	160	330
	20%ile	157	336	1469	1319	347	174	207	694
	Median	201	560	1831	1766	578	237	280	933
	80%ile	244	784	2194	2213	809	300	353	1172
	Max	290	920	2300	2300	1000	360	370	1200
	No. Samples	18	12	62	26	18	7	5	9
Turbidity (NTU)	Min	0.6	1.4	0.6	0.9	0.5	1.4	1.5	0.8
	20%ile	1.5	2.1	<0	<0	<0	0.1	3.8	<0
	Median	6.3	6.0	12.4	18.2	19.1	13.1	17.3	20.9
	80%ile	11.0	9.9	31.8	43.5	74.0	26.1	30.8	49.5
	Max	26.0	16.0	150.0	160.0	280.0	36.0	40.0	99.0
	No. Samples	18	12	62	26	18	7	5	9
Hydroxide (OH^-)	Min	1	1	1	1	1	3	3	1
	20%ile	2	2	2	2	2	3	3	2
	Median	2	2	2	2	2	3	3	2
	80%ile	3	3	3	3	3	3	3	3
	Max	3	3	3	3	3	3	3	3
	No. Samples	18	12	61	26	18	7	5	9
Carbonate (CO_3^{2-})	Min	1	1	1	1	1	3	3	1
	20%ile	2	<0	1	<0	2	3	3	1
	Median	2	4	3	6	2	3	3	11
	80%ile	3	8	4	13	3	3	3	21
	Max	3	19	17	27	3	3	3	33
	No. Samples	18	12	61	26	18	7	5	9
Bicarbonate (HCO_3-)	Min	28	61	110	120	65	42	43	100
	20%ile	41	100	290	269	111	48	63	219
	Median	56	157	348	338	183	75	97	311
	80%ile	71	213	406	407	254	101	131	404
	Max	87	240	430	430	310	140	150	440
	No. Samples	18	12	61	26	18	7	5	9
Total Alkalinity	Min	28	61	110	120	65	42	43	100
	20%ile	41	100	291	272	111	48	63	220
	Median	56	158	348	342	183	75	97	320
	80%ile	71	217	406	412	254	101	131	420
	Max	87	240	430	430	310	140	150	470
	No. Samples	18	12	62	26	18	7	5	9
Chloride (Cl)	Min	16	23	47	64	26	17	17	41
	20%ile	20	38	223	215	37	19	18	68
	Median	25	70	290	302	67	22	21	99
	80%ile	30	101	357	390	96	26	24	129
	Max	35	120	400	440	140	27	27	140
	No. Samples	18	12	61	26	18	7	5	9

SURFACE WATER STATISTICAL SUMMARY (February 2012 to June 2017)

Table G1: Surface Water Statistical Analysis and Percentiles (Continued)

Water Quality Parameter		Sampling Site							
		Bylong River					Lee Creek		Dry Creek
		SW1	SW2	SW4	SW6	SW8	SW7	SW9	SW3
Ammonia (NH_3) as N	Min	0.003	0.003	0.003	0.003	0.003	0.003	0.019	0.003
	20%ile	0.000	<0	<0	0.002	<0	0.006	0.021	<0
	Median	0.007	0.057	0.070	0.011	0.053	0.014	0.036	0.014
	80%ile	0.013	0.193	0.379	0.021	0.150	0.022	0.051	0.027
	Max	0.030	0.570	2.900	0.040	0.490	0.030	0.067	0.055
	No. Samples	18	12	62	26	18	7	5	9
NOx (NO_2- +NO_3-)	Min	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	20%ile	<0	<0	<0	0.003	<0	0.008	0.031	<0
	Median	0.123	0.087	0.356	0.028	0.100	0.080	0.107	2.092
	80%ile	0.280	0.190	2.300	0.054	0.277	0.153	0.182	6.293
	Max	0.77	0.40	18.00	0.10	0.83	0.20	0.20	15.00
	No. Samples	18	12	61	26	18	7	5	9
Sulphate (SO_4^{2-})	Min	2	8	19	29	4	3	3	6
	20%ile	2	13	181	130	5	4	7	3
	Median	4	26	244	184	12	9	13	19
	80%ile	6	40	307	238	20	15	20	36
	Max	10	51	370	260	45	18	24	69
	No. Samples	18	12	61	26	17	7	5	9
Calcium	Min	4	12	19	25	11	7	8	13
	20%ile	5	18	88	71	18	8	12	22
	Median	7	31	111	92	30	12	19	29
	80%ile	10	44	135	114	42	15	26	36
	Max	13	51	150	120	52	17	28	39
	No. Samples	18	12	61	26	17	7	5	9
Potassium	Min	2.3	4.6	5.3	5.3	4.3	2.5	2.8	3.2
	20%ile	2.5	4.8	6.3	6.8	4.5	2.7	3.4	4.7
	Median	2.9	5.9	8.4	8.4	5.9	3.0	4.8	6.7
	80%ile	3.4	6.9	10.5	10.0	7.3	3.2	6.2	8.7
	Max	4.5	8.9	17.0	13.0	11.0	3.4	7.4	12.0
	No. Samples	18	12	61	26	17	7	5	9
Sodium	Min	13	21	33	43	22	12	13	40
	20%ile	15	32	148	143	33	13	15	101
	Median	19	52	191	205	60	18	19	140
	80%ile	24	72	235	267	87	22	23	179
	Max	28	88	250	300	120	26	24	180
	No. Samples	18	12	61	26	17	7	5	9
Magnesium	Min	4	8	15	19	8	7	7	10
	20%ile	6	14	71	63	14	8	9	21
	Median	8	24	90	88	23	10	13	30
	80%ile	10	33	110	112	33	12	17	40
	Max	13	42	120	130	43	13	19	46
	No. Samples	18	12	62	26	18	7	5	9
Total Phospherus	Min	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	20%ile	0.03	0.03	<0	0.02	<0	0.03	0.03	0.01
	Median	0.03	0.07	0.25	0.05	0.12	0.03	0.06	0.03
	80%ile	0.03	0.12	0.94	0.09	0.24	0.03	0.08	0.05
	Max	0.03	0.2	6.3	0.2	0.6	0.03	0.1	0.1
	No. Samples	18	12	62	26	18	7	5	9

SURFACE WATER STATISTICAL SUMMARY (February 2012 to June 2017)

Table G1: Surface Water Statistical Analysis and Percentiles (Continued)

Water Quality Parameter		Sampling Site							
		Bylong River					Lee Creek		Dry Creek
		SW1	SW2	SW4	SW6	SW8	SW7	SW9	SW3
Aluminium (Dissolved)	Min	0.0020	0.0040	0.0003	0.0008	0.0020	0.0030	0.0090	0.0020
	20%ile	<0	0.0025	0.0014	0.0014	0.0010	0.0062	0.0048	<0
	Median	0.0267	0.0148	0.0047	0.0053	0.0135	0.0164	0.0278	0.0667
	80%ile	0.0600	0.0270	0.0079	0.0092	0.0260	0.0266	0.0508	0.2070
	Max	0.15	0.044	0.019	0.018	0.042	0.036	0.071	0.51
	No. Samples	18	12	62	26	18	7	5	9
Arsenic (Dissolved)	Min	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0005	0.0004	0.0003	0.0003	0.0005	0.0005	0.0004	0.0005
	Median	0.0005	0.0005	0.0006	0.0007	0.0005	0.0005	0.0006	0.0005
	80%ile	0.0005	0.0007	0.0008	0.0010	0.0005	0.0005	0.0008	0.0005
	Max	0.0005	0.0010	0.0020	0.0020	0.0005	0.0005	0.0010	0.0005
	No. Samples	18	12	62	26	18	7	5	9
Barium (Dissolved)	Min	0.006	0.013	0.025	0.039	0.012	0.013	0.016	0.048
	20%ile	0.009	0.021	0.067	0.074	0.019	0.017	0.023	0.054
	Median	0.014	0.034	0.087	0.098	0.029	0.027	0.036	0.070
	80%ile	0.018	0.047	0.107	0.121	0.040	0.038	0.049	0.085
	Max	0.026	0.057	0.160	0.180	0.058	0.045	0.058	0.110
	No. Samples	18	12	62	26	18	7	5	9
Beryllium (Dissolved)	Min	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	20%ile	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001
	Median	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	80%ile	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Max	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0001	0.0001
	No. Samples	18	12	62	26	18	7	5	9
Cadmium (Dissolved)	Min	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	20%ile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
	Median	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	80%ile	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Max	0.0001	0.0001	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001
	No. Samples	18	12	62	26	18	7	5	9
Chromium (Dissolved)	Min	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0004	0.0004	0.0005	0.0004	0.0004	0.0005	0.0005	0.0001
	Median	0.0006	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0008
	80%ile	0.0007	0.0007	0.0005	0.0006	0.0006	0.0005	0.0005	0.0015
	Max	0.0010	0.0010	0.0005	0.0010	0.0010	0.0005	0.0005	0.0030
	No. Samples	18	12	62	26	18	7	5	9
Cobalt (Dissolved)	Min	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0004	0.0001	0.0002	0.0005	0.0005	0.0005	0.0007	0.0002
	Median	0.0006	0.0007	0.0007	0.0005	0.0005	0.0005	0.0015	0.0007
	80%ile	0.0007	0.0013	0.0013	0.0005	0.0005	0.0005	0.0023	0.0011
	Max	0.0010	0.0030	0.0040	0.0005	0.0005	0.0005	0.0030	0.0020
	No. Samples	18	12	62	26	18	7	5	9
Copper (Dissolved)	Min	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	20%ile	<0	0.001	<0	0.000	0.001	0.000	<0	0.001
	Median	0.003	0.002	0.002	0.003	0.002	0.002	0.003	0.002
	80%ile	0.005	0.003	0.006	0.006	0.003	0.003	0.006	0.003
	Max	0.014	0.004	0.029	0.013	0.004	0.004	0.010	0.004
	No. Samples	18	12	62	26	18	7	5	9

SURFACE WATER STATISTICAL SUMMARY (February 2012 to June 2017)

Table G1: Surface Water Statistical Analysis and Percentiles (Continued)

Water Quality Parameter		Sampling Site							
		Bylong River					Lee Creek		Dry Creek
		SW1	SW2	SW4	SW6	SW8	SW7	SW9	SW3
Iron (Fe^{2+}) (Dissolved)	Min	0.02	0.01	0.01	0.01	0.01	0.04	0.08	0.01
	20%ile	0.04	0.04	<0	0.00	0.03	0.07	0.17	<0
	Median	0.10	0.11	0.10	0.02	0.08	0.13	0.28	0.07
	80%ile	0.15	0.17	0.23	0.04	0.14	0.18	0.39	0.19
	Max	0.23	0.22	1.10	0.10	0.24	0.24	0.45	0.45
	No. Samples	18	12	62	26	18	7	5	9
Lead (Dissolved)	Min	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	<0	0.0005
	Median	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0014	0.0005
	80%ile	0.0005	0.0005	0.0010	0.0005	0.0005	0.0005	0.0031	0.0005
	Max	0.0005	0.0005	0.0030	0.0005	0.0005	0.0005	0.0050	0.0005
	No. Samples	18	12	62	26	18	7	5	9
Manganese (Dissolved)	Min	0.003	0.003	0.010	0.003	0.006	0.012	0.018	0.003
	20%ile	0.019	-0.067	0.066	0.007	-0.005	0.009	0.127	0.000
	Median	0.057	0.077	0.314	0.017	0.084	0.049	0.284	0.005
	80%ile	0.095	0.221	0.561	0.026	0.172	0.088	0.440	0.010
	Max	0.15	0.61	1.50	0.04	0.47	0.12	0.48	0.02
	No. Samples	18	12	62	26	18	7	5	9
Mercury (Dissolved)	Min	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
	20%ile	<0	0.00003	<0	<0	0.00002	0.00003	0.00030	0.00003
	Median	0.00004	0.00003	0.00005	0.00004	0.00003	0.00003	0.00030	0.00003
	80%ile	0.00008	0.00003	0.00013	0.00008	0.00003	0.00003	0.00030	0.00003
	Max	0.00024	0.00003	0.00062	0.00023	0.00005	0.00003	0.00003	0.00003
	No. Samples	18	12	62	26	18	7	5	9
Nickel (Dissolved)	Min	0.002	0.002	0.001	0.001	0.002	0.002	0.003	0.001
	20%ile	0.002	0.002	0.001	0.001	0.002	0.002	0.003	0.001
	Median	0.003	0.003	0.002	0.002	0.003	0.002	0.004	0.002
	80%ile	0.003	0.004	0.003	0.003	0.004	0.002	0.006	0.004
	Max	0.004	0.005	0.004	0.004	0.005	0.003	0.008	0.006
	No. Samples	18	12	62	26	18	7	5	9
Selenium (Dissolved)	Min	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0005	0.0005	0.0003	0.0004	0.0005	0.0005	0.0005	0.0005
	Median	0.0005	0.0005	0.0007	0.0005	0.0005	0.0005	0.0005	0.0005
	80%ile	0.0005	0.0005	0.0012	0.0007	0.0005	0.0005	0.0005	0.0005
	Max	0.0005	0.0005	0.0030	0.0010	0.0005	0.0005	0.0005	0.0005
	No. Samples	18	12	62	26	18	7	5	9
Vanadium (Dissolved)	Min	0.0005	0.0005	0.0005	0.0010	0.0005	0.0005	0.0005	0.0005
	20%ile	0.0003	0.0004	0.0003	0.0018	0.0002	0.0003	0.0004	0.0002
	Median	0.0006	0.0008	0.0006	0.0024	0.0008	0.0008	0.0009	0.0010
	80%ile	0.0009	0.0011	0.0009	0.0030	0.0014	0.0013	0.0014	0.0018
	Max	0.0020	0.0020	0.0020	0.0040	0.0030	0.0020	0.0020	0.0030
	No. Samples	18	12	62	26	18	7	5	9
Zinc (Dissolved)	Min	0.002	0.001	0.001	0.001	0.002	0.001	0.004	0.003
	20%ile	0.004	<0	<0	<0	0.005	0.002	<0	0.006
	Median	0.008	0.015	0.010	0.010	0.010	0.005	0.027	0.010
	80%ile	0.011	0.038	0.023	0.020	0.015	0.008	0.061	0.015
	Max	0.01	0.10	0.09	0.06	0.02	0.01	0.10	0.02
	No. Samples	18	12	62	26	18	7	5	9

Notes to Table G1: All results expressed in mg/L unless otherwise stated

WATER LEVEL STATISTICAL SUMMARY (November 2011 to June 2017)

Table G2: Water Level (Well Monitoring) Statistical Analysis and Percentiles

Well ID	Alternate Well ID	Mean	Max	Min	St Dev	5%ile	Adopted 5%ile
A01-D	BY0015-D	242.08	243.41	241.36	0.39	241.44	241.44
A01-S	BY0015-S	242.16	243.57	241.43	0.38	241.54	
A02-D	-	296.52	298.21	294.31	1.14	294.65	294.65
A02-S	-	297.28	298.27	295.79	0.66	296.19	
A03-D	-	286.43	288.01	284.78	0.93	284.89	284.89
A03-S	-	286.62	287.97	285.01	0.84	285.24	
A04	-	292.28	294.71	290.07	1.09	290.49	290.49
A06-D	-	272.08	273.83	270.58	0.90	270.60	270.60
A06-S	-	272.69	274.06	271.35	0.62	271.67	
A08-D	-	263.18	264.31	261.77	0.62	262.16	262.16
A08-S	-	263.57	264.31	262.83	0.35	263.00	
A09	-	253.13	255.27	251.76	0.73	251.94	251.94
A10	-	272.58	276.53	270.50	1.44	270.21	270.21
A11-D	-	310.55	312.68	309.26	0.85	309.14	309.14
A11-S	-	310.78	312.67	309.33	0.95	309.22	
A12	-	339.65	340.90	336.53	0.94	338.10	338.10
A13	-	248.87	249.32	244.71	0.25	248.45	248.45
A14	-	273.24	273.71	272.66	0.29	272.77	272.77
A15	-	297.37	299.92	294.38	1.41	295.05	295.05
A17-D	-	319.59	321.25	318.71	0.64	318.54	318.54
A17-S	-	319.61	321.26	318.70	0.64	318.55	
A18	-	325.30	327.26	323.11	1.11	323.47	323.47
A19	-	243.04	243.53	242.44	0.28	242.58	242.58
A20	-	271.17	272.60	269.50	0.84	269.79	269.79
A21	-	307.71	309.65	299.71	2.93	302.90	302.90
A23	-	327.26	333.40	324.32	2.22	323.60	323.60
A24-D	-	336.18	339.91	334.19	1.77	333.26	333.26
A25	-	346.92	348.56	346.16	0.70	345.77	345.77
AGE01-D	-	234.49	235.24	234.36	0.09	234.34	234.34
AGE01-S	-	234.50	235.23	234.32	0.10	234.34	
AGE01-W	-	234.44	234.57	234.30	0.05	234.36	234.36
AGE02-D	-	246.02	247.23	245.56	0.34	245.46	245.46
AGE02-S	-	246.02	247.22	245.61	0.34	245.45	
AGE04	-	250.49	250.89	249.76	0.25	250.09	250.09
AGE04-D	-	250.60	251.07	250.26	0.18	250.30	250.30
AGE04-S	-	250.56	251.03	250.22	0.18	250.26	250.26
AGE04-W	-	250.62	251.10	250.32	0.17	250.34	250.34
AGE05	-	253.98	254.75	253.49	0.38	253.35	253.35
AGE05-A	-	252.80	253.66	252.18	0.45	252.06	252.06
AGE05-W	-	252.73	253.65	252.15	0.43	252.02	252.02
AGE07	-	255.96	256.85	255.28	0.50	255.14	255.14
AGE07-W	-	258.36	259.03	257.95	0.27	257.92	257.92
AGE08	-	272.68	274.28	271.74	0.71	271.52	271.52
AGE08-W	-	274.62	275.44	274.01	0.38	274.00	274.00

WATER LEVEL STATISTICAL SUMMARY (November 2011 to June 2017)

Table G2: Water Level (Well Monitoring) Statistical Analysis and Percentiles

Well ID	Alternate Well ID	Mean	Max	Min	St Dev	5%ile	Adopted 5%ile
AGE09	-	273.70	277.96	271.83	1.70	270.90	270.90
AGE09-W	-	275.39	279.64	274.35	1.56	272.82	272.82
AGE10	BY0206	281.35	284.01	280.06	1.14	279.47	279.47
AGE10-W	BY0206-W	284.26	285.48	283.33	0.61	283.26	283.26
AGE11-W	-	318.03	319.93	316.92	0.55	317.14	317.14
AGE12-W	-	324.68	326.96	322.08	1.35	322.46	322.46
AGE13	-	319.86	321.65	318.93	0.71	318.69	318.69
AGE14	-	285.29	286.92	284.32	0.81	283.97	283.97
AGE15	-	285.46	286.69	284.66	0.57	284.53	284.53
AGE16	-	266.74	266.86	266.59	0.08	266.62	266.62
AGE18	-	273.12	273.13	273.10	0.01	273.10	273.10
AGE19	-	282.67	283.32	282.40	0.17	282.38	282.38
AGE20	-	289.68	290.14	289.20	0.30	289.18	289.18
AGE22M	-	272.21	272.46	271.99	0.13	272.00	272.00
AGE26W	-	265.28	265.38	265.17	0.05	265.20	265.20
AGE28P	-	282.90	283.10	282.57	0.14	282.67	282.67
AGE33M	-	277.82	277.95	277.47	0.12	277.62	277.62
B3-D	-	301.85	309.18	297.71	3.34	296.35	296.35
B3-S	-	301.74	309.18	297.41	3.47	296.04	
BY0001	CP035	272.59	273.68	271.76	0.56	271.67	271.67
BY0007	CP028	253.84	254.58	253.17	0.40	253.18	253.18
BY0010	CP014	251.08	251.73	250.15	0.28	250.62	250.62
BY0014	CP027	253.80	254.65	250.09	0.38	253.18	253.18
BY0015	CP009	249.70	251.03	248.38	0.67	248.59	248.59
BY0016	CP045	271.91	295.12	263.38	1.14	270.04	270.04
BY0091-S	-	330.48	330.58	330.37	0.05	330.40	330.40
BY0188	OP020	293.96	294.31	292.25	0.64	292.90	292.90
BY0204	CP063	287.37	288.41	286.03	0.56	286.45	286.45
CPT13	BY0174	274.29	278.15	272.61	1.59	271.67	271.67
CPT15	BY0173	276.35	278.93	273.29	1.64	273.66	273.66
CPT18	-	278.71	279.00	278.40	0.16	278.45	278.45
CPT36	-	289.57	289.87	289.23	0.12	289.38	289.38
CPT39	-	287.07	290.41	285.52	1.22	285.07	285.07
M1	-	261.02	261.40	260.76	0.16	260.75	260.75
M2	-	257.27	261.40	260.76	0.21	256.92	256.92
OP028	BY0020	323.40	324.62	322.77	0.59	322.43	322.43

WATER LEVEL STATISTICAL SUMMARY (November 2011 to June 2017)

Table G3: Water Level (Vibrating Wire Piezometer Monitoring) Statistical Analysis and Percentiles

Well ID	VWP ID	Depth (m)	Elevation (mRL)	Mean	Max	Min	St Dev	5%ile
A06	VWP1	12.5	262.7	271.16	272.63	269.88	0.75	269.93
	VWP2	17.0	258.2	274.52	277.49	272.19	1.41	272.20
	VWP3	26.8	248.4	274.25	277.15	272.13	1.05	272.52
	VWP4	36.6	238.6	278.72	281.73	271.95	2.15	275.19
AGE01	VWP1	27.7	209.6	247.20	258.44	233.59	7.09	235.54
	VWP2	67.1	170.2	239.36	240.31	237.31	0.21	239.01
	VWP3	120.2	117.1	263.87	268.26	268.26	5.14	255.41
	VWP4	128.2	109.1	250.04	254.66	254.66	2.26	246.33
	VWP5	140.7	96.6	252.49	263.67	234.65	2.31	248.68
AGE02	VWP1	31.2	210.5	241.80	242.93	240.79	0.54	240.91
	VWP2	45.5	196.2	241.77	242.88	240.68	0.37	241.15
	VWP3	84.3	157.4	252.64	256.20	241.83	1.46	250.23
	VWP4	94.0	147.7	248.04	248.95	241.26	0.39	247.40
	VWP5	103.0	138.7	255.19	258.66	241.98	1.98	251.93
	VWP6	116.0	125.7	248.96	251.04	241.98	1.01	247.31
AGE03	VWP1	30.5	246.9	240.41	243.24	241.27	0.53	239.55
B3	VWP1	43.2	267.4	295.78	303.42	292.00	4.21	288.85
	VWP2	82.0	310.6	280.89	295.20	279.39	1.01	279.22
	VWP3	108.5	202.1	273.67	296.73	271.94	1.67	270.93
	VWP4	120.5	190.1	282.25	296.19	268.60	4.67	274.56
	VWP5	135.0	175.6	281.60	292.89	275.98	0.90	280.12
BY0011	VWP1	73.4	283.2	322.61	338.05	312.08	4.08	315.90
	VWP2	148.8	208.2	248.23	338.55	247.27	2.46	244.19
	VWP3	190.4	166.2	245.96	337.62	245.09	2.38	242.04
	VWP4	202.4	154.2	245.15	336.77	244.43	2.31	241.35
	VWP5	220.0	136.6	243.66	336.86	242.82	2.46	239.61
BY0077	VWP1	48.3	249.0	257.67	259.71	251.59	2.17	254.10
	VWP2	107.9	189.4	262.13	265.37	265.37	1.98	258.88
	VWP3	118.8	178.5	263.02	266.84	248.32	1.94	259.82
	VWP4	139.75	157.5	247.98	253.44	246.80	1.25	245.92
BY0080	VWP1	177.2	228.5	271.38	316.53	270.18	1.39	269.10
	VWP2	200.0	205.7	270.62	316.17	268.38	1.24	268.58
	VWP3	210.7	195.0	295.00	316.91	274.22	8.21	281.49
	VWP4	230.0	175.7	264.46	316.11	262.58	2.31	260.67
BY0091	VWP1	57.0	306.7	308.60	311.86	306.50	1.59	305.99
	VWP2	103.4	260.3	258.96	294.47	258.52	1.05	257.24
	VWP3	172.5	191.2	246.40	292.13	240.80	2.41	242.43
	VWP4	185.0	178.7	250.52	292.25	249.03	1.76	247.62
BY0208	VWP1	37.3	289.8	305.85	314.55	301.39	2.79	301.27
	VWP2	60.0	267.1	300.59	304.16	295.91	1.77	297.67
	VWP3	87.5	239.6	305.32	316.21	295.84	4.49	297.94
	VWP4	98.5	228.6	294.57	302.78	292.26	1.97	291.32

WATER LEVEL STATISTICAL SUMMARY (November 2011 to June 2017)

Table G3: Water Level (Vibrating Wire Piezometer Monitoring) Statistical Analysis and Percentiles

CPT18	VWP1	22.75	276.1	277.20	279.39	275.47	1.44	274.83
CPT36	VWP1	47.75	254.3	287.90	291.68	287.58	0.57	286.96
	VWP2	56.75	245.3	285.86	288.39	283.56	0.91	284.36
CPT39	VWP1	25.0	282.1	283.09	281.28	293.31	2.54	278.92
	VWP2	33.0	274.1	281.45	284.15	280.12	1.17	279.52

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG **STATISTICAL ANALYSIS**

Coal Measures

Feb 2012 to June 2017

	Basic									
Parameter:	**Turbidity**	**pH**	**Conduct-ivity**	**Aluminium (Al)**	**Barium**	**Arsenic (As)**	**Cadmium (Cd)**	**Chromium (Cr)**	**Copper (Cu)**	**Cobalt (Co)**
Units	NTU	pH Units	mS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	311	311	311	311	311	311	311	311	311	311
Minimum:	0.2	5.5	880	0.00025	0.0005	0.0005	0.00005	0.0005	0.0005	0.0005
Maximum:	3200	7.9	3900	0.11	0.44	0.083	0.0003	0.002	0.023	0.014
Average:	55.9839	7.0620	1575.9807	0.0068	0.2126	0.0038	0.0001	0.0005	0.0013	0.0007
Standard Deviation:	203.4475	0.4318	559.5819	0.0106	0.1121	0.0094	0.0000	0.0001	0.0025	0.0012
Coefficient of Variation:	3.6340	0.0611	0.3551	1.5509	0.5274	2.4567	0.5800	0.1921	1.9673	1.7427
Student's t	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498
LogNormal Mean	2.5562	1.9528	7.3043	-5.4517	-1.7115	-6.8009	-9.8537	-7.5898	-7.1839	-7.5146
LogNormal Standard Deviation:	1.6503	0.0632	0.3366	0.9168	0.6478	1.2546	0.2585	0.1036	0.7746	0.4230
Skewness	12.451	-0.870	0.839	5.922	0.404	4.069	6.563	12.678	6.171	8.460
H-Statistic	3.022	1.966	2.020	2.342	2.161	2.628	1.997	1.970	2.241	2.051
Appropriate Distribution	Log-Normal	Normal	Normal	Log-Normal	Normal	Log-Normal	Normal	Normal	Log-Normal	Log-Normal
ANZECC Criteria	NC	8.0 - 8.4	NC	NC	NC	0.013	0.0007	0.0044	0.0013	1
Percentiles:										
20th Percentile	**<0**	**6.7**	**1110**	**<0**	**0.119**	**<0**	**0.00005**	**0.0005**	**<0**	**<0**
50th Percentile	**56**	**7.07**	**1580**	**0.00682**	**0.213**	**0.00382**	**0.0000557**	**0.00051**	**0.00127**	**0.000684**
80th Percentile	**228**	**7.43**	**2050**	**0.0158**	**0.307**	**0.0118**	**0.0000828**	**0.000593**	**0.00336**	**0.00169**
84.13th Percentile	**260**	**7.5**	**2140**	**0.0174**	**0.325**	**0.0132**	**0.0000879**	**0.000608**	**0.00375**	**0.00188**
97.73th Percentile	**464**	**7.93**	**2700**	**0.028**	**0.437**	**0.0226**	**0.000121**	**0.000706**	**0.00624**	**0.00307**

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG
Coal Measures
Feb 2012 to June 2017

	Metals									
Parameter:	**Iron (Fe)**	**Lead (Pb)**	**Magnesium (Mg)**	**Manganese (Mn)**	**Beryllium (Be)**	**Mercury (Hg)**	**Nickel (Ni)**	**Selenium (Se)**	**Vanadium (V)**	**Zinc (Zn)**
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	311	311	311	311	311	311	311	311	311	311
Minimum:	0.005	0.0005	17	0.02	0.00005	0.000025	0.0005	0.0005	0.0005	0.0005
Maximum:	2.1	0.003	88	0.26	0.0004	0.000025	0.093	0.005	0.002	6.5
Average:	0.3254	0.0005	37.2315	0.0595	0.0001	0.000025	0.0051	0.0005	0.0005	0.0461
Standard Deviation:	0.2267	0.0002	22.2648	0.0377	0.0001	0.000000	0.0099	0.0003	0.0002	0.3707
Coefficient of Variation:	0.6967	0.3253	0.5980	0.6324	0.7250	0.0000	1.9291	0.5395	0.3655	8.0339
Student's t	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498
LogNormal Mean	-1.3530	-7.5885	3.4621	-3.0000	-9.6701	-10.5966	-6.2272	-7.5779	-7.5742	-4.5163
LogNormal Standard Deviation:	0.7601	0.1340	0.5358	0.5914	0.4674	0.0000	1.3023	0.1834	0.1827	1.3705
Skewness	2.494	12.980	0.953	1.351	2.842	1.005	4.619	13.423	7.333	17.154
H-Statistic	2.231	1.973	2.101	2.130	2.069	1.964	2.673	1.981	1.981	2.738
Appropriate Distribution	Normal	Normal	Normal	Normal	Normal	Normal	Log-Normal	Normal	Normal	Log-Normal
ANZECC Criteria	NC	0.0044	NC	1.9	NC	0.1	0.007	0.011	NC	0.015
Percentiles:										
20th Percentile	**0.135**	**0.0005**	**18.5**	**0.0279**	**0.00005**	**0.000025**	**<0**	**0.0005**	**0.0005**	**<0**
50th Percentile	**0.326**	**0.000515**	**37.3**	**0.0596**	**0.000073**	**0.000025**	**0.00512**	**0.000529**	**0.000528**	**0.0462**
80th Percentile	**0.517**	**0.000656**	**56**	**0.0913**	**0.000118**	**0.000025**	**0.0135**	**0.00077**	**0.00069**	**0.359**
84.13th Percentile	**0.553**	**0.000682**	**59.5**	**0.0972**	**0.000126**	**0.000025**	**0.015**	**0.000815**	**0.000721**	**0.417**
97.73th Percentile	**0.78**	**0.00085**	**81.8**	**0.135**	**0.000179**	**0.0000251**	**0.0249**	**0.0011**	**0.000914**	**0.788**

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG
Coal Measures
Feb 2012 to June 2017

	Non-Metals									
Parameter:	**Total Phosphorus**	**Ammonia**	**Total Alkalinity**	**Hydroxide**	**Carbonate**	**Bicarbonate**	**Chloride**	**Nox**	**Sulphate**	**Calcium**
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	311	311	311	311	311	311	311	311	311	311
Minimum:	0.025	0.04	400	2.5	2.5	400	38	0	0.5	26
Maximum:	1.1	3.7	1200	2.5	110	1200	630	1.8	310	80
Average:	0.0357	1.5187	693.41	2.5000	3.3842	692.3473	144.9871	0.0311	21.0595	44.1190
Standard Deviation:	0.0652	0.6139	251.47	0.0000	7.1321	250.9221	71.2198	0.1277	27.5260	13.8378
Coefficient of Variation:	1.8286	0.4042	0.3627	0.0000	2.1074	0.3624	0.4912	4.1065	1.3071	0.3136
Student's t	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498	1.6498
LogNormal Mean	-3.5439	0.3366	6.4784	0.9163	0.9803	6.4769	4.8792	-4.8312	1.6876	3.7429
LogNormal Standard Deviation:	0.4514	0.4262	0.3530	0.0000	0.4058	0.3528	0.4306	1.3055	2.0465	0.2899
Skewness	14.301	0.889	0.556	#DIV/0!	11.877	0.557	2.172	10.443	4.220	0.966
H-Statistic	2.062	2.052	2.025	1.964	2.044	2.025	2.054	2.676	3.459	2.005
Appropriate Distribution	Log-Normal	Normal	Normal	Normal	Log-Normal	Normal	Normal	Log-Normal	Log-Normal	Normal
ANZECC Criteria	0.004	0.91	400	7	0.5	0.6	0.01	1	0.1	NC
Percentiles:										
20th Percentile	**<0**	**1.01**	**482**	**-**	**<0**	**482**	**85.1**	**<0**	**<0**	**32.5**
50th Percentile	**0.0357**	**1.52**	**694**	**-**	**3.39**	**693**	**145**	**0.0311**	**21.1**	**44.2**
80th Percentile	**0.0906**	**2.04**	**906**	**-**	**9.39**	**904**	**205**	**0.139**	**44.3**	**55.8**
84.13th Percentile	**0.101**	**2.14**	**945**	**-**	**10.6**	**944**	**217**	**0.159**	**48.6**	**58**
97.73th Percentile	**0.167**	**2.75**	**1200**	**-**	**17.7**	**1200**	**288**	**0.287**	**76.2**	**71.9**

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG **STATISTICAL ANALYSIS**

Alluvial Series

Feb 2012 to June 2017

	Basic									
Parameter:	**Turbidity**	**pH**	**Conduct-ivity**	**Aluminium (Al)**	**Barium**	**Arsenic (As)**	**Cadmium (Cd)**	**Chromium (Cr)**	**Copper (Cu)**	**Cobalt (Co)**
Units	NTU	pH Units	mS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	544	548	548	549	549	549	549	549	548	548
Minimum:	0.3	4.8	150	0.00025	0.005	0.0005	0.00005	0.0005	0.0005	0.0005
Maximum:	45000	8.1	3100	1	0.65	0.019	0.0006	0.012	0.72	0.038
Average:	324.0583	6.6596	1089.1971	0.0123	0.0851	0.0007	0.0001	0.0006	0.0077	0.0013
Standard Deviation:	2352.2261	0.5641	711.6218	0.0664	0.0665	0.0009	0.0001	0.0010	0.0469	0.0033
Coefficient of Variation:	7.2587	0.0847	0.6533	5.4044	0.7815	1.3525	1.2920	1.5980	6.1034	2.5186
Student's t	1.6477	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476
LogNormal Mean	3.5007	1.8923	6.7251	-5.9125	-2.7277	-7.4402	-9.7933	-7.5435	-6.2115	-7.2162
LogNormal Standard Deviation:	1.8571	0.0885	0.7943	1.2979	0.7809	0.4476	0.4435	0.3515	1.2344	0.7588
Skewness	15.443	-0.791	0.585	11.801	3.604	13.873	5.387	9.931	13.019	7.532
H-Statistic	3.241	1.966	2.251	2.665	2.242	2.059	2.057	2.022	2.606	2.228
Appropriate Distribution	Log-Normal	Normal	Normal	Log-Normal	Normal	Log-Normal	Log-Normal	Log-Normal	Log-Normal	Log-Normal
ANZECC Criteria	NC	8.0 - 8.4	NC	NC	NC	0.013	0.0007	0.0044	0.0013	1
Percentiles:										
20th Percentile	**<0**	**6.19**	**491**	**<0**	**0.0292**	**<0**	**<0**	**<0**	**<0**	**<0**
50th Percentile	**325**	**6.66**	**1090**	**0.0123**	**0.0851**	**0.000702**	**0.0000684**	**0.000626**	**0.00769**	**0.00131**
80th Percentile	**2310**	**7.14**	**1690**	**0.0682**	**0.142**	**0.0015**	**0.000143**	**0.00147**	**0.0472**	**0.00409**
84.13th Percentile	**2680**	**7.23**	**1810**	**0.0787**	**0.152**	**0.00165**	**0.000157**	**0.00163**	**0.0546**	**0.00461**
97.73th Percentile	**5040**	**7.79**	**2520**	**0.146**	**0.219**	**0.0026**	**0.000246**	**0.00263**	**0.102**	**0.00791**
99.87th Percentile	**7410**	**8.36**	**3240**	**0.213**	**0.286**	**0.00356**	**0.000335**	**0.00364**	**0.149**	**0.0113**

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG
Alluvial Series
Feb 2012 to June 2017

Parameter:	Metals								
	Iron (Fe)	Lead (Pb)	Magnesium (Mg)	Manganese (Mn)	Beryllium (Be)	Mercury (Hg)	Nickel (Ni)	Selenium (Se)	Vanadium (V)
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	549	549	548	549	549	549	549	549	549
Minimum:	0.005	0.0005	4.9	0.0025	0.00005	0.000025	0.0005	0.0005	0.0005
Maximum:	59	0.012	160	12	0.00025	0.00025	0.038	0.017	0.009
Average:	1.0526	0.0006	52.0330	0.3989	0.0001	0.000025	0.0042	0.0016	0.0008
Standard Deviation:	5.4090	0.0006	36.0963	1.0317	0.0000	0.000010	0.0046	0.0028	0.0007
Coefficient of Variation:	5.1386	1.0973	0.6937	2.5863	0.3898	0.3779	1.0929	1.6872	0.9015
Student's t	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476
LogNormal Mean	-3.0519	-7.5565	3.6313	-2.4285	-9.8813	-10.5924	-5.7884	-7.0786	-7.2890
LogNormal Standard Deviation:	2.3180	0.2890	0.8867	2.0133	0.1736	0.0983	0.7676	0.9508	0.5252
Skewness	8.306	12.950	0.613	7.636	9.032	23.431	3.976	3.116	4.798
H-Statistic	3.771	2.003	2.317	3.416	1.977	1.967	2.233	2.365	2.094
Appropriate Distribution	Log-Normal	Normal	Normal	Log-Normal	Normal	Normal	Normal	Log-Normal	Normal
ANZECC Criteria	NC	0.0044	NC	1.9	NC	0.1	0.007	0.011	NC
Percentiles:									
20th Percentile	**<0**	**0.0005**	**21.7**	**<0**	**0.00005**	**0.000025**	**0.0005**	**<0**	**0.0005**
50th Percentile	**1.06**	**0.000576**	**52.1**	**0.399**	**0.0000525**	**0.0000255**	**0.00423**	**0.00165**	**0.000824**
80th Percentile	**5.61**	**0.00111**	**82.5**	**1.27**	**0.0000697**	**0.0000335**	**0.00811**	**0.00397**	**0.00145**
84.13th Percentile	**6.47**	**0.00121**	**88.2**	**1.44**	**0.000073**	**0.0000351**	**0.00884**	**0.00441**	**0.00157**
97.73th Percentile	**11.9**	**0.00184**	**125**	**2.47**	**0.0000934**	**0.0000447**	**0.0135**	**0.00718**	**0.00231**
99.87th Percentile	**17.4**	**0.00248**	**161**	**3.51**	**0.000115**	**0.0000544**	**0.0182**	**0.00998**	**0.00306**

Douglas Partners
Geotechnics / Environment / Groundwater

BYLONG
Alluvial Series
Feb 2012 to June 2017

Parameter:	Zinc (Zn)	Total Phosphorus	Ammonia	Total Alkalinity	Hydroxide	Carbonate	Bicarbonate	Chloride	Nox	Sulphate	Calcium
					Non-Metals						
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	549	548	549	548	548	548	548	548	549	0	548
Minimum:	0.002	0.025	0.0025	32	2.5	2.5	32	9	0.0025	0	2.6
Maximum:	0.36	3.2	5.3	630	2.5	51	630	570	37	0	150
Average:	0.0237	0.1006	0.0760	274.08	2.5000	2.7628	273.8066	153.9507	1.2633		64.6314
Standard Deviation:	0.0324	0.2927	0.3800	141.43	0.0000	2.9237	141.2324	127.3530	3.7438	-	42.2075
Coefficient of Variation:	1.3687	2.9089	5.0025	0.5160	0.0000	1.0582	0.5158	0.8272	2.9635	-	0.6530
Student's t	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	1.6476	-	1.6476
LogNormal Mean	-4.1453	-3.0181	-4.3447	5.4134	0.9163	0.9401	5.4127	4.6233	-2.3390	-	3.8173
LogNormal Standard Deviation:	0.8104	0.8920	1.5361	0.7146	0.0000	0.2368	0.7141	0.9864	2.4236	-	0.9932
Skewness	5.250	8.015	9.946	-0.118	#DIV/0!	12.936	-0.118	0.996	4.825	-	0.149
H-Statistic	2.262	2.321	2.899	2.199	1.963	1.990	2.199	2.393	3.897	#NUM!	2.399
Appropriate Distribution	Log-Normal	Log-Normal	Log-Normal	Normal	Normal	Normal	Normal	Normal	Log-Normal	Log-Normal	Normal
ANZECC Criteria	0.015	0.004	0.91	400	7	0.5	0.6	0.01	1	0.1	NC
Percentiles:											
20th Percentile	**<0**	**<0**	**<0**	**156**	**-**	**2.5**	**155**	**46.8**	**<0**	**-**	**29.2**
50th Percentile	**0.0237**	**0.101**	**0.076**	**275**	**-**	**2.77**	**274**	**154**	**1.27**	**-**	**64.7**
80th Percentile	**0.051**	**0.347**	**0.396**	**394**	**-**	**5.23**	**393**	**262**	**4.42**	**-**	**101**
84.13th Percentile	**0.0561**	**0.394**	**0.456**	**416**	**-**	**5.69**	**416**	**282**	**5.01**	**-**	**107**
97.73th Percentile	**0.0886**	**0.687**	**0.837**	**558**	**-**	**8.62**	**557**	**409**	**8.76**	**-**	**150**
99.87th Percentile	**0.122**	**0.983**	**1.23**	**700**	**-**	**11.6**	**700**	**538**	**12.6**	**-**	**192**

Bylong **STATISTICAL ANALYSIS**

Feb 2012 to June 2017	Basic										
Parameter:	**Turbidity**	**pH**	**Conduct-ivity**	**Aluminium (Al)**	**Barium**	**Arsenic (As)**	**Cadmium (Cd)**	**Chromium (Cr)**	**Copper (Cu)**	**Cobalt (Co)**	**Iron (Fe)**
Units	NHTG	pH Units	mS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	155	155	155	155	155	155	155	155	155	155	155
Minimum:	0.5	6.2	120	0.00025	0.006	0.0005	0.00005	0.0005	0.0005	0.0005	0.005
Maximum:	280	8.6	2300	0.51	0.18	0.002	0.0005	0.003	0.029	0.004	1.1
Average:	13.46839	7.710903	1220.387	0.013979	0.064529	0.000568	5.94E-05	0.000535	0.002361	0.000658	0.088065
Standard Deviation:	30.39349	0.460601	781.0057	0.043885	0.037432	0.000262	4.18E-05	0.000221	0.003473	0.000528	0.126928
Coefficient of Variation:	2.256654	0.059734	0.639966	3.139336	0.580073	0.460768	0.704057	0.413624	1.47091	0.801836	1.441311
Student's t	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808
LogNormal Mean	1.808204	2.040815	6.777114	-5.182461	-2.983351	-7.52488	-9.808138	-7.562511	-6.548444	-7.458897	-3.062321
LogNormal Standard Deviation:	1.114834	0.060961	0.92538	1.194904	0.786608	0.268661	0.306453	0.195147	0.924398	0.416265	1.141514
Skewness	6.082	-0.513	-0.092	9.783	0.195	4.569	8.289	9.423	4.707	4.038	4.549
H-Statistic	2.510	1.971	2.355	2.581	2.255	2.005	2.015	1.988	2.355	2.053	2.534
Appropriate Distribution	Log-Normal	Normal	Normal	Log-Normal	Normal	Normal	Normal	Normal	Log-Normal	Normal	Log-Normal
ANZECC Criteria	NC	8.0 - 8.4	NC	NC	NC	0.013	0.0007	0.0044	0.0013	1	NC
Percentiles:											
20th Percentile	**<0**	**7.33**	**564**	**<0**	**0.0331**	**0.0005**	**0.00005**	**0.0005**	**<0**	**0.0005**	**<0**
50th Percentile	**13.5**	**7.72**	**1230**	**0.014**	**0.0646**	**0.000568**	**5.94E-05**	**0.000536**	**0.00237**	**0.000659**	**0.0881**
80th Percentile	**39.1**	**8.1**	**1880**	**0.051**	**0.0961**	**0.000788**	**9.46E-05**	**0.000722**	**0.00529**	**0.00111**	**0.195**

Bylong

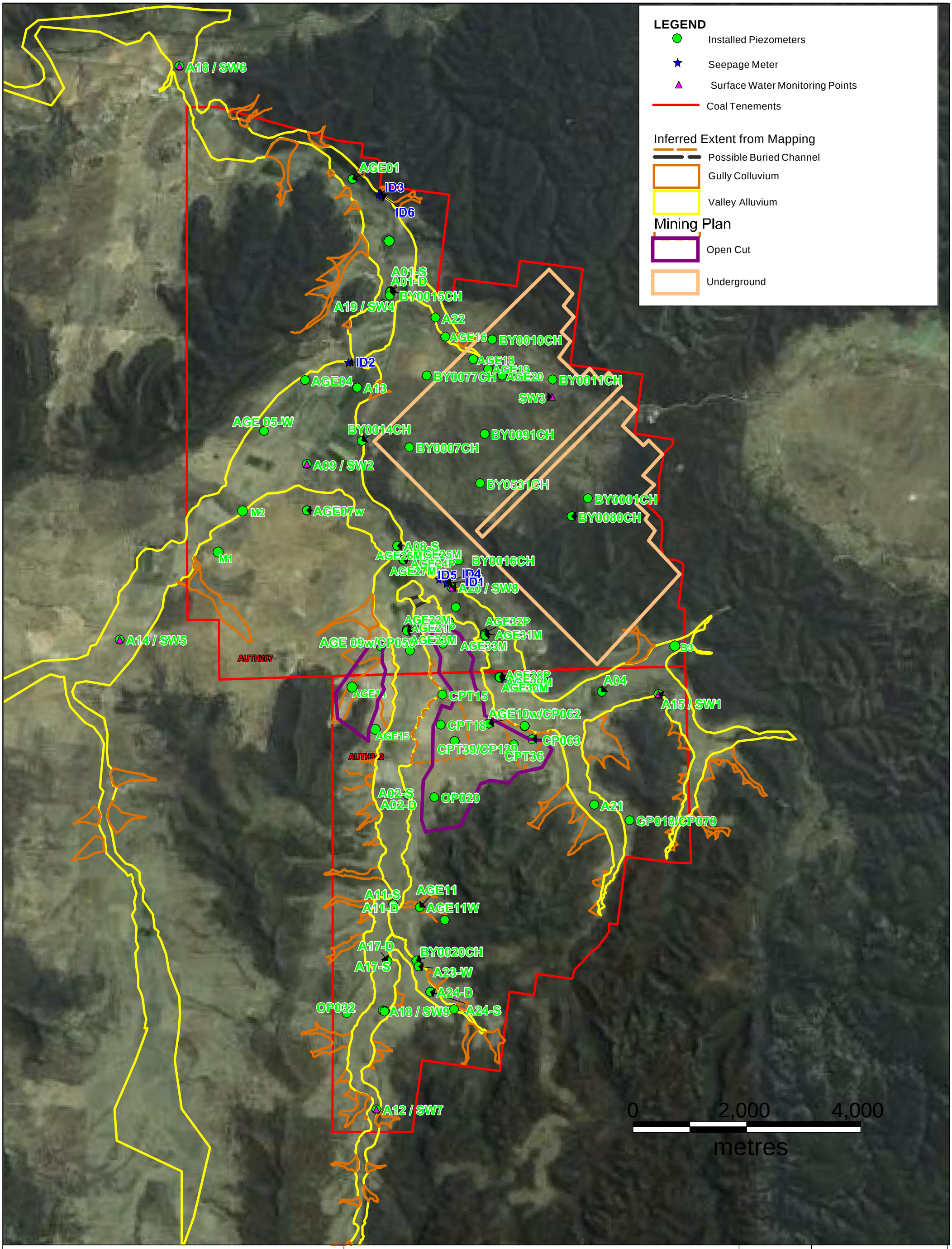
Feb 2012 to June 2017	Metals									Other	
Parameter:	**Lead (Pb)**	**Magnesium (Mg)**	**Manganese (Mn)**	**Beryllium (Be)**	**Mercury (Hg)**	**Nickel (Ni)**	**Selenium (Se)**	**Vanadium (V)**	**Zinc (Zn)**	**Total Phosphorus**	**Ammonia**
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	155	155	155	155	155	155	155	155	155	155	155
Minimum:	0.0005	4.1	0.0025	0.00005	0.000025	0.0005	0.0005	0.0005	0.0005	0.025	0.0025
Maximum:	0.005	130	1.5	0.00025	0.00062	0.008	0.003	0.004	0.1	6.3	2.9
Average:	0.000561	58.1	0.159377	5.387E-05	3.765E-05	0.002348	0.000594	0.00099	0.010426	0.130419	0.043871
Standard Deviation:	0.000457	40.7424	0.237611	2.764E-05	6.875E-05	0.001133	0.000346	0.000823	0.015184	0.526003	0.240096
Coefficient of Variation:	0.814259	0.701246	1.490867	0.5131348	1.8261697	0.482458	0.582259	0.830751	1.456357	4.033167	5.472777
Student's t	1.654808	1.654808	1.654808	1.6548084	1.6548084	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808
LogNormal Mean	-7.562928	3.670715	-2.931317	-9.872337	-10.48731	-6.172476	-7.504376	-7.165943	-5.077862	-2.907132	-4.654885
LogNormal Standard Deviation:	0.273258	1.005866	1.689337	0.222449	0.5015611	0.512516	0.319287	0.649229	1.018041	0.969029	1.338759
Skewness	8.023	0.061	2.932	7.046	6.674	1.319	4.516	1.670	4.432	10.832	11.187
H-Statistic	2.006	2.419	3.073	1.993	2.090	2.095	2.019	2.168	2.429	2.389	2.716
Appropriate Distribution	Normal	Normal	Log-Normal	Normal	Log-Normal	Normal	Normal	Normal	Log-Normal	Log-Normal	Log-Normal
ANZECC Criteria	0.0044	NC	1.9	NC	0.1	0.007	0.011	NC	0.015	0.004	0.91
Percentiles:											
20th Percentile	**0.0005**	**23.9**	**<0**	**0.00005**	**<0**	**0.0014**	**0.0005**	**0.0005**	**<0**	**<0**	**<0**
50th Percentile	**0.000562**	**58.1**	**0.16**	**0.0000539**	**0.0000377**	**0.00235**	**0.000594**	**0.000991**	**0.0105**	**0.131**	**0.0439**
80th Percentile	**0.000946**	**92.4**	**0.36**	**0.0000772**	**0.0000956**	**0.00331**	**0.000885**	**0.00169**	**0.0233**	**0.574**	**0.246**

Bylong

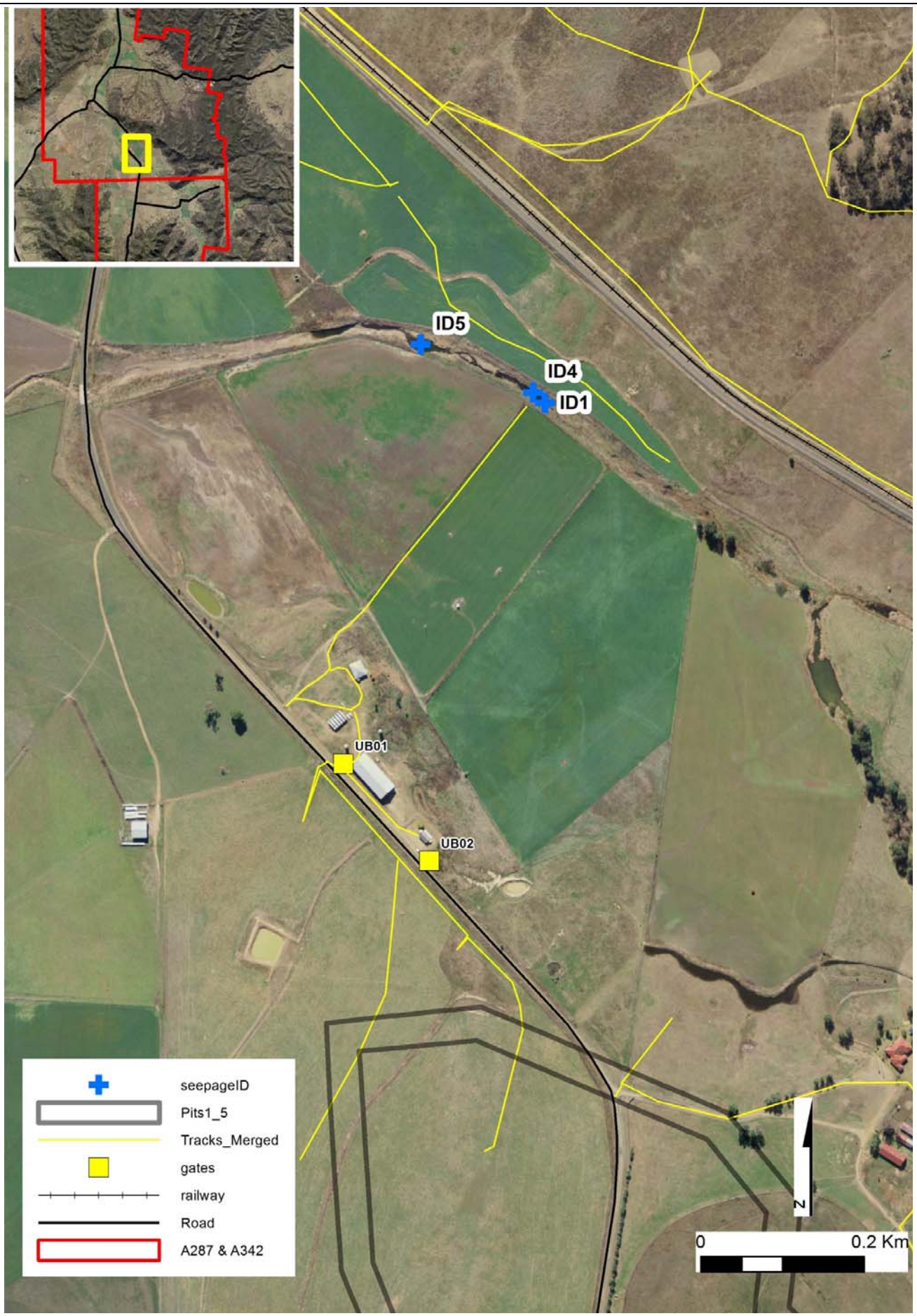
Feb 2012 to June 2017		ydrocarbor	Polycyclic Aromatic Hydrocarbons				
Parameter:	**Total Alkalinity**	**Hydroxide**	**Carbonate**	**Bicarbonate**	**Chloride**	**Nox**	**Calcium**
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Readings	155	155	155	155	155	155	155
Minimum:	28	0.5	0.5	28	16	0.0025	3.5
Maximum:	470	2.5	33	440	440	18	150
Average:	258.5806	2.422581	3.829032	257.0323	188.2129	0.306097	68.67871
Standard Deviation:	134.4401	0.387055	5.074586	133.1966	138.831	1.897195	48.16376
Coefficient of Variation:	0.519916	0.15977	1.325292	0.51821	0.737627	6.198024	0.701291
Student's t	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808	1.654808
LogNormal Mean	5.333649	0.85399	1.023369	5.329276	4.784062	-3.892505	3.80963
LogNormal Standard Deviation:	0.76291	0.31147	0.655394	0.759895	1.093358	1.84426	1.073356
Skewness	-0.418	-4.829	3.851	-0.424	0.086	8.432	0.039
H-Statistic	2.239	2.017	2.172	2.237	2.492	3.243	2.475
Appropriate Distribution	Normal	Normal	Log-Normal	Normal	Normal	Log-Normal	Normal
ANZECC Criteria	400	7	0.5	0.6	0.01	1	NC
Percentiles:							
20th Percentile	**146**	**2.1**	**<0**	**145**	**71.4**	**<0**	**28.2**
50th Percentile	**259**	**2.43**	**3.83**	**258**	**189**	**0.307**	**68.7**
80th Percentile	**372**	**2.75**	**8.1**	**370**	**306**	**1.91**	**110**

Appendix H

Drawing 1: Monitoring Locations
Drawing S1: Seepage Meter Locations: ID1, ID4, ID5
Drawing S2: Seepage Meter Locations: ID2
Drawing S3: Seepage Meter Locations: ID3, ID6



Douglas Partners Geotechnics / Environment / Groundwater	TITLE: **Monitoring Locations** **Bylong Coal Project** **Bylong, New South Wales**			OFFICE: Newcastle DRAWN BY: MAS DATE: 25.7.2017
CLIENT: WorleyParsons Services Pty Ltd	PROJECT No: 49761.04	DRAWING No: 1	REVISION: 3	SCALE: 1:60,000 @ A3

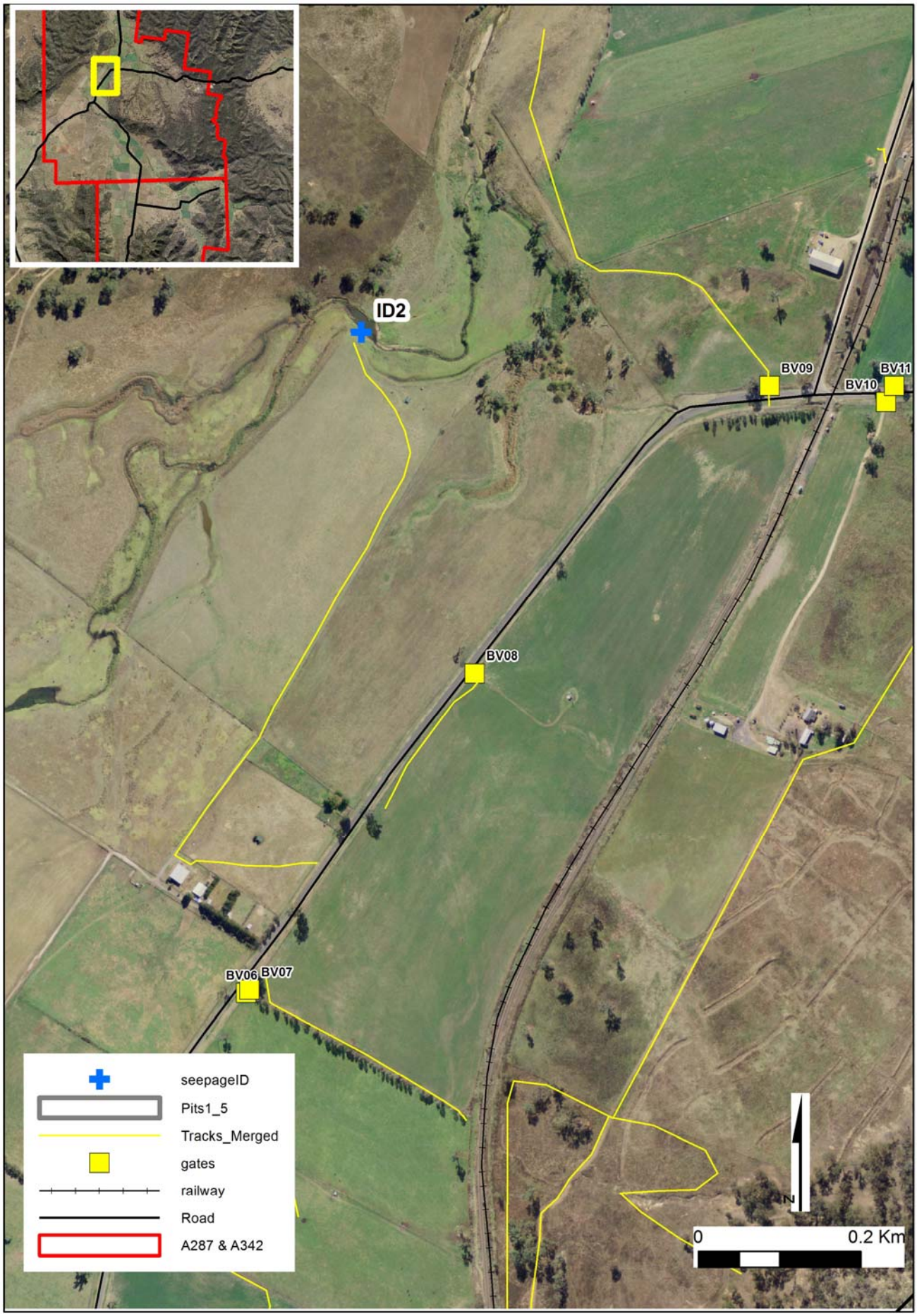


Douglas Partners
Geotechnics / Environment / Groundwater

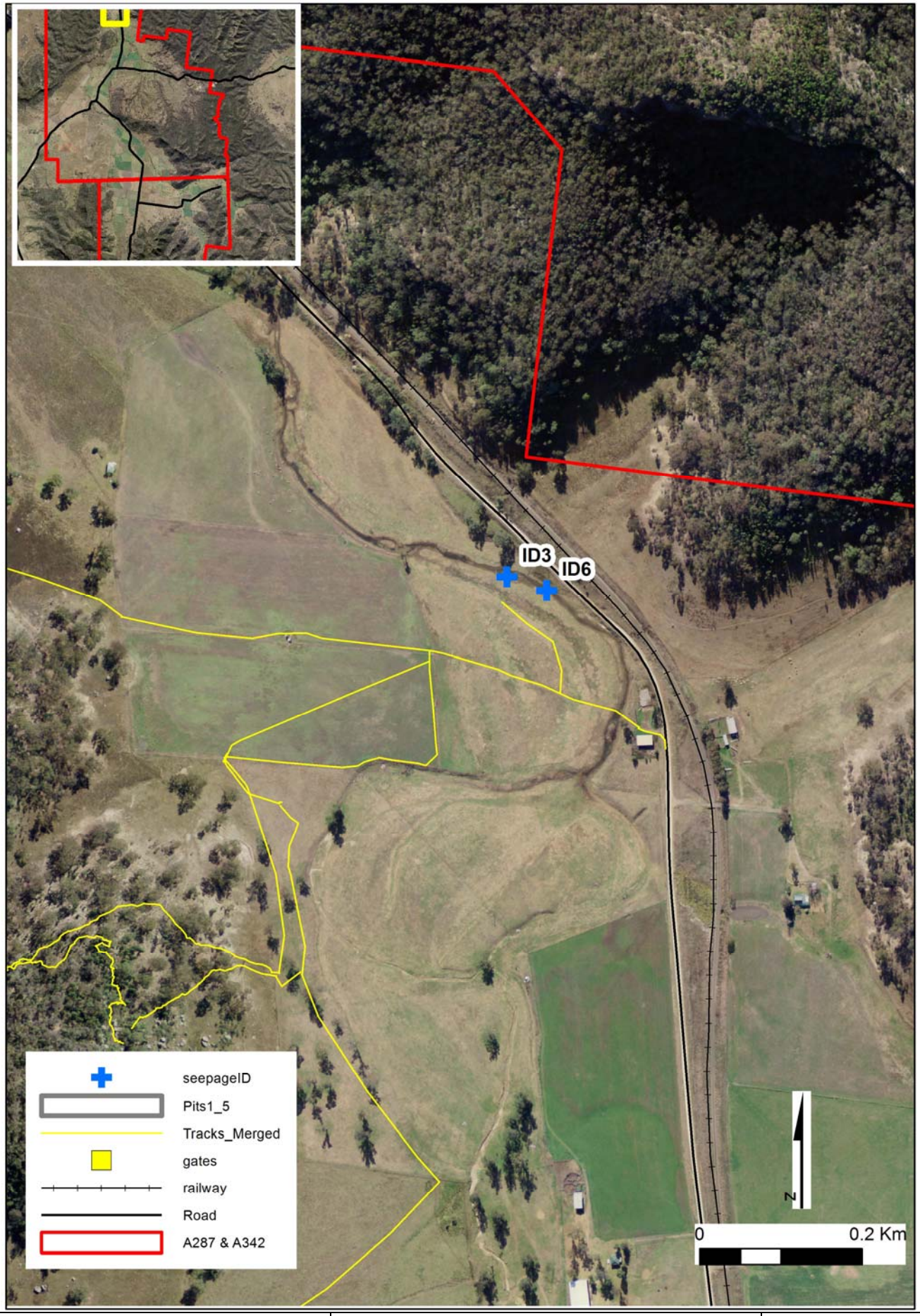
Seepage Meter Locations – ID1, ID4, ID5
Bylong Coal Project
Bylong, NSW

CLIENT: WorleyParsons Services Pty Ltd

PROJECT:	49761.04
DWG No:	S1
REV:	0
DATE:	10/12/2014



Douglas Partners Geotechnics / Environment / Groundwater	**Seepage Meter Locations – ID2** **Bylong Coal Project** **Bylong, NSW**	PROJECT: 49761.04 DWG No: S2 REV: 0
	CLIENT: WorleyParsons Services Pty Ltd	DATE: 10/12/2014



Douglas Partners
Geotechnics / Environment / Groundwater

Seepage Meter Locations – ID3, ID6
Bylong Coal Project
Bylong, NSW

CLIENT: WorleyParsons Services Pty Ltd

PROJECT:	49761.04
DWG No:	S3
REV:	0
DATE:	10/12/2014

APPENDIX B

Standard Operating Procedure for Water Sampling

1 STANDARD OPERATING PROCEDURES FOR GROUNDWATER LEVEL MONITORING

1.1 PURPOSE

The purpose of this document is to outline the minimum requirements for groundwater monitoring.

1.2 SCOPE

This procedure affects all employees, contractors, sub-contractors, their employees and visitors conducting groundwater level monitoring at Bylong.

1.3 REFERENCES

- Minimum Construction Requirements for Water Bores in Australia, second edition, September 2003.
- The Australian / New Zealand Standard Water Quality – "Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples" (AS / NZS 5667.1:1998).
- The Australian / New Zealand Standard Water quality – "Sampling, Part 11: Guidance on sampling of groundwaters" (AS / NZS 5667.11:1998).
- Geoscience Australia, (2009), "Groundwater Sampling and Analysis – A Field Guide".
- Murray-Darling Basin Commission, (1997), "Murray Darling Basin Groundwater Quality Sampling Guidelines", Technical Report No. 3, Groundwater Working Group.

1.4 SUMMARY

Good groundwater level data is essential for a good assessment or model. Best practice in accordance with all relevant standards and national governances will be followed as a matter of course.

1.5 SCOPE OF WORK

1.5.1 Assumptions

- Monitoring bore is clean and open to completed depth.

1.5.2 Preparation

- All necessary equipment should be checked before leaving the office.
- Take spare batteries for the water level dipper.
- Appropriate field forms need to be available.
- The bore construction details need to available prior to monitoring.
- Access to and from the bore needs to be determined in terms of travel time, route, road conditions, weather and accessibility.
- If landholders need to be notified to access land, ensure that this is done.

1.5.3 Documentation

- Ensure all bore construction details are available including physical construction details:
  - Landholder/client contact details.
  - Actual co-ordinates and elevation.
  - Water quality information.
  - Aquifer yield information.
  - Formation description.

1.5.4 Mobilisation

- Park sufficient distance from the monitoring bore to allow adequate room to manoeuvre around the well head.
- Where possible, reverse park or park so that you can drive straight out.

1.5.5 Unpack

- Lookout for spiders, snakes and any other foreign obstacles.
- Wearing a pair of gloves, unlock the protective cap and cover from the wellhead and remove the PVC end cap.
- Note any damage to the monitoring bore that may be obvious at the surface.
- Get the water level dipper from the vehicle, paying attention to your manual handling technique and any trip hazards.
- Ensure there is a visible mark on the top or side of the PVC standpipe indicating where the measurement is to be taken. If there is no mark. Place a visible mark on the PVC using a permanent marker.
- Ensure there is a small hole or slot in the top of the PVC cap to allow air pressure inside the bore to be at equilibrium with atmosphere. If there is not a small hole or slot, cut a small slot into the top of the PVC.
- Ensure the bore name is visible and obvious either at the bore site or within the top of the well head protector. If there is no bore ID visible, write the bore ID on the top of the PVC end cap.

1.5.6 Monitor the bore water level

- Switch the water level dipper on and test at the surface.
- Wearing a pair of gloves, run the tape and probe into the monitoring bore until an audible sound is heard from the dipper.
- Record the depth at which this sound is first heard.

- Repeat the measurement to ensure a consistent result.

1.5.7 Measure the total depth

- After measuring the water level in the bore, switch the water level dipper off and remove it from the bore.
- Run a tag line into the bore hole until the weight is off the tape, this is the total depth of the bore. Measure and record the depth accurately.
- Wind back the tag line until the weight is at the surface. Ensure that this is done slower as the weight reaches the surface so the weight does not eject the bore at speed.

1.5.8 Measure stickup

- Using a tape measure, measure the height of the measuring datum above ground level.
- Record this height of casing stickup.

1.5.9 Site clean-up

- Pack up and stow monitoring equipment.
- Pick up and remove surplus materials and rubbish.
- Demobilise from site.

1.6 REVIEW

This procedure will be reviewed in 3 years or after a major change in operation.

Issue	Date	Description	Initial
v01.01	28/11/2017	Generic SOP for review and comment	AGE

2 STANDARD OPERATING PROCEDURES FOR GROUNDWATER QUALITY SAMPLING

2.1 PURPOSE

The purpose of this document is to outline the minimum requirements for groundwater quality sampling.

2.2 SCOPE

This procedure affects all employees, contractors, sub-contractors, their employees and visitors conducting groundwater level monitoring at Bylong.

2.3 REFERENCES

- Minimum Construction Requirements for Water Bores in Australia, second edition, September 2003.
- The Australian / New Zealand Standard Water Quality – "Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples" (AS / NZS 5667.1:1998).
- The Australian / New Zealand Standard Water quality – "Sampling, Part 11: Guidance on sampling of groundwaters" (AS / NZS 5667.11:1998).
- Geoscience Australia, (2009), "Groundwater Sampling and Analysis – A Field Guide".
- Murray-Darling Basin Commission, (1997), "Murray Darling Basin Groundwater Quality Sampling Guidelines", Technical Report No. 3, Groundwater Working Group.

2.4 SUMMARY

Good groundwater quality data is essential for a good assessment or model. Best practice in accordance with all relevant standards and national governances will be followed as a matter of course.

2.5 SCOPE OF WORK

2.5.1 Assumptions

- Monitoring bore is clean and open to completed depth.
- Monitoring bore screen is still intact.

2.5.2 Preparation

- All necessary equipment should be checked before leaving the office.
- Take spare batteries for the water level dipper.
- Appropriate field forms need to be available.
- The bore construction details need to available prior to monitoring.
- Access to and from the bore needs to be determined in terms of travel time, route, road conditions, weather and accessibility.

- If landholders need to be notified to access land, ensure that this is done.

2.5.3 Equipment

Equipment required to complete task includes:

- Water level dipper.
- Tape measure.
- Water quality meter and appropriate calibration solutions.
- Appropriate PPE - long sleeve shirt and long pants, hard hat or broad brimmed hat, sun screen, gloves, protective eyewear and protective footwear.
- Water quality sample bottles.
- Filters and syringes if required.
- Esky with cooler packs or ice.
- Bailer or electric 12v pump.
- Decon 90 for decontaminating reusable equipment.

2.5.4 Documentation

- Water quality sample chain of custody form.
- Applicable SOPs.
- Ensure all bore construction details are available including physical construction details:
  - Landholder/client contact details.
  - Actual co-ordinates and elevation.
  - Water quality information.
  - Aquifer yield information.
  - Formation description.
  - Screened interval.
  - Total depth.
  - Historical water level data if available.

2.5.5 Mobilisation

- Park sufficient distance from the monitoring bore to allow adequate room to manoeuvre around the well head.
- Where possible, reverse park or park so that you can drive straight out.

2.5.6 Unpack

- Lookout for spiders, snakes and any other foreign obstacles.

- Wearing a pair of gloves, unlock the protective cap and cover from the wellhead and remove the PVC end cap.
- Note any damage to the monitoring bore that may be obvious at the surface.
- Get the water level dipper from the vehicle, paying attention to your manual handling technique and any trip hazards.

2.5.7 Monitor the bore water level

- Follow SOP for Groundwater Level Monitoring prior to the commencement of sampling.
- Obtain a water level prior to sampling.

2.5.8 Purge bore

- Ensure that the field water quality meter has been calibrated to standard solutions within the last 24 hours.
- After determining the water level and depth of the bore calculate the volume of water within the bore.
- The equivalent of three times the volume of water present in the bore should be purged. This can be done using a bailer, electric 12v pump, or by using polypipe connected to a compressor to airlift the water out of the bore.
- Field water quality parameters such as pH, TDS, electrical conductivity and temperature should be monitored during purging and the odour, colour and turbidity should be monitored (see Table below).

Criteria to determine stable field parameters

Measurement	Variance	Recording
pH	< ± 10 %	Previous measurement at time of sampling
Temperature	< ± 0.2 oC	Median of five previous readings
EC	< ± 10%	Median of five previous readings

Note: Source: The Australian / New Zealand Standard Water quality – "Sampling, Part 11: Guidance on sampling of groundwaters" (AS / NZS 5667.11:1998)

- When the water quality parameters have stabilised, sediment load is minimal and three times the bore volume has been purged, the groundwater quality sample can be collected.

2.5.9 Collect sample

- Label sample bottles using a Xylene free permanent marker with the site number, sampler name and date and time prior to filling with water.
- Nitrile latex gloves should be worn while filling sample bottles, especially when collecting nutrient samples.

- The sample bottles that do not have any preservatives should be rinsed out with the water from the bore before filling the sample bottle to the top and screwing the cap on tightly.
- The sample bottles with preservative (metals) will need to be field filtered:
    - Rinse and fill a new container with the water from the bore. Fill the syringe with water from the bore, attach the filter to the end of the syringe. Sit the filter over the sample bottle and push the water through from the syringe. Continue to do this until the sample bottle is full before screwing the cap on tightly.
    - Take note of any other specific bottle filling instructions on the sample bottles before filling them up, for example; no headspace.
- Once all samples have been collected, check the bottles are appropriately labelled with the site number and date. Put the sample bottles into an esky with either cooler packs or ice to keep chilled.

2.5.10 Sampling parameters

Groundwater bores are sampled for the following analytes at Bylong:

- pH;
- Electrical Conductivity (EC);
- Total dissolved solids (TDS)
- Turbidity – pumping bores only;
- Alkalinity: Hydroxide (OH-) as CaCO3, Carbonate (CO32-) as CaCO3, Bicarbonate (HCO3-) as CaCO3 and Total Alkalinity as CaCO3;
- Anions: Chloride (Cl-), Ammonia (NH3) as Nitrogen (N), Nitrogen Oxides (NO2- and NO3-) and Sulphate SO42-);
- Cations: Sodium (Na+), Potassium (K+), Calcium (Ca2+) and Magnesium (Mg2+);
- Total Phosphorous (P); and
- Dissolved metals (16): Aluminium (Al), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Vanadium (V) and Zinc (Zn).

2.5.11 Site clean-up

- Pack up and stow monitoring equipment.
- Pick up and remove surplus materials and rubbish.
- Demobilise from site.

2.5.12 Dispatch samples

- Fill in the chain of custody and send to the samples to the NATA approved laboratory as soon as possible.

2.6 REVIEW

This procedure will be reviewed in 3 years or after a major change in operation.

Issue	Date	Description	Initial
v01.01	28/11/2017	Generic SOP for review and comment	AGE

3 STANDARD OPERATING PROCEDURES FOR LOW FLOW GROUNDWATER QUALITY SAMPLING

3.1 PURPOSE

The purpose of this document is to outline the minimum requirements for low flow groundwater quality sampling.

3.2 SCOPE

This procedure affects all employees, contractors, sub-contractors, their employees and visitors conducting groundwater level monitoring at Bylong.

3.3 REFERENCES

- Groundwater Sampling and Analysis – A Field Guide. Geoscience Australia 2009.
- US EPA: 1996 – 'Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures'.
- US EPA Region 1: 2010 – 'Low-Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Bores'.
- 'Minimum Construction Requirements for Water Bores in Australia', third edition, 2012.

3.4 SUMMARY

Good groundwater quality data is essential for a good assessment or model. Best practice in accordance with all relevant standards and national governances will be followed as a matter of course.

3.5 SCOPE OF WORK

3.5.1 Assumptions

- Monitoring bore is clean and open to completed depth.
- Monitoring bore screen is still intact.

3.5.2 Preparation

- All necessary equipment should be checked before leaving the office.
- Take spare batteries for the water level dipper.
- Appropriate field forms need to be available.
- The bore construction details need to available prior to monitoring.
- Access to and from the bore needs to be determined in terms of travel time, route, road conditions, weather and accessibility.
- If landholders need to be notified to access land, ensure that this is done.

3.5.3 Equipment

Equipment required to complete task includes:

- water level dipper
- gas detector (if required)
- tape measure
- water quality meter
- flow through cell for water quality meter (if required)
- water quality sample bottles
- syringes and filters
- GPS
- nitrile sampling gloves
- esky with cooler packs or ice
- pump/drawdown controller and compressor
- power pack for controller
- additional sample tubing
- water for decontamination and cleaning
- Decon 90
- buckets
- pencils, pens and permanent marker

3.5.4 Documentation

- Water quality sample chain of custody form.
- Applicable SOPs.
- Ensure all bore construction details are available including physical construction details:
    - Landholder/client contact details.
    - Actual co-ordinates and elevation.
    - Water quality information.
    - Aquifer yield information.
    - Formation description.
    - Screened interval.
    - Total depth.
    - Historical water level data if available.

3.5.5 Mobilisation

- Park sufficient distance from the monitoring bore to allow adequate room to manoeuvre around the well head.
- Where possible, reverse park or park so that you can drive straight out.

3.5.6 Unpack

- Lookout for spiders, snakes and any other foreign obstacles.
- Wearing a pair of gloves, unlock the protective cap and cover from the wellhead and remove the PVC end cap.
- Note any damage to the monitoring bore that may be obvious at the surface.
- Get the water level dipper from the vehicle, paying attention to your manual handling technique and any trip hazards.

3.5.7 Monitor the bore water level

- Follow SOP for Groundwater Level Monitoring prior to the commencement of sampling.
- Obtain a water level prior to sampling.

3.5.8 Setup sampling equipment

- • Assemble the equipment in close proximity to the bore head in a safe and organised manor so that it is easy to manoeuvre around the site without disturbing the pumping equipment.
- • Unlatch and remove bore cap and expose the sample hose connections, assuming the pump is installed permanently at the site. If there's no pump installed, connect the power cable and associated hoses to the pump and lower it carefully down the bore until it is in the lower half of the screened section, ensuring it is not sitting on or near the bottom of the bore.
- Attach pump air tube, water sample tube and power cables to the bore head, flow through cell and water quality meter, power source, and pump controller. Use caution when attaching the power cables to batteries as they can spark, which is potentially hazardous in long dry grass.

3.5.9 Purge bore

- Ensure that the field water quality meter has been calibrated to standard solutions within the last 24 hours.
- After measuring the water level and calculating the bore screen volume (e.g. this will typically be about 6 L for a 3 m screen in a 50 mm bore) purging can begin.
- The goal is to purge three screen volumes without significant disturbance to the stagnant water column above the screen.

- Purged water should be stored in a water tank until water quality parameters deem it safe to discharge it to the ground or, if required, removed from site for alternate disposal.
- Start the pump at a low flow rate until surface discharge occurs. Check water level. If no drawdown occurs, gradually increase the pumping rate until flow is optimized with minimal drawdown.
- Field water quality parameters such as pH, electrical conductivity (EC), total dissolved solids (TDS), redox potential (ORP), dissolved oxygen (DO) and temperature should be monitored every 3-5 minutes during purging. Observations of the colour, turbidity and odour should be made and recorded as well.
- When the water quality parameters have stabilised and three times the screen volume has been purged, the groundwater sample can be collected. Water quality parameters are deemed to be stabilised when:
  - pH is < ±10%
  - Temperature is < ± 0.2°C
  - EC is < ± 10%

3.5.10 Collect sample

- Label sample bottles with site number, date, and other required information prior to filling with water.
- Nitrile gloves should be worn while collecting the sample, particularly when collecting nutrient samples.
- Disconnect the flow cell (if used) from the discharge tube before collecting the samples to prevent cross contamination.
- The sample bottles that do not have any preservatives should be rinsed out with the water from the bore before filling the sample bottle to the top and screwing the cap on tightly.
- The sample bottles for dissolved metals will need to be field filtered:
  - Rinse and fill a new sample container with the water from the bore. Fill a syringe with water from the bore, attach the 0.45µm filter to the end of the syringe. Sit the filter over the sample bottle and expel the water from the syringe and filter. Continue until the sample bottle is full before screwing the cap on tightly.
- Once all samples have been collected, check the bottles are appropriately labelled with the site number and date. Put the sample bottles into an esky with either cooler packs or ice to keep chilled.

3.5.11 Decontamination

- Prior to disassembling the pumping equipment and packing it away after the sample has been collected, pull the pump out of the bore and place it in a bucket.
- Mix Decon 90 with some water in the bucket to the correct mixing ratio as noted on the Decon 90 instruction panel on the packaging.

- Run the pump until the decontamination fluid has circulated the pumping equipment and the bucket is empty.
- Fill a separate bucket with fresh water and run that through the pump as well.
- Any excess Decon 90 can be used to scrub the hoses and cable on the pump reel, if required.

3.5.12 Sampling parameters

Groundwater bores are sampled for the following analytes at Bylong:

- pH;
- Electrical Conductivity (EC);
- Total dissolved solids (TDS)
- Turbidity – pumping bores only;
- Alkalinity: Hydroxide (OH-) as CaCO3, Carbonate (CO32-) as CaCO3, Bicarbonate (HCO3-) as CaCO3 and Total Alkalinity as CaCO3;
- Anions: Chloride (Cl-), Ammonia (NH3) as Nitrogen (N), Nitrogen Oxides (NO2- and NO3-) and Sulphate SO42-);
- Cations: Sodium (Na+), Potassium (K+), Calcium (Ca2+) and Magnesium (Mg2+);
- Total Phosphorous (P); and
- Dissolved metals (16): Aluminium (Al), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Vanadium (V) and Zinc (Zn).

3.5.13 Site clean-up

- Pack up and stow monitoring equipment.
- Pick up and remove surplus materials and rubbish.
- Demobilise from site.

3.5.14 Dispatch samples

- Fill in the chain of custody and send to the samples to the NATA approved laboratory as soon as possible.

3.6 REVIEW

This procedure will be reviewed in 3 years or after a major change in operation.

Issue	Date	Description	Initial
v01.01	28/11/2017	Generic SOP for	AGE

		review and comment	

4 STANDARD OPERATING PROCEDURES FOR TRANSPORTING SAMPLES

4.1 PURPOSE

The purpose of this document is to outline the procedure for packaging and shipping samples for analysis and completing a laboratory chain of custody document.

4.2 SCOPE

This procedure affects all employees, contractors, sub-contractors, their employees and visitors conducting groundwater level monitoring at Bylong.

4.3 REFERENCES

- Groundwater Sampling and Analysis – A Field Guide. Geoscience Australia 2009.
- The Australian / New Zealand Standard Water quality – "Sampling, Part 11: Guidance on sampling of groundwaters" (AS / NZS 5667.11:1998).

4.4 SUMMARY

Good groundwater quality data is essential for a good assessment or model. It is necessary that once the samples have been collected that the correct labelling, packaging, and chain of custody documents are in place to ensure the quality of the samples and the lab results.

4.5 SCOPE OF WORK

4.5.1 Assumptions

This standard operating procedure (SOP) assumes that the samples have been collected using all relevant sampling and fieldwork related SOPs.

4.5.2 Sample Identification

Labelling the samples is an important consideration in the process of sending samples to a laboratory for analysis. Correct, legible writing on all sample containers with a xylene free permanent marker is essential. Typically, sample labels on laboratory supplied containers will include space to provide information about the job number or job code, the sampler or sampling company, the site ID, the date and the time. This information is then transferred to the chain of custody (COC) document.

4.5.3 Chain of Custody

The chain of custody document is used to demonstrate that the samples are in someone's custody through their journey from the sample location to the laboratory. The chain of custody document is supplied with the samples being submitted to the laboratory to provide information on the contents of the submitted samples and the requested analysis. Figure 1 is an example of a COC document. Information required on the COC includes; the sample name, the date and time the sample was collected, the number of samples to be analysed, the containers contents (as they may contain hazardous substances), which analyses will be performed, as well as billing information, sampler

contact information and other pertinent information required for the completion of the analysis by the laboratory. It is essential that the COC is filled out correctly to ensure the laboratory QA/QC procedures are adhered to and to ensure the quality of the analyses. Prior to collecting the sample it is prudent to have spoken with the laboratory and obtained information on the correct sample containers and analysis codes to assist in completing the COC correctly.

When the COC is received by the laboratory, the receiving technician reviews the samples have arrived safely, signs the COC, and scans and emails the completed COC back to the sampler as noted on the COC.

4.5.4 Packaging

Prior to packaging the samples for shipping, it is essential to ensure that the sample containers have been correctly sealed. Re-check the caps on the containers are tight and are unlikely to leak. If necessary, separate glass containers and wrap them in bubble wrap to prevent breakage during transport. If multiple samples are collected at one site e.g. a sampling suite, it can be useful to package the suites in one bag, to make processing each sites samples simpler. If multiple samples are to be transported in the same esky, pack the esky carefully allowing enough space to apply a sufficient amount of ice or cold bricks for the journey from the field to the laboratory.

Once the samples have been correctly packaged, the esky needs to be sealed and labelled. If the samples are travelling as airfreight they need to be completely sealed i.e. water tight, to prevent leakage. It is worth planning the sample transport method in advance as it will dictate the type of preservation required and whether there will be any exceedances in the sample holding times. If the samples are travelling via land the esky needs to be sealed with packing tape and labelled correctly. Security seals, “fragile” stickers, “this way up” stickers and a consignment note need to be applied to the esky before delivery to the transport company.

4.5.5 Transport

Once the samples have been collected, the labels have been checked for completeness, the COC filled out and attached to the esky, ice added to the esky, and the esky lid sealed, the esky can be submitted for transport. The transport requirements of each sample may vary. If the samples have a short holding time, an immediate departure or same day delivery may be required. Each samples individual holding times and associated transport requirements can be obtained from the laboratory. The transport company details should ideally be obtained prior to commencing the fieldwork, as well as the locations of depots where the samples can be dropped off.

4.6 REVIEW

This procedure will be reviewed in 3 years or after a major change in operation.

Issue	Date	Description	Initial
v01.01	28/11/2017	Generic SOP for	AGE

		review and comment	

APPENDIX C

Compensatory Water Supply Agreement

Compensatory Water Supply Agreement

—

KEPCO Bylong Australia Pty Ltd (**KEPCO**)
[***#insert name of landholder***] (**Landholder**)

—

Level 40 Governor Macquarie Tower 1 Farrer Place
Sydney NSW 2000 Australia DX 117 Sydney
T +61 2 9921 8888 F +61 2 9921 8123
minterellison.com
ME_141762607_4

MinterEllison

Compensatory Water Supply Agreement

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Details

Date

Parties

Name	**KEPCO Bylong Australia Pty Ltd** ACN 075 361 769
ABN	79 075 361 769
Short form name	**KEPCO**
Notice details	Level 12, 141 Walker Street, North Sydney NSW 2060

Name	**[#insert name of landholder]**
Short form name	**Landholder**
Notice details	[*#insert address of landholder*]

Background

A KEPCO is:

(i) the proponent of the Project; and

(ii) has obtained or will obtain the Development Consent under the EPA Act.

B The Landholder is the owner of the Property.

C The Property is located in the area that is not predicted to be Adversely Impacted, in terms of surface water and/or groundwater supply, by the Project.

D KEPCO acknowledges that, if the Existing Water Supply on the Property is Adversely Impacted as a direct result of the Project, it will need to provide Interim Water Supply, implement Compensatory Water Supply Measures and/or pay the Compensation Payment.

E KEPCO has agreed to undertake the Baseline Assessment and the measures detailed in this Deed to monitor and respond to any adverse impacts on the Existing Water Supply as a direct result of the Project, on the terms and conditions set out in this Deed.

Agreed terms

1. Defined terms & interpretation

1.1 Defined terms

In this Deed:

Adversely Impacted means an impact to the quantity or quality of water in the Existing Water Supply on the Property exceeding the trigger levels and/or performance criteria in the Baseline Assessment (other than a negligible impact) as a result of the Project.

Approval means any consent, approval, authorisation, licence, registration, order, permission or concurrence required by Law.

Baseline Assessment means the baseline assessment carried out for the Existing Water Supply on the Property in accordance with clause 5.1.

Business Day means any day except for a Saturday, Sunday or public holiday in the State of New South Wales.

Claim means any claim, demand or proceeding arising out of any cause of action, including breach of contract, tort (including negligence), any other common law, equitable or statutory cause of action.

Commencement Date means the day on which this Deed is executed by all of the parties.

Compensation Payment means the amount of money agreed by the Parties or otherwise determined in accordance with clause 9.1.

Compensatory Water Supply Measures means any measures necessary to reinstate the Landholder to the position they would have been but for the Project undertaken by KEPCO which have resulted in the Existing Water Supply becoming Adversely Impacted, as agreed or determined in accordance with clause 8.1.

Condition 27 means draft condition 27 of Schedule 4 of the proposed development consent for the Project as contained in Annexure M of the DPE Assessment Report dated March 2017, as modified from time to time. For abundant clarity, draft condition 27 is set out in full at Schedule 1 to this Deed.

Corporations Act means the *Corporations Act 2001* (Cth).

CPI means the All Groups Consumer Price Index applicable to Sydney published by the Australian Bureau of Statistics.

Deed means this deed, including any schedules and annexures.

Development Application means State Significant Development Application No. SSD 14_6367 for the Project lodged under Division 4.1 of Part 4 of the EPA Act, as modified from time to time.

Development Consent means any development consent granted in respect of the Development Application, as approved and modified from time to time.

DPE means the NSW Department of Planning and Environment.

Environmental Impact Statement means the Environmental Impact Statement for the Bylong Coal Project dated September 2015 prepared by Hansen Bailey which is available on the Major Project Assessments Register kept by the NSW Department of Planning and Environment: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6367

EPA Act means the *Environmental Planning and Assessment Act 1979* (NSW).

Existing Water Supply means surface water and/or groundwater supply available on the Property, including via existing bores and any subsequent bores installed by the Landholder, dams and other water supply infrastructure located on the Property.

GST has the same meaning as in the GST Law.

GST Law has the same meaning given to that term in A New Tax System (Goods and Services Tax) Act 1999 (Cth) and any other Act or regulation relating to the imposition or administration of the GST.

Interim Water Supply means the provision of temporary water supply by KEPCO to the Landholder for domestic water and livestock purposes only. The purpose of this supply is to temporarily mitigate the Existing Water Supply being Adversely Impacted as a direct result of the Project to the extent that such impacts will affect the availability of water supply for domestic or livestock use only pending the implementation of the Compensatory Water Supply Measures in accordance with clause 8.2.

KEPCO Notification means notice provided by KEPCO to the Landholder in accordance with clause 7.2.

Landholder Notification has the same meaning as in clause 7.1(a).

Law means:

(a) any statute, regulation, rule, proclamation, order, ordinance or by-law whether present or future and whether Commonwealth, State, territorial or local; and

(b) the common law.

Mining Act means the *Mining Act 1992* (NSW).

Party means KEPCO and the Landholder jointly or severally, as the context requires.

Project means the Bylong Coal Project, being the proposed development of an open cut and underground coal mine generally described in the Development Application and Environmental Impact Statement and on the land described in Appendix A of the Environmental Impact Statement.

Property means the property known as [insert address] and identified as Lot [insert number] in DP [insert number] owned by the Landholder.

Secretary means the Secretary of DPE or duly authorised delegate or nominee.

Water Approval means any Approval granted in respect of the Property under the Water Legislation.

Water Legislation means the *Water Act 1912* (NSW) and *Water Management Act 2000* (NSW), as well as any associated legislation.

Water Management Plan means the water management plan to be prepared and implemented by KEPCO accordance with condition 30 of Schedule 4 of the Development Consent.

1.2 Interpretation

In this Deed, except where the context otherwise requires:

(a) the singular includes the plural and vice versa, and a gender includes other genders;

(b) another grammatical form of a defined word or expression has a corresponding meaning;

(c) a reference to a clause, paragraph, schedule or annexure is to a clause or paragraph of, or schedule or annexure to, this agreement, and a reference to this Deed includes any schedule or annexure;

(d) a reference to a document or instrument includes the document or instrument as novated, altered, supplemented or replaced from time to time;

(e) a reference to A$, $A, dollar or $ is to Australian currency;

(f) a reference to time is to Sydney, Australia time;

(g) a reference to a party is to a party to this Deed, and a reference to a party to a document includes the party's executors, administrators, successors and permitted assigns and substitutes;

(h) a reference to a person includes a natural person, partnership, body corporate, association, governmental or local authority or agency or other entity;

(i) a reference to a statute, ordinance, code or other law includes regulations and other instruments under it and consolidations, amendments, re-enactments or replacements of any of them;

(j) a word or expression defined in the Corporations Act has the meaning given to it in the Corporations Act;

(k) the meaning of general words is not limited by specific examples introduced by including, for example or similar expressions;

(l) any agreement, representation, warranty or indemnity by two or more parties (including where two or more persons are included in the same defined term) binds them jointly and severally;

(m) any agreement, representation, warranty or indemnity in favour of two or more parties (including where two or more persons are included in the same defined term) is for the benefit of them jointly and severally;

(n) words and expressions which are not defined in this Deed but which have a defined meaning in the GST Law have the same meaning as in the GST Law;

(o) a rule of construction does not apply to the disadvantage of a party because the party was responsible for the preparation of this agreement or any part of it; and

(p) if a day on or by which an obligation must be performed or an event must occur is not a Business Day, the obligation must be performed or the event must occur on or by the next Business Day.

1.3 Headings

Headings are for ease of reference only and do not affect interpretation.

2. Commencement

This Deed operates on and from the Commencement Date.

3. Intention

The intention of the Parties is:

(a) to recognise, for the purposes of Condition 27, that the Parties have agreed on methods and procedures to be undertaken by KEPCO to implement any Compensatory Water Supply Measures on the Property if the Landholder's Existing Water Supply is Adversely Impacted by the Project;

(b) for KEPCO to access the Property to undertake the Baseline Assessment;

(c) for KEPCO to undertake ongoing monitoring and review of impacts of the Project on the surface water and/or groundwater for the Property (including piezometric, water supply and water quality information) and for the monitoring results to be made available to the Landholder upon request;

(d) for KEPCO to carry out the Compensatory Water Supply Measures if it is determined that surface water and/or groundwater available to the Property is Adversely Impacted by the Project;

(e) in the event that KEPCO is unable to carry out the Compensatory Water Supply Measures, to provide for compensation to the Landholder; and

(f) to indicate when the obligations under this Deed will cease or terminate.

4. Landholder's responsibilities

The Landholder shall:

(a) use and take the Existing Water Supply on the Property prudently, in accordance with sound operating practices and in accordance with all Water Approvals;

(b) keep, maintain and make available on request to KEPCO the records relating to the Landholder's use and take of the Existing Water Supply on the Property in accordance with all Water Approvals;

(c) allow the installation, reading and maintenance of meters to record hours of operation of pumps and volumes of water taken from the Existing Water Supply on the Property by, and at the expense of, KEPCO; and

(d) promptly give notice in accordance with clause 7.1 to KEPCO of any material changes observed by the Landholder in relation to the water level, water quality and pumping capacity of the Existing Water Supply on the Property.

5. Baseline Assessment

5.1 KEPCO to undertake Baseline Assessment

KEPCO shall, within six months of the Commencement Date, commence and continue to carry out a Baseline Assessment of any Existing Water Supply on the Property to collate as much information as is reasonably practicable regarding the quality and quantity of water in the Existing Water Supply and will provide a copy of that Baseline Assessment to the Landholder.

5.2 Landholder to cooperate

The Landholder will provide:

(a) all information within the Landholder's knowledge, possession or control regarding any Existing Water Supply on the Property for incorporation into the Baseline Assessment prepared by KEPCO in accordance with clause 5.1; and

(b) copies of all Water Approvals for the Property.

6. Access to the Property

6.1 Landholder's obligations

The Landholder shall allow reasonable access to KEPCO and all persons nominated by KEPCO to the Property for the purposes of performing any of KEPCO's obligations or exercising any of its rights under this Deed.

6.2 Reasons for access to the Property

The Landholder acknowledges that KEPCO will require access to the Property to, among other things:

(a) carry out the Baseline Assessment;

(b) carry out periodic monitoring in accordance with the Water Management Plan;

(c) undertake an assessment following a Landholder Notification from the Landholder in accordance with clause 7.1;

(d) deliver any Interim Water Supply; and

(e) implement the Compensatory Water Supply Measures and to measure their effectiveness.

6.3 Access by KEPCO

Where KEPCO accesses the Property under this Deed, KEPCO:

(a) must give 24 hours prior notice by telephone before entry, except if there is an emergency, a delivery of Interim Water Supply or a need to investigate a Landholder Notification immediately, in which case KEPCO must make every reasonable endeavour to notify the Landholder as soon as possible, by phone or other means;

(b) must have regard to any reasonable requests of the Landholder;

(c) must minimise, so far as is reasonably practicable, disturbance to the Landholder and the Landholder's operations;

(d) must comply with any land access protocols notified by the Landholder from time to time; and

(e) must repair and reinstate, so far as is practicable and necessary, the area to the condition it was in prior to KEPCO exercising its right of access under clause 6.1.

7. Trigger for Compensatory Water Supply Measures

7.1 Notification issued by Landholder

(a) If the Landholder considers, on reasonable grounds, that the Existing Water Supply for the Property is Adversely Impacted as a direct result of the Project, the Landholder may give written notice to KEPCO (**Landholder Notification**) together with:

(i) reasonable evidence in support obtained from the Landholder's own records (kept in accordance with this Deed); and

(ii) a reasonable estimate of the shortfall in surface water and/or groundwater (as the case may be) available to the Property (on a kilolitres per day basis) needed to offset the reduction in the Existing Water Supply to the extent that it has been Adversely Impacted as a direct result of the Project.

(b) In relation to a Landholder Notification provided under clause 7.1(a), KEPCO may (at its absolute discretion) investigate and/or test the Property, the Existing Water Supply (including associated infrastructure) and the Landholder's water management practices in order to verify the evidence provided by the Landholder.

7.2 Adverse impact identified by KEPCO

If monitoring undertaken by KEPCO indicates that the Existing Water Supply is being Adversely Impacted as a direct result of the Project, KEPCO must provide notice to the Landholder about the potential impact that has been identified (**KEPCO Notification**), including:

(a) reasonable evidence in support obtained from the monitoring; and

(b) a reasonable estimate of the shortfall in surface water and/or groundwater (as the case may be) available to the Property (on a kilolitres per day basis) needed to offset the reduction in the Existing Water Supply to the extent that it has been Adversely Impacted as a direct result of the Project.

7.3 Response to notifications

(a) Promptly after the Landholder Notification or the KEPCO Notification is provided in accordance with clause 7.1 or 7.2 respectively, the Parties shall meet to try to agree in good faith:

(i) whether or not impacts on availability of the Existing Water Supply for the Property to satisfy the Landholder's water use needs are directly attributable to the Project;

(ii) the shortfall in available surface water and/or groundwater as described in clause 7.1(a)(ii); and

(iii) whether any Compensatory Water Supply Measures proposed by KEPCO are appropriate (and the Landholder must act reasonably in considering any proposals put forward by KEPCO).

(b) If the Parties agree that the Existing Water Supply is being Adversely Impacted as a direct result of the Project, then KEPCO shall document the nature of the agreed Compensatory Water Supply Measures in a letter to the Landholder.

(c) If the Parties do not agree:

(i) that the Existing Water Supply is being Adversely Impacted as a direct result of the Project; or

(ii) on the nature of the Compensatory Water Supply Measures required,

either party may refer the matter for dispute resolution in accordance with the process detailed in clause 11.2.

8. Provision of Compensatory Water Supply Measures

8.1 Interim Water Supply

(a) An Interim Water Supply must be provided by KEPCO within 24 hours of the Parties agreeing (in accordance with clause 7.3) that the Existing Water Supply is being Adversely Impacted as a direct result of the Project.

(b) KEPCO must continue to provide the Interim Water Supply to the Landholder until the implementation of the Compensatory Water Supply Measures is completed in accordance with clause 8.2.

(c) In providing the Interim Water Supply, KEPCO must ensure that the volume of water to be provided is sufficient to meet the shortfall in available surface water and/or groundwater as described in clause 7.1(a)(ii), as experienced by the Landholder during the relevant period.

(d) Prior to the first delivery of the Interim Water Supply, the Landholder must promptly notify KEPCO of a single location for the water truck to deliver the Interim Water Supply and such location must be reasonable capable of being accessed by the water truck. If this is not feasible and practicable, the Parties must use reasonable endeavours to reach agreement on the appropriate manner and means of the delivery of the Interim Water Supply.

(e) For the avoidance of doubt, KEPCO is not required to provide an Interim Water Supply to the Landholder for any purpose other than domestic and/or livestock use.

(f) If an Interim Water Supply is provided by KEPCO to the Landowner and it is found that the Existing Water Supply was not Adversely Impacted as a direct result of the Project, KEPCO may (at its absolute discretion) seek a reimbursement of all costs associated with the Interim Water Supply for each and every day on which the Interim Water Supply was provided to the Landholder after 14 calendar days. For the avoidance of doubt, the Landholder will not be liable to reimburse KEPCO for any such Interim Water Supply provided in the first 14 calendar days.

8.2 Compensatory Water Supply Measures

Where the Compensatory Water Supply Measures are agreed between the Parties in accordance with clause 7.3, KEPCO shall implement the Compensatory Water Supply Measures as soon as reasonably practicable after providing the letter to the Landholder.

8.3 Provision of Compensatory Water Supply Measures

The Compensatory Water Supply Measures to be provided by KEPCO must:

(a) be prepared in consultation with the Department of Primary Industries, Division of Water and approved by the Secretary in accordance with Condition 27; and

(b) provide a compensatory water supply to the Landholder that is equivalent to the loss experienced by the Existing Water Supply that has been Adversely Impacted as a direct result of the Project.

9. Compensation

9.1 Method to determine value of Compensation Payment

(a) If agreement cannot be reached between the Parties regarding the Compensatory Water Supply Measures to be implemented at the Property under clause 7.3 or if KEPCO is unable to carry out Compensatory Water Supply Measures, the Parties shall use reasonable endeavours to determine the Compensation Payment to be made to the Landholder in lieu of the provision of Compensatory Water Supply Measures.

(b) If the Parties cannot agree on the Compensation Payment in accordance with clause 9.1(a), then either party may refer the matter to the Secretary for a determination as to the appropriate Compensation Payment to be made in accordance with Condition 27. Such determination is final and binding.

9.2 Approval of Compensation Payment by Secretary

If the Parties agree on the Compensation Payment in accordance with clause 9.1(a), then the amount of the Compensation Payment must be provided to the Secretary for approval in accordance with Condition 27. If approved by the Secretary, the agreed Compensation Payment will be final and binding on KEPCO and the Landholder.

9.3 Making Compensation Payment

KEPCO will pay the Compensation Payment to the Landholder within 20 Business Days of receiving written approval or a final determination (as the case may be) from the Secretary.

9.4 No further Compensation Claim

The Landholder agrees that the obligations of KEPCO in this Deed are accepted by the Landholder in full and final satisfaction of any Claim which the Landholder may have against KEPCO at any time in respect of the relevant or particular event whereby the Existing Water Supply was Adversely Impacted as a direct result of the Project.

10. Monitoring

Unless otherwise agreed by the Parties:

(a) groundwater quality and levels must be monitored by KEPCO at the locations and frequencies identified in the Water Management Plan, as approved from time to time; and

(b) monitoring results will be provided to the Landholder upon request.

11. Dispute resolution

11.1 Negotiation

If there is a difference between the Parties arising out of or in connection with this Deed (**Dispute**), then a Party notifying the other Party in writing of a Dispute, a representative from KEPCO must meet with the Landholder and their advisers and use all reasonable endeavours acting in good faith to resolve the Dispute within 15 Business Days.

11.2 Referral to the NSW Land and Water Commissioner

(a) If the Dispute is not settled within 15 Business Days, either Party may refer the Dispute to the NSW Land and Water Commissioner for adjudication (if the Commissioner is willing to adjudicate the Dispute).

(b) The Parties must use reasonable endeavours to have the Dispute Adjudicated within a further 15 Business Days.

(c) Any such adjudication is not final or binding, however may be considered by the Secretary in the event that clause 11.3 is triggered.

11.3 Resolution by Secretary

(a) If the Dispute is not settled or adjudicated (as the case may be) within 30 Business Days of notification, the Parties must submit the Dispute to the Secretary for resolution in accordance with Condition 27.

(b) The determination of the Secretary is final and binding.

12. Costs

12.1 Cost reimbursement

KEPCO will reimburse the reasonable legal costs of the Landholder in relation to the negotiation, preparation and execution of this Deed, subject to the provision of relevant tax invoices, up to a maximum of $1,000 (GST exclusive).

12.2 Stamp duty

KEPCO will pay any stamp duty imposed on this Deed or the transaction envisaged by this Deed.

13. Dealing with the Property

13.1 Landholder not to deal adversely with Property

The Landholder shall not, during the term of this Deed, enter into any agreement or arrangement which would or might adversely affect the Landholder's ability to comply with the obligations imposed on the Landholder under this Deed.

13.2 Sale or disposal of the Property

If the Landholder transfers or otherwise disposes with the Property or any interest in the Property the Landholder must, before completion of that transfer or other dealing, novate its rights and obligations under this Deed (to the extent of the interest transferred) to the transferee under a deed of novation in a form reasonably acceptable to KEPCO under which the transferee or other party agrees with KEPCO to be bound by the terms of this Deed.

14. Termination

14.1 Termination of Deed

This Deed terminates on the earliest of:

(a) the written agreement of the Parties;

(b) KEPCO deciding not to proceed with the Project and providing written notice; or

(c) the expiry or surrender of the Development Consent.

14.2 KEPCO released from further obligations

On the termination of this Deed in accordance with clause 14.1, KEPCO is released from any further obligations to provide any Compensatory Water Supply or make a Compensation Payment to the Landholder.

15. Notices and other communications

15.1 Service of notices

A notice, demand, consent, approval or communication under this Deed (**Notice**) must be:

(a) in writing, in English and signed by a person duly authorised by the sender; and

(b) hand delivered or sent by prepaid post to the recipient's address for Notices specified in the Details, as varied by any Notice given by the recipient to the sender.

15.2 Effective on receipt

A Notice given in accordance with clause 15.1 takes effect when taken to be received (or at a later time specified in it), and is taken to be received:

(a) if hand delivered, on delivery; or

(b) if sent by prepaid post, on the second Business Day after the date of posting (or on the seventh Business Day after the date of posting if posted to or from a place outside Australia),

but if the delivery or receipt is not on a Business Day or is after 5.00pm on a Business Day, the Notice is taken to be received at 9.00am on the next Business Day.

16. GST

16.1 Consideration

(a) Any consideration to be paid or provided under or in connection with this Deed, unless specifically described in this Deed as 'GST inclusive', does not include an amount on account of GST.

(b) If and to the extent, for any reason, a supply under or in connection with this Deed specifically described in this Deed as 'GST inclusive' is not subject to GST, the amount payable or other consideration to be provided for that supply shall be reduced by 1/11th and if and to the extent that a payment has already been made for that supply, the payee shall refund that component.

16.2 Gross up of consideration

Despite any other provision in this Deed, if a party (**Supplier**) makes a supply under or in connection with this Deed on which GST is imposed (not being a supply the consideration for which is specifically described in this Deed as 'GST inclusive'):

(a) the consideration payable or to be provided for that supply under this Deed, but for the application of this clause (**GST exclusive consideration**), is increased by, and the recipient of the supply (**Recipient**) must also pay to the Supplier, an amount equal to the GST payable on the supply (**GST Amount**); and

(b) the GST Amount must be paid to the Supplier by the Recipient without set off, deduction or requirement for demand, at the same time as the GST exclusive consideration is payable or to be provided.

16.3 Reimbursements (net down)

If a payment to a party under this Deed is a reimbursement or indemnification, calculated by reference to a loss, cost or expense incurred by that party, then the payment will be reduced by the amount of any input tax credit to which that party, or the representative member of a GST group of which that party is a member, is entitled for that loss, cost or expense.

16.4 Exclusion of GST from calculations

If a payment is calculated by reference to or as a specified percentage of another amount or revenue stream, that payment shall be calculated by reference to or as a specified percentage of the amount or revenue stream exclusive of GST.

16.5 Tax invoice

The Recipient need not pay the GST Amount until the Supplier has given the Recipient a tax invoice for the supply to which the payment relates.

16.6 GST obligations to survive termination

This clause 16 will continue to apply after expiration or termination of this Deed.

17. General

17.1 Amendments

This Deed may only be amended or varied by a later written agreement between all parties.

17.2 Assignment

KEPCO does not require the consent of the Landholder to assign this Deed or a right under this Deed.

17.3 Entire agreement

This Deed supersedes all previous agreements about its subject matter. This Deed embodies the entire agreement between the parties.

17.4 Further assurances

Each party must do all things reasonably necessary to give effect to this Deed.

17.5 No waiver

(a) The failure of a party to require full or partial performance of a provision of this Deed does not affect the right of that party to require performance subsequently.

(b) A right under this Deed may only be waived in writing signed by the party granting the waiver, and is effective only to the extent specifically set out in that waiver.

17.6 Relationship between parties

(a) Nothing in this Deed:

(i) constitutes a partnership between the parties; or

(ii) except as expressly provided, makes a party an agent of another party for any purpose.

(b) A party cannot in any way or for any purpose:

(i) bind another party; or

(ii) contract in the name of another party.

(c) If a party must fulfil an obligation and that party is dependent on another party, then that other party must do each thing reasonably within its power to assist the other in the performance of that obligation.

17.7 Time for doing acts

(a) If the time for doing any act or thing required to be done or a notice period specified in this Deed expires on a day other than a Business Day, the time for doing that act or thing or the expiration of that notice period is extended until the following Business Day.

(b) If any act or thing required to be done is done after 5pm on the specified day, it is taken to have been done on the following Business Day.

17.8 Severability

(a) A clause or part of a clause of this Deed that is illegal or unenforceable may be severed from this Deed and the remaining clauses or parts of the clause of this Deed continue in force.

(b) If any provision is or becomes illegal, unenforceable or invalid in any jurisdiction, it is to be treated as being severed from this Deed in the relevant jurisdiction, but the rest of this Deed will not be affected.

17.9 Governing law and jurisdiction

(a) The laws of the State of New South Wales govern this Deed.

(b) Each party irrevocably submits to the exclusive jurisdiction of the New South Wales courts and courts competent to hear appeals from those courts.

Schedule 1– Condition 27

Compensatory Water Supply

27. The Applicant must provide a compensatory water supply to the owner of any privately-owned land whose surface water and/or groundwater supply is adversely and directly impacted (other than a negligible impact) as a result of the development, in consultation with DPI Water, and to the satisfaction of the Secretary.

    The compensatory water supply measures must provide an alternative supply of water that is equivalent, in quality and volume, to the loss attributed to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable from the loss being identified, unless otherwise agreed with the landowner.

    If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

    If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide alternative compensation to the satisfaction of the Secretary.

    Note: The Water Management Plan (see condition 30) is required to include trigger levels for investigating potentially adverse impacts on water supplies.

Signing page

EXECUTED as an deed.

Signed, sealed and delivered by **KEPCO Bylong Australia Pty Ltd ACN 075 361 769** in accordance with section 127 of the Corporations Act 2001 (Cth) by:

Signature of director	Signature of director/company secretary (Please delete as applicable)
Name of director (print)	Name of director/company secretary (print)

Signed, sealed and delivered by [***#insert name***] in the presence of

Signature of witness	Signature of landholder
Name of witness (print)	Name of landholder (print)

Suite 1301, Level 13, 141 Walker St
North Sydney NSW 2060
Phone: 02 8904 9508 Fax: 02 8904 9588

BASELINE ASSESSMENT GUIDELINE

BYLONG MINE

VERSION: 1

DATE: 19 DECEMEBER 2017

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1 INTRODUCTION AND BACKGROUND

Compensatory Water Supply Agreements between KEPCO Bylong Australia Pty Ltd (KEPCO) and private landholders are supported by the following two guidelines designed to ensure a consistent approach to implementation of each agreement:

- Baseline Assessment Guideline
- Bore Impact Assessment Guideline

The first element is the Baseline Assessment Guideline, which describes how baseline information is collected from water bores and wells located on private property in proximity to the Bylong Coal Project (the Project). The Baseline Assessment Guideline is followed prior to, or at the commencement of a Compensatory Water Supply Agreement.

The second element is the Bore Impact Assessment Guideline which provides details of the procedures KEPCO will follow to assess if a private bore has been impacted by the Project. The Bore Impact Assessment Guideline will be followed when either KEPCO or the landholder issue a notification under the Compensatory Water Supply Agreements (Section 7.1 and 7.2) that a water supply has been adversely impacted.

This document, the Baseline Assessment Guideline provides details about the minimum requirements for undertaking a baseline assessment on water bores and wells located on private property in proximity to the Project. Specifically, this guideline will apply to any water bores and wells on private property where the landholder and KEPCO have entered into a Compensatory Water Supply Agreement in relation to any unforeseen impacts from the Project.

1.1 WHAT IS A BASELINE ASSESSMENT?

A baseline assessment aims to collect information about private bores or wells as part of any Compensatory Water Supply Agreement between the private landholder and KEPCO. A baseline assessment includes collection of information on:

- The level and quality of water in a bore or well;
- How the bore or well is constructed;
- The type of infrastructure used to pump water from the bore or well; and
- The volume of water pumped and its beneficial use.

1.2 WHY ARE BASELINE ASSESSMENTS REQUIRED?

The information collected in the baseline assessments establishes benchmark data in the unlikely event that the bore or well experiences an impact from the Project. Baseline assessments are intended to:

- Provide a measure of security for both bore (or well) owners and KEPCO by providing information about the current condition and pumping capacity for a water bore;

- Provide a reference point for comparison with subsequent assessments to assist in the triggering of actions under Compensatory Water Supply Agreements, where this may be required; and
- Assist in the resolution of any potential future disputes that may arise between bore owners and KEPCO following a bore assessment or in the implementation of mitigations under the Compensatory Water Supply Agreement.

1.3 NOTICE OF INTENTION TO UNDERTAKE A BASELINE ASSESSMENT

KEPCO will provide notice to the bore owner prior to commencement of the baseline assessment. This notice will be provided at least 10 business days prior to commencement and will include details of who will be undertaking the assessment.

1.4 BORE OWNER RESPONSIBILITIES

For the bore baseline assessment to be successful, KEPCO will require information about the location of water bores or wells on the owner's land. It is assumed property owners with water bores or wells on their land will comply with any reasonable request for information from KEPCO, if they possess the information. It is intended that the provision of this information will result in a more accurate baseline assessment and consequently greater confidence around when the measures defined under the Compensatory Water Supply Agreement will be triggered.

1.5 REPORTING

The information collected during a baseline assessment will be provided by KEPCO to the bore owner within 30 business days following completion of the assessment. The assessment includes analysing data obtained about water level, water quality, bore construction and infrastructure. The 30 business day period commences once laboratory results are received and this information has been analysed.

Baseline information will assist in regional underground water flow modelling, providing more accurate predictions of underground water impacts on each bore and well, and may therefore be included in reports describing updates to the numerical model for the Bylong Coal Project.

2 COLLECTION OF DATA AND QUALIFICATIONS

2.1 QUALIFICATIONS FOR PERSONS CONDUCTING BASELINE ASSESSMENTS

KEPCO will engage consultants experienced in the fields of water level monitoring and water quality sampling, and with a practical knowledge of water bore construction and infrastructure. These minimum qualifications for field personnel will ensure high quality data is collected.

2.2 QUALITY ASSURANCE AND QUALITY CONTROL

A quality assurance program will include quality control procedures consistent with the principles of the following documents or subsequent versions thereof:

- The Australian/New Zealand Standard Water Quality – "Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples" (AS/NZS 5667.1:1998);
- The Australian/New Zealand Standard Water quality – "Sampling, Part 11: Guidance on sampling of groundwaters" (AS/NZS 5667.11:1998);
- Geoscience Australia, (2009), "Groundwater Sampling and Analysis – A Field Guide"; and
- Murray-Darling Basin Commission, (1997), "Murray Darling Basin Groundwater Quality Sampling Guidelines", Technical Report No. 3, Groundwater Working Group.

As the baseline assessment is a key component to determine if there is potential for the capacity of private bores or wells to be impacted, as well as the basis of negotiating compensatory water supply agreements, it is essential that the best quality data be obtained.

3 ESSENTIAL ELEMENTS OF A BASELINE ASSESSMENT

Carrying out a baseline assessment will involve the following parts:

- PART A - Document identification and bore site information.
- PART B – Bore/well construction details.
- PART C – Bore/well equipment and condition details.
- PART D – Bore/well supply information.
- PART E - Water level measurement.
- PART F - Water quality assessment.
- PART G - Property owner/manager details.

The minimum requirements specified in the below sections will be complied with when undertaking a baseline assessment. Information supplied to meet the minimum requirement will assist KEPCO in providing the landholder with an accurate baseline assessment of their bores/wells. Where a minimum requirement cannot be met, KEPCO will outline the reasons to the landholder.

3.1 PART A – DOCUMENT IDENTIFICATION AND BORE SITE INFORMATION

3.1.1 Minimum Requirements

1. A unique identifier for the bore (Bore ID) will be recorded.
2. If the bore owner has a local name for the bore, this information will be recorded.
3. The location of the bore site referenced to Geocentric Datum of Australia (GDA94) will be recorded by a registered surveyor.

Prior to KEPCO (and/or its consultants) visiting the bore or well to undertake a baseline assessment, any information held by the Department of Primary Industries – Office of Water (DPI-Water) on their groundwater database (GWDB) will be reviewed. This will mean, in some cases, KEPCO will have some preliminary information of details about the bore or well prior to visiting the bore site. This data will then be verified with the land owner and throughout the completion of the baseline assessment.

When undertaking a baseline assessment, it is essential that each bore is assigned a unique identifier to assist in identifying the correct bore in any future bore assessment.

In the GWDB, each water bore is given a registration number (the Bore RN). However, there are some difficulties in using the registration number as a unique identifier for survey purposes, as it may be difficult to correlate a bore's physical location with the registration number details. For example, there may be two bores located within close proximity to one another, and this may lead to confusion over which bore registration number is assigned to which bore.

In addition, there may be other bores which may not be recorded in the GWDB, and these bores may not have a registration number. Therefore, assigning a unique identifier (Bore ID) for each bore at the time of survey is required. This unique identifier will be a sequential number determined by KEPCO. Where a registration number is known for that bore, this will also be recorded separately as additional information for cross referencing. In instances where there could be a possibility of more than one registration number correlating to a bore, more than one registration number can be provided.

If the bore owner has a local name for the bore, this information will also be recorded to ensure that the bore can be cross-referenced as accurately as possible. The bore owner may also have a bore registration number for their water bore which will be recorded.

If there is some doubt over the registration number, it is necessary to record commentary around the confidence level or accuracy for the purposes of identifying the bore in the future.

The purpose of this information is for cross-reference and comparison with other nearby bores that have been assessed by KEPCO. This is important for evaluating the likely accuracy of the standing water level measurement in Part E.

KEPCO will commission a surveyor to record the location of the bore site referenced to GDA94, and the elevation of the bore to Australian Height Datum (AHD). The accuracy of the elevation should be at least ±50 mm.

3.2 PART B – BORE CONSTRUCTION DETAILS

3.2.1 Minimum Requirements

1. The following information regarding the bore's or wells' construction will be recorded:
    a. name of drilling contractor;
    b. date of construction;
    c. type of casing;
    d. casing inner and outer diameter;
    e. perforated intervals and/or screens that have been installed in the bore or well;
    f. details of any seals and cement grouting installed in the bore annulus; and
    g. geological strata log.
2. The source aquifer for the bore will be recorded.
3. Despite 2, where the supply source is uncertain or unknown, the reasons for the uncertainty will be analysed and reported.
4. Commentary on the confidence level of the source aquifer will be recorded.

Information regarding the bore construction and supply source will be recorded where available. This information may be attainable from drilling logs for the bore (if this information is available). The purpose for collecting construction information of the water bore is shown in Table 1.

The name of the source aquifer or geological formation that is the supply source for the bore will be recorded. Where the supply source is uncertain or unknown, the reasons for the uncertainty will be analysed and reported. It is noted that, in many cases, it may be difficult to be certain that the bore is accessing a certain geological formation. Therefore, commentary on the confidence level of the source aquifer (e.g. how confident is the assessor that the bore is in fact accessing the identified aquifer) is to be recorded.

Table 1
Bore Construction Information

Information required	Purpose for which information is used
Name of drilling contractor	Drilling contractor may be contacted for construction details if required to improve the certainty in the bore/well construction.
Date of construction	Can provide an indication of the likely condition of the casing and perforated interval/s.
Type of casing	Assists in the interpretation of the chemical composition of the water from the bore and the condition of the casing.
Casing diameter	Used to calculate the volume of stagnant water that is contained within the bore or well that needs to be purged out prior to collecting samples for chemical analysis.
Perforated intervals and / or screens that have been installed in the bore	Important for assessing the aquifer/s that the water bore taps for its supply.
Details of any seals and cement grouting installed in the bore annulus	Important for assessing potential for invasion of the bore's supply from the surface or other aquifer layers.

Details of the water supply bore or wells capacity (yield) would normally have been established at the time of development of the bore. The 2012 Minimum Construction Requirements[1] for Water Bores in Australia recommend that "on completion of any production bore, the driller should carry out adequate testing to provide the client with a reasonable indication of the capacity of the bore. This test will also demonstrate to the client that the bore has been constructed properly and is therefore capable of producing clean water" (National Uniform Drillers Licensing Committee, 2012).

[1] National Uniform Drillers Licensing Committee, (2012), "Minimum construction requirements for water bores in Australia", Third edition, February 2012.

In addition, an estimation of the rate at which water may be produced from the bore or well will be collected during the baseline assessment.

Consequently, whenever capacity information is available from driller's records, this information should also be obtained from these records and recorded. It may also be necessary to conduct a capacity assessment at the time of baseline assessment to confirm the yield of the bore or well.

3.3 PART C – BORE EQUIPMENT AND CONDITION DETAILS

3.3.1 Minimum Requirements

1. Information about the pumping equipment for a water bore including the following, will be recorded:
    a. If the bore is in operating condition or has been decommissioned;
    b. The pump type and make;
    c. Pump setting depth;
    d. If the bore is metered;
    e. The power source for the bore;
    f. Details on the riser; and
    g. Details on the head-works.
2. Photograph(s) of the bore and pumping equipment will be taken and attached to the baseline assessment.

KEPCO will record information about the bore's condition and pumping equipment. Photograph(s) will be taken to accurately capture the condition of the bore and equipment at the time of the baseline assessment. Sufficient photographs will be taken to represent the condition of the bore or well, including a photograph of the head-works.

KEPCO will also record any details that the bore owner has about any repairs or maintenance that has previously been undertaken on the bore. For example, it is useful to record information about who has carried out the maintenance on the bore, as well as when and what sort of maintenance that was undertaken. These records will be useful background information to support any future bore assessment and assist in determining whether the bore has an impacted capacity due to the Bylong Coal Project.

3.4 PART D – BORE SUPPLY INFORMATION

3.4.1 Minimum Requirements

1. The purpose of the bore will be identified and recorded, in consultation with the bore owner.
2. How often the bore is utilised (i.e. hours pumped/day) will be recorded.

3. The operating capacity of the bore and any associated commentary on the operating capacity, including any seasonal variation in use, will be recorded.

4. Peak usage information for the bore (including maximum volumes extracted and period of peak extraction) will be recorded.

Understanding the purpose of the bore at the time of baseline assessment is a vitally important component of the assessment and any subsequent mitigation or compensation measures under a Compensatory Water Supply Agreement. Additional commentary as to how often the bore is utilised (hours pumped per day) will be recorded. This information will support any future investigations and provide a point for comparison in determining whether the bore has an impacted capacity. KEPCO will consult the bore owner to verify this information, and the owner has an obligation to provide information that KEPCO reasonably requires to undertake the baseline assessment.

The operating capacity of the bore and any associated commentary that the bore owner can supply, including any seasonal variation in use, will be recorded. The bore owner should provide KEPCO with any historical water use records that are available for the bore.

Peak usage information for the bore, including maximum volumes extracted and period of peak extraction, will be recorded. If this information is not available, accurate information relating to the use of the water extracted from the bore that needs to be captured will include, as a minimum:

- Stock watering (type, head);
- Irrigation (crop type and area); and
- Domestic use (number of households supplied, area of gardens watered).

Where no volumetric usage information is available, the figures supplied in Appendix A should be used to estimate volumes supplied by the bore. KEPCO may request evidence to confirm stocking rates, irrigation areas (etc) to support the estimated volumes. Volumetric limits imposed by water licences will also be collected.

3.5 PART E – WATER LEVEL MEASUREMENT

3.5.1 Minimum Requirements

1. The standing water level (SWL) in the bore or well will be recorded.

2. Where a SWL cannot be recorded, as it is not practicable for a bore owner to cease pumping, the following information will be recorded:

    a. Duration of pumping and rest periods; and

    b. Maximum pumping rates.

3. A photograph of the bore clearly showing the following will be taken and attached to the baseline assessment:

a. A datum for SWL;

b. The unique identification number of the bore and the GWDB registered number if available;

c. The bore owner's name;

d. Property name; and

e. The date of the photograph.

4. The height of the datum above ground level will be recorded.

It is a fundamental requirement of the baseline assessment that a SWL be obtained for the water bore. As this is an essential component of the baseline assessment, KEPCO will use its best endeavours to obtain this information.

For those bores that are equipped with a pump, there is often limited space in the annulus of the bore to allow for unobstructed access for the water level probe. If works are required to gain access to the bore or well, these will only be undertaken with the permission of the bore owner. Access to measure the SWL may be obtainable with minor works such as removing a face plate or jacking up a well head. In some cases, more major works such as removing windmills and pumps may be required.

3.5.2 Bore pumping at time of inspection

It may be possible that at the time of the site visit to obtain a SWL, the bore could be pumping or has recently ceased pumping. In these circumstances, the optimal course of action is to revisit the bore when the water level has fully recovered from the influence of pumping and has stabilised.

The residual drawdown of the water level of a bore can take many hours or days to recover to a SWL. As a guide, a bore or well that has a yield less than five litres per second will be given at least 48 hours to recover. A bore or well that has a yield greater than five litres per second, will be given at least 96 hours to recover. However, where appropriate the recovery period for each bore or well will be considered on its own merit and KEPCO will discuss timeframe for recovery of the SWL with the owner.

It is acknowledged that in some circumstances, such as where an extensive irrigation campaign is underway, it may not be practicable for the bore owner to cease pumping the bore for an extended period of time. In these cases, best endeavours will be made to take the most representative SWL measurement possible. Detailed information relating to the antecedent conditions of the bore will need to be obtained and recorded, in these situations. This information will include periods of pumping and rest periods and maximum pumping rates whenever this information is available.

Where an appropriate recovery period cannot be achieved, the use of automatic water level data loggers may be adopted to obtain detailed information regarding impacts of extraction from the bore and nearby bores. Where automatic data loggers are not being used, the water level will be measured for as long as possible to record recovery and specify the bore recovery rate at the time the final water level was recorded.

Where the above measures are not feasible, a return visit at a later time may be scheduled.

3.5.3 Datum

Before a water level measurement is taken for a bore, a datum will be established on the water bore to ensure that any future measurements taken in the water bore will be referenced back to the same point.

All depth measurements are conventionally taken from the top of the bore casing or bore cover (at a marked point, such as the padlocking point). When selected, this point will need to be documented for each individual bore. This is to be achieved by photographing the bore head with the datum point clearly marked.

The photograph will also include a legible written record of:

- The unique identification number of the bore and the GWDB registered number, if available;
- The bore owner's name;
- Property name; and
- The date of the photograph.

The height of the datum above ground level is also to be measured and recorded.

Underground water levels will be expressed as a level relative to the ground surface. The distance between the measuring point (e.g. datum at the top of casing) and the ground surface will be subtracted from the measured distance between the measuring point (e.g. datum at the top of casing) and the level in the bore. Underground water levels will be reported in metres below ground level (m bgl).

3.5.4 Accuracy and calibration

The instruments that are used to take SWL measurements will be regularly checked to ensure that they are within calibration. This means that the device will be checked against an applied standard value to ensure that the device is indicating that value within a specified accuracy. Accuracy and calibration should be part of quality assurance and quality control procedures for baseline assessments, and error should not exceed ±50mm for water level measurements.

3.6 PART E – WATER QUALITY ASSESSMENT

The water quality assessment consists of the following three sub-parts:

1. Obtaining water quality samples;
2. Field parameters and laboratory analytes; and
3. Sample identification, preservation and transportation.

3.6.1 Obtaining Water Quality Samples

Minimum Requirements

1. Samples for water quality analysis will be collected, where feasible.
2. Sample collection will occur as close to the water bore as possible, and where possible, before any other pipework joins the bore discharge pipework.
3. The location of the sampling point will be documented.
4. Where the sampling point is not within 15m of the bore:
    a. A photograph of the sampling point will be taken and attached; and
    b. The location referenced to GDA94 will be recorded.
5. Prior to sampling a water bore, the volume of stagnant water within the bore or well casing and discharge piping (upstream of the sampling point) will be calculated.
6. Water quality samples will only be collected:
    a. After three times the volume of stagnant water in the bore casing and the discharge piping (including a sufficient additional volume to account for any error in volume calculations) have been purged, and
    b. When the field water quality parameters have stabilised.
7. Where full purging as stated in requirement 6 is not practicable, but a meaningful sample can still be collected, the pumping history of the bore, including when the bore was last used will be recorded.
8. When water quality samples are taken where there is no pumping equipment in place in the bore, photographs showing the bore and sampling setup will be taken and attached.
9. When taking samples, potential sources of contamination will be identified and avoided.
10. When taking samples, disturbance to the existing infrastructure will be minimised.

A comprehensive water quality assessment will be undertaken to ensure that baseline data exists should a bore impact assessment be required or a bore's approved use change.

It should be noted that only changes in water quality caused by a decline in water level which results from KEPCO developing the Project, form part of the Compensatory Water Supply Agreement. However, water quality information is also important as it can provide information about other issues with the bore not related to the Project.

Water quality samples will be collected from all bores equipped with pumping infrastructure. If a bore is not equipped with pumping infrastructure, KEPCO will exercise best endeavours to obtain water quality samples. However, it is recognised that in some circumstances difficulties in purging the bore

will mean that obtaining a representative water quality sample may not be practicable. Further guidance is provided in the "Sampling procedure" (section 3.6.3 below) about what actions may be taken in order to obtain a water quality sample.

3.6.2 Selection of Sampling Location

Sample collection will occur as close to the water bore as possible, and where possible, before any other pipework joins the bore discharge pipework. This will minimise the effects of temperature and pressure changes on the sample at the surface and avoid contamination of the sample from other sources.

KEPCO and the bore owner should reach agreement on the most appropriate place to obtain a sample that will be representative of the bore water. When taking samples, potential sources of contamination will be identified and avoided wherever practicable and disturbance to the existing infrastructure will be minimised. The location of the sampling point will be documented and where the sampling point is not within 15m of the bore, it will be photographed as outlined in Section 3.6.1 above. Samples of bore water should not be collected from storages such as water tanks, troughs or dams. Refer to Figure 1 for a schematic of acceptable water samples for an example bore.

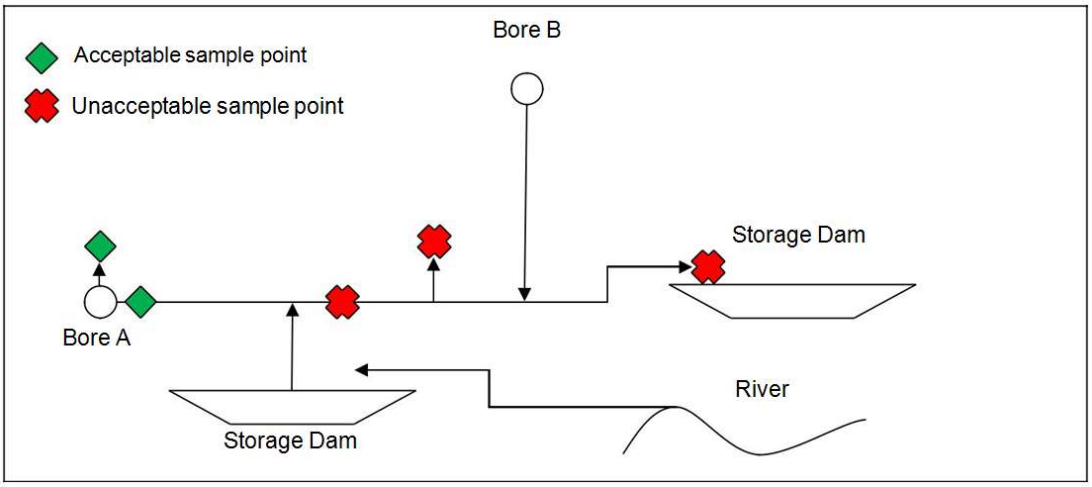

Figure 1
Schematic of acceptable water sampling locations from Bore A

3.6.3 Sampling Procedure

Prior to sampling a water bore, wherever practicable, the volume of stagnant water within the bore casing and discharge piping (upstream of the sampling point) will be calculated. Water quality samples will only be collected:

- After three times the volume of stagnant water in the bore casing and the discharge piping (including a sufficient additional volume to account for any error in volume calculations) have been discharged; and

- When the field water quality parameters have stabilised.

Stabilisation of the water quality parameters indicates stagnant water has been removed and the bore is producing formation water of a consistent quality.

It is recognised that there may be circumstances where full purging of a bore in compliance with the above requirements prior to sampling is not practicable, such as when the bore is not equipped with pumping equipment or where there are restrictions on disposing of the purge water. In such cases, KEPCO will develop an appropriate strategy for purging and sampling bores. This strategy will be consistent with recognised standards and guidelines for purging and sampling bores.

In cases where full purging is not practicable but a meaningful sample can still be collected, the pumping history of the bore, including when the bore was last used will be recorded in detail. When water quality samples are taken where there is no pumping equipment in place in the bore, photographs showing the bore and sampling setup will be taken by KEPCO to assist in demonstrating the integrity of the samples.

Possible options for obtaining a sample when pumping equipment is already in place may include:

- Sampling from an existing valve and pipe;
- Temporarily replacing another piece of equipment (e.g. a pressure gauge) with a valve to enable a sample to be obtained from this point; or
- Installing a temporary valve and piping setup to be removed after sampling with reinstatement of the original piping.

The preferred option is that which allows sample collection to occur in a controlled manner and avoids disturbance to the sample by contamination from physical, chemical or biological processes. Use of a diversion pipe and flow regulating valve is therefore recommended. KEPCO may request a permanent sampling port be installed to allow consistent follow-up sampling. If required this work will be undertaken by a licensed plumber.

3.6.4 Field Parameters and Laboratory Analytes

Minimum Requirements

1. The minimum chemical analyses for baseline assessments that will be performed on water samples are specified in Table 2 below:

Table 2

Chemical Analysis for Baseline Assessments

Category	Parameters
Physical parameters	pH (field and laboratory)
	Temperature (field only)
	Electrical conductivity (field and laboratory)

	Total dissolved solids	
Ions	calcium	potassium
	chloride	sodium
	fluoride	sulphate
	magnesium	
Alkalinity and hardness	Alkalinity - bicarbonate, carbonate, hydroxide and total as CaCO3	
	Total hardness as CaCO3	
	Sodium absorption ratio (SAR)	
	Dissolved silica	
	Ion balance	
Metals (dissolved and total)	aluminium	iron
	arsenic	lead
	barium	manganese
	beryllium	mercury
	boron	molybdenum
	bromide	nickel
	cadmium	selenium
	chromium	uranium
	cobalt	vanadium
	copper	zinc
	lithium	
Nutrients	Total Nitrogen	Total Phosphorus

2. All samples for baseline assessments are to be analysed at laboratories accredited by the National Association of Testing Authorities (NATA).

3. The limit of detection will be sufficient for assessment against current and relevant guidelines, including but not limited to:

    a. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000); and

    b. The Australian Drinking Water Guidelines (National Health and Medical Research Council, 2011).

3.6.5 Sample Identification, Preservation and Transportation

KEPCO will ensure that sample identification, preservation and transport adhere to best practice industry standards.

Minimum Requirements

1. Water quality samples will have a unique identification number that can be cross-referenced to the monitoring location and time of sampling.
2. Sample preservation measures will be documented and will comply with the laboratories requirements and relevant standards (e.g. AS/NZS 5667.1:1998).
3. Sample integrity will be maintained through the use of chain of custody procedures and documentation in accordance the Geoscience Australia (2009) Groundwater Sampling and Analysis – A Field Guide.

3.6.6 Rescheduling of Water Sampling

Should sampling of the water from the water bore not be feasible at the time of the initial field visit, the bore owner and KEPCO will need to agree on an alternate time for obtaining a sample. If sampling is rescheduled, then, both parties should formally record the agreed rescheduled timeframe. Should the bore owner choose not to reschedule a time for water quality sampling, KEPCO will record this within the results of the baseline assessment.

3.7 PART G – PROPERTY OWNER/MANAGER DETAILS

Minimum Requirements

1. The contact details of the bore owner, and any person who has provided information to KEPCO about the bore's condition for the baseline assessment, will be recorded.

The contact details of the person responsible for providing information to KEPCO about the baseline assessment, including the bore owner's details, will be recorded. Where a person, other than KEPCO, has provided information about the bore's condition for the baseline assessment, KEPCO will specifically identify the information provided by this person.

4 DEFINITIONS / GLOSSARY

Definitions / Glossary	
Analyte	A chemical parameter determined by either physical measurement at the bore head (e.g. electrical conductivity), or by laboratory analysis.
Aquifer	A geological structure, formation or formations that holds water in sufficient quantity to provide a source of water that can be tapped by a bore.
Artesian bore	A bore or well where the water flows, or has flowed, naturally to the surface.
Consolidated aquifer	An aquifer consisting predominantly of consolidated sediment forming rock. The term includes geological formations such as sandstone and basalt.
Datum	An agreed reference point at the bore head. This is usually the top of the casing.
Meaningful sample	A meaningful sample means that the material sampled is genuinely representative of the body of water from which it was collected (from the location of interest), that in situ measurements are reliable, and that the integrity of materials sent for laboratory analysis has not been compromised by contamination, degradation, transformation or losses.
Residual drawdown	The depth of the water level calculated by subtracting the static water level before pumping began from appropriate water levels taken during the recovery process.
Sub-artesian bore	A bore or well that taps an aquifer and the water does not flow and never has flowed naturally to the surface.
Unconsolidated aquifer	Flood plain materials ranging from clay to sand and gravel capable of being developed into a water supply bore.
Underground water quality	A term that encompasses the chemical and biological characteristics of the water from a bore. It is assessed by physical measurements at the bore head and follow-up laboratory analysis of sample/s of the water.
Water level	If the aquifer were tapped by a sub-artesian bore - the level of the water in the bore.

5 REVISION HISTORY

Internal Version History and Approval Register

Version	Version Date	Description of Changes	Approved By
1	19/12/2017	Guideline for Stakeholder Consultation	

6 REFERENCES

ANZECC and ARMCANZ. (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Committee CE/28. (1990), *AS2368—1990 Test pumping of water wells*.

Geoscience Australia. (2009), *Groundwater Sampling and Analysis – A Field Guide.*

Joint Technical Committee EV/8. (2016), *AS/NZS 5667:11 1998 Water quality - Sampling - Guidance on sampling of groundwaters*.

Joint Technical Committee EV/8. (1998), *AS/NZS 5667.1:1998 Water quality - Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.*

Joint Technical Committee EV/8. (1998), *AS/NZS 5667.1:1998 Water quality - Sampling, Part 11: Guidance on sampling of groundwaters.*

Murray-Darling Basin Commission. (1997), *Murray Darling Basin Groundwater Quality Sampling Guidelines*, Technical Report No. 3.

National Health and Medical Research Council. (2011), *Australian Drinking Water Guidelines*.

National Uniform Drillers Licensing Committee. (2011, 2012), *Minimum construction requirements for water bores in Australia*.

Sundaram, B. et al. (2009), *Groundwater Sampling and Analysis—A Field Guide.*

APPENDIX A

Water Consumption Estimates

Appendix A
Water Consumption Estimates

Table A-1
Household Water Consumption Estimates

Type of livestock	Average daily	Type of livestock	Average daily
Sheep			
Nursing ewes on dry feed	9	11.5	3 600
Mature sheep on dry pastures	7	8.5	2 700
Mature sheep on irrigated pastures	3.5	4.5	1 300
Fattening lambs on dry pastures	2.2	3.0	900
Fattening lambs on irrigated pastures	1.1	1.5	400
Cattle			
Dairy cows in milk	70	85	25 000
Dairy cows, dry	45	60	17 000
Beef cattle	45	60	17 000
Calves	22	30	8 000
Horses			
Working	55	70	20 000
Grazing	35	45	13 000
Pigs			
Brood sows	22	30	8 000
Mature pigs	11	15	4 000
Poultry	**litres per 100**	**litres per 100**	**litres per 100**
	birds	**birds**	**birds**
Laying hens	32	40	11 500
Non-laying hens	18	23	6 500
Turkeys	55	70	20 000

Source: Volume 3 Primary Industries—Rationale and Background Information of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).

Table A-2
Household Water Consumption Estimates

Use	Average consumption litres/head/day	litres/head/year
Household with septic system	180	65 000
Household without septic system	135	50 000
Homestead gardens	As an approximate rule of thumb for small gardens an average daily consumption of 35 000 litres per hectare of watered garden, decreasing to 17 000 litres for the winter months, can be used.	

APPENDIX B

Field Form

Appendix 1—Bore baseline assessment information

Mandatory supporting information to be included with the application. Refer to the EHP Baseline Assessment Guideline (www.ehp.qld.gov.au) for more details. For electronic submission of this information to the Office of Groundwater Impact Assessment visit www.dnrm.qld.gov.au/ogia

Note: If records are indicated as being 'available', they must be supplied as part of the baseline assessment.

PART A: DOCUMENT IDENTIFICATION AND BORE SITE INFORMATION		
Tenure holder	**Individual's surname:**	**Individual's given names:**
	Company name:	
	ABN *(if applicable)*:	
Principal contact	**Surname:**	**Given names:** **Phone:**
Tenure	**Type:** ☐ **PL** ☐ **ATP**	**Tenure number:**
Bore	**Tenure holder bore Id:**	**DNRM bore registration number:**
	DNRM registration number comments:	
	Local bore name:	
	Property name:	
	Lot:	**Plan:**
Date of site assessment:		
Geographic location *(GDA94)*	**Latitude:**	**Longitude:**
	Location method: ☐ **GPS** ☐ **GPS – Differential** ☐ **Surveyed**	
Status of works: ☐ **Existing** ☐ **Abandoned but still useable**		
Facility Type	☐ **Sub-Artesian**	
	☐ **Artesian – controlled flow** ☐ **Artesian – uncontrolled flow** ☐ **Artesian – ceased to flow**	
Additional comments:		

PART B: BORE CONSTRUCTION DETAILS	
Are construction details available? ☐ **Yes** ☐ **No** ***If* Yes** *then verify details (where possible) and supply in the format provided in the Data File Details document. If available, a copy of original log should also be provided.* *If* **No** *then complete this section based on the site inspection and reported information from the bore owner representative (if the information is not available then please leave blank)*	
Driller name:	**Drilling company name:**
Date the bore was drilled:	**Depth of water bore** *(m)*:
Water entry *(e.g. perforations, slots, open hole, screens)*:	**Casing material and outside diameter:**
Geological formation from which water is accessed:	
Additional comments:	

PART C: BORE EQUIPMENT AND CONDITION DETAILS		
Is the bore equipped with a pump? ☐ **Yes** ☐ **No** *If* **Yes** *then attach photo of surface mounted pumping equipment and well head and complete this section.* *If* **No** *go to Part D*		
Pump type:	**Pump make and model:**	
Maximum pump capacity *(L/s)* :		
Power source: ☐ **Electric motor** ☐ **Generator** ☐ **Direct drive engine** ☐ **Mains supply** ☐ **Tractor** ☐ **Windmill**		
Pump setting depth *(depth from ground in metres)*:		
Pumping rate at the time of visit *(L/s) (If possible, run the pump and measure the pumping rate):*		
Is the bore equipped with a meter?	☐ **Yes** *(Provide description)*	**Description:**
	☐ **No**	

Headworks description *(Provide details on the size and type of riser pipe e.g. material, diameter, joint type; details of any connection to a reticulation system e.g. pipe sizes, distances, schematic diagram; headworks size; valves; flow meter)* **:**

Repairs/maintenance history *(Provide any commentary on repairs/maintenance undertaken on the bore e.g. nature and date of work, who has undertaken the maintenance)* **:**

PART D: BORE WATER SUPPLY INFORMATION

Purpose of bore *(Select one or more)*	☐ **Stock** ☐ **Domestic** ☐ **Intensive livestock** ☐ **Irrigation** ☐ **Town water supply**	
	☐ **Other** *(Provide description)* **Description:**	
Is the water use from this bore metered?	☐ **Yes** *(Specify average take of water from the bore in last five years and attach records if available)*	**Average volume used yearly** *(ML/year)***:**
	☐ **No** *(Provide bore owner's estimated yearly take of water from the bore and basis for this estimate e.g. no of hours the bore is pumped, storage of ring tank, no of properties supplied, area irrigated, using standard usage rates supplied in Appendix 1 of the Baseline Assessment Guideline)*	**Estimated volume used yearly** *(ML/Year)***:**
		Estimated volume method description:
Bore Utilisation	**How often is the bore utilised** *(estimated hours pumped/day)***:**	
	Description *(provide information on operational capacity, seasonal variations, peak usage)***:**	

PART E: WATER LEVEL MEASUREMENT *(Attach landholder agreement)*

Was a water level or pressure measurement taken?	☐ **Yes**	☐ **Pressure** *(Provide details)*	**Artesian pressure** *(KPa)* **:**
			Method of measuring pressure:
		☐ **Water level** *(Provide details)*	**Water level** *(depth from ground in metres)***:**
			Method of measuring water level *(e.g. conduit, direct access)***:**
		Datum point description *(Attach photo and describe measurement point e.g. top of bore casing)**:***	
		Height of datum above ground level ***(metres)*** **:**	
	☐ **No** *(Provide reason)*	**Reason not measured:**	
Antecedent and/or current conditions relevant to the water level or pressure measurement:			
Are water level and/or pressure records available for this bore? ☐ **Yes** ☐ **No**			

PART F: WATER QUALITY *(Please note that any measurement of water quality should only be undertaken after measuring the standing water level. Water quality parameters required to be sampled are detailed in the baseline assessment guideline.)*

LABORATORY WATER QUALITY

Were water quality samples taken for submission to a laboratory?	☐ **Yes**	
	☐ **No** *(Provide reason)*	**Reason not measured:**
Were dissolved gas samples taken for submission to a laboratory?	☐ **Yes**	**Method:** ☐ **Flow through** ☐ **Geosciences Australia Method**
		Reason method chosen:
	☐ **No** *(Provide reason)*	**Reason not measured:**
Are the laboratory results for the samples indicated above supplied with this baseline assessment?	☐ **Yes**	
	☐ **No** (*Provide reason)*	**Reason not supplied:**

Are historical water quality laboratory records available for this bore? ☐ **Yes** ☐ **No**

FIELD WATER QUALITY

Were water quality field measurements taken?	☐ **Yes** *(Provide results)*	**Field measurements**		
		pH:	**Temperature** (^{O}C)**:**	**Electrical conductivity** ($\mu S/cm$)**:**
		HCO_3^- Alkalinity as $CaCO_3$ *(mg/L)***:**	**CO_3^{2-} Alkalinity as $CaCO_3$** *(mg/L)***:**	**OH^- Alkalinity as $CaCO_3$** *(mg/L)***:**
		Total Alkalinity as $CaCO_3$ *(mg/L)***:**		
		Field dissolved gas measurements		
		Method: ☐ **Flow through** ☐ **Geosciences Australia Method**		
		Reason method chosen:		
		CO_2 *(mg/L)***:**	**H_2S** *(mg/L)***:**	**CH_4** *(mg/L)***:**
		Field gas measurements *(multi-parameter gas detector)*		
		CO_2 *(ppm_V)* **:**	**H_2S** *(ppm_V)* **:**	**CH_4** *(%LEL)***:**
	☐ **No** *(Provide reason)*	**Reason not measured:**		

Are historical water quality field records available for this bore? ☐ **Yes** ☐ **No**

WATER QUALITY SAMPLING METHODOLOGY

Was the sampling point and field measurement point at the bore head?	☐ **Yes**	
	☐ **No** *(Attach photo and provide measurement point description including GPS location)*	**Measurement point description**:
Was bore purged according to guidelines?	☐ **Yes**	
	☐ **No** *(Provide purging method description)*	**Purge method description:**
Were samples taken using existing pump on bore?	☐ **Yes**	
	☐ **No** *(Attach photo and provide sampling setup description)*	**Sampling setup description:**

PART G: ASSESSMENT FIELD OFFICER DETAILS (*Provide the contact details of the assessment officer responsible for conducting the baseline assessment)*		
Surname:		**Given names:**
Company:		
Phone:	**Alternative phone:**	
Fax:	**Email:**	

PART H: DECLARATION		
Tenure holder declaration	**Surname:**	**Given names:**
	Position title:	
	Date:	
Third Party Certification (*Provide the contact details of the person providing third party certification that the baseline assessment has been undertaken in line with appropriate quality control procedures, in compliance with EHP's Baseline Assessment Guideline)*	**Surname:**	**Given names:**
	Company:	
	Phone:	**Alternative phone:**
	Email:	
	Date certified:	

PART I: BORE OWNER REPRESENTITIVE (*Provide the contact details of the person responsible for providing information to the tenure holder about the baseline assessment)*	
Surname:	**Given names:**
Phone:	**Alternative phone:**
Fax:	**UHF:**
Email:	
Has a copy of the information collected for the baseline assessment been retained by the bore owner representative? ☐**Yes** ☐**No**	

ATTACHMENTS *(Provide a list of the photos and documentation (i.e. digital images and scanned documents) obtained as part of the baseline assessment applicable only to this bore in accordance with the naming conventions outlined in the Data File Details document)*

Documentation Type		**Description**
Photos *(JPEG)*	☐**Pump photo** *(Part C)*	
	☐**Water level meas. point photo** *(Part E)*	
	☐ **Water quality meas. point photo** *(Part F)*	
	☐ **Water quality sample setup photo** *(Part F)*	
	☐ **Other photo**	
Documents *(PDF)*	☐**Driller's log** *(part b)*	
	☐ **Water use log** *(part d)*	
	☐**Landholder agreement** *(part e)*	
	☐ **Water level log** *(part e)*	
	☐ **Water quality sample lab results from this baseline assessment** *(part f)*	
	☐ **Water quality historical lab results** *(part f)*	
	☐ **Water quality historical field results** *(part f)*	
	☐ **Other document**	

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BORE IMPACT ASSESSMENT GUIDELINE

BYLONG MINE

VERSION: 1

DATE: 19 DECEMBER 2017

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1 INTRODUCTION AND BACKGROUND

Compensatory Water Supply Agreements between KEPCO Bylong Australia Pty Ltd (KEPCO) and private landholders are supported by the following two guidelines designed to ensure a consistent approach to implementation of each agreement:

- Baseline Assessment Guideline; and
- Bore Impact Assessment Guideline.

The first element is the Baseline Assessment Guideline, which describes how baseline information is collected from water bores and wells located on private property in proximity to the Bylong Coal Project (the Project). The Baseline Assessment Guideline is followed prior to, or at the commencement of a Compensatory Water Supply Agreement.

The second element is the Bore Impact Assessment Guideline which provides details of the procedures KEPCO will follow to assess if a private bore has been impacted by the Project. The Bore Impact Assessment Guideline will be followed when either KEPCO or the landholder issue a notification under the Compensatory Water Supply Agreements (Section 7.1 and 7.2) that a water supply has been adversely impacted.

This document presents the Bore Impact Assessment Guideline designed to assist in determining whether a bore's water levels, and supply capacity has been impacted. Bore impact assessments will aim to establish whether a bore has an impacted capacity to supply water as a result of activities associated with the Project.

The bore impact assessment also determines whether compensatory water supply measures are required as part of a Compensatory Water Supply Agreement between KEPCO and the bore owner. Compensatory Water Supply Agreements ensure that the bore owner is not disadvantaged if their bore is impacted as a result of the Project.

The bore impact assessment process is triggered in two ways. The first method is by Landholder notification. This is actioned by the landholder notifying KEPCO that there has been an impact to their bore and the landholder has provided KEPCO with reasonable evidence to progress to a bore impact assessment, as per section 7.1 of the Compensatory Water Supply Agreement. The second method of triggering a bore impact assessment is by KEPCO notification. This is actioned by KEPCO detecting changes in water level via KEPCO monitoring, as per section 7.2 of the Compensatory Water Supply Agreement.

A baseline assessment, which is carried out prior to a bore impact assessment, is conducted first and applies to any water bores and wells on private property where the landholder has requested KEPCO to enter into a Compensatory Water Supply Agreement in relation to any unforeseen impacts from the Project. The baseline assessment establishes benchmark data in the unlikely event that the bore or well experiences an impact from the Project.

This document provides a four step process to following notification from landholder as per 7.1a of agreement or KEPCO monitoring shows a drop in water level:

Step 1: Field assessment of the current bore condition.

Step 2: Determination of whether water levels have declined or are predicted to decline.

Step 3: Determination of whether declining water levels are due to the development of the Project by KEPCO, natural fluctuations, prevailing weather conditions, site/ farm activities, land uses, other neighbours pumping etc.

Step 4: Determination of whether the bore can or will continue to provide a reasonable quantity and quality of water for its intended use or purpose.

1.1 NOTICE OF INTENTION TO UNDERTAKE A BORE ASSESSMENT

A bore impact assessment will be initiated promptly with KEPCO providing the owner notice when the bore impact assessment will be undertaken. The notice will also include details regarding who will be undertaking the bore impact assessment.

1.2 IMPACTED CAPACITY OF A WATER BORE

The purpose of a bore impact assessment is to establish whether a bore has been adversely impacted due to the Project. The bore or well is considered to have an adversely impacted if a decline in water level impacts the bore's ability to provide a reasonable quantity or quality of water for the intended use or purpose.

An existing water bore has an impacted capacity if:

- There is a decline in the water level of an aquifer at the location of the bore and the Project has caused or materially contributed to the decline; and
- Because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its intended use or purpose.

A new water bore has an impacted capacity if:

- There is a decline in the water level of the aquifer at the location of the bore and the Project has caused or materially contributed to the decline; and
- The decline is more than the decline predicted at the location of the bore; and because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its intended use or purpose.

1.3 METHOD FOR UNDERTAKING A BORE IMPACT ASSESSMENT

This guideline provides a method for undertaking a bore impact assessment to determine whether a bore an impacted capacity as a direct result of the Project. The method provides the requirements for undertaking a bore impact assessment on a water bore or well where KEPCO is required to evaluate

whether there is a decline in water level as a result of the Project, which has caused or is likely to cause the bore or well to have an impacted capacity. KEPCO will undertake a bore impact assessment:

- When a landholder notifies KEPCO as per 7.1a of the Compensatory Water Supply Agreement; and
- When KEPCO monitoring shows a decline, as per 7.2 of the Compensatory Water Supply Agreement.

1.4 BORE OWNER RESPONSIBILITIES

Landholders with water bores on their land are expected to comply with any reasonable request for information from KEPCO, if they possess the information. It is intended that the provision of this information will result in more accurate bore impact assessment and consequently assist in the negotiation of any required Compensatory Water Supply Measures.

KEPCO may need to ask landowners for information about:

- The location of any water bores on the owner's land; and
- Any other information KEPCO may reasonably require to undertake a bore impact assessment of any bores on the owner's land.

2 COLLECTION OF DATA AND QUALIFICATIONS FOR ALL BORE IMPACT ASSESSMENTS UNDERTAKEN

2.1 MINIMUM QUALIFICATIONS FOR PERSONS UNDERTAKING BORE IMPACT ASSESSMENTS

2.1.1 Minimum Requirements

KEPCO will ensure that the person undertaking the field measurements required for a bore impact assessment possess:

1. A minimum of two years professional experience in at least one of the following fields:
    a) Underground water level monitoring programs, including monitoring of water level in bores equipped with pumping infrastructure;
    b) The conduct of underground water quality sampling programs; and
    c) Hydrogeology and/or groundwater engineering.
2. A practical knowledge of water bore construction and infrastructure.

Experience requirements in the fields of water level monitoring, water quality sampling and hydrogeology or engineering ensure that the persons undertaking bore impact assessments possess a practical knowledge of water bore construction and infrastructure. These minimum qualifications for field data collection personnel are required to ensure integrity and quality of the data collected. Failure to use appropriate field data collection personnel may affect the quality of data collected, and the subsequent Compensatory Water Supply Agreement.

2.2 QUALITY ASSURANCE AND QUALITY CONTROL

2.2.1 Minimum Requirements

3. KEPCO will develop a quality assurance program, and undertake bore impact assessments in accordance with this program.
4. The quality assurance program will include quality control procedures consistent with the principles of the following documents or subsequent versions thereof:
    - The Australian/New Zealand Standard Water Quality – “Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples” (AS/NZS 5667.1:1998); and
    - The Australian/New Zealand Standard Water quality – “Sampling, Part 11: Guidance on sampling of groundwaters” (AS/NZS 5667.11:1998).

Quality control procedures may include requirements such as performance of work by two personnel, thus enabling field checks, and analysis of duplicate water quality samples.

Considerable literature already exists on the topic of underground water monitoring and sampling. In addition to the minimum requirements for quality assurance and quality control, relevant industry standards that should be referenced include, but are not limited to, the below or subsequent versions thereof:

- Geoscience Australia, (2009), "Groundwater Sampling and Analysis – A Field Guide"; and
- Murray-Darling Basin Commission, (1997), "Murray Darling Basin Groundwater Quality Sampling Guidelines", Technical Report No. 3, Groundwater Working Group.

3 WATER LEVEL DECLINE

Undertaking a bore impact assessment to determine whether the bore has an impacted capacity as a result of the development of the Project causing a decline in the water level of the aquifer at the bore's location, will involve the following four steps:

Step 1: Field assessment of the current bore condition.

Step 2: Determination of whether water levels have declined or are predicted to decline.

Step 3: Determination of whether declining water levels are due to the development of the Project by KEPCO.

Step 4: Determination of whether the bore can or will continue to provide a reasonable quantity and quality of water for its intended use or purpose.

For steps 1 – 3, there are certain circumstances where the bore impact assessment may be completed without progressing through the remaining steps. Figure 1 below summaries the bore impact assessment steps for determining whether a bore has an impacted capacity due to water level decline from KEPCOs development of the Project.

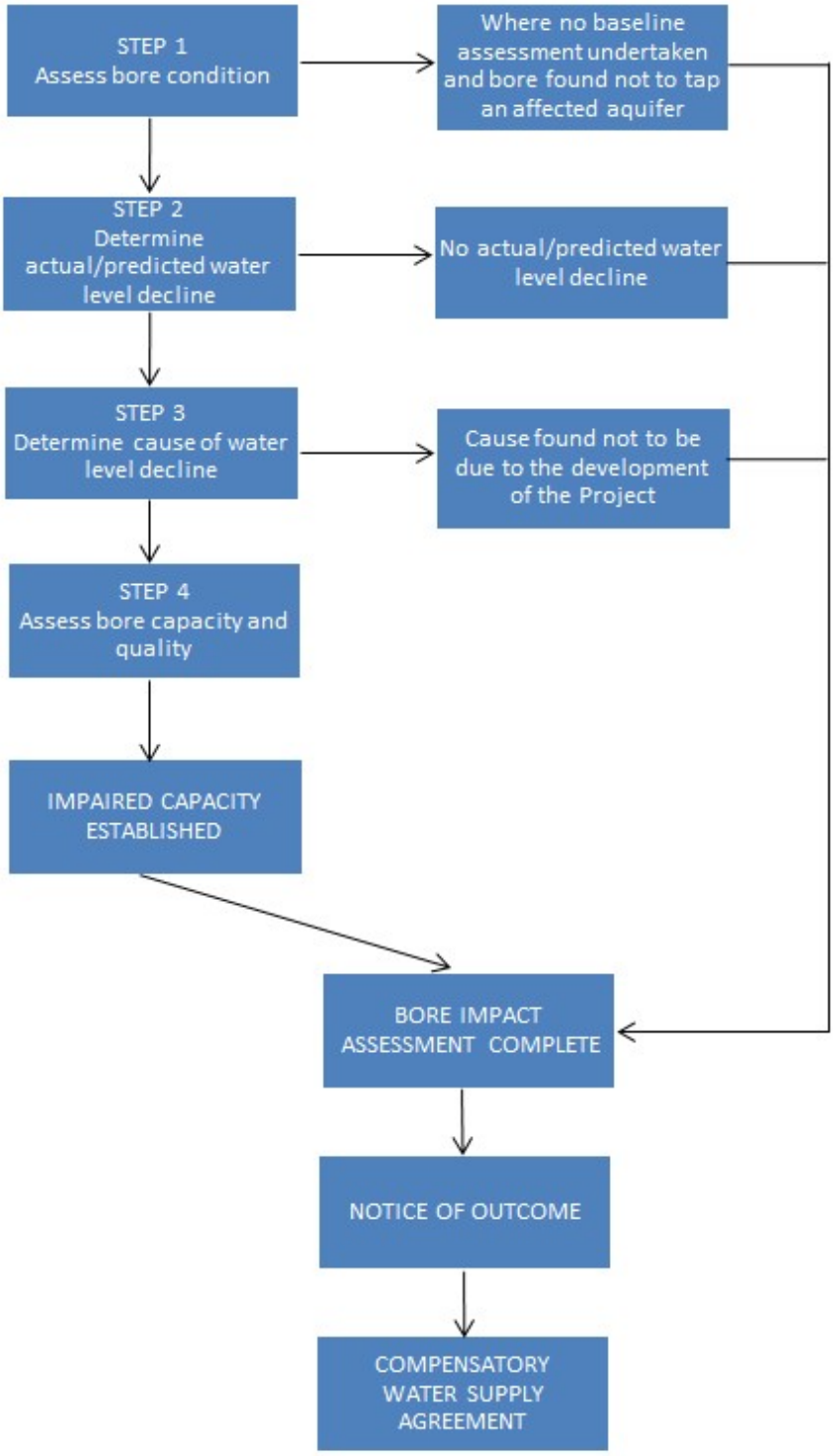

Figure 1 Process for Undertaking a Bore Impact Assessment for Water Level Decline

3.1 STEP 1 – FIELD ASSESSMENT

The initial step in determining whether a bore has impacted capacity requires the measurement of the current bore condition. This is then compared to information documented in the baseline assessment. If a baseline assessment has not been undertaken for a bore, a field assessment may demonstrate that the bore does not actually tap an affected aquifer. In these circumstances, KEPCO may finalise the bore impact assessment without completing any further steps, and submit the outcomes of this step to the landholder.

3.1.1 Minimum Requirements

1. When assessing the current bore condition, the bore impact assessment will be carried out in accordance with the requirements for completing a baseline assessment.
2. The bore impact assessment will verify bore details that remain unchanged from the baseline assessment.
3. The bore impact assessment will state any variation to the current bore condition from the baseline assessment.
4. If a baseline assessment has previously been carried out, and the method for carrying out the bore impact assessment is different, the use of a different method will be fully explained and noted.

To enable an accurate determination about whether a bore has an impacted capacity as a result of the development of the Project, it is essential that bore impact assessments are carried out in a manner consistent with the requirements for carrying out a baseline assessment (refer to Baseline Assessment Guidelines).

Where a baseline assessment has been previously carried out, some of the information will likely be unchanged when undertaking the bore impact assessment (e.g. bore site and construction details). Where this is the case, it is important that the bore impact assessment verifies these details and notes that they are unchanged.

Where a variation exists, for example where a bore has been reconditioned and the head-works or casing has changed, these details will be clearly noted.

There are a range of circumstances where a bore impact assessment will have to be carried out differently to how the baseline assessment was conducted. For example, there may be a change in bore equipment or conditions which requires a different sampling method to be employed. All variations will be explained and clearly noted in all recordings to establish the extent to which data can be compared.

3.2 STEP 2 – DETERMINING WATER LEVEL DECLINE

Step two involves determining whether the water level in the bore has declined. To make this determination, comparisons will be made with the relevant baseline assessment, historical water level measurements and any other pertinent information relating to the bore or the aquifer in the region.

3.2.1 Minimum Requirements

1. To determine whether the water level in the bore has declined, comparisons will be made with the baseline assessment data collected for the water bore and based on the same reference point.
2. Where baseline assessment data is not available, or a baseline assessment has not been carried out, all available water level data will be considered to estimate historic water levels.
3. The sources of information used to determine the historical water level will be clearly noted.
4. The magnitude and time period of water level decline will be clearly noted when comparing current water level/data and historic water level/data.
5. For new bores, comparisons will be made between any declines in water levels that have occurred for the bore and declines in water levels that were predicted.
6. For new bores, assumptions about the rate of decline will be stated for overlapping but non-identical time periods.

If it has been established that the bore does not have an impacted capacity (i.e. no water level decline has occurred or is predicted to occur), KEPCO may finalise the bore impact assessment without completing any further steps and submit the outcomes of the steps that have been taken to the landholder.

3.3 STEP 3 – DETERMINING IF WATER LEVEL DECLINES RESULT FROM THE PROJECT

Step 3 involves determining if the development of the Project has caused or materially contributed to a water decline at the location of a bore.

3.3.1 Minimum Requirements

1. When assessing the extent to which the development of the Project has caused or materially contributed to a decline in groundwater level, the following information will be referred to:
    a) Whether declines were predicted to occur in the area in the relevant aquifer.
    b) The proximity of the bore to the Project.
    c) Assessment of the connectivity between aquifers supporting the water bore and the Project – this will include reviewing monitoring undertaken by KEPCO between the Project and the landholder bore.

d) Any available data on groundwater level trends in bores in the vicinity of the water bore that tap the same aquifer to determine if declines are localised or regional. This could include government monitoring bores and bores on neighbouring properties.

e) Assessment of regional groundwater elevation contours to determine if there is any evidence of drawdown expanding outwards from the Project.

2. To demonstrate that the development of the Project is not the cause, or has not materially contributed to the decline in water levels, an investigation of other possible causes for the declining water levels will be undertaken and documented.

KEPCO is only responsible for compensatory water supply measures where it is determined that the development of the Project has caused or materially contributed to the decline in water levels.

There are a number of factors that could affect groundwater levels. A bore may not be able to supply a reasonable quantity of water because of natural environmental factors such as drought, or other water extracting activities.

If evidence supports that declining water levels are not due to the development of the Project, an investigation of other possible causes for the declining water levels will be undertaken to justify this conclusion. It is important to note however, for impacted capacity to be established, it is sufficient if the development of the Project has materially contributed to the decline. Therefore, the investigation will conclusively demonstrate that the decline in water level is solely caused by another or other factors.

Appropriate methods for determining other possible causes for declining water levels include but are not limited to:

- **D**etermining whether the current water level/measurement falls within the range of previous water level/measurements (or surrounding bores that tap the same target aquifer);
- Comparing the recent changes in groundwater levels/to long-term trends in measured groundwater levels; and
- Plotting the available water level data against rainfall (e.g. cumulative departure from mean rainfall); and using down-hole cameras and/or geophysical logging (including calliper, neutron/gamma, cement bond log, ultrasonic, temperature, casing collar locator and conductivity logs) to determine whether there are holes in the casing (for example, where the casing has been corroded).

If it has been established that the decline was not a result of the development of the Project, KEPCO may finalise the bore impact assessment without undertaking any further steps and submit the outcomes of the steps that have been taken to the bore owner.

3.4 STEP 2 – DETERMINING WATER LEVEL DECLINE

At this stage, steps two and three have established that there is a decline in the water level of the aquifer at the location of the of the bore and the development of the Project has caused or materially contributed to that decline. The final step to determine the impacted capacity of the water bore is to establish whether the bore can no longer provide a reasonable quantity or quality of water for its intended use or purpose.

3.4.1 Minimum Requirements

1. The current bore yield will be determined.
2. Comparisons will be made with historical data to determine if bore yield has reduced.
3. The sources of historical data will be clearly recorded.
4. The likelihood of reductions in bore yield occurring due to water level declines will be evaluated considering:
    a) Magnitude of the water level decline or predicted water decline;
    b) Aspects of the bore construction (including bore depth and screen depth);
    c) The pump depth; and
    d) Aquifer properties.
5. The following will be referred to when determining if the bore can or will continue to provide a reasonable quantity and quality of water for its intended use or purpose:
    a) Information about the water licence and metered use; and
    b) Existing plans for any allocated water entitlement.

5. Current groundwater quality will be determined through an analysis of collected groundwater samples.
6. Groundwater quality sampling will be undertaken according to the guideline for the baseline assessments and including the analysis of samples by a National Association of Testing Authorities (NATA) accredited laboratory.
7. When comparing two sets of water quality data, the detection limits and analytical methods used for water quality analyses will be equivalent.
8. Where a bore impact assessment indicates that the water quality may be affected in the future due to a decline in water level, the assessment will estimate the extent of impact and evaluate the likelihood of these negative impacts occurring.

To determine the current bore yield, particularly for a water bore frequently utilised by a landholder, the following tests should be conducted:

- Pumping tests or flow/pressure tests; or
- Measurements of flow rate (only where a pumping test is not possible e.g. because of fixed head works).

There may be situations however, where these tests are not practical (e.g. where a water bore is located in a low permeable formation) and other methods such as slug or bail tests may provide useful information for consideration.

The Australian Standard AS2368—1990 Test pumping of water wells should be used when determining the most suitable type and duration of pumping test. It is important that methods for determining bore yield are supported by a rationale which considers the assumptions and limitations of that method in relation to the water bore and the condition of the water bore itself as established under step 1 of this guideline.

If no other historic information is available, comparisons may be made with the bore capacity as listed in the drillers' records. However, this estimate of bore capacity should be used with caution, as it is highly dependent on site specific conditions at the time of drilling and on the methods used to determine bore capacity.

If information about the water licence and metered use is not available, water requirements should be estimated. To estimate the water requirements, the guideline for the baseline assessments may be referred to. Information on estimating water quantity requirements for livestock and domestic use can be found in Appendix A of the abovementioned guideline.

Existing plans for using a water entitlement may include seasonal water assignments that have yet to be allocated to the bore owner.

Negative impacts on water quality that may be associated with water level declines include increases in salinity due to induced flow of water from underlying or overlying formations. To estimate the extent of negative water quality impacts and evaluate the likelihood of these occurring, the following contributing factors can be evaluated:

- Magnitude of the water level decline;
- The connectivity between the target aquifer for the Project and the aquifer where the landholder's bore is screened; and
- Differences in water quality at the water entry zone (i.e. where the bore is screened, slotted, perforated or open to the aquifer) of the landholder's bore and the water quality in aquifers overlying and/or underlying this aquifer.

4 DEFINITIONS / GLOSSARY

Definitions / Glossary	
Analyte	A chemical parameter determined by either physical measurement at the bore head (e.g. electrical conductivity), or by laboratory analysis.
Aquifer	A geological structure, formation or formations that holds water in sufficient quantity to provide a source of water that can be tapped by a bore.
Artesian bore	A bore or well where the water flows, or has flowed, naturally to the surface.
Consolidated aquifer	An aquifer consisting predominantly of consolidated sediment forming rock. The term includes geological formations such as sandstone and basalt.
Datum	An agreed reference point at the bore head. This is usually the top of the casing.
Drawdown	Drawdown means a lowering of the water table of an unconfined aquifer or the potentiometric surface of a confined aquifer caused by extraction of underground water from wells.
Pumping test	A pumping test involves pumping a well at a certain rate and recording the drawdown (decline) of water level in the pumping well and in nearby observation wells over a certain time period. Pumping tests are conducted to determine performance characteristics of a well and to determine the hydraulic properties of the aquifer.
Hydraulic properties	Hydraulic properties mean the quantitative measures of an aquifer's ability to store and transmit water
Meaningful sample	A meaningful sample means that the material sampled is genuinely representative of the body of water from which it was collected (from the location of interest), that in situ measurements are reliable, and that the integrity of materials sent for laboratory analysis has not been compromised by contamination, degradation, transformation or losses.
New water bore	A new water bore has the meaning in section 412 of the Water Act and means a bore other than an existing bore.
Residual drawdown	The depth of the water level calculated by subtracting the static water level before pumping began from appropriate water levels taken during the recovery process.
Sub-artesian bore	A bore or well that taps an aquifer and the water does not flow and never has flowed naturally to the surface.

Unconsolidated aquifer	Flood plain materials ranging from clay to sand and gravel capable of being developed into a water supply bore.
Underground water quality	A term that encompasses the chemical and biological characteristics of the water from a bore. It is assessed by physical measurements at the bore head and follow-up laboratory analysis of sample/s of the water.
Water level	If the aquifer were tapped by a sub-artesian bore - the level of the water in the bore.
Analyte	A chemical parameter determined by either physical measurement at the bore head (e.g. electrical conductivity), or by laboratory analysis.
Aquifer	A geological structure, formation or formations that holds water in sufficient quantity to provide a source of water that can be tapped by a bore.
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Hydraulic properties	Hydraulic properties mean the quantitative measures of an aquifer's ability to store and transmit water

5 REVISION HISTORY

Internal Version History and Approval Register

Version	Version Date	Description of Changes	Approved By
1	19/12/17	Guideline for Stakeholder Consultation	

6 REFERENCES

Committee CE/28. (1990), *AS2368—1990 Test pumping of water wells*.

Joint Technical Committee EV/8. (2016), *AS/NZS 5667:11 1998 Water quality - Sampling - Guidance on sampling of groundwaters*.

Sundaram, B. et al. (2009), *Groundwater Sampling and Analysis—A Field Guide*.