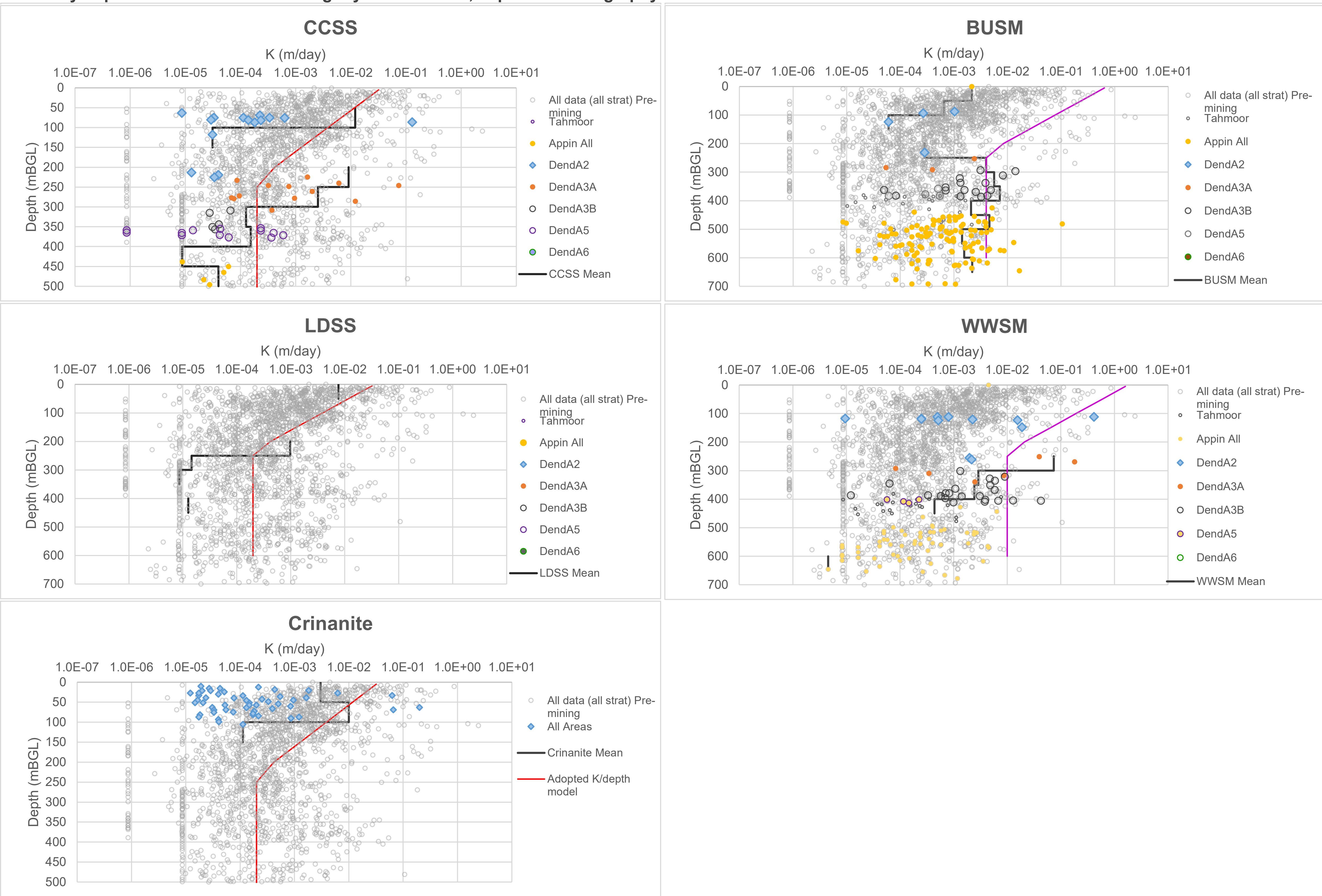
Appendix A: Hydraulic conductivity data

Summary of packer and drillstrem testing: by Area/Domain, depth and stratigraphy

Summary of packer and drillstrem testing: by Area/Domain, depth and stratigraphy



E:\DENDROBIUM\Tech\AquiferProperties\[Dendrobium_AquiferPropertiesDatabase_20210413.xlsx]Dend_AreaStrat

Appendix B: Groundwater model history

In response to a request by WaterNSW, the following table summarises the history and key features of groundwater modelling for Dendrobium Mine.

Report	Project / Requirement	Software	Grid	Key features	Other features	Peer Review
GHD, 2007. Document: 21/11716/03/AY116.	Area 3 Application	SEEP/W v.6.20	2D “slice” or cross-section model	2D slice model focussing on Area 3A.	Simulated mining: Areas 2-3A Layers: n/a (finite element model). Recharge: estimated as ~2.5% of rainfall. Hydraulic conductivity: zones. Inflow calibration: not calibrated to inflow.	
Coffey, 2012. Document: GEOTLCOV 24507AA-AB2.	Area 3B SMP Approval	MODFLOW-SURFACT v.3	3D rectilinear grid. Detail around A3B.	Fractured zone representation: ‘Stacked Drains’. Height of connected fracturing estimated by: Tammetta (2012) H.	Simulated mining: Areas 1-3B. Layers: 15. Recharge: estimated as 2.7% of rainfall. Hydraulic conductivity: zones. Inflow calibration: total mine inflow.	Noel Merrick (Heritage Computing)
HydroSimulations, 2013. Document: HC2013-28.	A3B SMP approval condition	MF-SURFACT v.3	3D (as for Coffey, 2012)	Fracture zone representation: as for Coffey, 2012. Improved representation of topography. Improved simulation of watercourses (MODFLOW-SFR) and included swamp deposits/regolith.	Simulated mining: Areas 1-3B. Layers: 16 (swamp deposits added). Recharge: as per Coffey, 2012 Hydraulic conductivity: zones. Inflow calibration: total mine inflow.	
HydroSimulations, 2014. Document: HC2014-04.	A3B SMP approval condition / DPIE request	MF-SURFACT v.3	3D (as for Coffey, 2012)	Fractured zone represented: transient material properties (TMP). Height of connected fracturing estimated by: Ditton (2012) A-zone.	Simulated mining: Areas 1-3B. Layers: 16. Recharge: as per Coffey, 2012 Hydraulic conductivity: zones. Inflow calibration: total mine inflow.	
HydroSimulations, 2016. Document: HC2016-02c.	Longwalls 14-18 SMP Application	MODFLOW-USG (‘transport’)	3D (as for Coffey, 2012)	Fractured zone representation: Connected Linear Networks (CLN). Height of connected fracturing estimated as Ditton (2014) A and as Tammetta H. First incorporation of surface cracking via time-varying material properties (TVM) package. Reservoirs simulated with transient stage for historical period.	Simulated mining: Areas 1-3B. Layers: 16. Recharge: soil moisture balance model calibrated against independent estimates. Hydraulic conductivity: zones. Inflow calibration: total mine inflow.	
HydroSimulations, 2017. Document: HS2017-37e.	Longwalls 16-18 SMP Application	MF-USG-T	3D (as for Coffey, 2012)	Fractured zone representation: Stacked Drains with high conductance in line with PSM (2017) conceptualisation. Assumed seam-to-surface connection as per PSM conceptualisation for >300m panels (otherwise Tammetta H). Incorporation of off-goaf valley closure via TVM. Improved representation of surface cracking depth, surface cracking modelled via TVM. Watercourses simulated w\ MODFLOW River package.	Simulated mining: Areas 1-3B. Layers: 17 (additional layer to allow swamps to sit about uppermost rock layer). Recharge: soil moisture balance model calibrated against independent estimates. Hydraulic conductivity: zones. Inflow calibration: area-by-area calibration.	Frans Kalf (Kalf and Associates)
HydroSimulations, 2019a.	Longwall 17 SMP Application	MF-USG-T		Fractured zone representation: primarily Stacked Drains with high conductance in line with PSM (2017) conceptualisation.	Simulated mining: Areas 1-3B.	

Report	Project / Requirement	Software	Grid	Key features	Other features	Peer Review
Document: HS2018-72c.			3D (as for Coffey, 2012)	Assumed seam-to-surface connection as per PSM conceptualisation for >300m panels (otherwise Tammetta H). Surface cracking and off-goaf valley closure via TVM.	Layers: 17. Recharge: soil moisture balance model calibrated against independent estimates. Hydraulic conductivity: zones. Inflow calibration: area-by-area calibration.	Frans Kalf (Kalf and Associates)
HydroSimulations, 2019b. Document: HS2019-19g.	Longwall 20-21 SMP Application	MF-USG-T	3D (as for Coffey, 2012)	Fractured zone representation: primarily Stacked Drains with high conductance in line with PSM (2017) conceptualisation. Assumed seam-to-surface connection as per PSM conceptualisation for >300m panels (otherwise Tammetta H). Surface cracking and off-goaf valley closure via TVM.	Simulated mining: Areas 1-3B + 3C (20-21). Layers: 17 Recharge: soil moisture balance model calibrated against independent estimates and against BoM AWRA model. Hydraulic conductivity: zones. Inflow calibration: area-by-area calibration.	
HydroSimulations, 2019c. Document: HS2018-76.	Area 5 and 6 EIS	MF-USG-T	3D unstructured mesh, detail around longwalls, local watercourses	Fractured zone representation: primarily Stacked Drains with new method for estimating conductance → better groundwater level and inflow calibration. Assumed seam-to-surface connection as per PSM conceptualisation for >300m panels (otherwise Tammetta H). Surface cracking / off-goaf valley closure via TVM.	Simulated mining: Areas 1-3B + 3C + A5 + A6 Layers: 17 Recharge: soil moisture balance model calibrated against independent estimates and against BoM AWRA model. Hydraulic conductivity: K/depth relationship and zones. Inflow calibration: area-by-area calibration.	Frans Kalf (Kalf and Associates)
SLR, 2020a Document: 665.10009-R02.	Longwall 19 SMP Application	MF-USG-T v.1.3	3D (as for Coffey, 2012)	Fractured zone representation: primarily Stacked Drains using drain conductance parameters from HydroSimulations, 2019c. Assumed seam-to-surface connection as per PSM conceptualisation for >300m panels (otherwise Tammetta H). Surface cracking / off-goaf valley closure via TVM.	Simulated mining: Areas 1-3B. Layers: 17 Recharge: soil moisture balance model calibrated against independent estimates and against BoM AWRA model. Hydraulic conductivity: zones. Inflow calibration: area-by-area calibration.	Frans Kalf (Kalf and Associates)
WatershedHG, 2020 and 2021		MF-USG-T v.1.4.0	3D unstructured. Modified from HS (2019c). 50m regular mesh applied in A3C/5/6 longwalls.	Fractured zone representation: TVM, constrained by data from centreline goaf bore investigations (e.g. HGEO, 2020). Surface cracking and off-goaf valley closure via TVM. Applied 'Stacked Drains' to improve estimation of surface water losses in headwater streams.	Simulated mining: Areas 1-3B + 3C (to LW23) Layers: 17 Recharge: soil moisture balance model calibrated against independent estimates and against BoM AWRA model. Hydraulic conductivity: K/depth relationship and zones. Inflow calibration: area-by-area calibration. Comparison and calibration to surface water losses from EOPs.	
Document: R014i4. (2020)	Longwall 18 SMP Application					
Document: R016i6. (2021)	Longwalls 22 and 23 SMP application					

Appendix C: Groundwater model temporal discretisation

Stage	SP	Days	DateFrom	DateTo	Scheduled Mining	Rainfall / Inflow signal	Total days
	1	***Steady State***					1
CALIBRATION	**2**	18993	1/01/1940	31/12/1991			18994
	3	3608	1/01/1992	16/11/2001			22602
	4	20	17/11/2001	6/12/2001			22622
	5	20	7/12/2001	26/12/2001			22642
	6	20	27/12/2001	15/01/2002			22662
	7	40	16/01/2002	24/02/2002			22702
	8	100	25/02/2002	4/06/2002			22802
	9	100	5/06/2002	12/09/2002			22902
	10	100	13/09/2002	21/12/2002			23002
	11	200	22/12/2002	9/07/2003			23202
	12	200	10/07/2003	25/01/2004			23402
	13	200	26/01/2004	12/08/2004			23602
	14	232	13/08/2004	1/04/2005			23834
	15	90	2/04/2005	30/06/2005	Start LW1		23924
	16	90	1/07/2005	28/09/2005			24014
	17	74	29/09/2005	11/12/2005	End LW1		24088
	18	60	12/12/2005	9/02/2006			24148
	19	60	10/02/2006	10/04/2006	Start LW2		24208
	20	95	11/04/2006	14/07/2006			24303
	21	95	15/07/2006	17/10/2006			24398
	22	96	18/10/2006	21/01/2007	End LW2		24494
	23	99	22/01/2007	30/04/2007	Start LW3		24593
	24	44	1/05/2007	13/06/2007			24637
	25	4	14/06/2007	17/06/2007		A2rain1	24641
	26	8	18/06/2007	25/06/2007		A2week1	24649
	27	43	26/06/2007	7/08/2007		A2inflow1	24692
	28	100	8/08/2007	15/11/2007	End LW3		24792
	29	33	16/11/2007	18/12/2007			24825
	30	47	19/12/2007	3/02/2008	Start LW4		24872
	31	6	4/02/2008	9/02/2008		A2 Rain2	24878
	32	8	10/02/2008	17/02/2008		A2 week2	24886
	33	36	18/02/2008	24/03/2008		A2 inflow2	24922
	34	50	25/03/2008	13/05/2008			24972
	35	32	14/05/2008	14/06/2008			25004
	36	110	15/06/2008	2/10/2008	End LW4		25114
	37	31	3/10/2008	2/11/2008			25145
	38	30	3/11/2008	2/12/2008			25175
	39	31	3/12/2008	2/01/2009	Start LW5		25206
	40	60	3/01/2009	3/03/2009			25266
	41	60	4/03/2009	2/05/2009			25326
	42	17	3/05/2009	19/05/2009			25343
	43	5	20/05/2009	24/05/2009		A2rain3	25348
	44	8	25/05/2009	1/06/2009		A2week3	25356
	45	22	2/06/2009	23/06/2009		A2inflow3	25378
	46	88	24/06/2009	19/09/2009			25466
	47	90	20/09/2009	18/12/2009	End LW5		25556
	48	53	19/12/2009	9/02/2010			25609
	49	105	10/02/2010	25/05/2010	Start LW6		25714
	50	10	26/05/2010	4/06/2010		A2rain4	25724
	51	8	5/06/2010	12/06/2010		A2week4	25732
	52	22	13/06/2010	4/07/2010		A2inflow4	25754
	53	75	5/07/2010	17/09/2010			25829
	54	72	18/09/2010	28/11/2010			25901
	55	9	29/11/2010	7/12/2010		A2rain5	25910
	56	8	8/12/2010	15/12/2010		A2week5	25918
	57	22	16/12/2010	6/01/2011		A2inflow5	25940
	58	71	7/01/2011	18/03/2011			26011
	59	4	19/03/2011	22/03/2011		A2rain6	26015
	60	8	23/03/2011	30/03/2011	End LW6	A2week6	26023
	61	60	31/03/2011	29/05/2011	StartLW7	A2inflow6	26083
	62	4	30/05/2011	2/06/2011		A2rain7	26087
	63	8	3/06/2011	10/06/2011		A2week7	26095
	64	38	11/06/2011	18/07/2011		A2inflow7	26133
	65	5	19/07/2011	23/07/2011		A2rain8	26138
	66	8	24/07/2011	31/07/2011		A2inflow8	26146
	67	22	1/08/2011	22/08/2011		A2inflow8	26168
	68	69	23/08/2011	30/10/2011			26237
	69	85	31/10/2011	23/01/2012	End LW7		26322
	70	35	24/01/2012	27/02/2012	Start LW8		26357

Stage	SP	Days	DateFrom	DateTo	Scheduled Mining	Rainfall / Inflow signal	Total days
	71	11	28/02/2012	9/03/2012		A2rain9	26368
	72	8	10/03/2012	17/03/2012		A2week9	26376
	73	31	18/03/2012	17/04/2012		A2inflow9	26407
	74	85	18/04/2012	11/07/2012			26492
	75	85	12/07/2012	4/10/2012			26577
	76	86	5/10/2012	29/12/2012	End LW8		26663
	77	41	30/12/2012	8/02/2013			26704
	78	11	9/02/2013	19/02/2013	Start LW9		26715
	79	12	20/02/2013	3/03/2013		A2rain10	26727
	80	8	4/03/2013	11/03/2013		A2week10	26735
	81	22	12/03/2013	2/04/2013		A2inflow10	26757
	82	80	3/04/2013	21/06/2013			26837
	83	9	22/06/2013	30/06/2013		A2rain11	26846
	84	8	1/07/2013	8/07/2013		A2week11	26854
	85	22	9/07/2013	30/07/2013		A2inflow11	26876
	86	48	31/07/2013	16/09/2013			26924
	87	106	17/09/2013	31/12/2013	End LW9		27030
	88	77	1/01/2014	18/03/2014	Start LW10		27107
	89	13	19/03/2014	31/03/2014		A2rain12	27120
	90	8	1/04/2014	8/04/2014		A2week12	27128
	91	22	9/04/2014	30/04/2014		A2inflow12	27150
	92	107	1/05/2014	15/08/2014			27257
	93	12	16/08/2014	27/08/2014		A2rain13	27269
	94	8	28/08/2014	4/09/2014		A2week13	27277
	95	22	5/09/2014	26/09/2014		A2inflow13	27299
	96	106	27/09/2014	10/01/2015	End LW10		27405
	97	96	11/01/2015	16/04/2015	Start LW11		27501
	98	16	17/04/2015	2/05/2015		A2rain14	27517
	99	8	3/05/2015	10/05/2015		A2week14	27525
	100	45	11/05/2015	24/06/2015		A2inflow14	27570
	101	196	25/06/2015	6/01/2016	End LW11		27766
	102	149	7/01/2016	3/06/2016	Start LW 12		27915
	103	7	4/06/2016	10/06/2016		rain15	27922
	104	20	11/06/2016	30/06/2016			27942
	105	233	1/07/2016	18/02/2017	End LW 12		28175
	106	71	19/02/2017	30/04/2017	Start LW 13		28246
	107	92	1/05/2017	31/07/2017			28338
	108	92	1/08/2017	31/10/2017			28430
	109	120	1/11/2017	28/02/2018	End LW 13		28550
	110	61	1/03/2018	30/04/2018	Start LW 14		28611
	111	92	1/05/2018	31/07/2018			28703
	112	92	1/08/2018	31/10/2018			28795
	113	61	1/11/2018	31/12/2018	End LW 14		28856
	114	90	1/01/2019	31/03/2019	Start LW 15		28946
	115	61	1/04/2019	31/05/2019			29007
	116	61	1/06/2019	31/07/2019			29068
	117	61	1/08/2019	30/09/2019			29129
	118	92	1/10/2019	31/12/2019	End LW 15		29221
	119	59	1/01/2020	28/02/2020			29280
	120	62	29/02/2020	30/04/2020	Start LW 16		29342
	121	61	1/05/2020	30/06/2020			29403
	122	92	1/07/2020	30/09/2020			29495
	123	61	1/10/2020	30/11/2020	End LW 16		29556
	124	62	1/12/2020	31/01/2021	Start LW 17		29618
PREDICTION	**125**	59	1/02/2021	31/03/2021			29677
	126	61	1/04/2021	31/05/2021			29738
	127	61	1/06/2021	31/07/2021			29799
	128	61	1/08/2021	30/09/2021	End LW 17		29860
	129	61	1/10/2021	30/11/2021	Start LW 18		29921
	130	31	1/12/2021	31/12/2021			29952
	131	59	1/01/2022	28/02/2022			30011
	132	61	1/03/2022	30/04/2022	End LW 18		30072
	133	61	1/05/2022	30/06/2022	Start LW 19		30133
	134	31	1/07/2022	31/07/2022			30164
	135	61	1/08/2022	30/09/2022			30225
	136	92	1/10/2022	31/12/2022	End LW 19		30317
	137	31	1/01/2023	31/01/2023	Start LW 21		30348
	138	59	1/02/2023	31/03/2023			30407
	139	30	1/04/2023	30/04/2023	End LW 21		30437
	140	71	1/05/2023	10/07/2023			30508

Stage	SP	Days	DateFrom	DateTo	Scheduled Mining	Rainfall / Inflow signal	Total days
	141	52	11/07/2023	31/08/2023	Start LW 22		30560
	142	122	1/09/2023	31/12/2023			30682
	143	121	1/01/2024	30/04/2024	End LW 22		30803
	144	123	1/05/2024	31/08/2024			30926
	145	30	1/09/2024	30/09/2024	Start LW 23		30956
	146	151	1/10/2024	28/02/2025			31107
	147	92	1/03/2025	31/05/2025	End LW 23		31199
	148	92	1/06/2025	31/08/2025			31291
	149	61	1/09/2025	31/10/2025	Start LW20		31352
	150	61	1/11/2025	31/12/2025			31413
	151	90	1/01/2026	31/03/2026	End LW20		31503
	152	153	1/04/2026	31/08/2026			31656
POST-MINING	**153**	122	1/09/2026	31/12/2026			31778
	154	90	1/01/2027	31/03/2027			31868
	155	91	1/04/2027	30/06/2027	End LW 501W		31959
	156	153	1/07/2027	30/11/2027	Start LW 502W		32112
	157	122	1/12/2027	31/03/2028			32234
	158	91	1/04/2028	30/06/2028	End LW 502W		32325
	159	153	1/07/2028	30/11/2028	Start LW 503W		32478
	160	121	1/12/2028	31/03/2029			32599
	161	91	1/04/2029	30/06/2029	End LW 503W		32690
	162	153	1/07/2029	30/11/2029	Start LW 504W		32843
	163	121	1/12/2029	31/03/2030			32964
	164	122	1/04/2030	31/07/2030	End LW 504W		33086
	165	61	1/08/2030	30/09/2030	Start LW 505WA		33147
	166	61	1/10/2030	30/11/2030			33208
	167	31	1/12/2030	31/12/2030	End LW 505WA		33239
	168	365	1/01/2031	31/12/2031	Start LW 505WB		33604
	169	366	1/01/2032	31/12/2032	End LW 505WB		33970
	170	365	1/01/2033	31/12/2033	Start LW 505WC		34335
	171	365	1/01/2034	31/12/2034			34700
	172	365	1/01/2035	31/12/2035	End LW 505WC		35065
	173	366	1/01/2036	31/12/2036	Start LW 506WA		35431
	174	365	1/01/2037	31/12/2037			35796
	175	365	1/01/2038	31/12/2038	End LW 506WA		36161
	176	365	1/01/2039	31/12/2039	Start LW506WB		36526
	177	366	1/01/2040	31/12/2040			36892
	178	365	1/01/2041	31/12/2041	End LW506WB		37257
	179	365	1/01/2042	31/12/2042	Start LW 506WC		37622
	180	365	1/01/2043	31/12/2043			37987
	181	366	1/01/2044	31/12/2044	End LW 506WC		38353
	182	365	1/01/2045	31/12/2045	Start LW507W		38718
	183	365	1/01/2046	31/12/2046			39083
	184	365	1/01/2047	31/12/2047			39448
	185	366	1/01/2048	31/12/2048	End LW 507W		39814
	186	365	1/01/2049	31/12/2049	Start LW 508WA		40179
	187	365	1/01/2050	31/12/2050			40544
	188	365	1/01/2051	31/12/2051	End LW 508WA		40909
	189	366	1/01/2052	31/12/2052	Start LW 508WB		41275
	190	365	1/01/2053	31/12/2053			41640
	191	365	1/01/2054	31/12/2054	End LW 508WB		42005
	192	365	1/01/2055	31/12/2055	Start LW 502E		42370
	193	366	1/01/2056	31/12/2056			42736
	194	365	1/01/2057	31/12/2057	End LW 502E		43101
	195	365	1/01/2058	31/12/2058	Start LW503E		43466
	196	365	1/01/2059	31/12/2059			43831
	197	366	1/01/2060	31/12/2060	End LW503E		44197
	198	1826	1/01/2061	31/12/2065	Start LW 501S		46023
	199	1826	1/01/2066	31/12/2070			47849
	200	3653	1/01/2071	31/12/2080	End LW501S		51502
	201	3652	1/01/2081	31/12/2090	Start LW 502S		55154
	202	3652	1/01/2091	31/12/2100			58806
	203	36524	1/01/2101	31/12/2200	End LW502S		95330

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Appendix D: Groundwater model 'Confidence Classification'

The following pages present the Model Confidence Classification as per the *Australian Groundwater Modelling Guidelines* (Barnett *et a*l., 2012).

Model Confidence Classification:
Dendrobium Area 3C: Longwalls 22-23 SMP - Groundwater model.
(April 2021)

Table 2-1: Model confidence level classification—characteristics and indicators

Confidence level classification	*Data*	*Calibration*	*Prediction*	*Key indicator*	*Examples of specific uses*
Class 3	• Spatial and temporal distribution of groundwater head observations adequately define groundwater behaviour, especially in areas of greatest interest and where outcomes are to be reported. • * Spatial distribution of bore logs and associated stratigraphic interpretations clearly define aquifer geometry. • Reliable metered groundwater extraction and injection data is available. • * Rainfall and evaporation data is available. • * Aquifer-testing data to define key parameters. • Streamflow and stage measurements are available with reliable baseflow estimates at a number of points. • Reliable land-use and soil-mapping data available. • Reliable irrigation application data (where relevant) is available. • * Good quality and adequate spatial coverage of digital elevation model to define ground surface elevation.	• Adequate validation* is demonstrated. • * Scaled RMS error (refer Chapter 5) or other calibration statistics are acceptable. • * Long-term trends are adequately replicated where these are important. • Seasonal fluctuations are adequately replicated where these are important. • * Transient calibration is current, i.e. uses recent data. • * Model is calibrated to heads and fluxes. • Observations of the key modelling outcomes dataset is used in calibration. ✓ Inflow ✓ GWLs ✓ Watercourse impacts ☒ Reservoir leakage	• Length of predictive model is not excessive compared to length of calibration period. • * Temporal discretisation used in the predictive model is consistent with the transient calibration. • Level and type of stresses included in the predictive model are within the range of those used in the transient calibration. • Model validation* suggests calibration is appropriate for locations and/or times outside the calibration model. • Steady-state predictions used when the model is calibrated in steady-state only.	• * Key calibration statistics are acceptable and meet agreed targets. • Model predictive time frame is less than 3 times the duration of transient calibration. • * Stresses are not more than 2 times greater than those included in calibration. • * Temporal discretisation in predictive model is the same as that used in calibration. • * Mass balance closure error is less than 0.5% of total. • Model parameters consistent with conceptualisation. • * Appropriate computational methods used with appropriate spatial discretisation to model the problem. • * The model has been reviewed and deemed fit for purpose by an experienced, independent hydrogeologist with modelling experience.	• Suitable for predicting groundwater responses to arbitrary changes in applied stress or hydrological conditions anywhere within the model domain. • Provide information for sustainable yield assessments for high-value regional aquifer systems. • Evaluation and management of potentially high-risk impacts. • Can be used to design complex mine-dewatering schemes, salt-interception schemes or water-allocation plans. • Simulating the interaction between groundwater and surface water bodies to a level of reliability required for dynamic linkage to surface water models. • Assessment of complex, large-scale solute transport processes.
Class 2 *Cont'd overleaf*	• * Groundwater head observations and bore logs are available but may not provide adequate coverage throughout the model domain.	• * Validation* is either not undertaken or is not demonstrated for the full model domain. • * Calibration statistics are generally reasonable but may suggest significant errors in parts of the	• * Transient calibration over a short time frame compared to that of prediction. • Temporal discretisation used in the predictive model is different from that used in transient	• Key calibration statistics suggest poor calibration in parts of the model domain. • *? Model predictive time frame is between 3 and 10 times the duration of transient calibration. • *? Stresses are between 2 and 5 times greater than those	• * Prediction of impacts of proposed developments in medium value aquifers. • Evaluation and management of medium risk impacts.

Model Confidence Classification: Dendrobium Area 3C: Longwalls 22-23 SMP - Groundwater model.
(April 2021)

Confidence level classification	*Data*	*Calibration*	*Prediction*	*Key indicator*	*Examples of specific uses*
Class 2 *Cont'd*	• Metered groundwater-extraction data may be available but spatial and temporal coverage may not be extensive. • Streamflow data and * baseflow estimates available at a few points. • Reliable irrigation-application data available in part of the area or for part of the model duration.	model domain(s). • Long-term trends not replicated in all parts of the model domain. • Transient calibration to historic data but not extending to the present day. • Seasonal fluctuations not * adequately replicated in all parts of the model domain. • Observations of the key modelling outcome data * set are not used in calibration.	calibration. • Level and type of stresses included in the predictive model are outside the range of those used in the transient calibration. • Validation* suggests relatively poor match to observations when calibration data is extended in time and/or space.	included in calibration. • Temporal discretisation in predictive model is not the same as that used in calibration. • Mass balance closure error is less than 1% of total. • Not all model parameters consistent with conceptualisation. • Spatial refinement too coarse in key parts of the model domain. • The model has been reviewed and deemed fit for purpose by an independent hydrogeologist.	• Providing estimates of * dewatering requirements for mines and excavations and the associated impacts. • Designing groundwater management schemes such as managed aquifer recharge, salinity management schemes and infiltration basins. • Estimating distance of travel of contamination through particle-tracking methods. Defining water source protection zones.
Class 1	• Few or poorly distributed existing wells from which to obtain reliable groundwater and geological information. • Observations and measurements unavailable or sparsely distributed in areas of greatest interest. • No available records of metered groundwater extraction or injection. • Climate data only available from relatively remote locations. • Little or no useful data on land-use, soils or river flows and stage elevations.	• No calibration is possible. • Calibration illustrates unacceptable levels of error especially in key areas. • Calibration is based on an inadequate distribution of data. • Calibration only to datasets other than that required for prediction.	• Predictive model time frame far exceeds that of calibration. • Temporal discretisation is different to that of calibration. • Transient predictions are made when calibration is in steady state only. • Model validation* suggests unacceptable errors when calibration dataset is extended in time and/or space.	• Model is uncalibrated or key calibration statistics do not meet agreed targets. • Model predictive time frame is more than 10 times longer than transient calibration period. • Stresses in predictions are more than 5 times higher than those in calibration. • Stress period or calculation interval is different from that used in calibration. • Transient predictions made but calibration in steady state only. • Cumulative mass-balance closure error exceeds 1% or exceeds 5% at any given calculation time. • Model parameters outside the range expected by the conceptualisation with no further justification. • Unsuitable spatial or temporal discretisation. • The model has not been reviewed.	• Design observation bore array for pumping tests. • Predicting long-term impacts of proposed developments in low-value aquifers. • Estimating impacts of low-risk developments. • Understanding groundwater flow processes under various hypothetical conditions. • Provide first-pass estimates of extraction volumes and rates required for mine dewatering. • Developing coarse relationships between groundwater extraction locations and rates and associated impacts. • As a starting point on which to develop higher class models as more data is collected and used.

→ cannot directly observe reservoir losses
→ cannot infer losses from water balance with any reliability

(*Refer Chapter 5 for discussion around validation as part of the calibration process.)

Appendix E: Modelled hydraulic properties

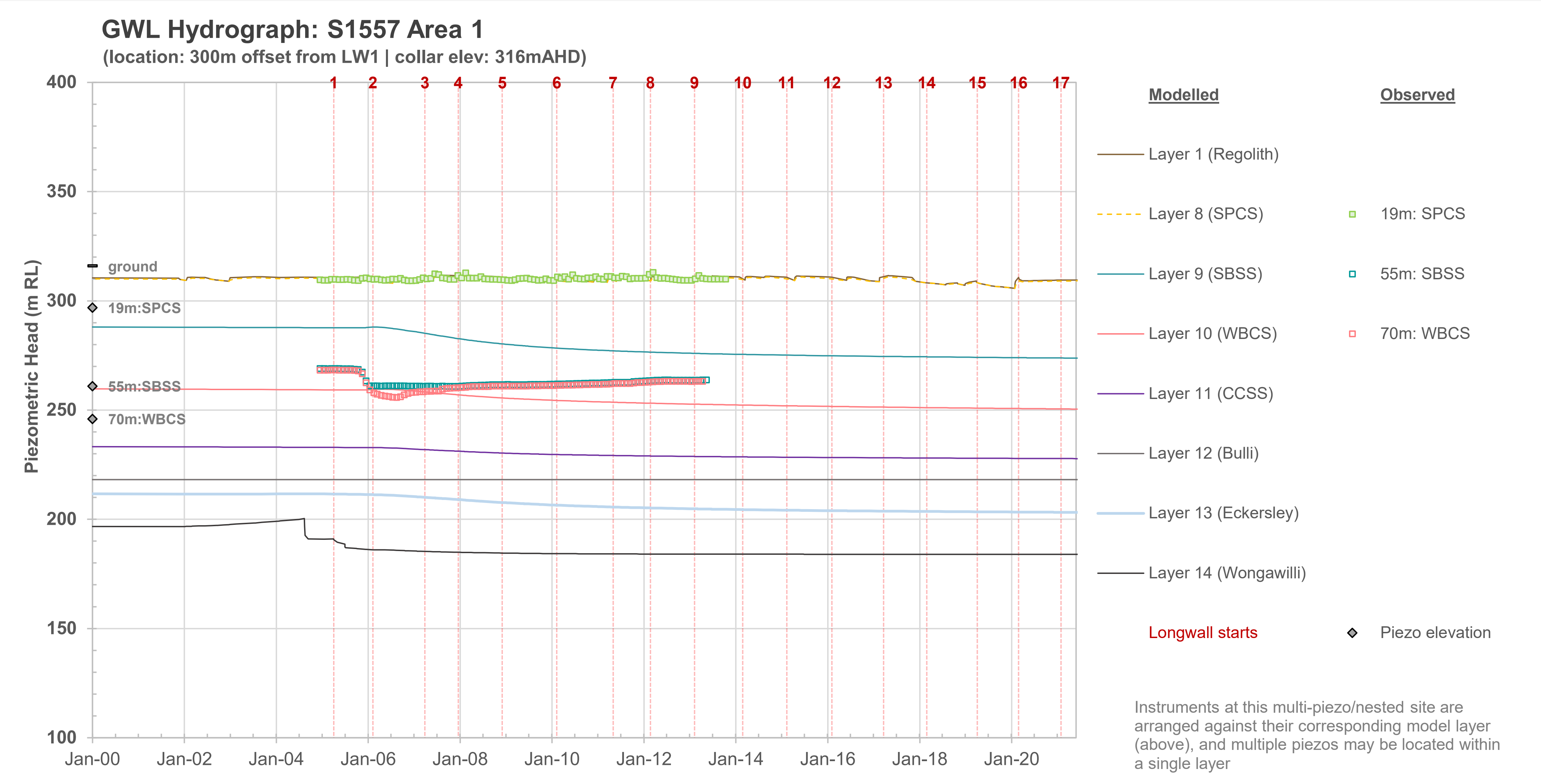
Calibrated Hydraulic Properties (K and S)

Layer	Zone#	Geology	abbrev.	Kh factor	K_h m/d	K_v m/d	Ss m-1	Sy
1	11	Swamps		n/a	1	0.05		0.3
	1, 3	Alluvium		n/a	10, 3	0.3, 5e-3		0.1
	2	Wianamatta Formation	WMFM	n/a	0.015	2.0E-05		0.1
	10	Regolith		n/a	0.03	0.03		0.1
2	20	Hawkesbury Sst (upper)	HBSS	1.3	*K-depth*	1E-05	5E-03	0.05
3	30	Hawkesbury Sst (mid)	HBSS	0.6	*K-depth*	1E-04	1E-06	0.025
4	40	Hawkesbury Sst (lower)	HBSS	1	*K-depth*	3E-05	1E-06	0.012
5	50	Bald Hill Claystone	BACS	0.03	*K-depth*	3E-06	1E-06	0.006
	51	Crinanite (weathered)		0.8	*K-depth*	3E-03	5E-04	0.01
6-11	multiple	Crinanite		0.05	*K-depth*	5E-05	5E-04	0.01
6	60	Bulgo Sst (upper)	BGSS	0.2	*K-depth*	1E-04	9E-07	0.008
	61	Bulgo Sst (upper)	BGSS	0.25	*K-depth*	5E-05	9E-07	0.008
	62	Bulgo Sst (upper) / CVSS	BGSS	0.14	*K-depth*	1E-06	9E-07	0.008
	64	Bulgo Sst (upper) (A2 outcrop)	BGSS	0.3	*K-depth*	2E-06	9E-07	0.008
7	70	Bulgo Sst (lower)	BGSS	0.3	*K-depth*	2E-05	8E-07	0.007
	71	Bulgo Sst (lower)	BGSS	0.2	*K-depth*	5E-05	8E-07	0.007
	72	Bulgo Sst (lower) / CVSS	BGSS	0.2	*K-depth*	2E-06	8E-07	0.007
	74	BGSS (lwr) near A2/crinanite	BGSS	0.6	*K-depth*	6E-06	8E-07	0.007
8	80	Stanwell Park Claystone	SPCS	0.25	*K-depth*	3E-05	7E-07	0.005
	81	Stanwell Park Claystone	SPCS	0.25	*K-depth*	2E-06	7E-07	0.005
	83	SPCS, near A2	SPCS	2	*K-depth*	4E-06	7E-07	0.005
9	90-92	Scarborough Sst	SBSS	2	*K-depth*	1E-06	6E-06	0.01
10	100	Wombarra Claystone	WBCS	0.25	*K-depth*	5E-06	5E-07	0.0035
11	110	Coalcliff Sandstone	CCSS	1	*K-depth*	7E-06	4E-07	0.004
	111	Coalcliff Sandstone	CCSS	0.5	*K-depth*	5E-06	4E-07	0.004
12	120	Bulli Seam	BUSM	20	*K-depth*	1E-06	2E-07	0.004
	121	Bulli Seam – cindered	BUSM	0.4	*K-depth*	6E-06	1E-06	0.016
	123	Bulli Seam – faulted (mylonite)	BUSM	0.1	*K-depth*	3E-05	1E-06	0.016
13	130	Lawrence and Loddon Ssts	LDSS	1	*K-depth*	1E-06	2E-07	0.004
	131	Nepheline syenite		0.4	*K-depth*	2E-06	3E-07	0.005
	132	Fault/mylonite		0.3	*K-depth*	9E-06	3E-07	0.005
14	140	Wongawilli Seam	WWSM	40	*K-depth*	1E-06	2E-07	0.004
	141	Nepheline syenite		0.4	*K-depth*	3E-06	4E-06	0.02
	142	Wongawilli Seam – cindered	WWSM	0.5	*K-depth*	2E-06	3E-06	0.012
	143	Fault/mylonite		0.5	*K-depth*	9E-06	1E-06	0.015
15	150	Kembla Sandstone	KBSS	1	*K-depth*	3E-05	3E-07	0.0045
	151	Kembla Sandstone – outcrop	KBSS	1	*K-depth*	1E-05	1E-04	0.02
	152	Kembla Sandstone – outcrop	KBSS	1	*K-depth*	8E-04	1E-04	0.02
16	160	lower Permian Coal Meas.	IPCM	1	*K-depth*	1E-05	3E-07	0.004
	161	lower Permian Coal Meas.	IPCM	1	*K-depth*	8E-04	3E-06	0.03
17	170	Shoalhaven Group		1	*K-depth*	2E-06	3E-07	0.005

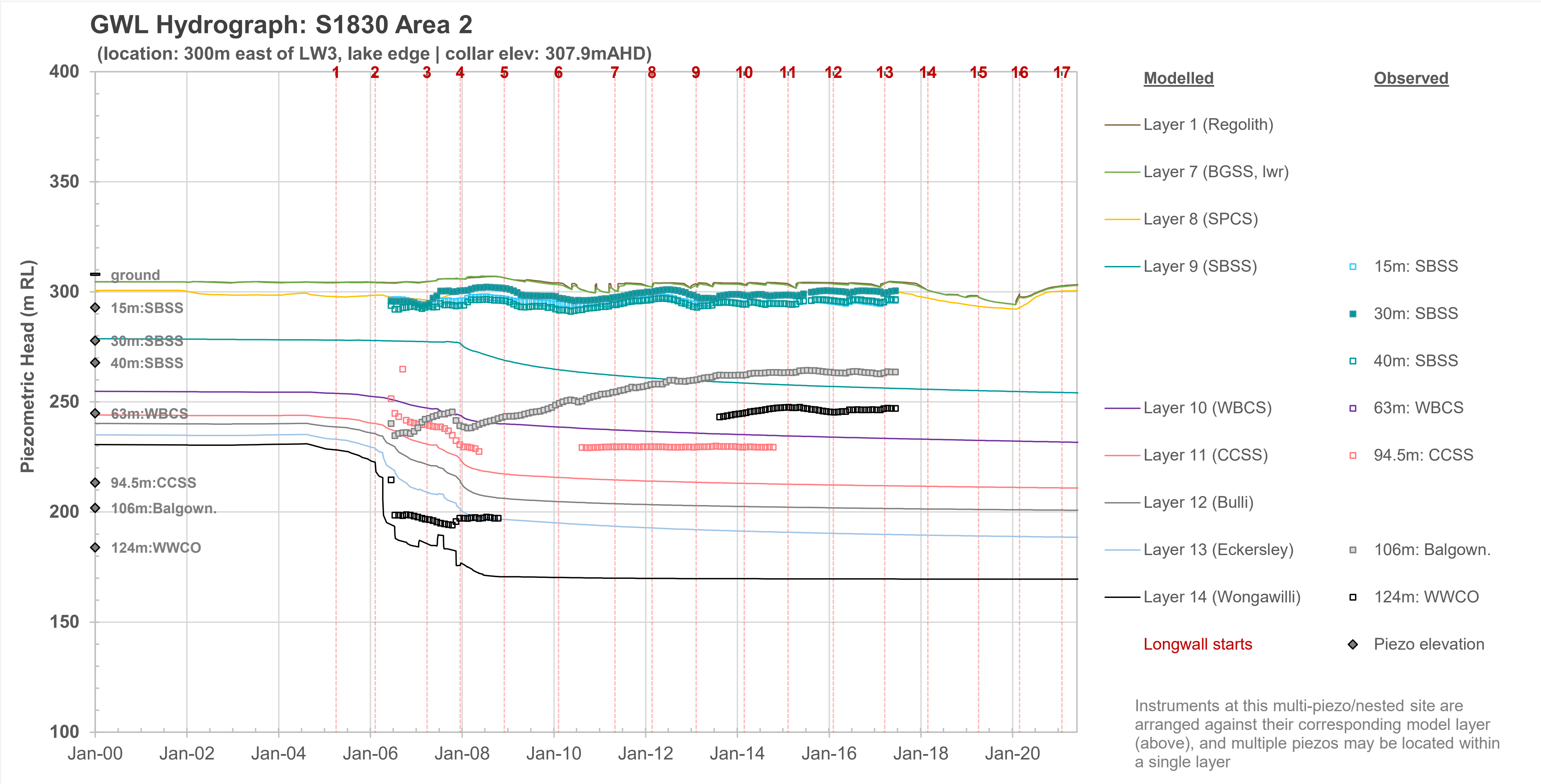
"K-depth" = means that Kh is primarily determined by depth of mid-point of model cell (see Equation 1 and 2).

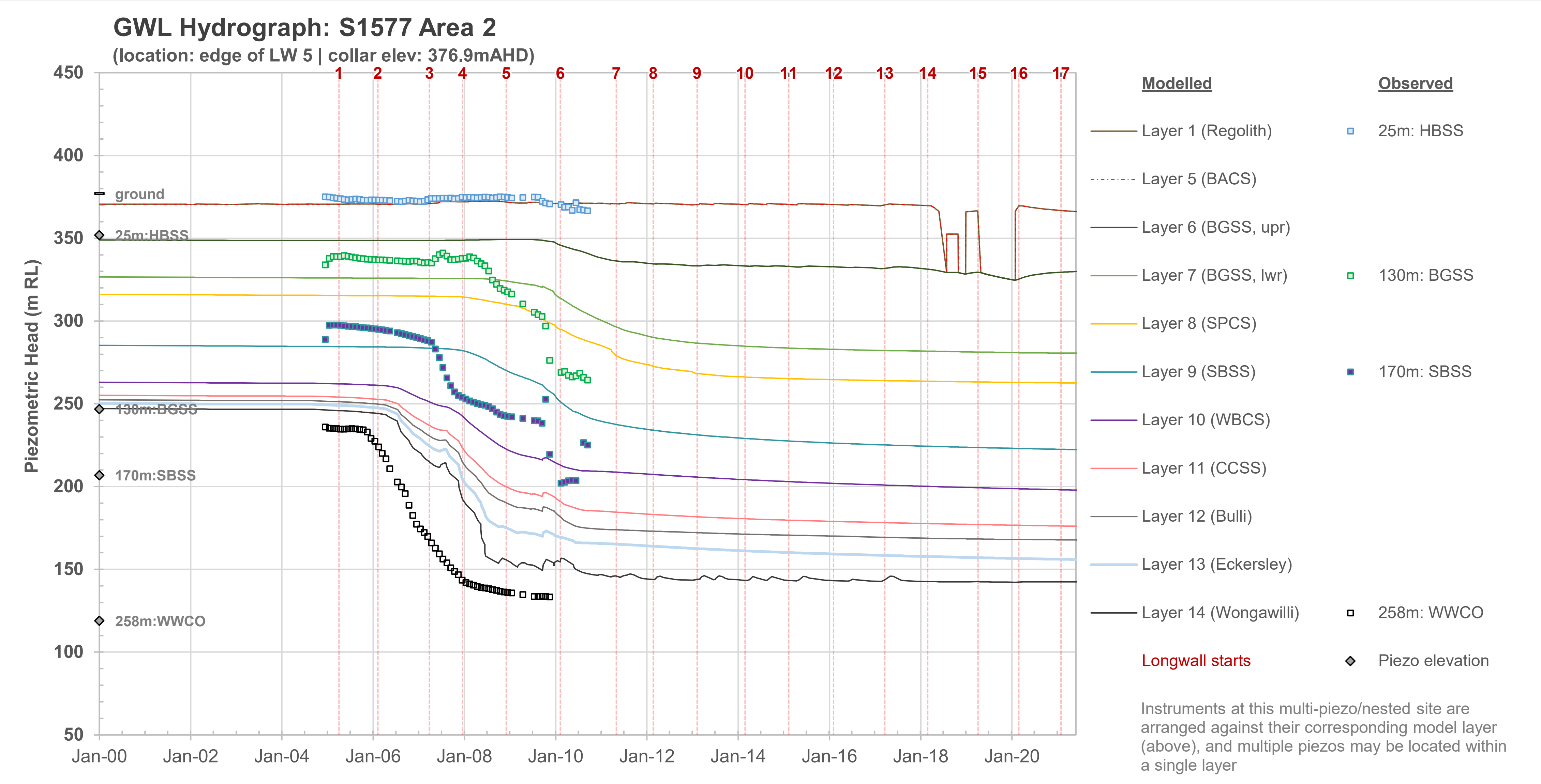
Kh factor used to provide additional control based on lithology, facies variation. The K from the K-w-depth relationship is multiplied by this factor. DND5_mesh_Kwdepth_5v44.xlsx

Appendix F: Modelled groundwater level calibration hydrographs

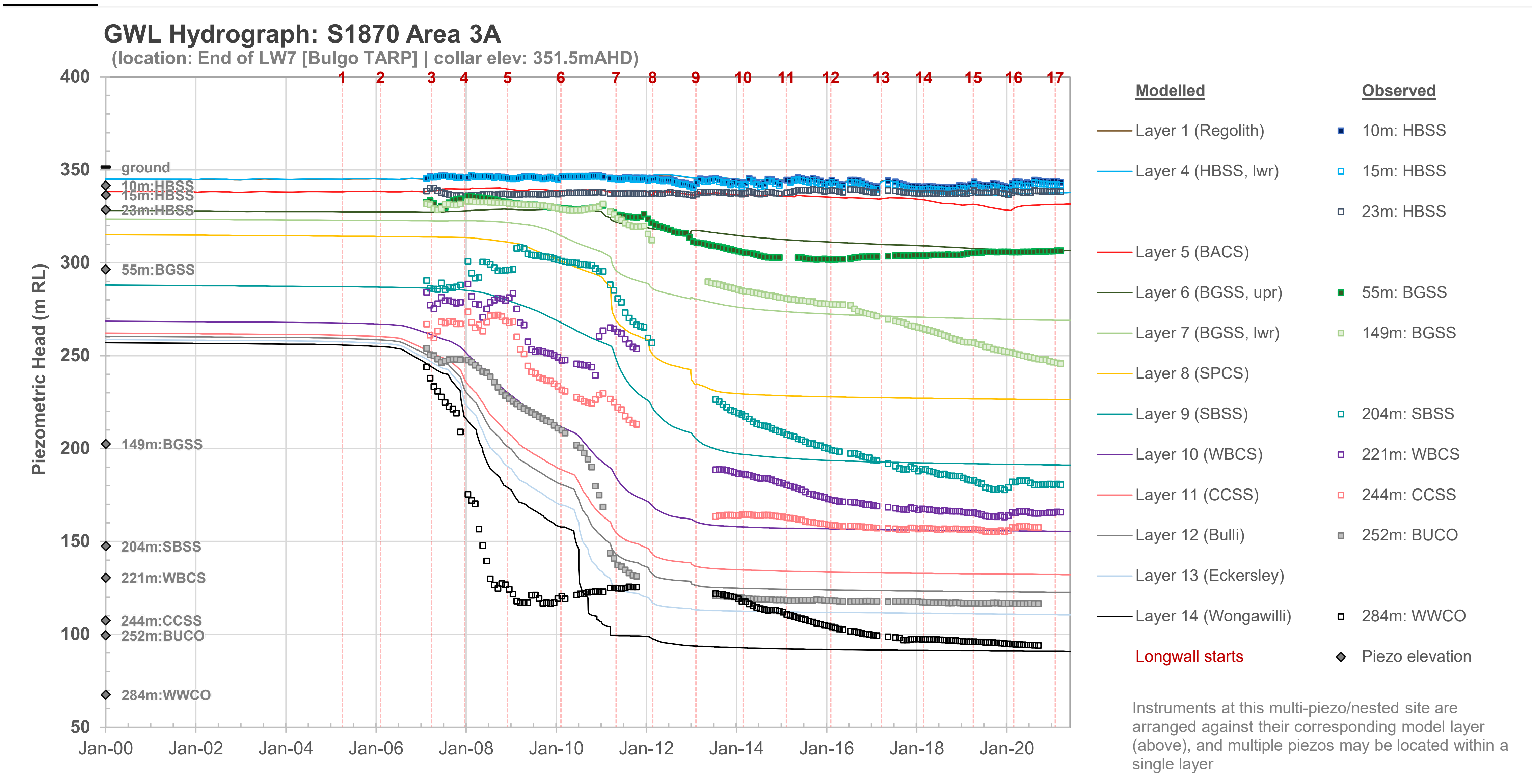


GWL Hydrograph: S1557 Area 1
(location: 300m offset from LW1 | collar elev: 316mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
19m:SPCS
55m:SBSS
70m:WBCS
Modelled
Observed
Layer 1 (Regolith)
Layer 8 (SPCS)
19m: SPCS
Layer 9 (SBSS)
55m: SBSS
Layer 10 (WBCS)
70m: WBCS
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

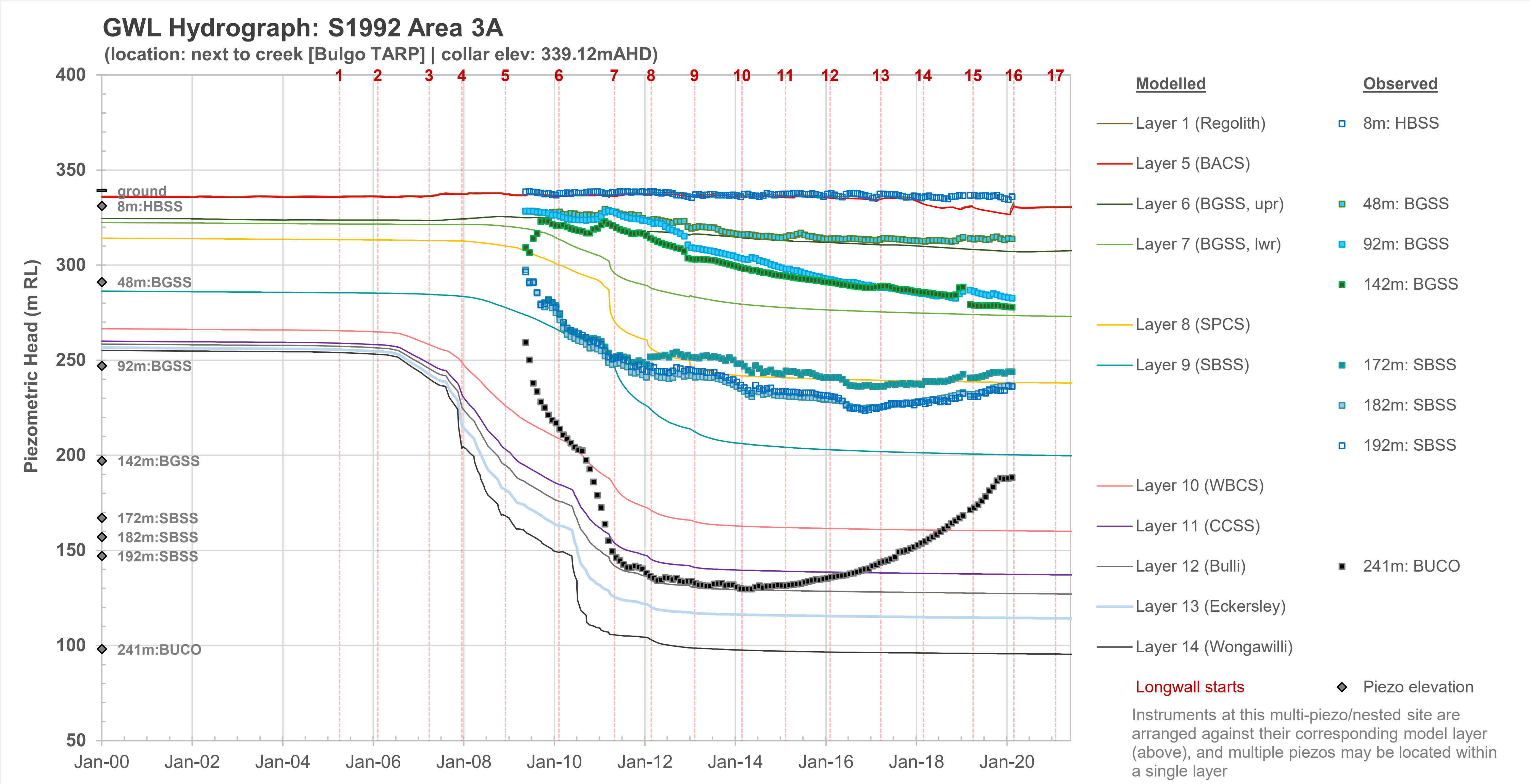

GWL Hydrograph: S1830 Area 2
(location: 300m east of LW3, lake edge | collar elev: 307.9mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ground
15m:SBSS
30m:SBSS
40m:SBSS
63m:WBCS
94.5m:CCSS
106m:Balgown.
124m:WWCO
Modelled
Observed
Layer 1 (Regolith)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
15m: SBSS
30m: SBSS
40m: SBSS
Layer 10 (WBCS)
63m: WBCS
Layer 11 (CCSS)
94.5m: CCSS
Layer 12 (Bulli)
Layer 13 (Eckersley)
106m: Balgown.
Layer 14 (Wongawilli)
124m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



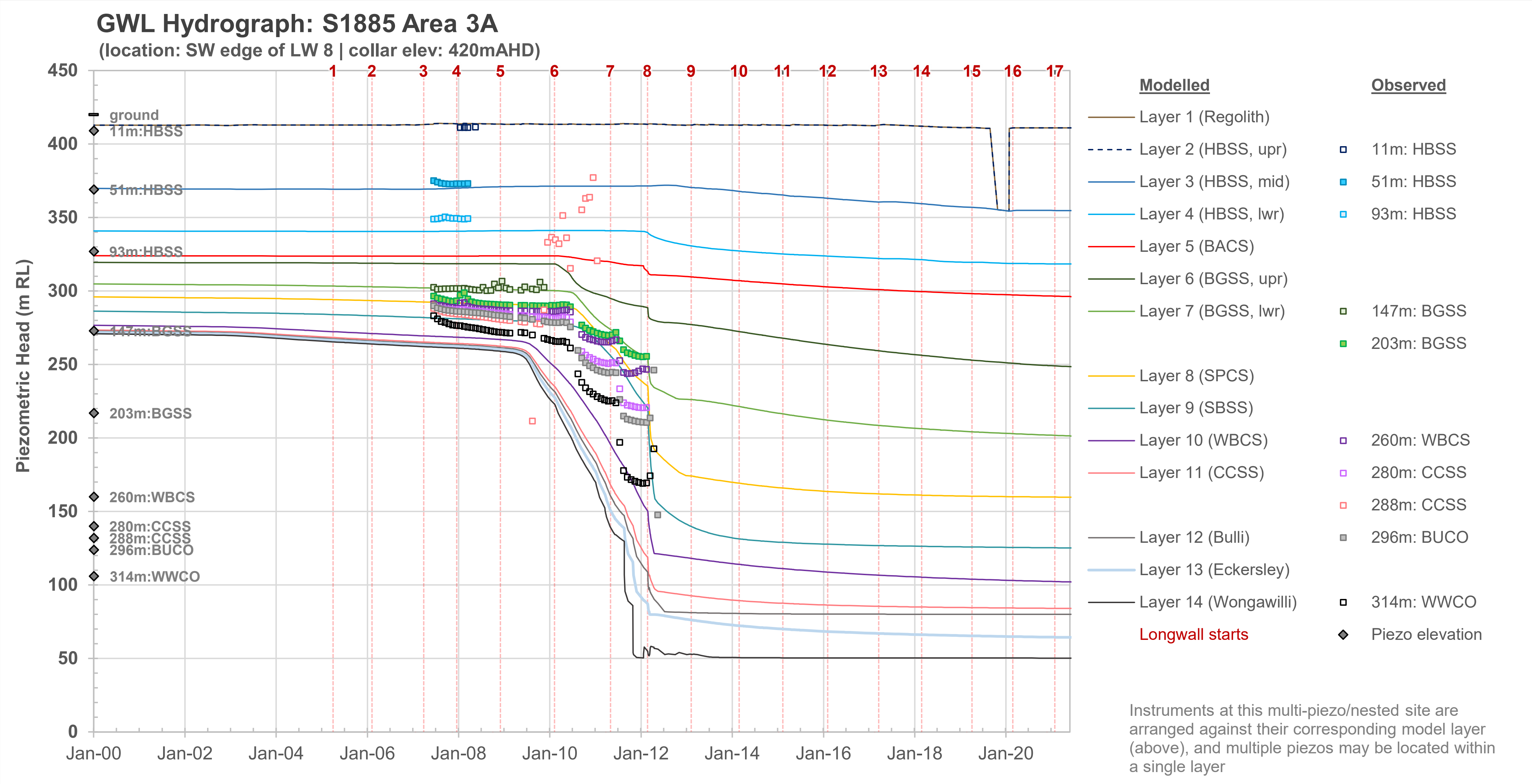
GWL Hydrograph: S1577 Area 2
(location: edge of LW 5 | collar elev: 376.9mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
25m:HBSS
130m:BGSS
170m:SBSS
258m:WWCO
Modelled
Observed
Layer 1 (Regolith)
25m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
130m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
170m: SBSS
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
258m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



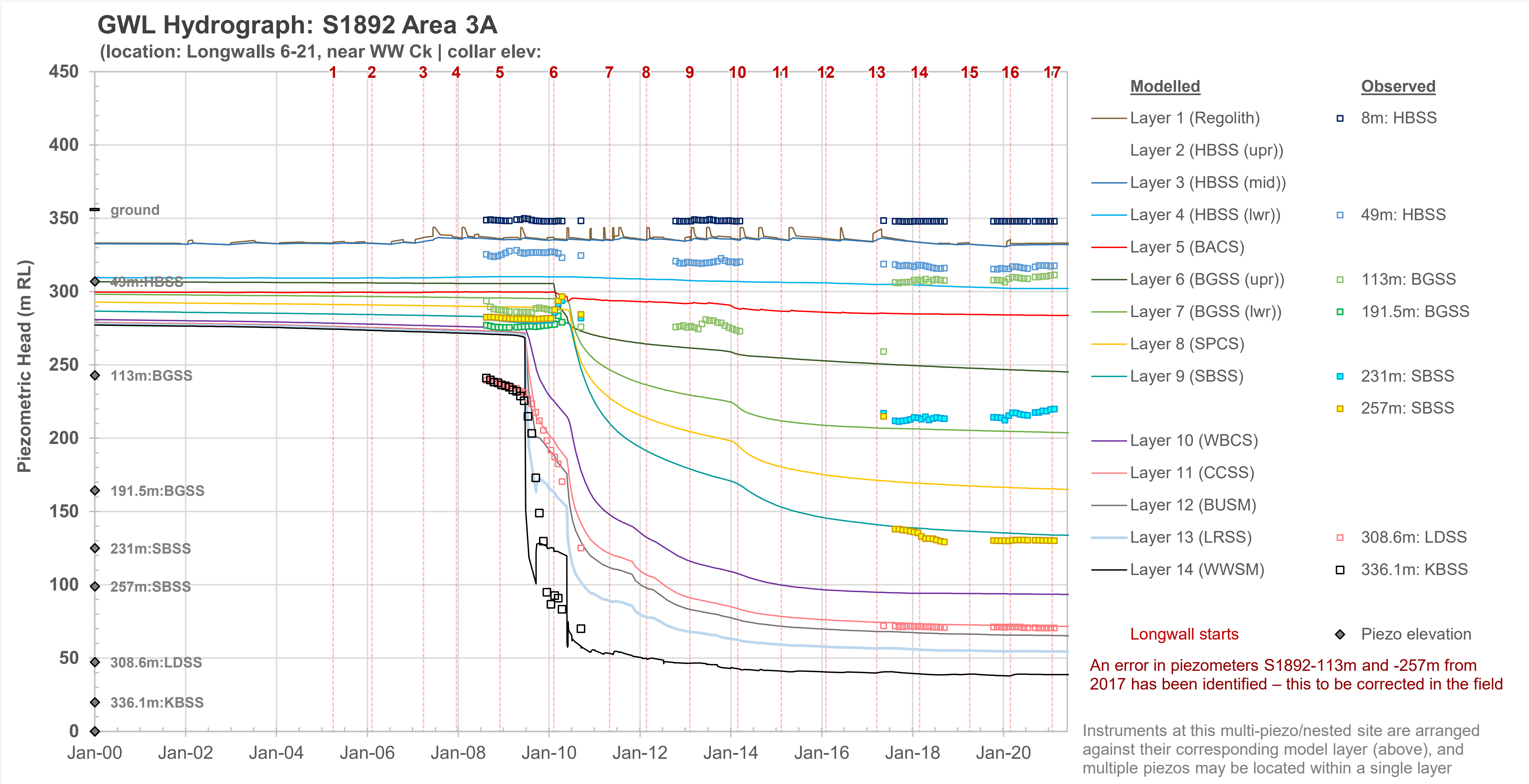
GWL Hydrograph: S1870 Area 3A
(location: End of LW7 [Bulgo TARP] | collar elev: 351.5mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
10m:HBSS
15m:HBSS
23m:HBSS
55m:BGSS
149m:BGSS
204m:SBSS
221m:WBCS
244m:CCSS
252m:BUCO
284m:WWCO
Modelled
Layer 1 (Regolith)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
10m: HBSS
15m: HBSS
23m: HBSS
55m: BGSS
149m: BGSS
204m: SBSS
221m: WBCS
244m: CCSS
252m: BUCO
284m: WWCO
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



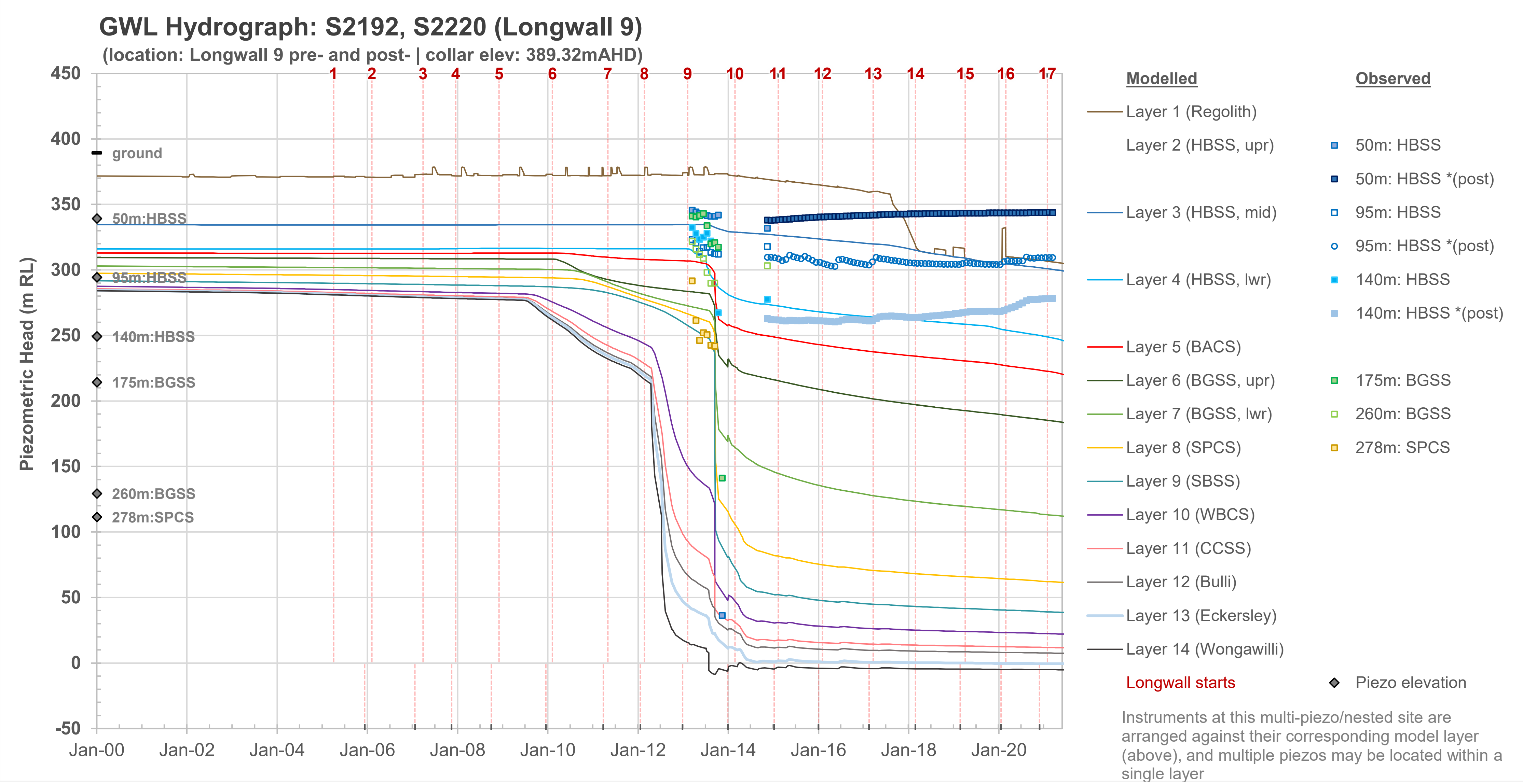
GWL Hydrograph: S1992 Area 3A
(location: next to creek [Bulgo TARP] | collar elev: 339.12mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ground
8m:HBSS
48m:BGSS
92m:BGSS
142m:BGSS
172m:SBSS
182m:SBSS
192m:SBSS
241m:BUCO
Modelled
Observed
Layer 1 (Regolith)
8m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
48m: BGSS
Layer 7 (BGSS, lwr)
92m: BGSS
142m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
172m: SBSS
182m: SBSS
192m: SBSS
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
241m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



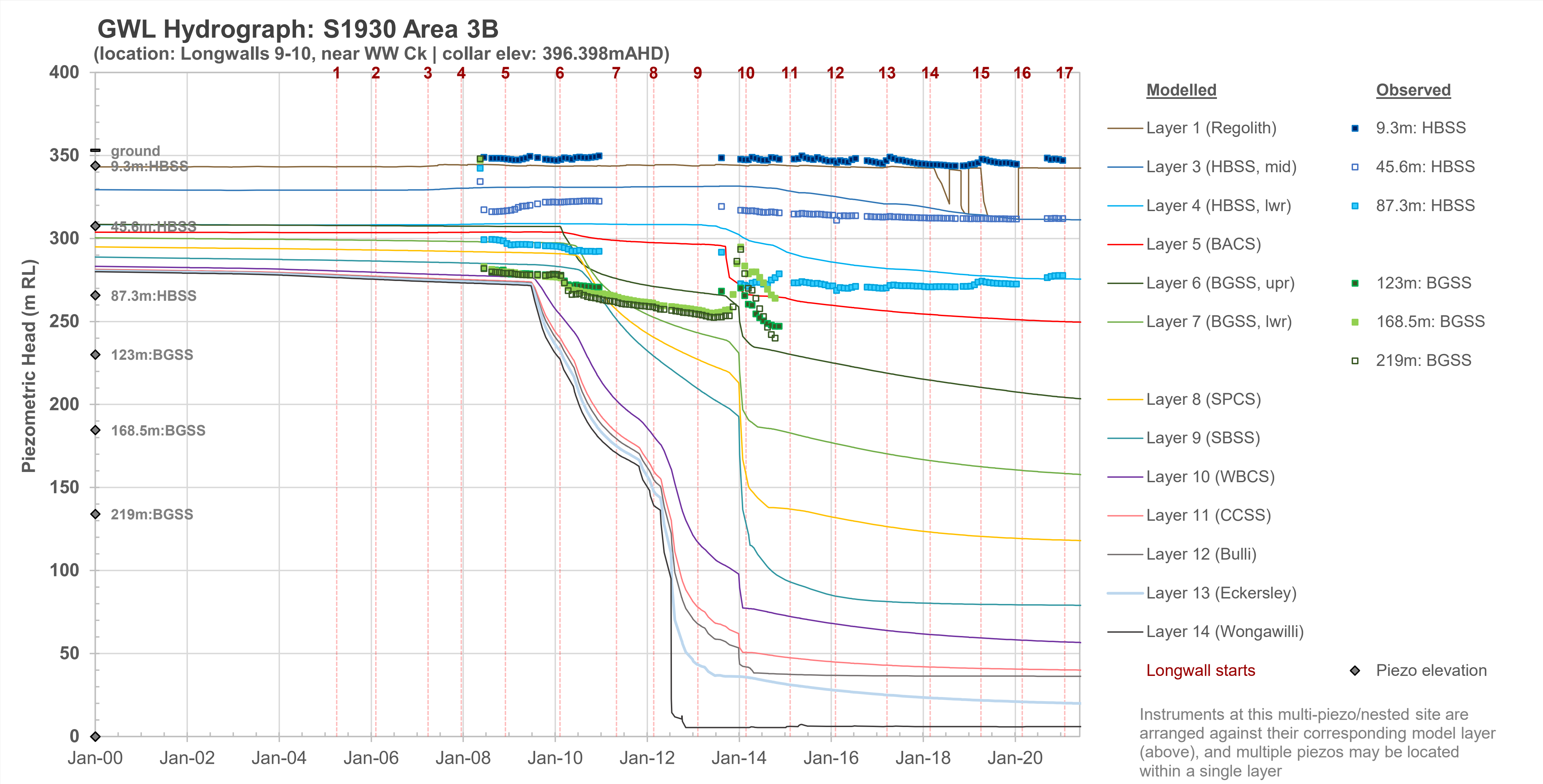
GWL Hydrograph: S1885 Area 3A
(location: SW edge of LW 8 | collar elev: 420mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
11m:HBSS
51m:HBSS
93m:HBSS
147m:BGSS
203m:BGSS
260m:WBCS
280m:CCSS
288m:CCSS
296m:BUCO
314m:WWCO
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
11m: HBSS
Layer 3 (HBSS, mid)
51m: HBSS
Layer 4 (HBSS, lwr)
93m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
147m: BGSS
203m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
260m: WBCS
Layer 11 (CCSS)
280m: CCSS
288m: CCSS
Layer 12 (Bulli)
296m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
314m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



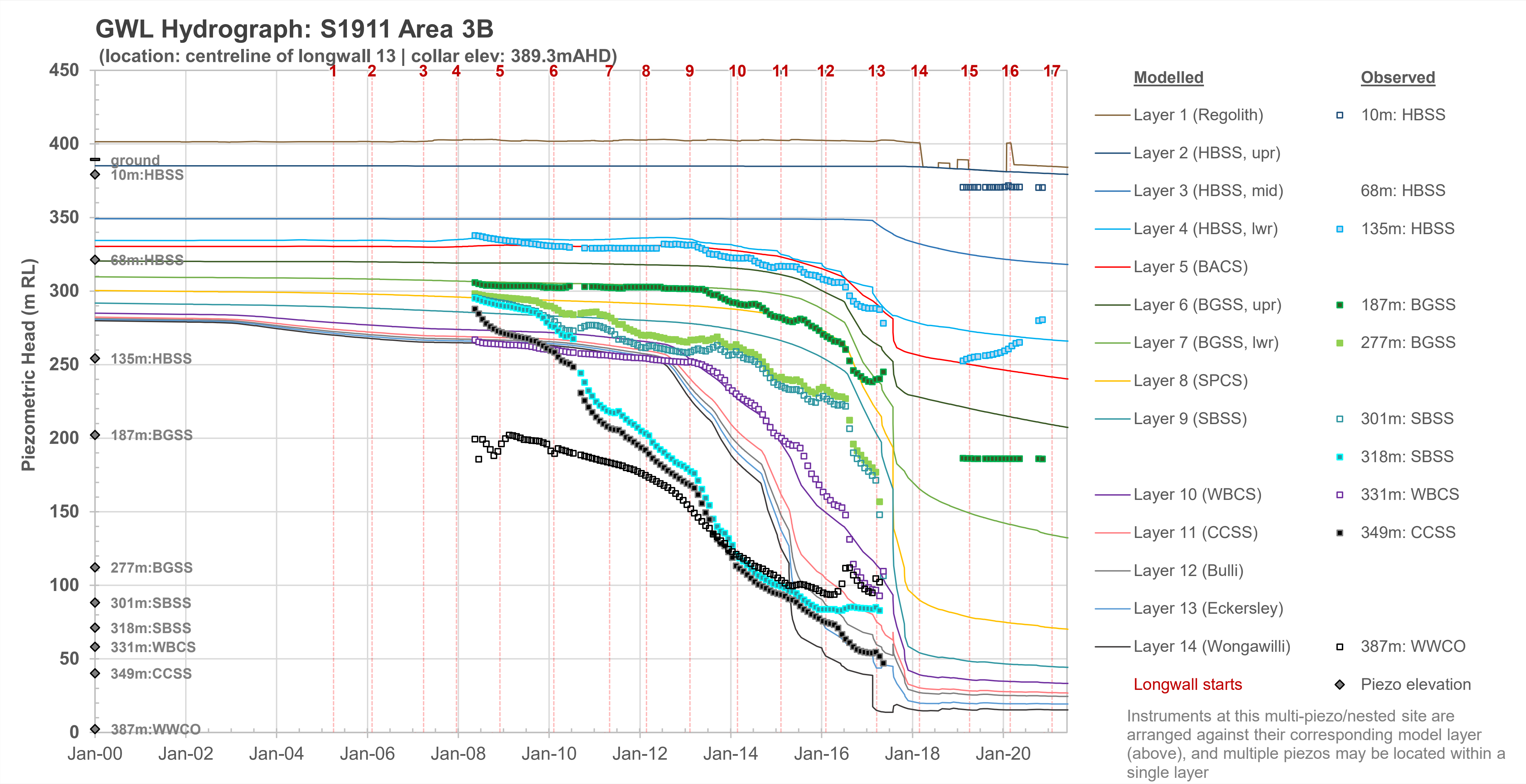
GWL Hydrograph: S1892 Area 3A
(location: Longwalls 6-21, near WW Ck | collar elev:
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
49m:HBSS
113m:BGSS
191.5m:BGSS
231m:SBSS
257m:SBSS
308.6m:LDSS
336.1m:KBSS
Modelled
Layer 1 (Regolith)
Layer 2 (HBSS (upr))
Layer 3 (HBSS (mid))
Layer 4 (HBSS (lwr))
Layer 5 (BACS)
Layer 6 (BGSS (upr))
Layer 7 (BGSS (lwr))
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (BUSM)
Layer 13 (LRSS)
Layer 14 (WWSM)
Observed
8m: HBSS
49m: HBSS
113m: BGSS
191.5m: BGSS
231m: SBSS
257m: SBSS
308.6m: LDSS
336.1m: KBSS
Longwall starts
Piezo elevation
An error in piezometers S1892-113m and -257m from 2017 has been identified – this to be corrected in the field
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



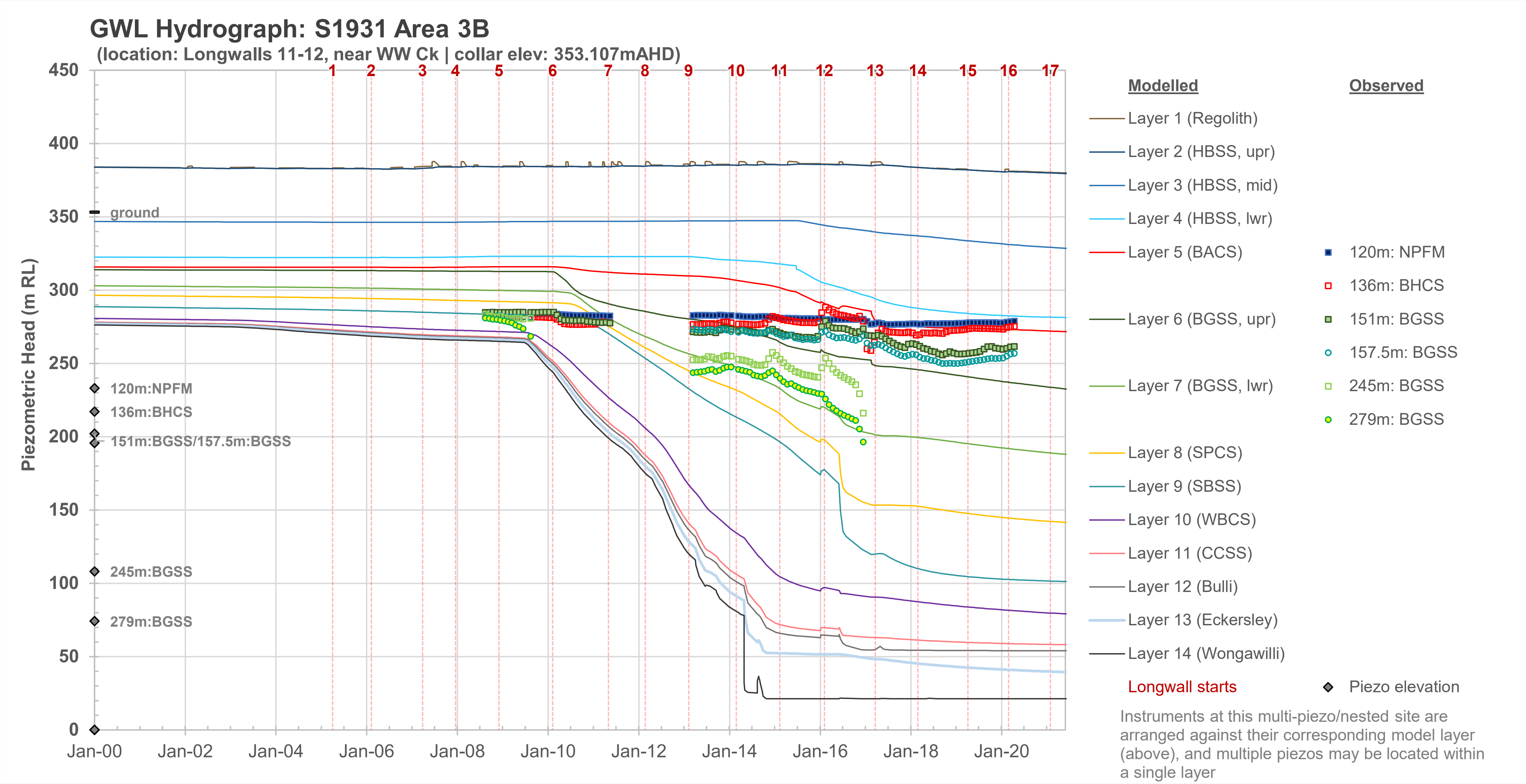
GWL Hydrograph: S2192, S2220 (Longwall 9)
(location: Longwall 9 pre- and post- | collar elev: 389.32mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
-50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
50m:HBSS
95m:HBSS
140m:HBSS
175m:BGSS
260m:BGSS
278m:SPCS
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
50m: HBSS
50m: HBSS *(post)
Layer 3 (HBSS, mid)
95m: HBSS
95m: HBSS *(post)
Layer 4 (HBSS, lwr)
140m: HBSS
140m: HBSS *(post)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
175m: BGSS
Layer 7 (BGSS, lwr)
260m: BGSS
Layer 8 (SPCS)
278m: SPCS
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



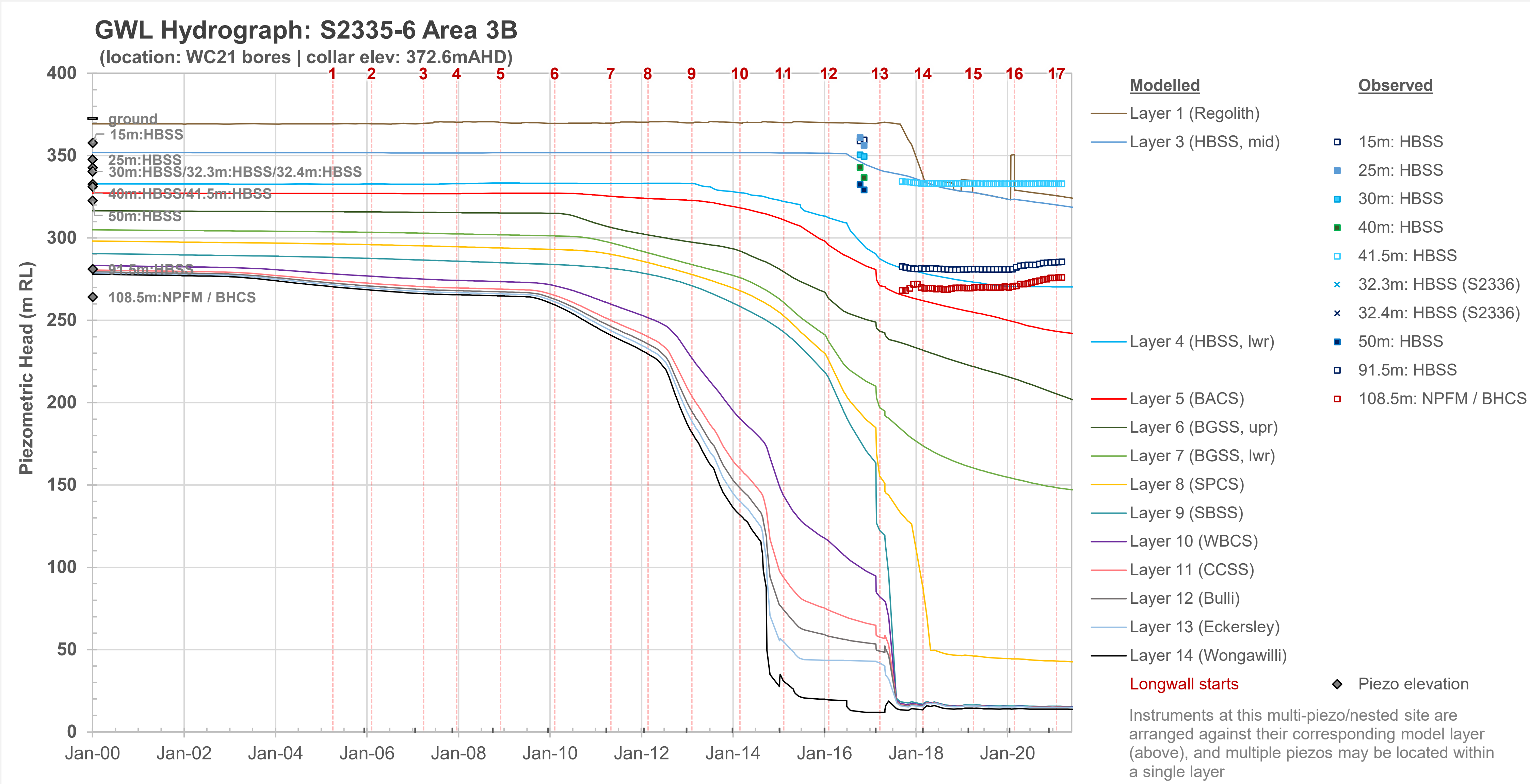
GWL Hydrograph: S1930 Area 3B
(location: Longwalls 9-10, near WW Ck | collar elev: 396.398mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
50
0
ground
9.3m:HBSS
45.6m:HBSS
87.3m:HBSS
123m:BGSS
168.5m:BGSS
219m:BGSS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Layer 1 (Regolith)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
9.3m: HBSS
45.6m: HBSS
87.3m: HBSS
123m: BGSS
168.5m: BGSS
219m: BGSS
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



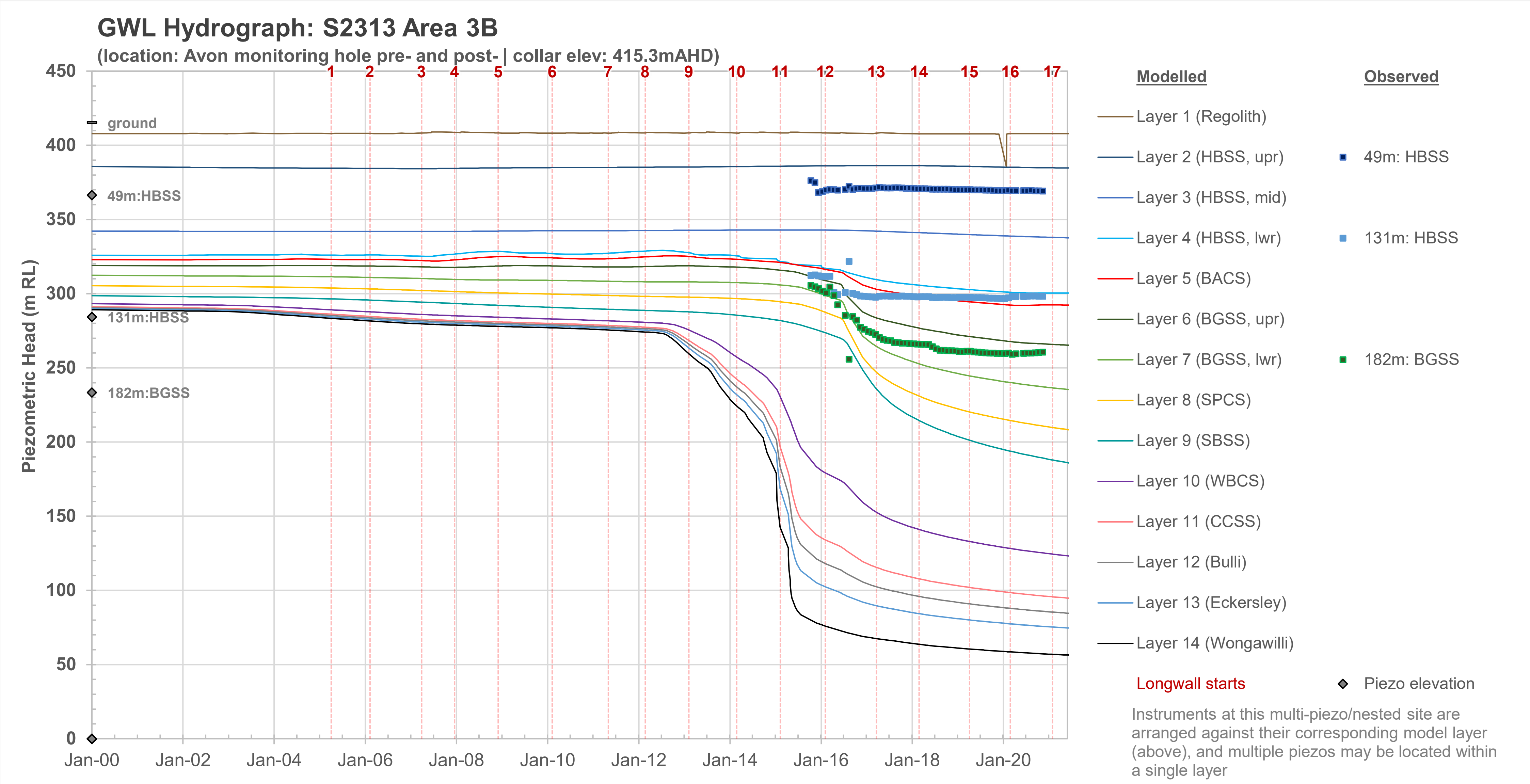
GWL Hydrograph: S1911 Area 3B
(location: centreline of longwall 13 | collar elev: 389.3mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
ground
10m:HBSS
68m:HBSS
135m:HBSS
187m:BGSS
277m:BGSS
301m:SBSS
318m:SBSS
331m:WBCS
349m:CCSS
387m:WWCO
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Observed
Layer 1 (Regolith)
10m: HBSS
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
68m: HBSS
Layer 4 (HBSS, lwr)
135m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
187m: BGSS
Layer 7 (BGSS, lwr)
277m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
301m: SBSS
318m: SBSS
Layer 10 (WBCS)
331m: WBCS
Layer 11 (CCSS)
349m: CCSS
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
387m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



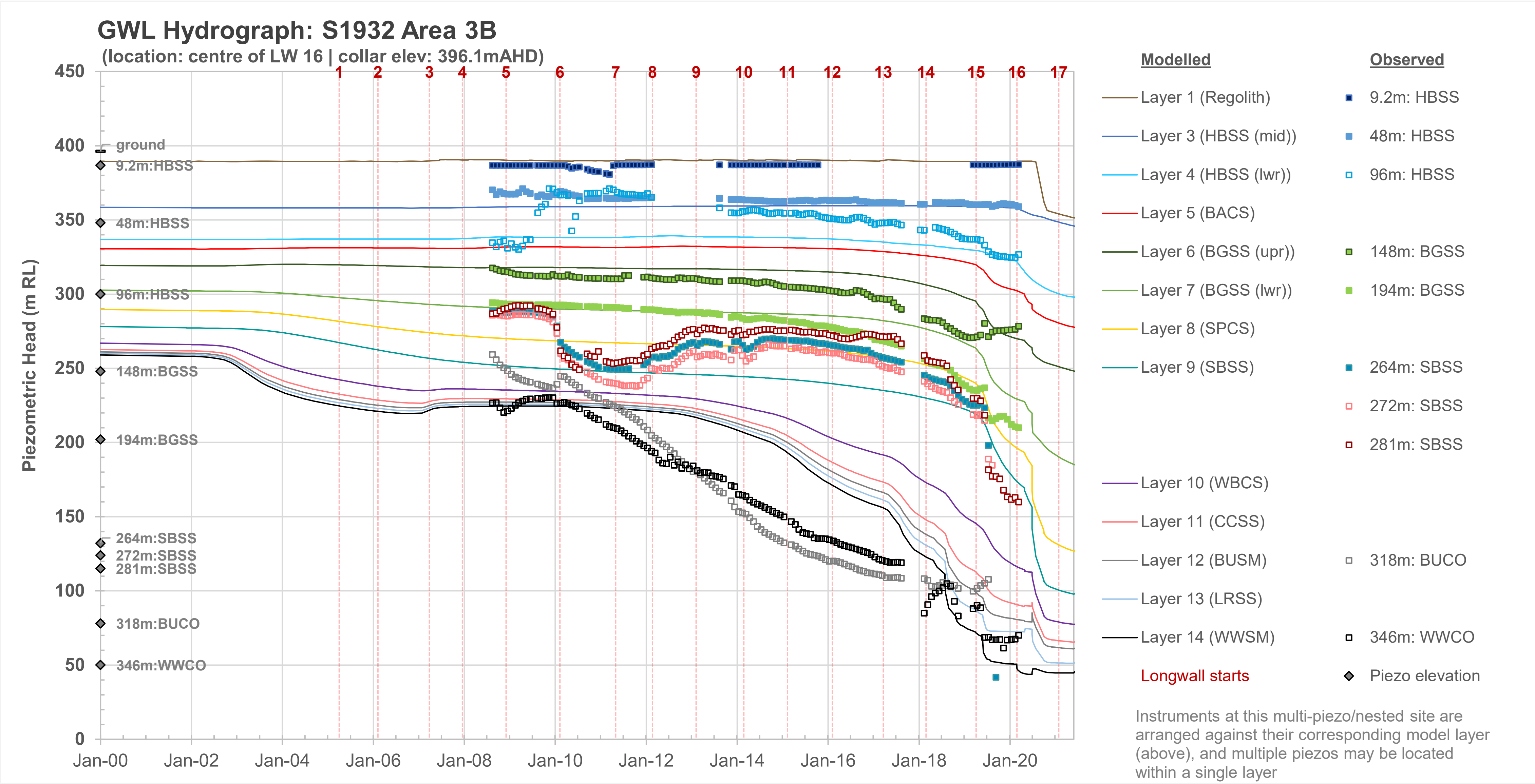
GWL Hydrograph: S1931 Area 3B
(location: Longwalls 11-12, near WW Ck | collar elev: 353.107mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
ground
120m:NPFM
136m:BHCS
151m:BGSS/157.5m:BGSS
245m:BGSS
279m:BGSS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
120m: NPFM
136m: BHCS
Layer 6 (BGSS, upr)
151m: BGSS
157.5m: BGSS
Layer 7 (BGSS, lwr)
245m: BGSS
279m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

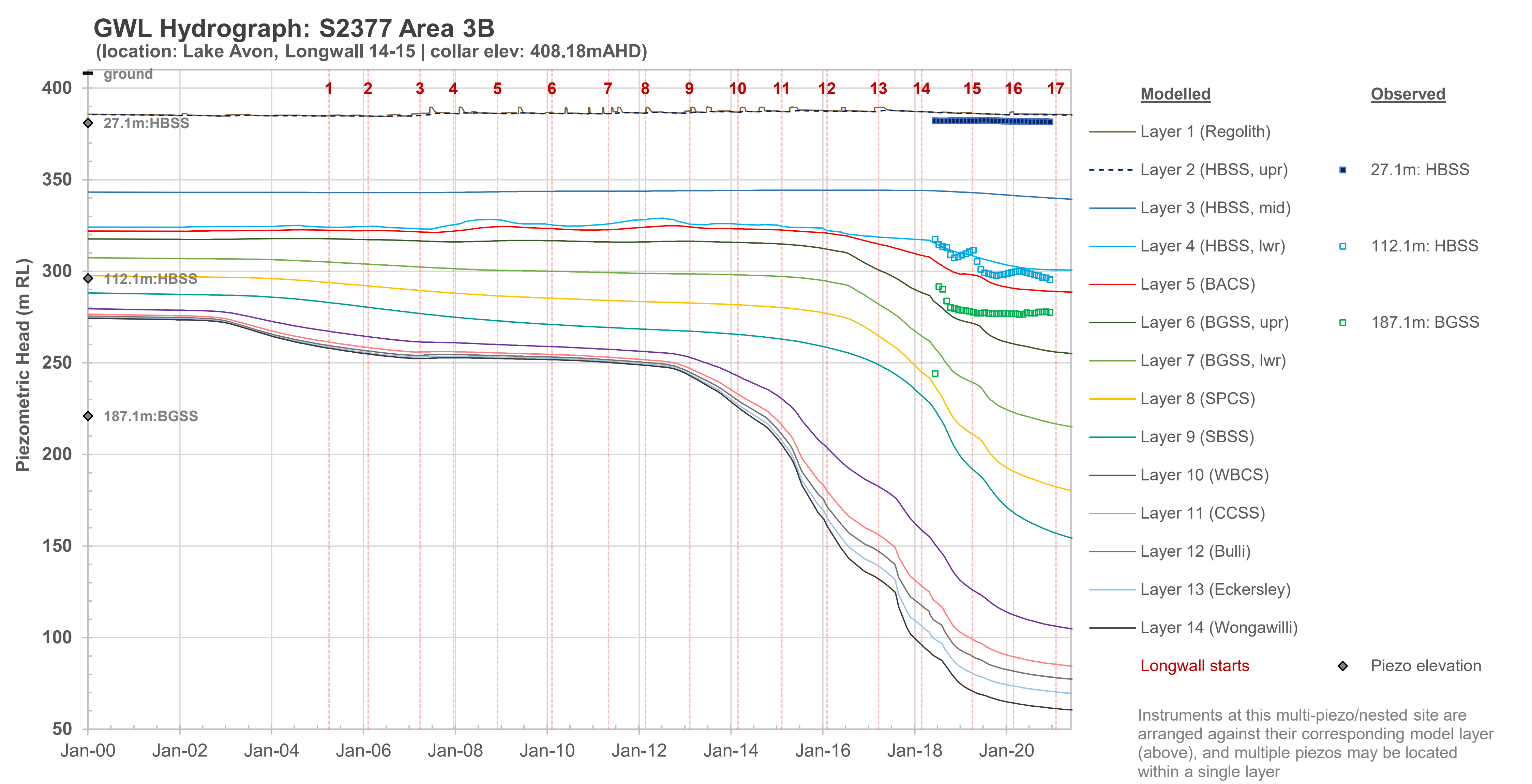


GWL Hydrograph: S2335-6 Area 3B
(location: WC21 bores | collar elev: 372.6mAHD)
Piezometric Head (m RL)
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
15m:HBSS
25m:HBSS
30m:HBSS/32.3m:HBSS/32.4m:HBSS
40m:HBSS/41.5m:HBSS
50m:HBSS
91.5m:HBSS
108.5m:NPFM / BHCS
Modelled
Layer 1 (Regolith)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
15m: HBSS
25m: HBSS
30m: HBSS
40m: HBSS
41.5m: HBSS
32.3m: HBSS (S2336)
32.4m: HBSS (S2336)
50m: HBSS
91.5m: HBSS
108.5m: NPFM / BHCS
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

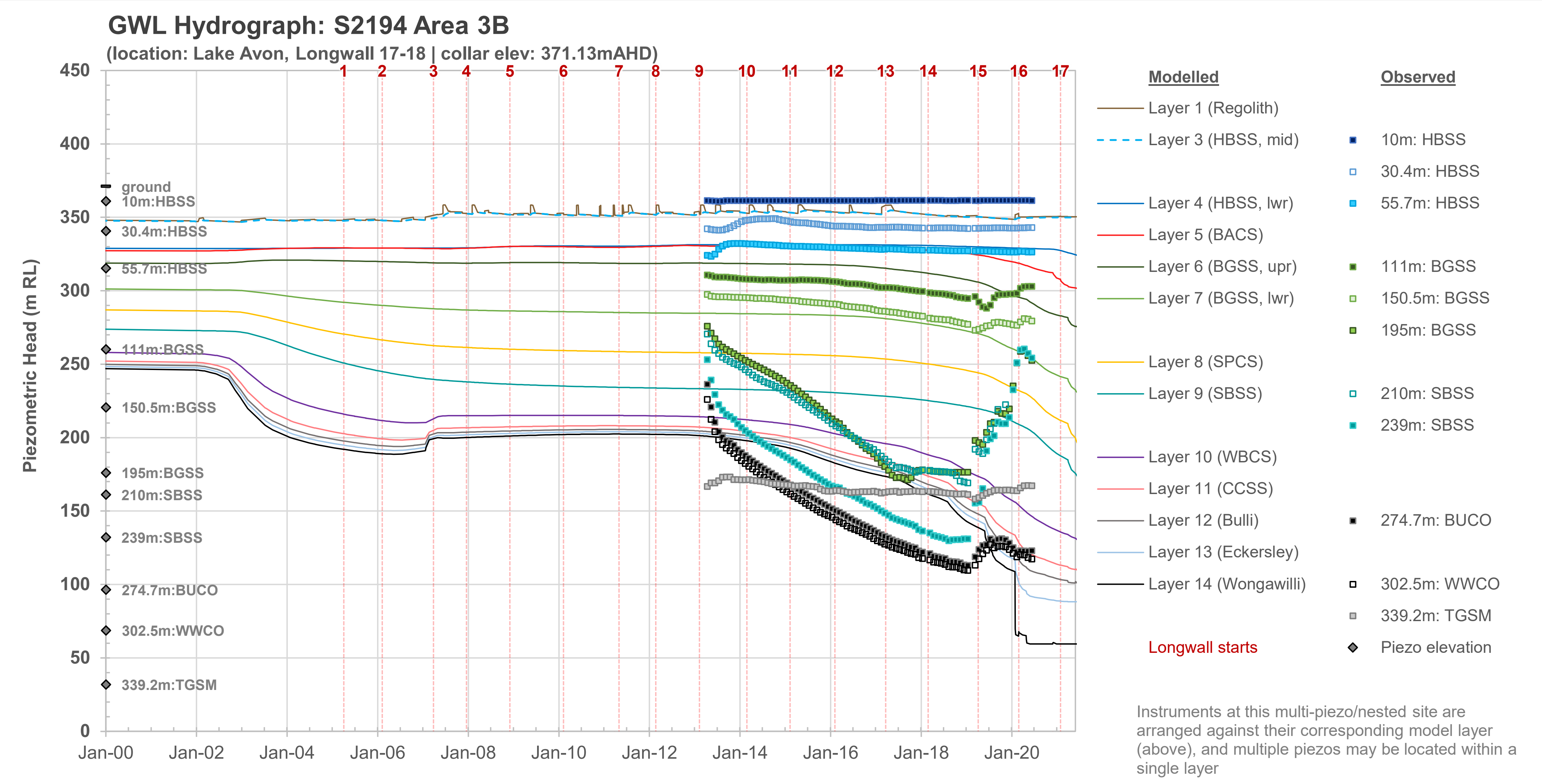


GWL Hydrograph: S2313 Area 3B
(location: Avon monitoring hole pre- and post- | collar elev: 415.3mAHD)
Piezometric Head (m RL)
ground
49m:HBSS
131m:HBSS
182m:BGSS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12 Jan-14 Jan-16 Jan-18 Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
49m: HBSS
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
131m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
182m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

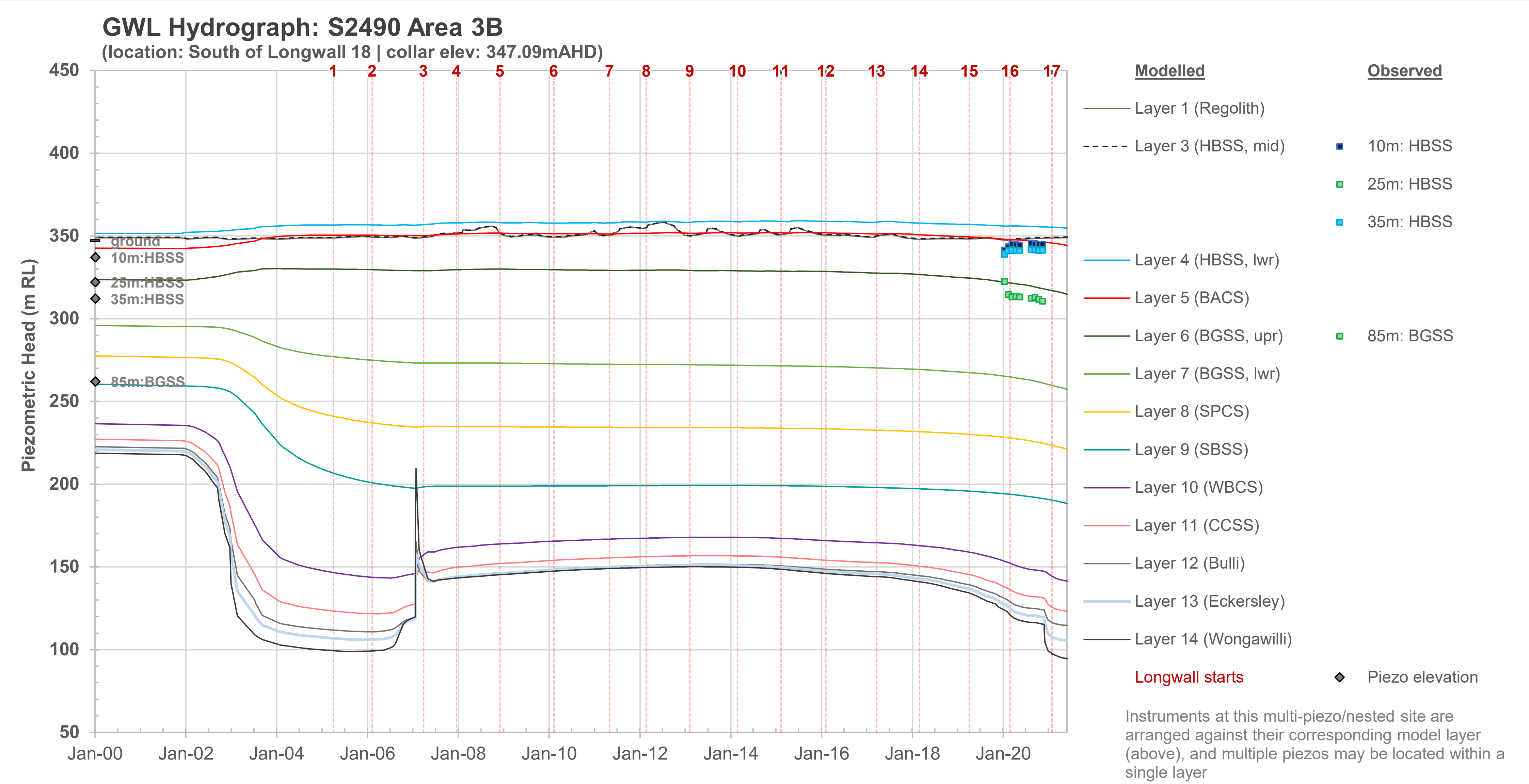

GWL Hydrograph: S1932 Area 3B
(location: centre of LW 16 | collar elev: 396.1mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
9.2m:HBSS
48m:HBSS
96m:HBSS
148m:BGSS
194m:BGSS
264m:SBSS
272m:SBSS
281m:SBSS
318m:BUCO
346m:WWCO
Modelled
Layer 1 (Regolith)
Layer 3 (HBSS (mid))
Layer 4 (HBSS (lwr))
Layer 5 (BACS)
Layer 6 (BGSS (upr))
Layer 7 (BGSS (lwr))
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (BUSM)
Layer 13 (LRSS)
Layer 14 (WWSM)
Longwall starts
Observed
9.2m: HBSS
48m: HBSS
96m: HBSS
148m: BGSS
194m: BGSS
264m: SBSS
272m: SBSS
281m: SBSS
318m: BUCO
346m: WWCO
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



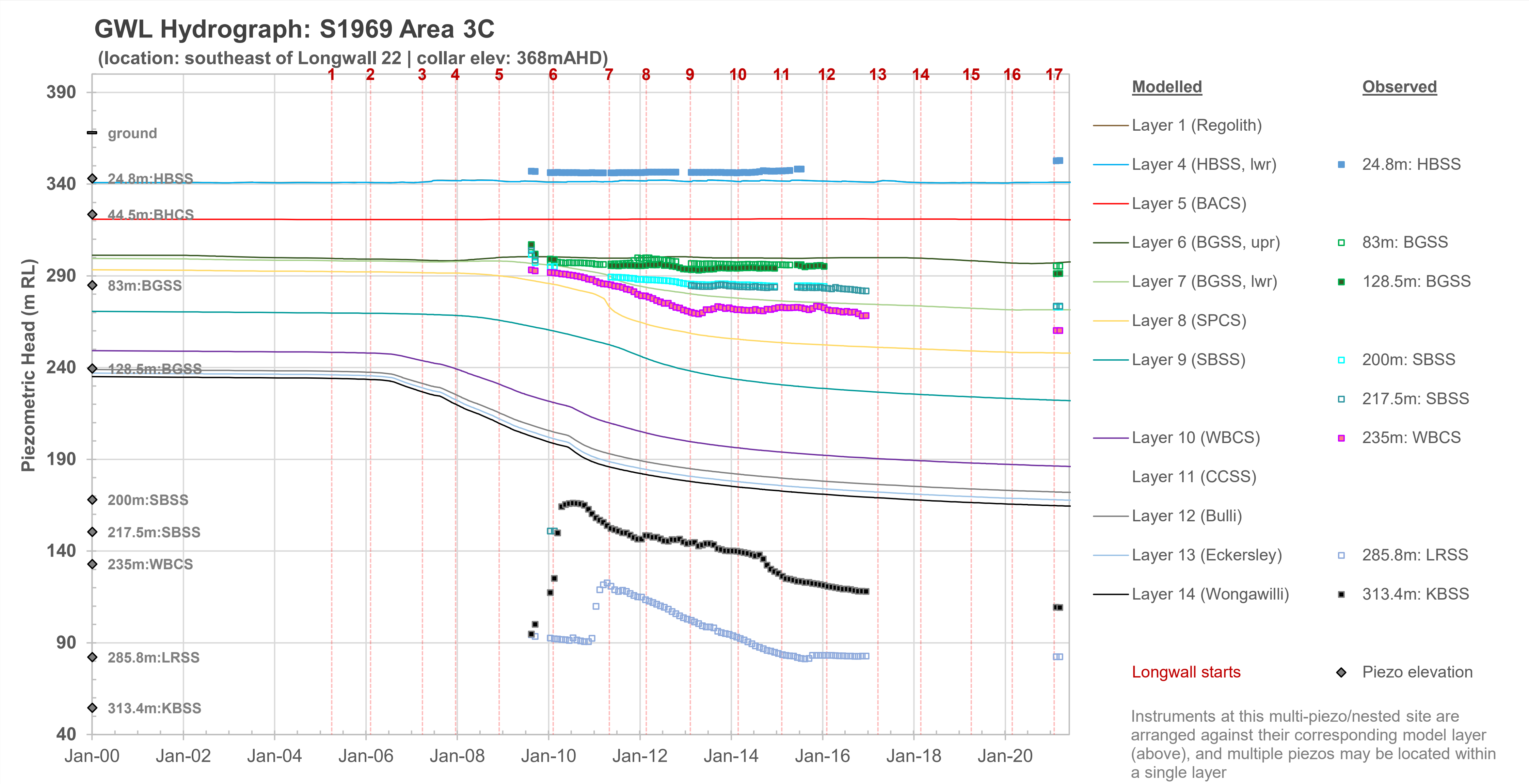
GWL Hydrograph: S2377 Area 3B
(location: Lake Avon, Longwall 14-15 | collar elev: 408.18mAHD)
ground
27.1m:HBSS
112.1m:HBSS
187.1m:BGSS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Piezometric Head (m RL)
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
27.1m: HBSS
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
112.1m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
187.1m: BGSS
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

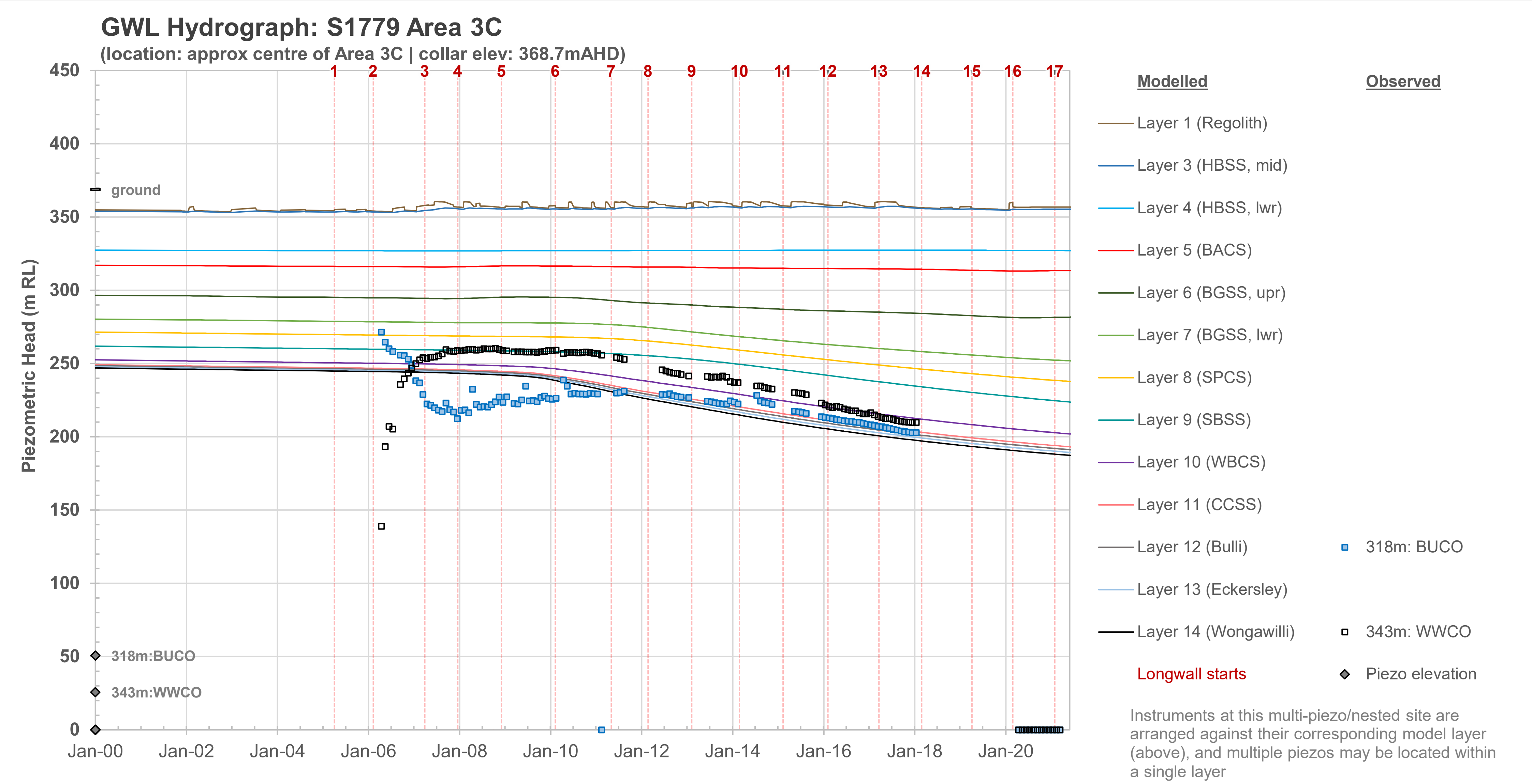


GWL Hydrograph: S2194 Area 3B
(location: Lake Avon, Longwall 17-18 | collar elev: 371.13mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
10m:HBSS
30.4m:HBSS
55.7m:HBSS
111m:BGSS
150.5m:BGSS
195m:BGSS
210m:SBSS
239m:SBSS
274.7m:BUCO
302.5m:WWCO
339.2m:TGSM
Modelled
Layer 1 (Regolith)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
10m: HBSS
30.4m: HBSS
55.7m: HBSS
111m: BGSS
150.5m: BGSS
195m: BGSS
210m: SBSS
239m: SBSS
274.7m: BUCO
302.5m: WWCO
339.2m: TGSM
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

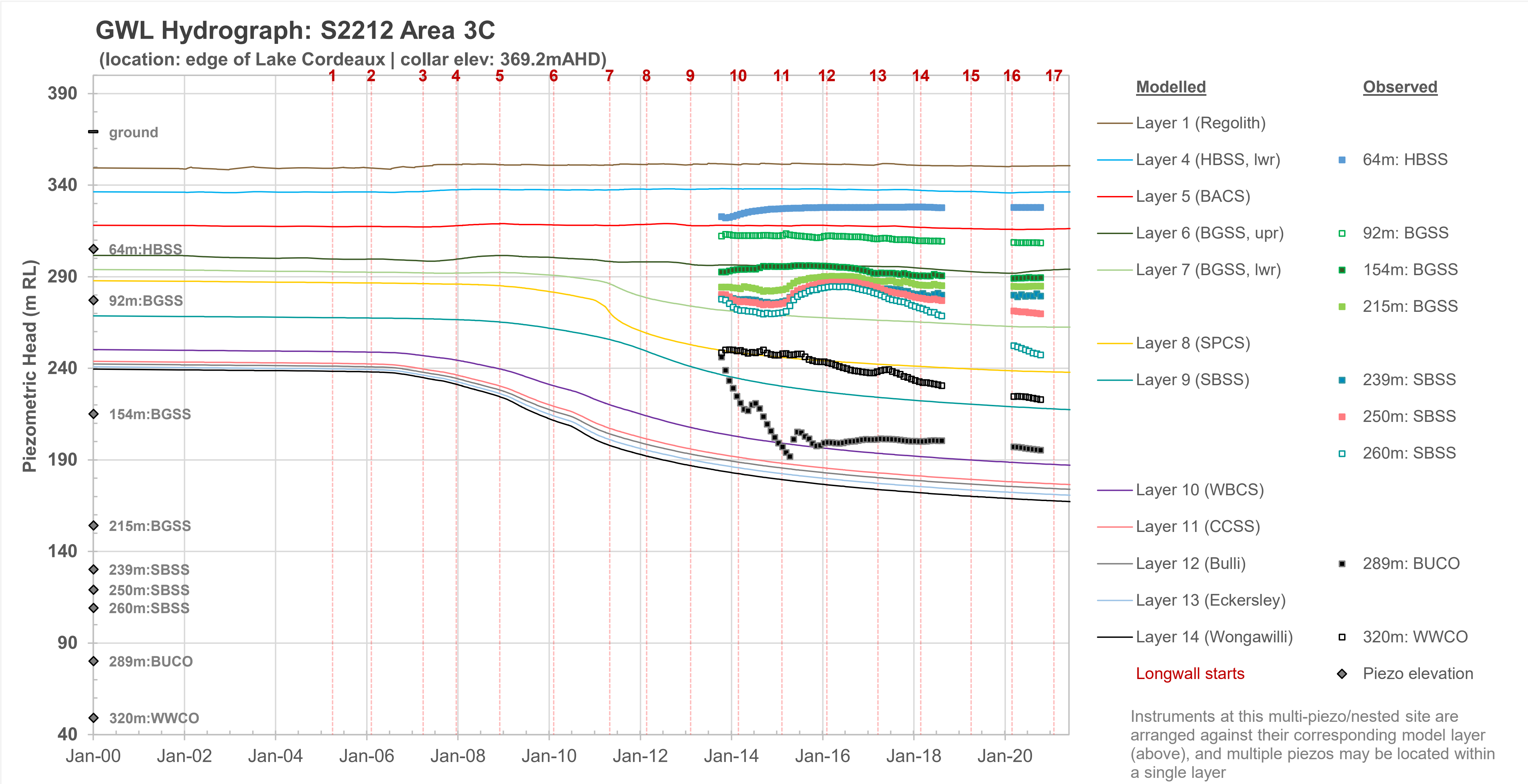


GWL Hydrograph: S2490 Area 3B
(location: South of Longwall 18 | collar elev: 347.09mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
10m:HBSS
25m:HBSS
35m:HBSS
85m:BGSS
Modelled
Observed
Layer 1 (Regolith)
Layer 3 (HBSS, mid)
10m: HBSS
25m: HBSS
35m: HBSS
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
85m: BGSS
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

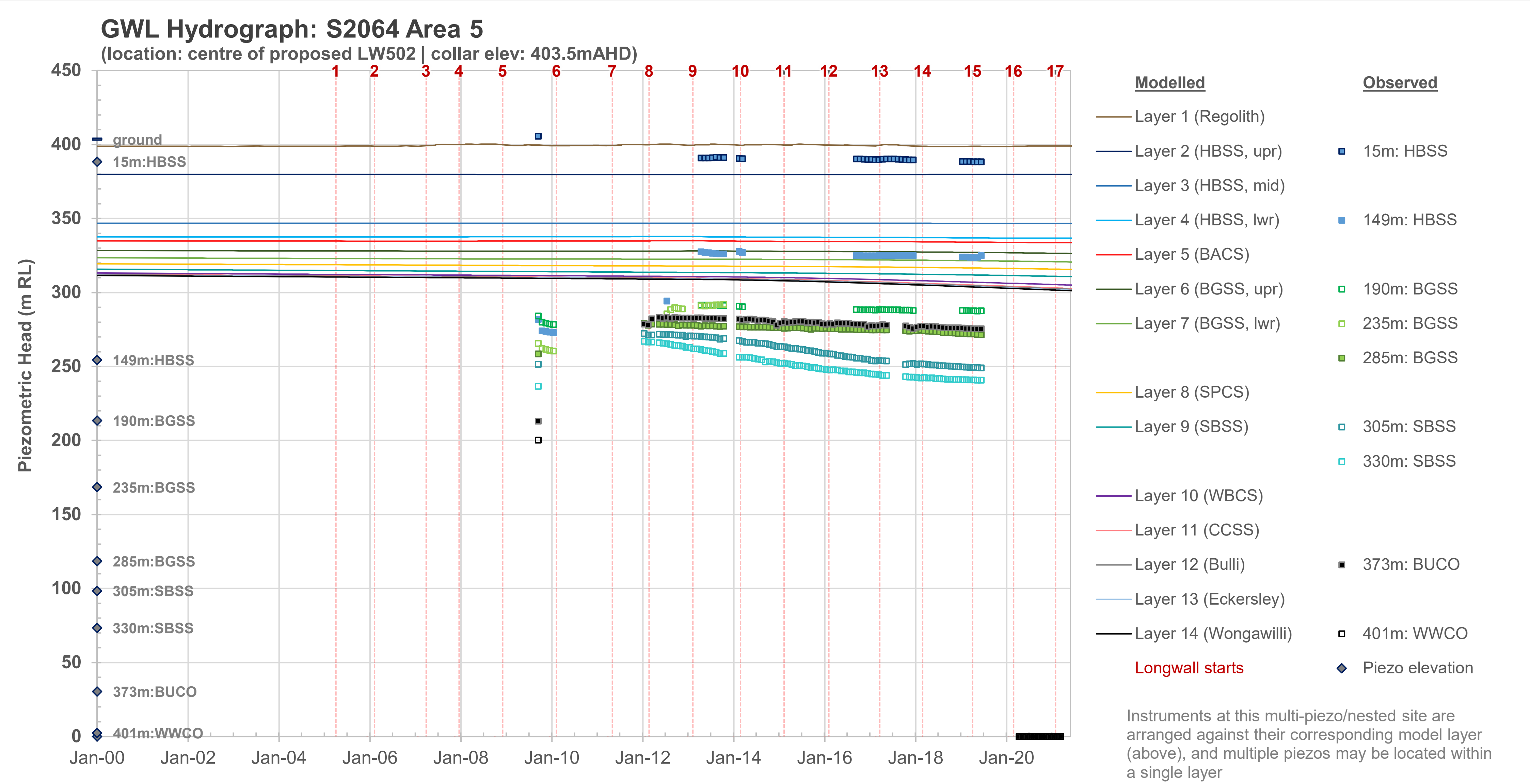

GWL Hydrograph: S1969 Area 3C
(location: southeast of Longwall 22 | collar elev: 368mAHD)
Piezometric Head (m RL)
390
340
290
240
190
140
90
40
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ground
24.8m:HBSS
44.5m:BHCS
83m:BGSS
128.5m:BGSS
200m:SBSS
217.5m:SBSS
235m:WBCS
285.8m:LRSS
313.4m:KBSS
Modelled
Observed
Layer 1 (Regolith)
Layer 4 (HBSS, lwr)
24.8m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
83m: BGSS
Layer 7 (BGSS, lwr)
128.5m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
200m: SBSS
217.5m: SBSS
Layer 10 (WBCS)
235m: WBCS
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
285.8m: LRSS
Layer 14 (Wongawilli)
313.4m: KBSS
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

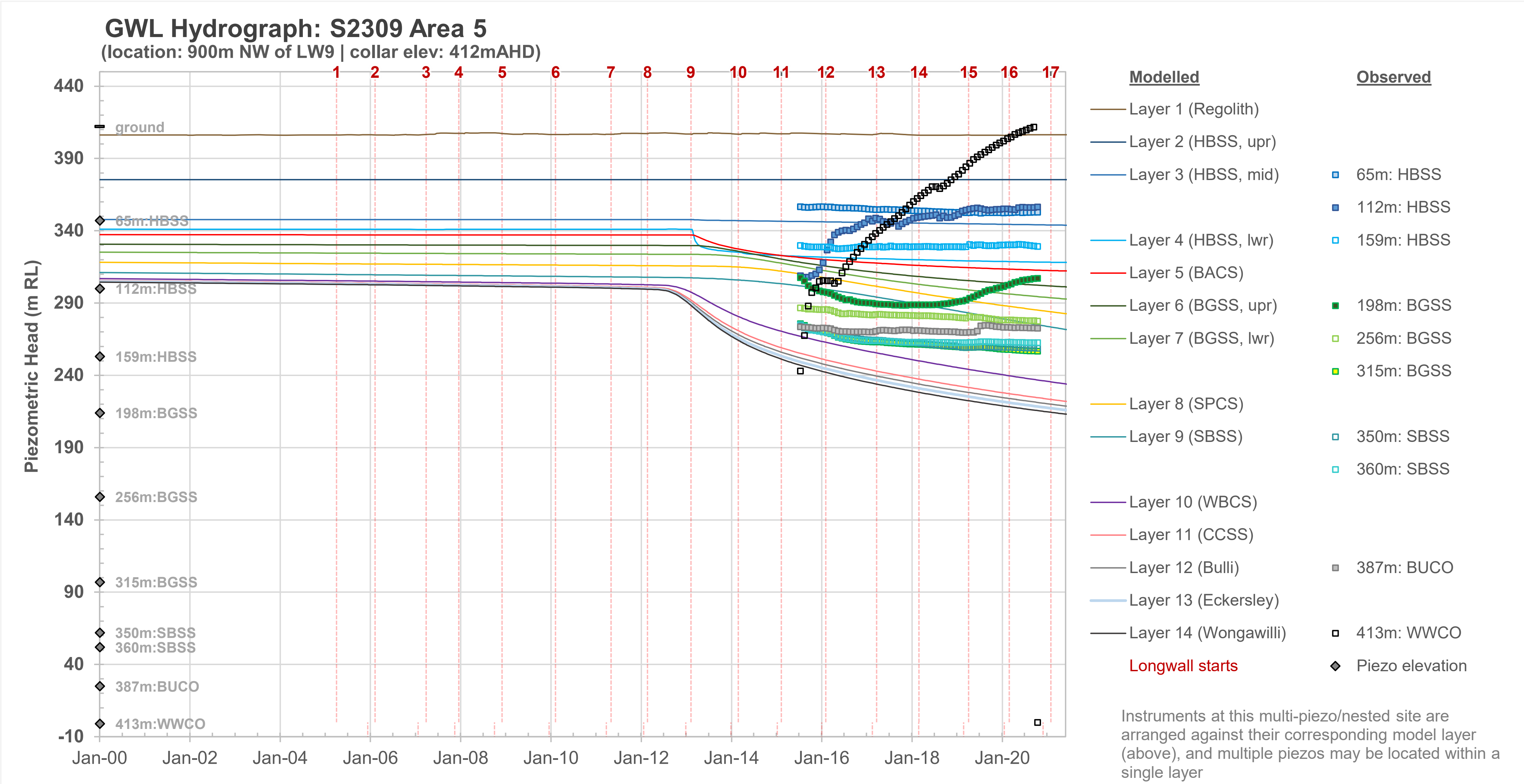


GWL Hydrograph: S1779 Area 3C
(location: approx centre of Area 3C | collar elev: 368.7mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
ground
318m:BUCO
343m:WWCO
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Modelled
Observed
Layer 1 (Regolith)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
318m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
343m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

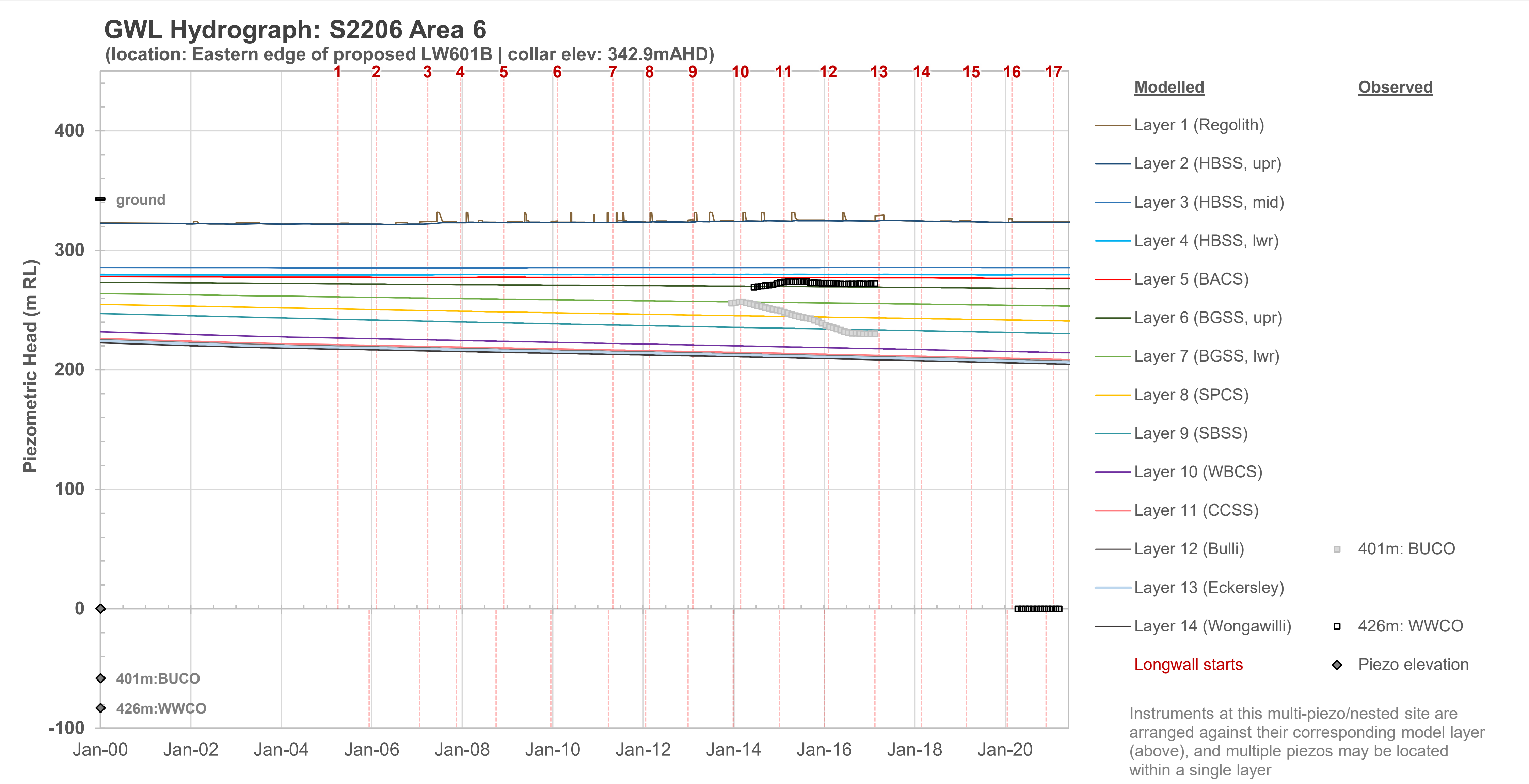


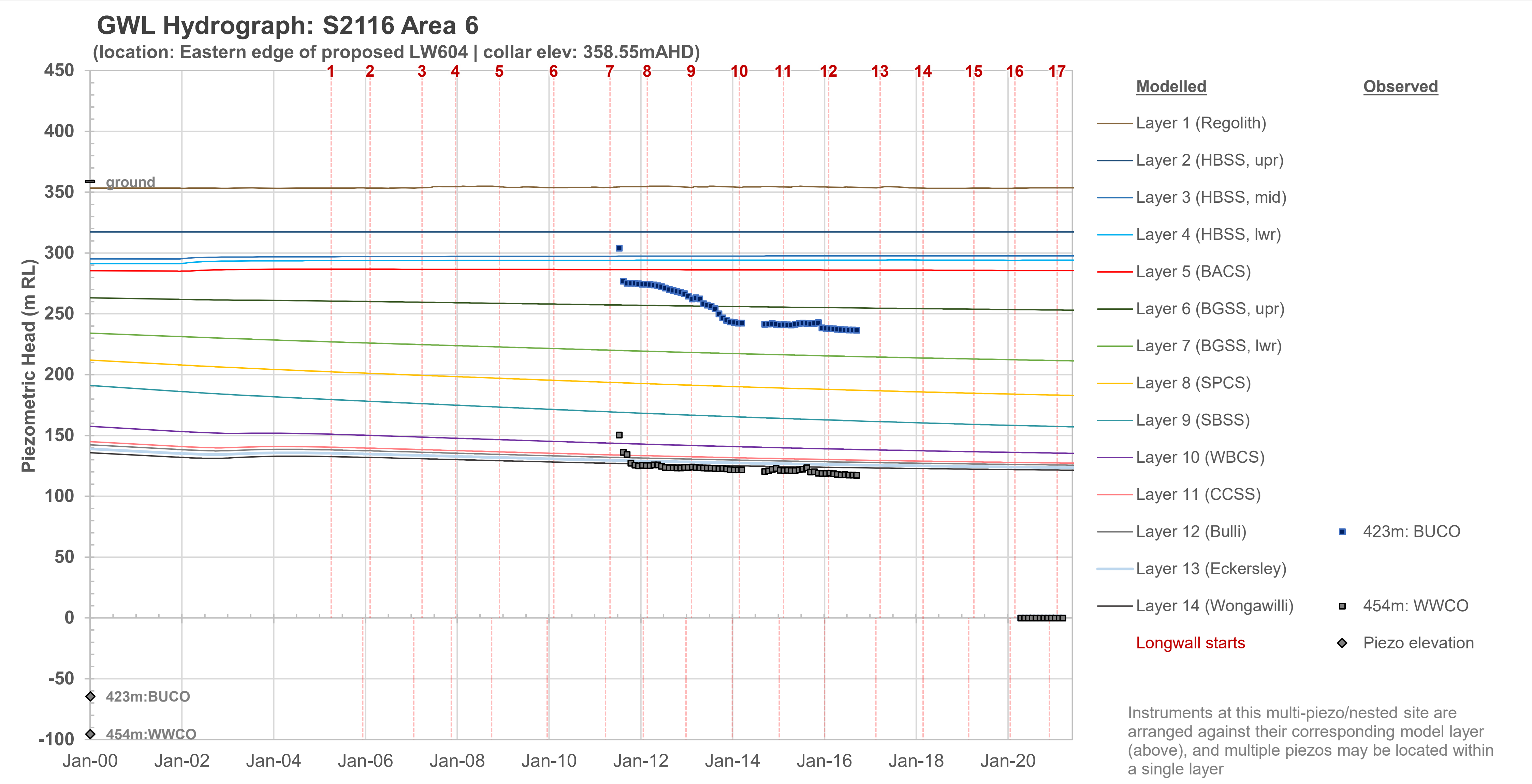
GWL Hydrograph: S2212 Area 3C
(location: edge of Lake Cordeaux | collar elev: 369.2mAHD)
Piezometric Head (m RL)
390
340
290
240
190
140
90
40
ground
64m:HBSS
92m:BGSS
154m:BGSS
215m:BGSS
239m:SBSS
250m:SBSS
260m:SBSS
289m:BUCO
320m:WWCO
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12 Jan-14 Jan-16 Jan-18 Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 4 (HBSS, lwr)
64m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
92m: BGSS
Layer 7 (BGSS, lwr)
154m: BGSS
215m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
239m: SBSS
250m: SBSS
260m: SBSS
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
289m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
320m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer


GWL Hydrograph: S2064 Area 5
(location: centre of proposed LW502 | collar elev: 403.5mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
15m:HBSS
149m:HBSS
190m:BGSS
235m:BGSS
285m:BGSS
305m:SBSS
330m:SBSS
373m:BUCO
401m:WWCO
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
15m: HBSS
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
149m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
190m: BGSS
Layer 7 (BGSS, lwr)
235m: BGSS
285m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
305m: SBSS
330m: SBSS
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
373m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
401m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

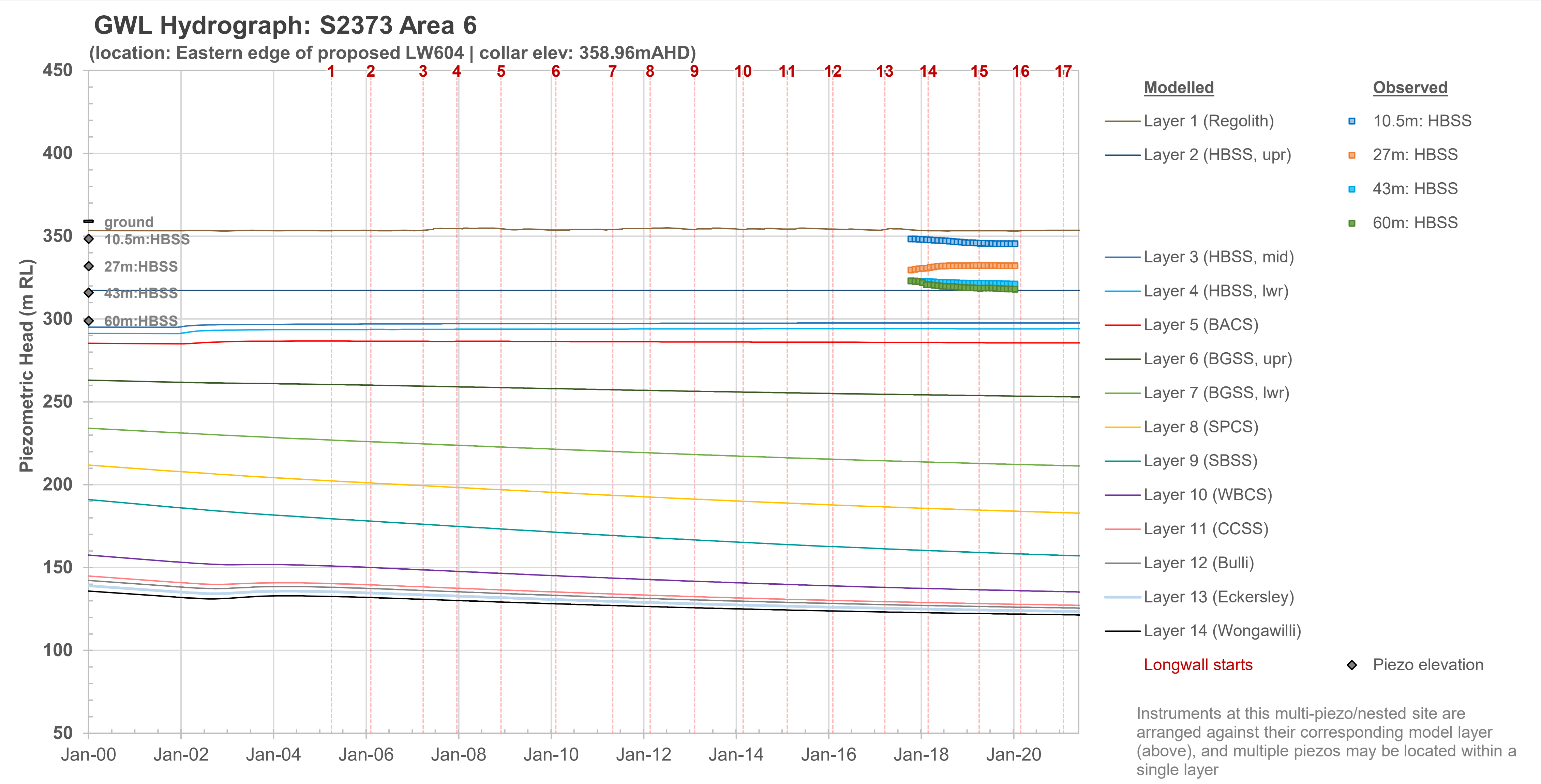


GWL Hydrograph: S2309 Area 5
(location: 900m NW of LW9 | collar elev: 412mAHD)
Piezometric Head (m RL)
440
390
340
290
240
190
140
90
40
-10
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
65m:HBSS
112m:HBSS
159m:HBSS
198m:BGSS
256m:BGSS
315m:BGSS
350m:SBSS
360m:SBSS
387m:BUCO
413m:WWCO
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
65m: HBSS
112m: HBSS
Layer 4 (HBSS, lwr)
159m: HBSS
Layer 5 (BACS)
Layer 6 (BGSS, upr)
198m: BGSS
Layer 7 (BGSS, lwr)
256m: BGSS
315m: BGSS
Layer 8 (SPCS)
Layer 9 (SBSS)
350m: SBSS
360m: SBSS
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
387m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
413m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

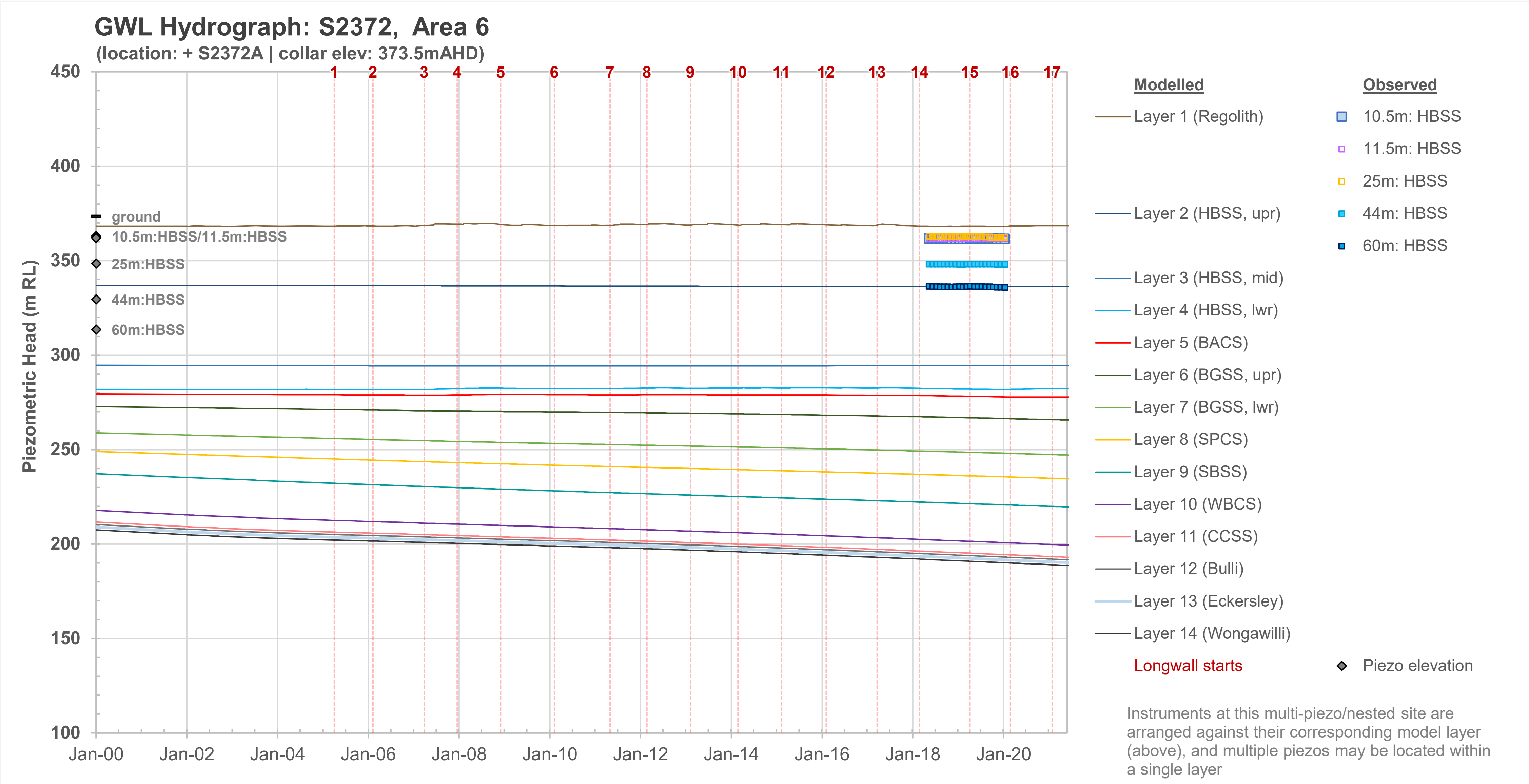

GWL Hydrograph: S2206 Area 6
(location: Eastern edge of proposed LW601B | collar elev: 342.9mAHD)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Piezometric Head (m RL)
400
300
200
100
0
-100
ground
401m:BUCO
426m:WWCO
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
401m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
426m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

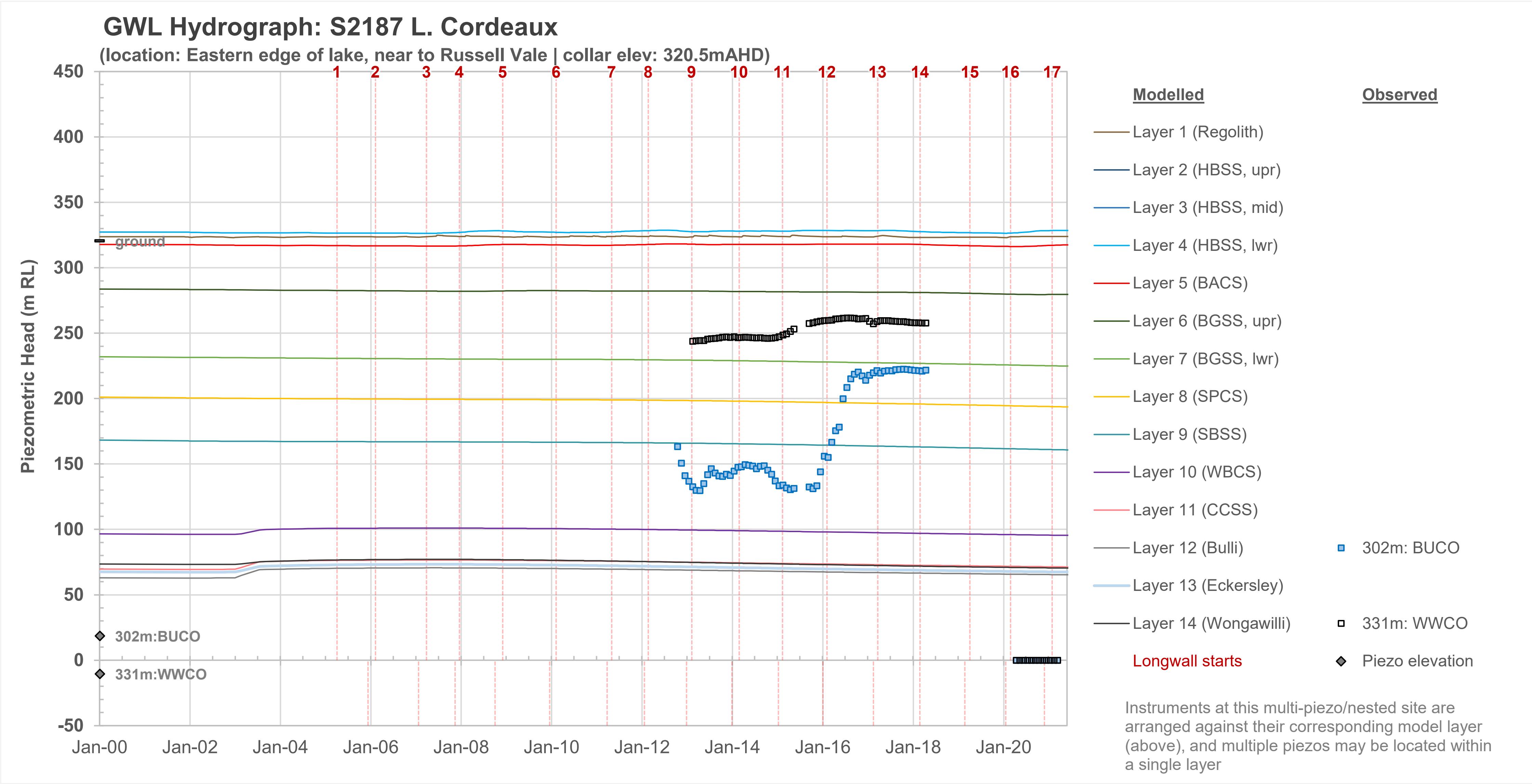


GWL Hydrograph: S2116 Area 6
(location: Eastern edge of proposed LW604 | collar elev: 358.55mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
-50
-100
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
423m:BUCO
454m:WWCO
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
423m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
454m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer



GWL Hydrograph: S2373 Area 6
(location: Eastern edge of proposed LW604 | collar elev: 358.96mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ground
10.5m:HBSS
27m:HBSS
43m:HBSS
60m:HBSS
Modelled
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
10.5m: HBSS
27m: HBSS
43m: HBSS
60m: HBSS
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer


GWL Hydrograph: S2372, Area 6
(location: + S2372A | collar elev: 373.5mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
10.5m:HBSS/11.5m:HBSS
25m:HBSS
44m:HBSS
60m:HBSS
Modelled
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
Longwall starts
Observed
10.5m: HBSS
11.5m: HBSS
25m: HBSS
44m: HBSS
60m: HBSS
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer


GWL Hydrograph: S2187 L. Cordeaux
(location: Eastern edge of lake, near to Russell Vale | collar elev: 320.5mAHD)
Piezometric Head (m RL)
450
400
350
300
250
200
150
100
50
0
-50
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
ground
302m:BUCO
331m:WWCO
Modelled
Observed
Layer 1 (Regolith)
Layer 2 (HBSS, upr)
Layer 3 (HBSS, mid)
Layer 4 (HBSS, lwr)
Layer 5 (BACS)
Layer 6 (BGSS, upr)
Layer 7 (BGSS, lwr)
Layer 8 (SPCS)
Layer 9 (SBSS)
Layer 10 (WBCS)
Layer 11 (CCSS)
Layer 12 (Bulli)
302m: BUCO
Layer 13 (Eckersley)
Layer 14 (Wongawilli)
331m: WWCO
Longwall starts
Piezo elevation
Instruments at this multi-piezo/nested site are arranged against their corresponding model layer (above), and multiple piezos may be located within a single layer

Appendix G: Modelled groundwater level maps

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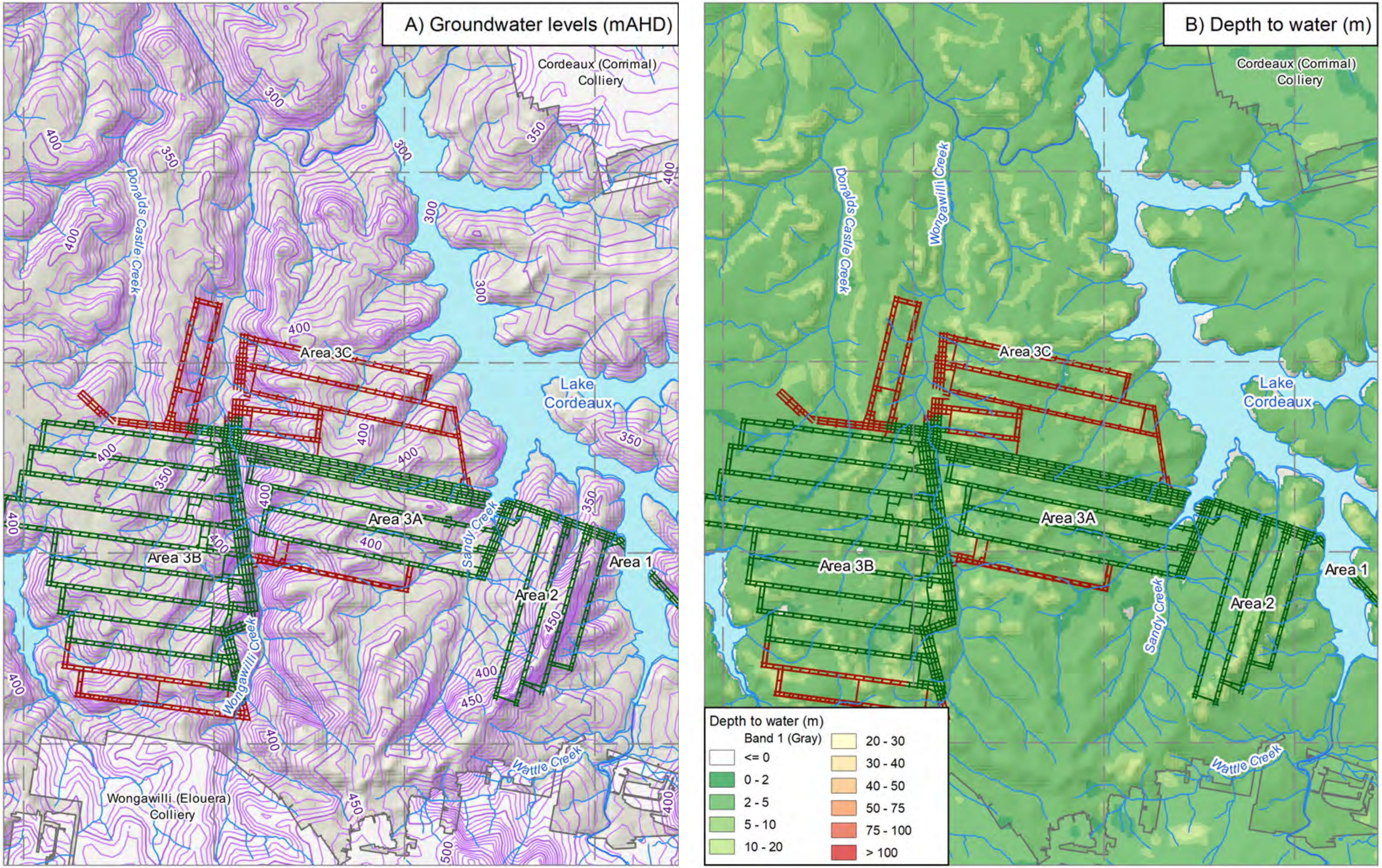
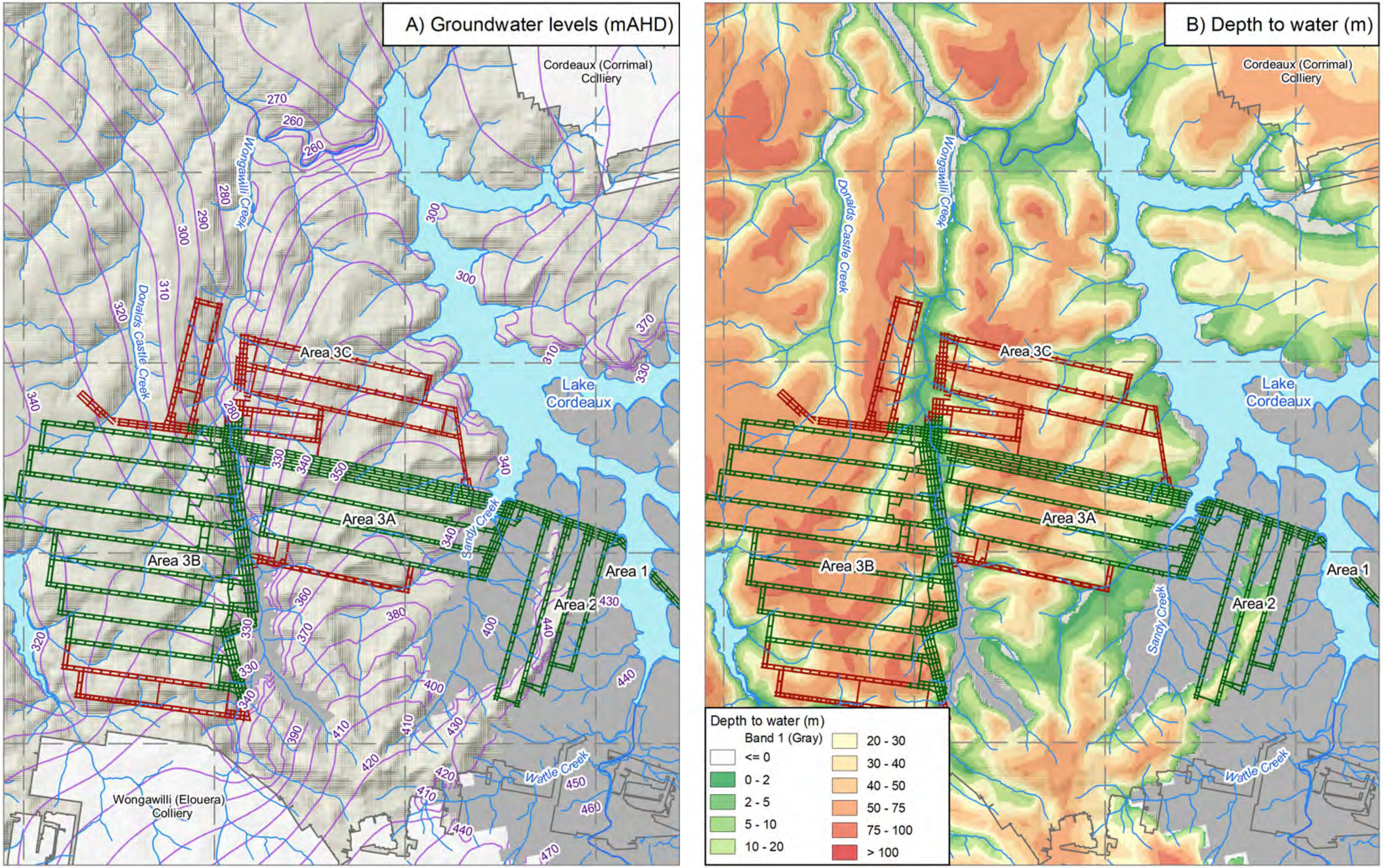


IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Water table - Pre-mining

Figure G-1



N 0 0.5 1 1.5 km

Map Scale: 1:65,000 @ A4

GDA 1994 MGA Zone 56

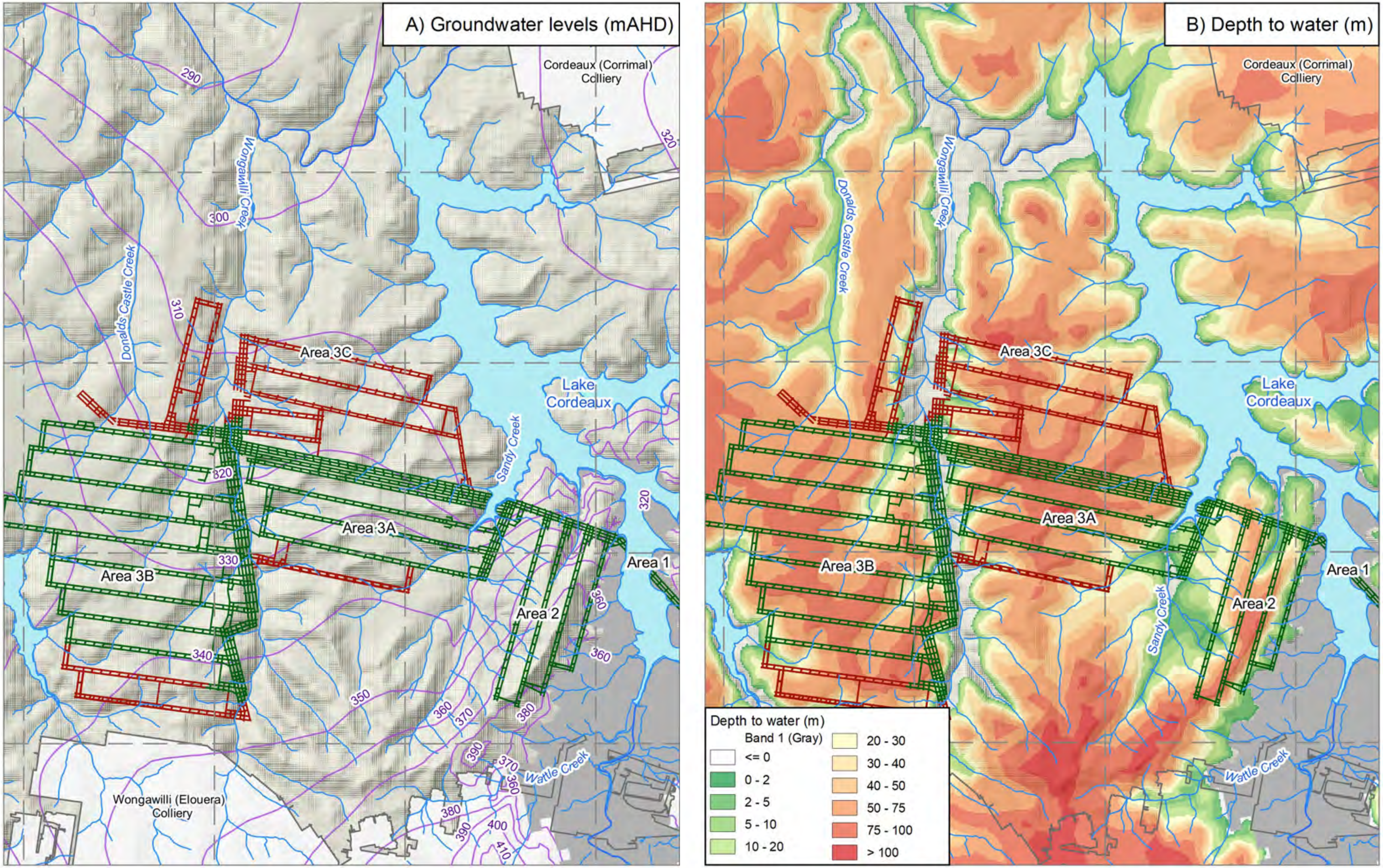
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: lower Hawkesbury Sandstone - Pre-mining

Figure G-2



N
0 0.5 1 1.5 km
Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

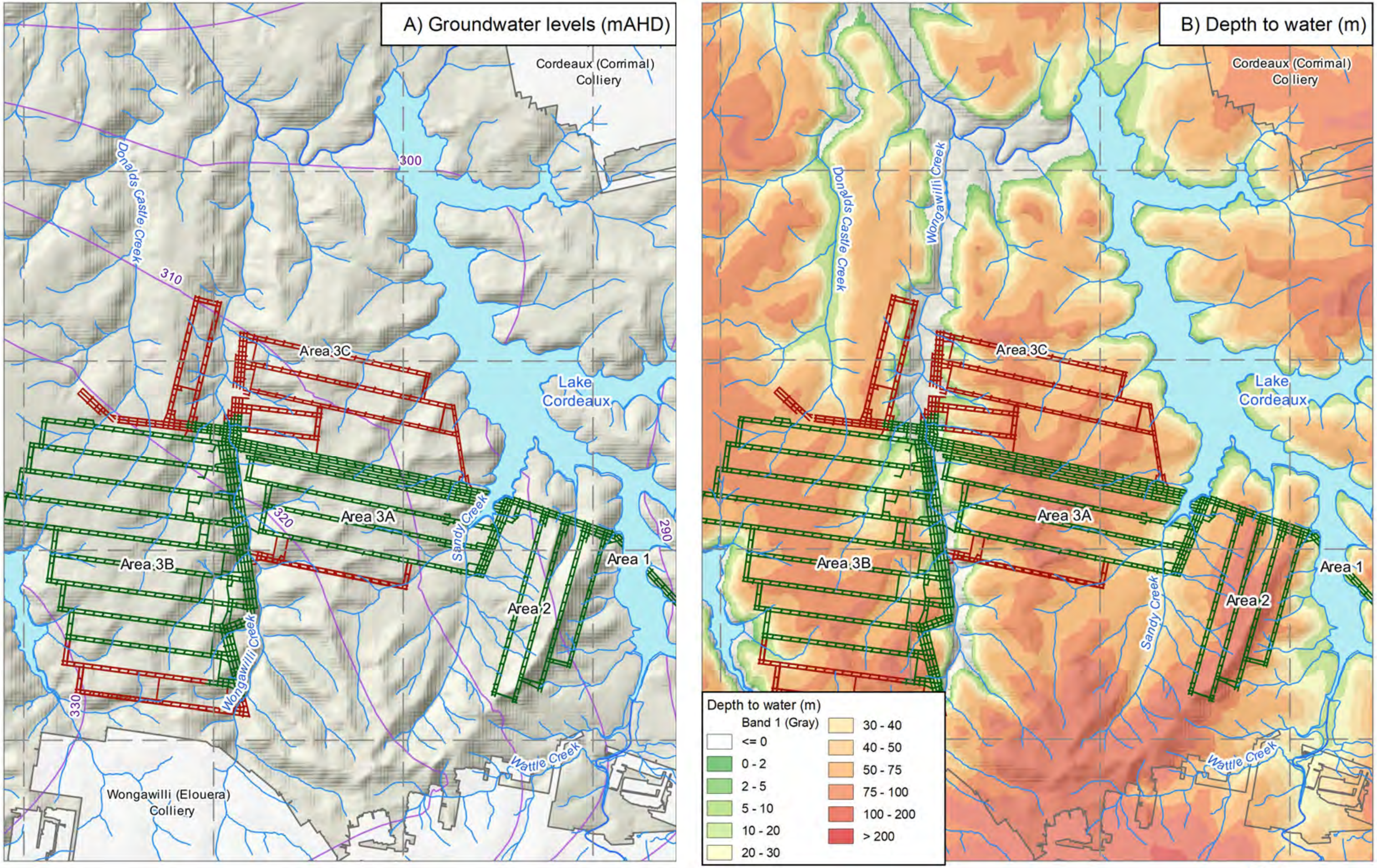
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Bulgo Sandstone - Pre-mining

Figure G-3

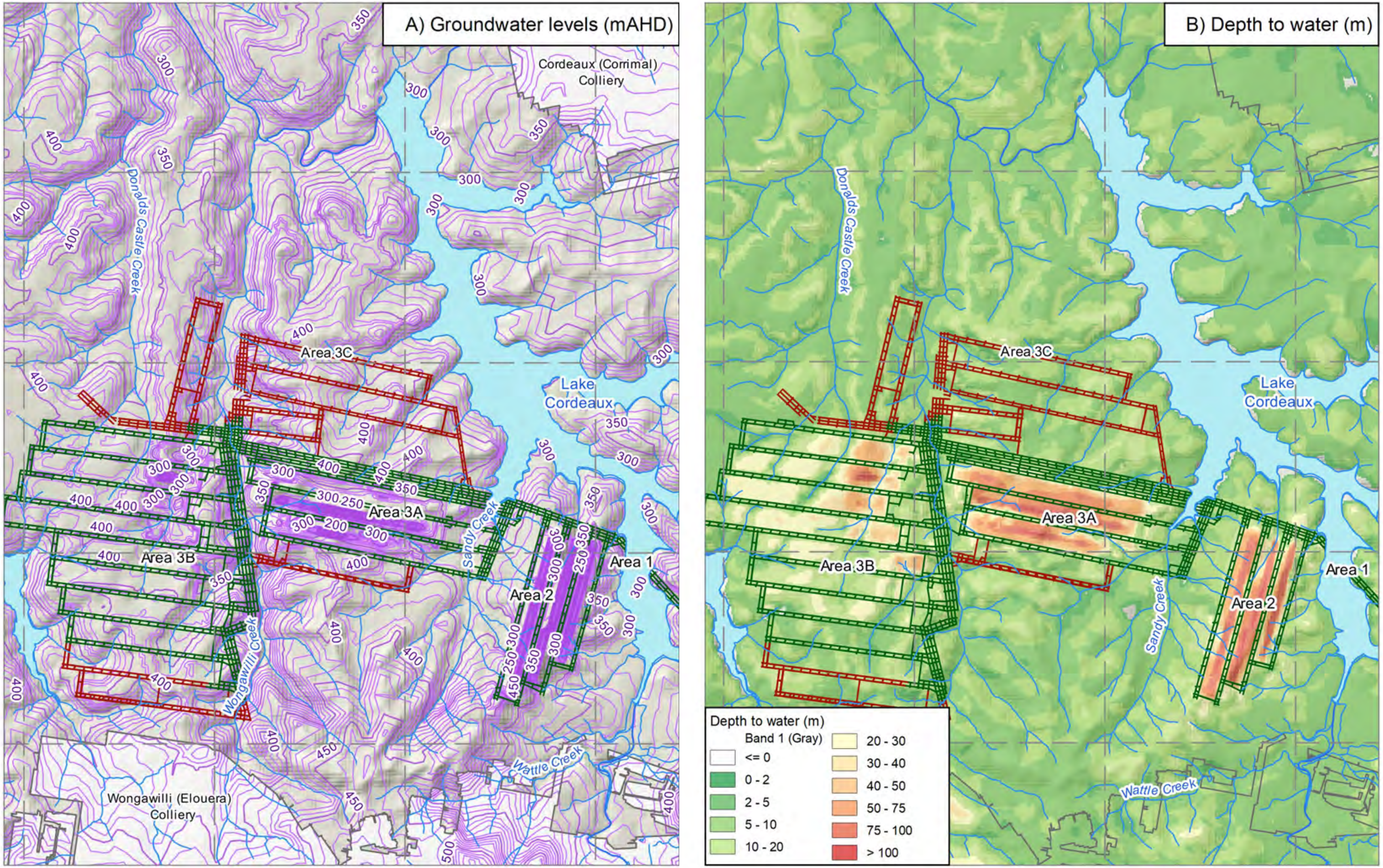


WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Wongawilli Coal Seam - Pre-mining

Figure G-4



0 0.5 1 1.5 km

Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

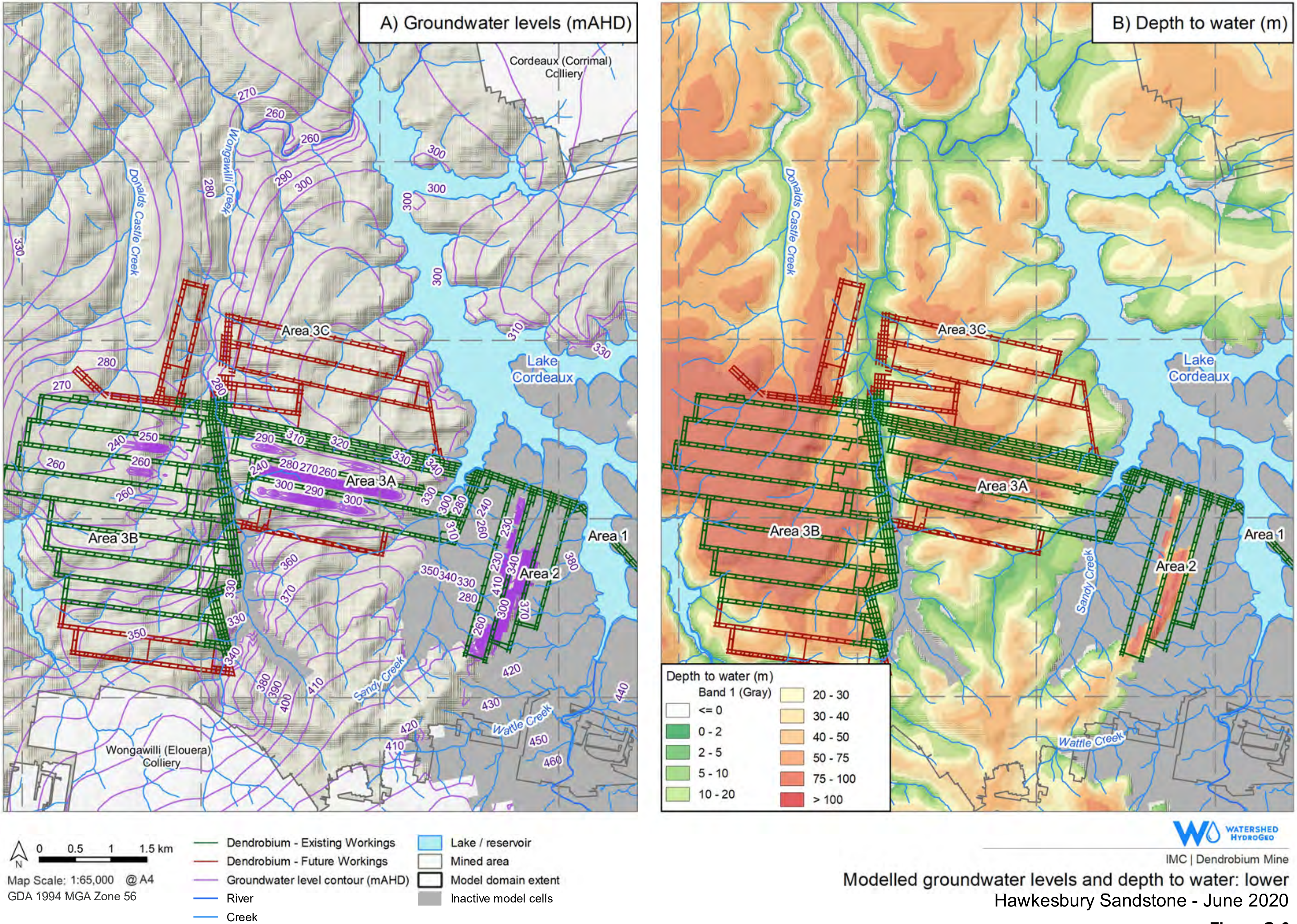
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- 10m groundwater level contour
- 50m groundwater level contour
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Water table - June 2020

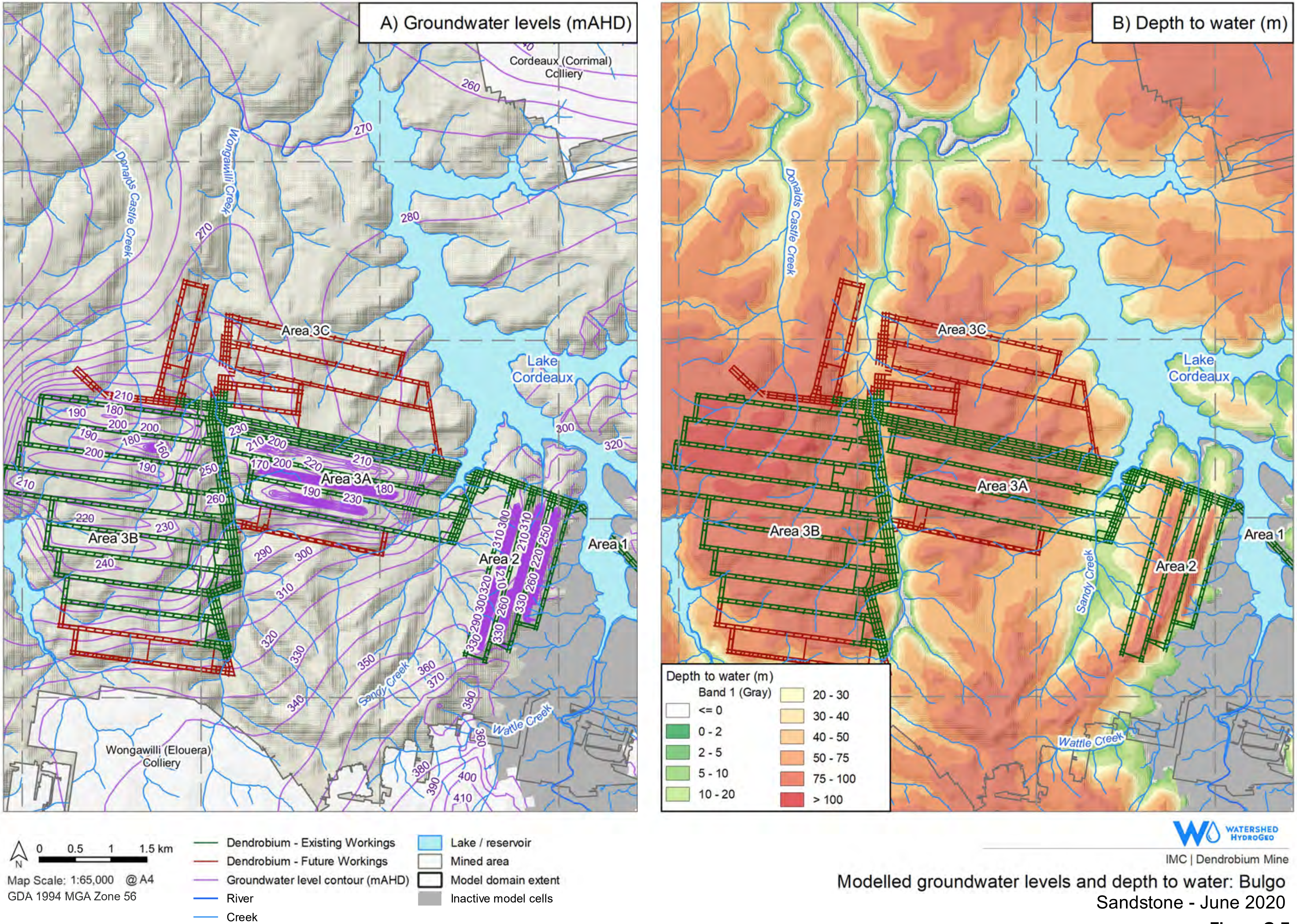
Figure G-5



IMC | Dendrobium Mine

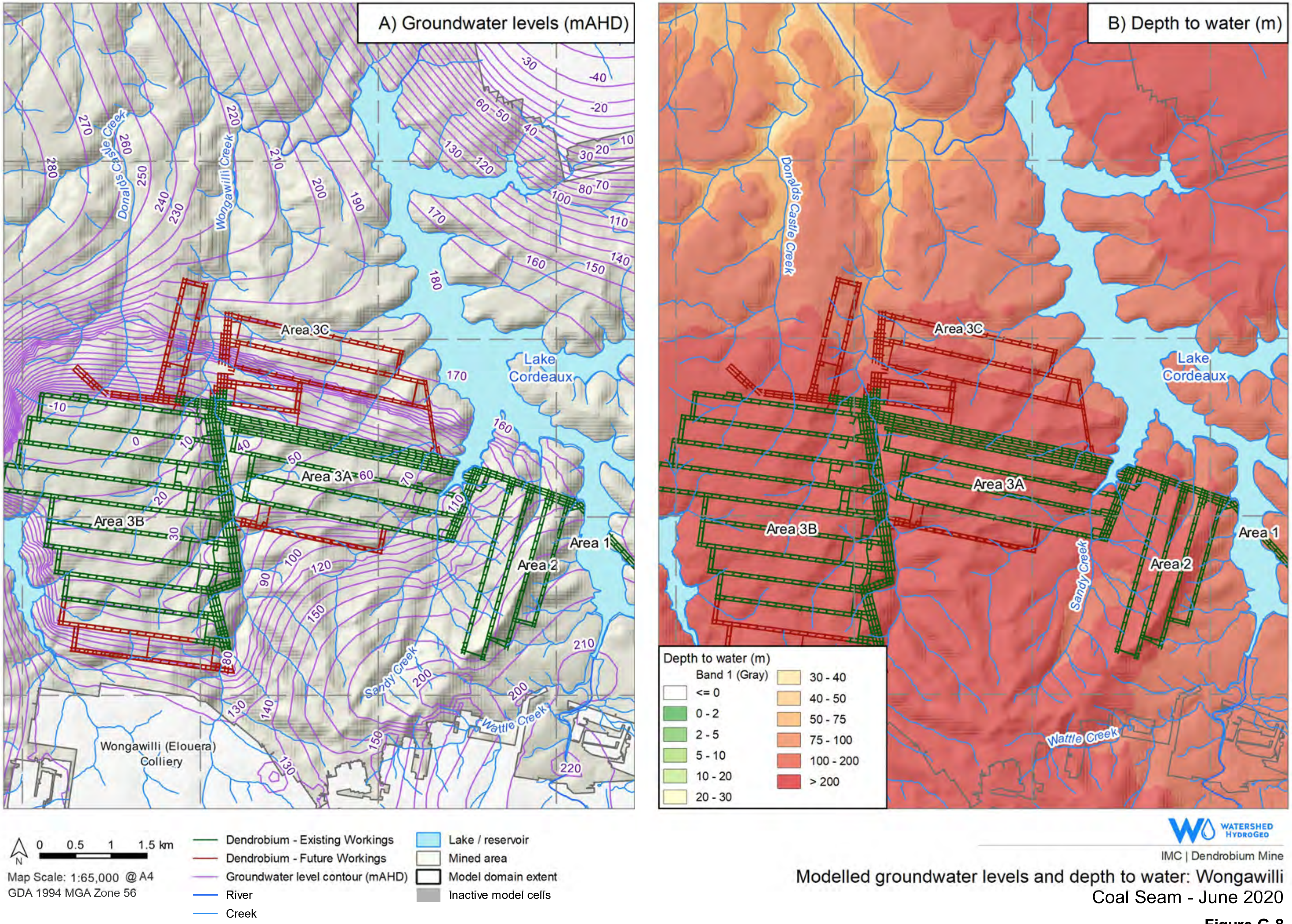
Modelled groundwater levels and depth to water: lower Hawkesbury Sandstone - June 2020

Figure G-6



Modelled groundwater levels and depth to water: Bulgo Sandstone - June 2020

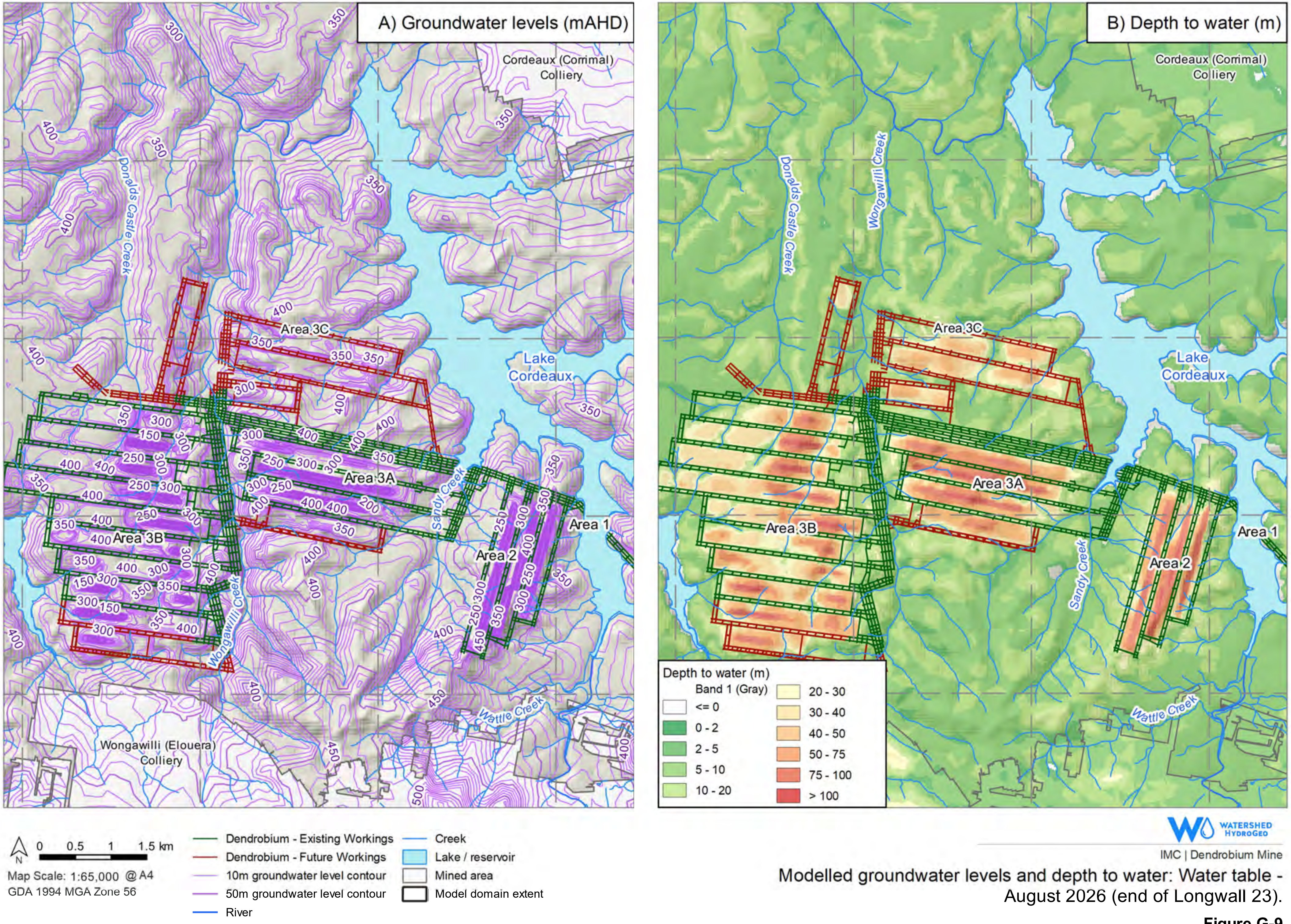
Figure G-7



IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Wongawilli Coal Seam - June 2020

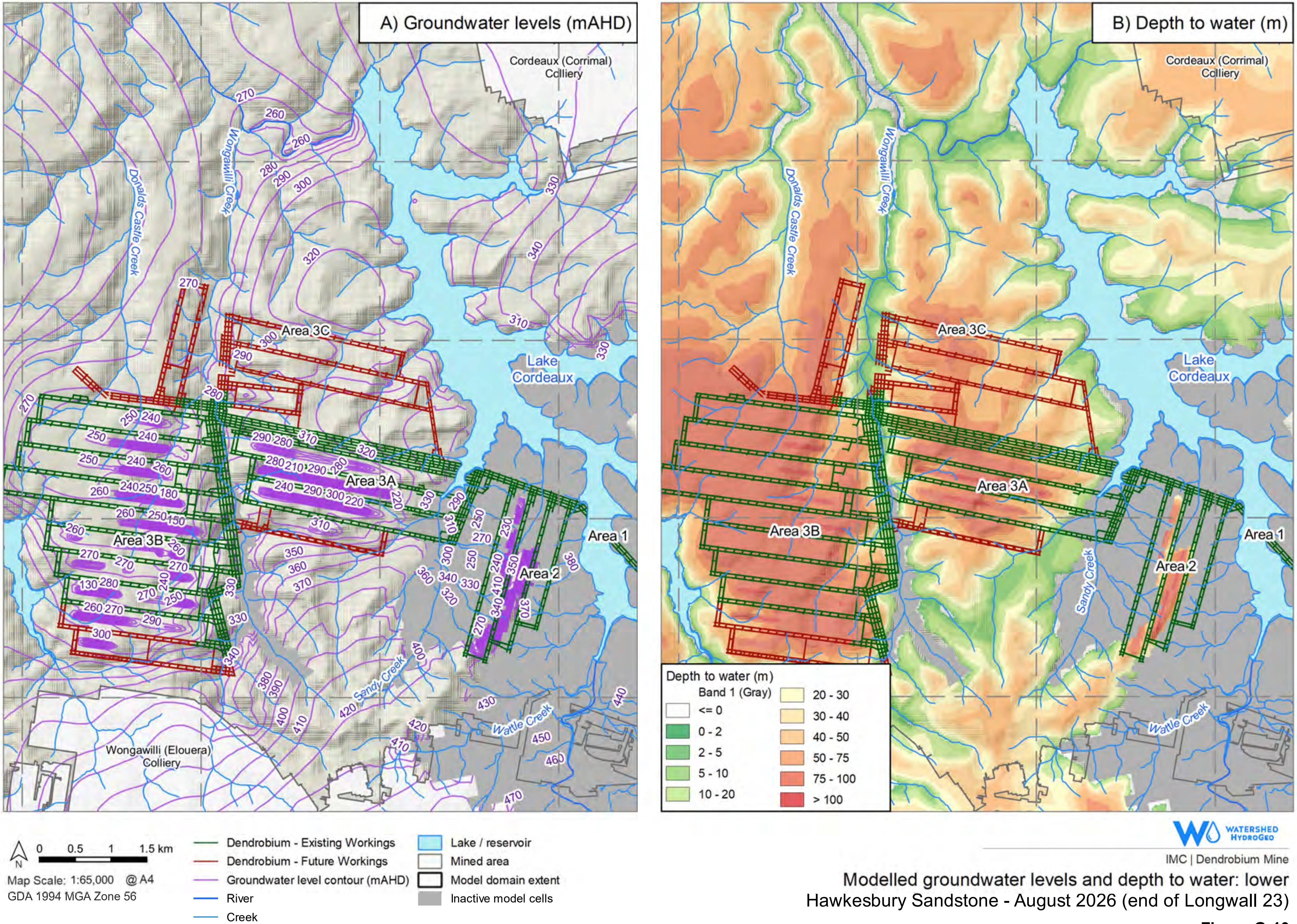
Figure G-8



IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Water table - August 2026 (end of Longwall 23).

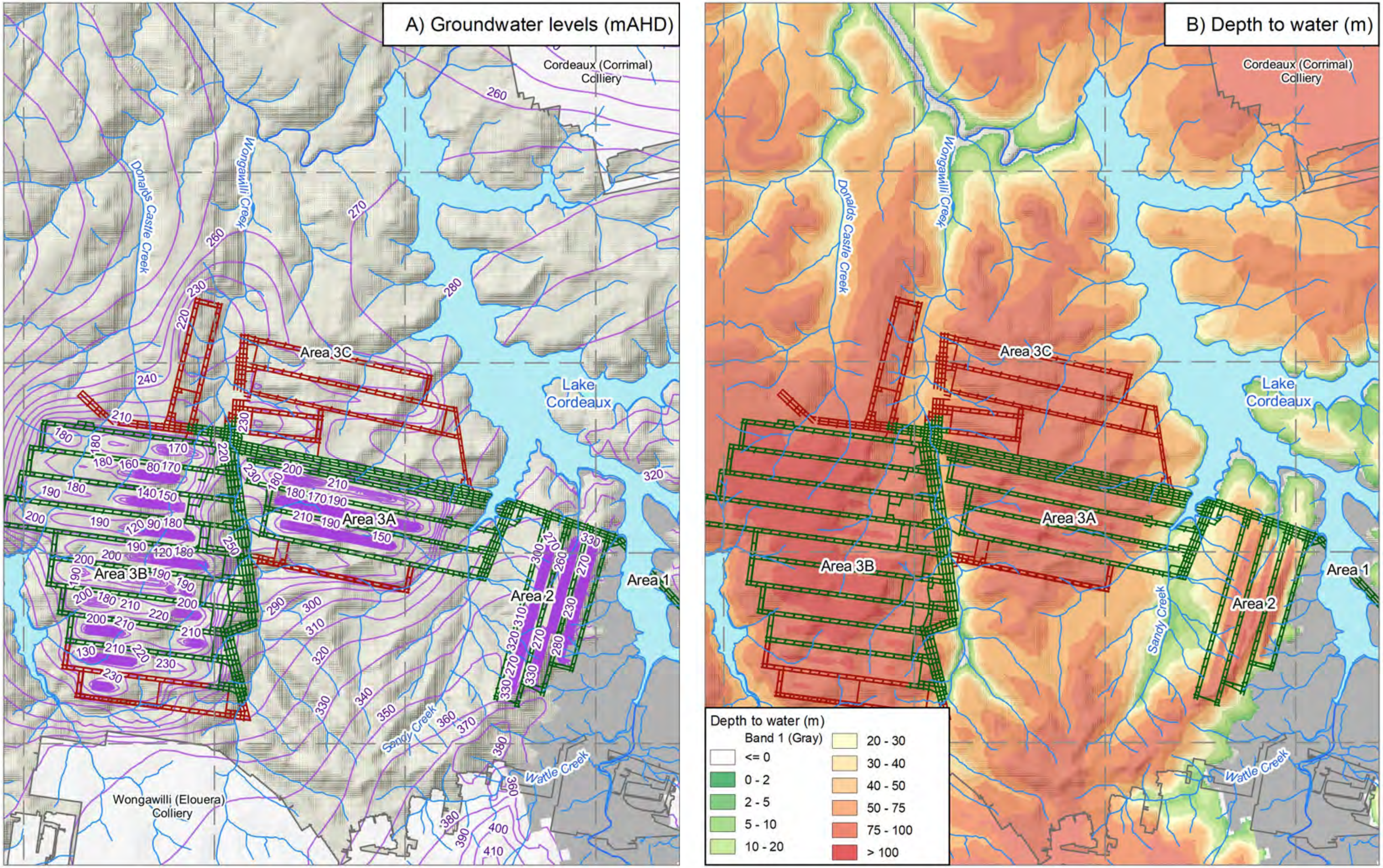
Figure G-9



IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: lower Hawkesbury Sandstone - August 2026 (end of Longwall 23)

Figure G-10



N
0 0.5 1 1.5 km
Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

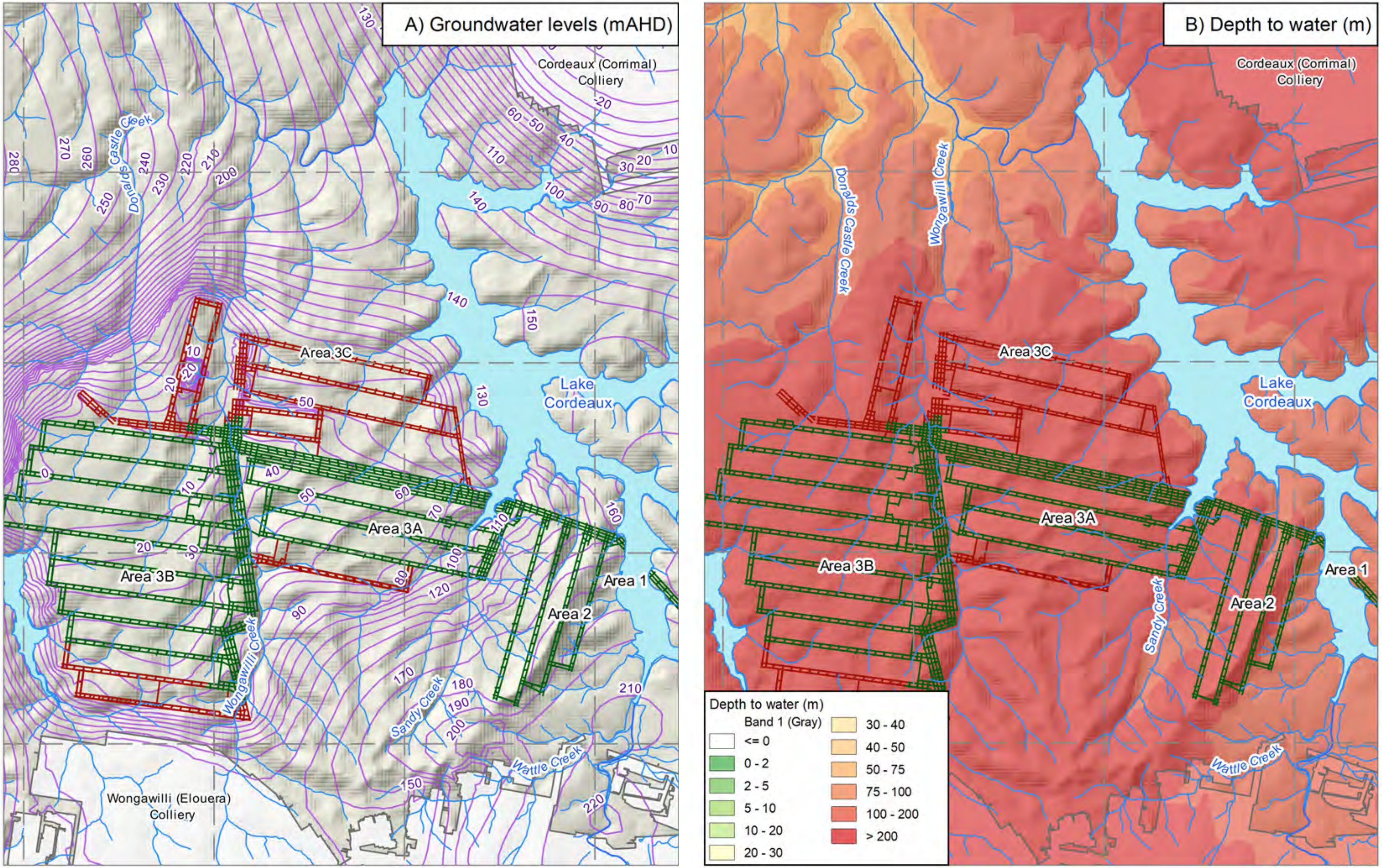
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Bulgo Sandstone - August 2026 (end of Longwall 23)

Figure G-11



0 0.5 1 1.5 km

Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

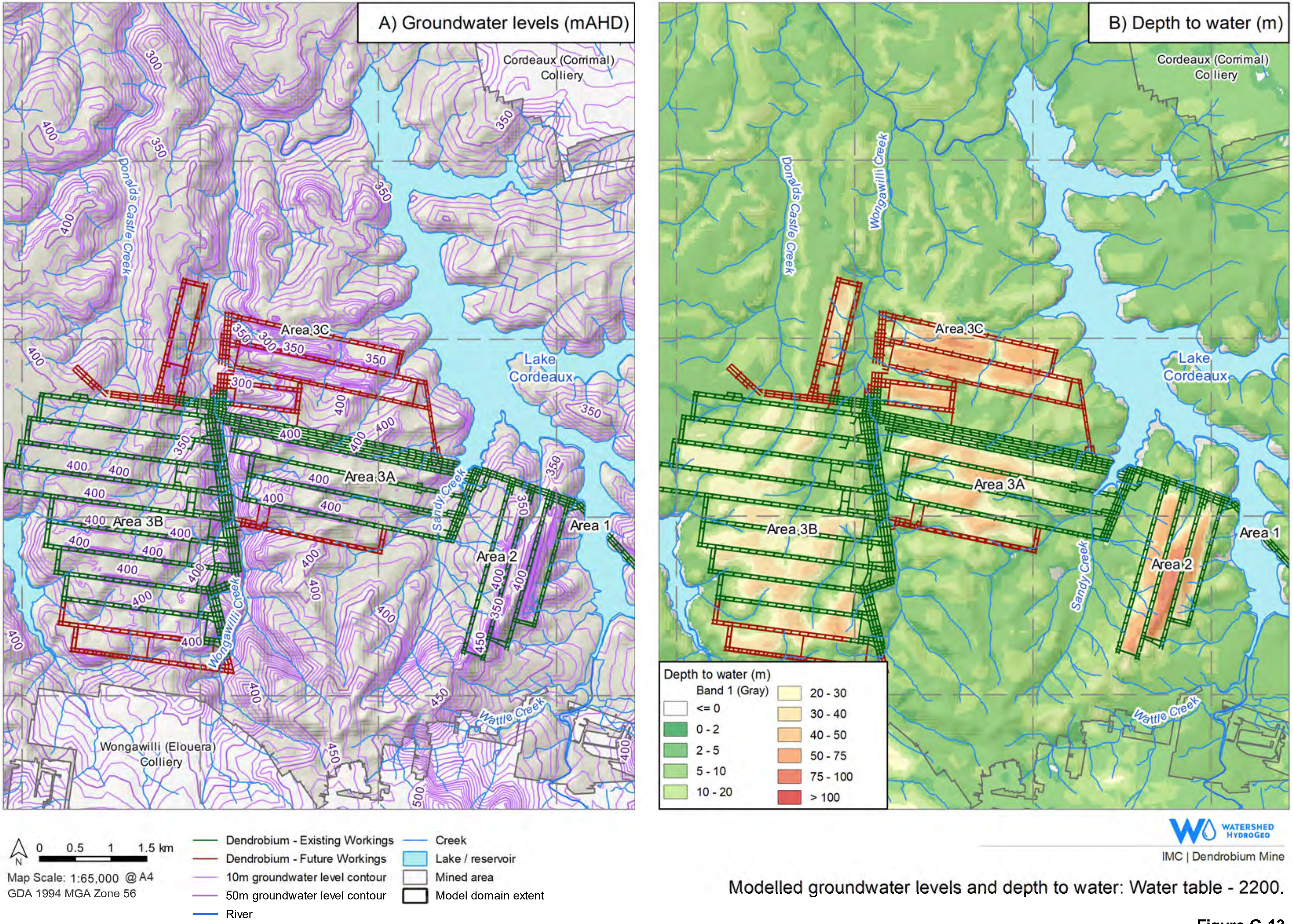
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Wongawilli Coal Seam - August 2026 (end of Longwall 23)

Figure G-12

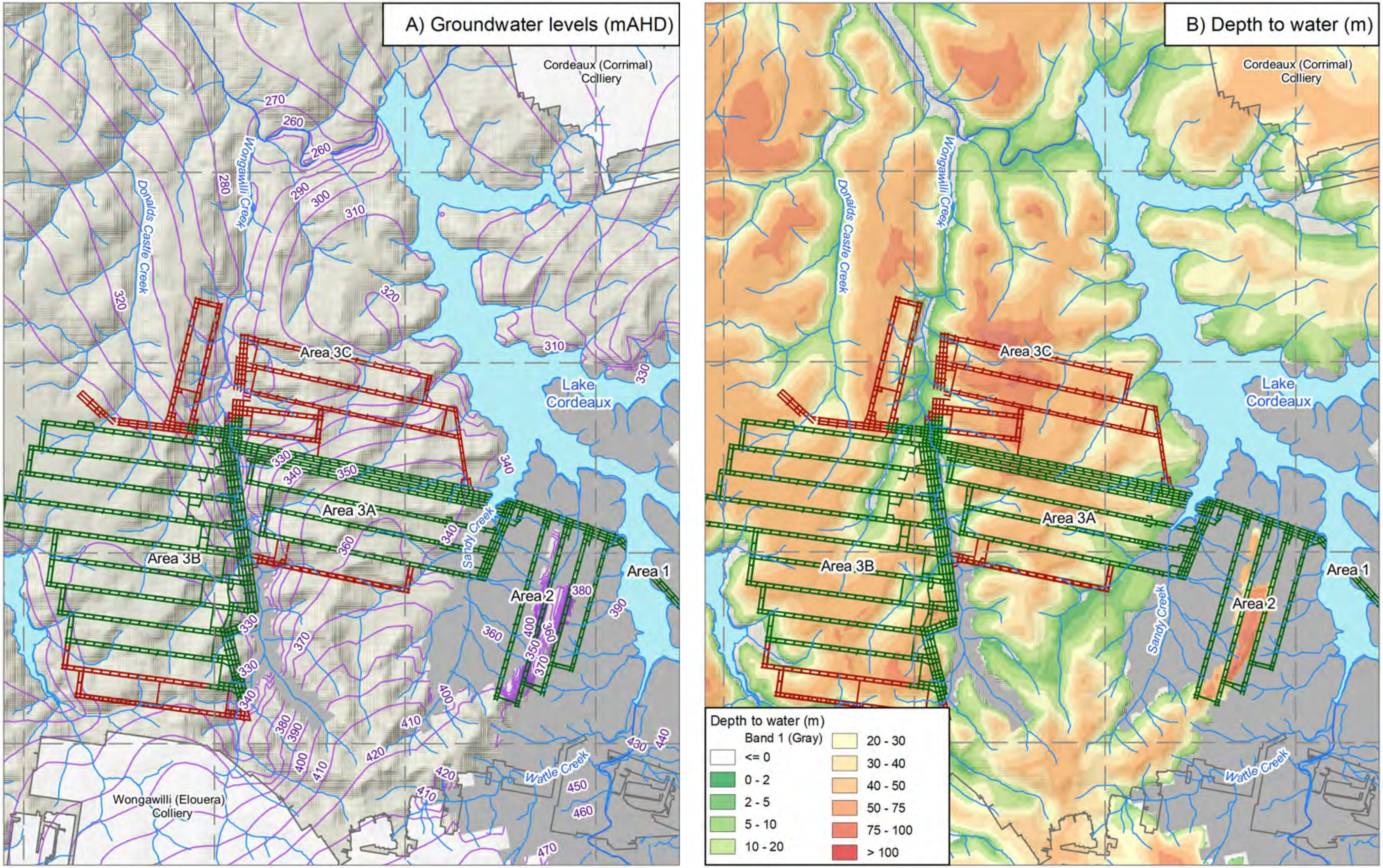


WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Water table - 2200.

Figure G-13



N 0 0.5 1 1.5 km

Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

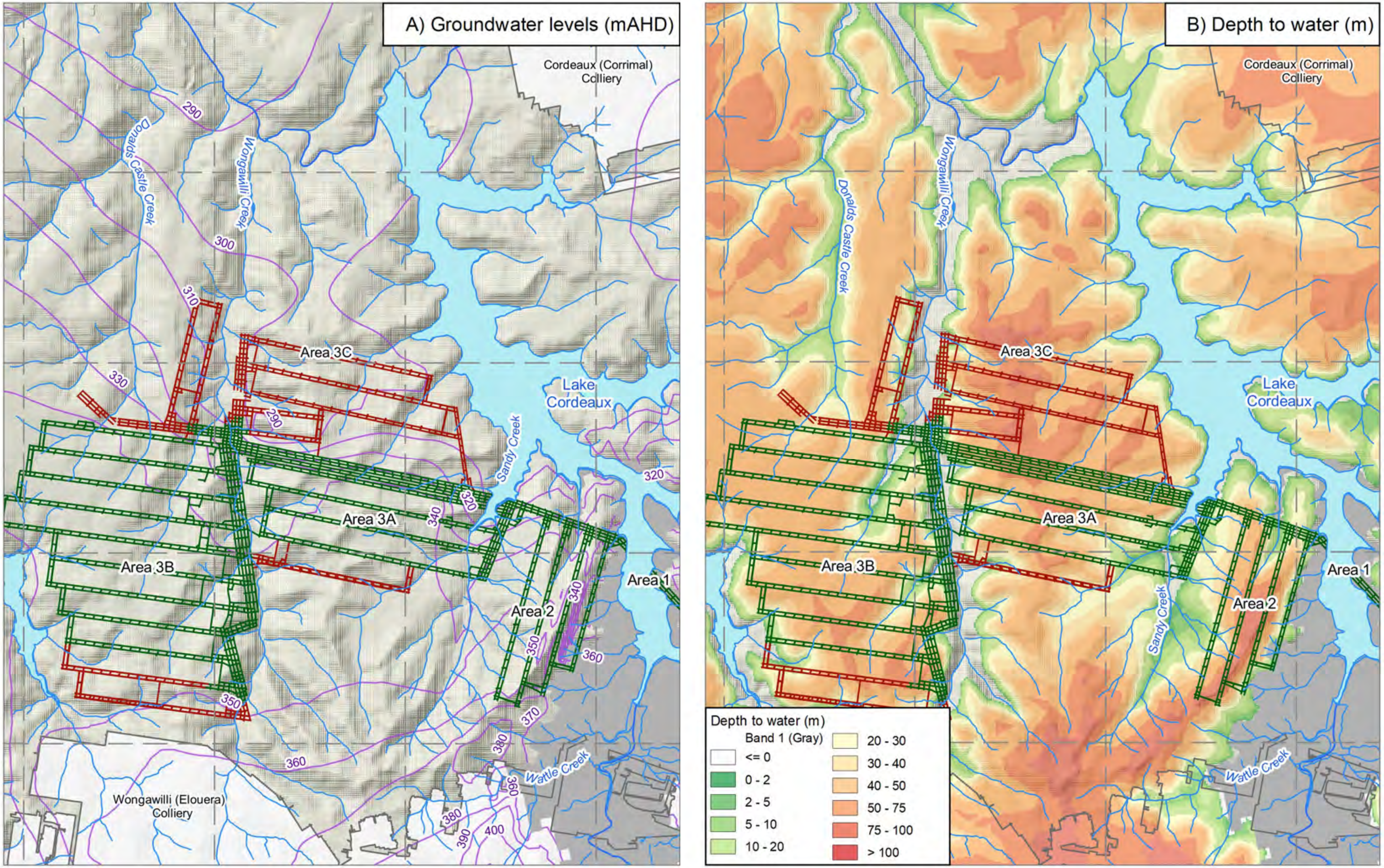
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: lower Hawkesbury Sandstone - 2200

Figure G-14



0 0.5 1 1.5 km

N

Map Scale: 1:65,000 @ A4
GDA 1994 MGA Zone 56

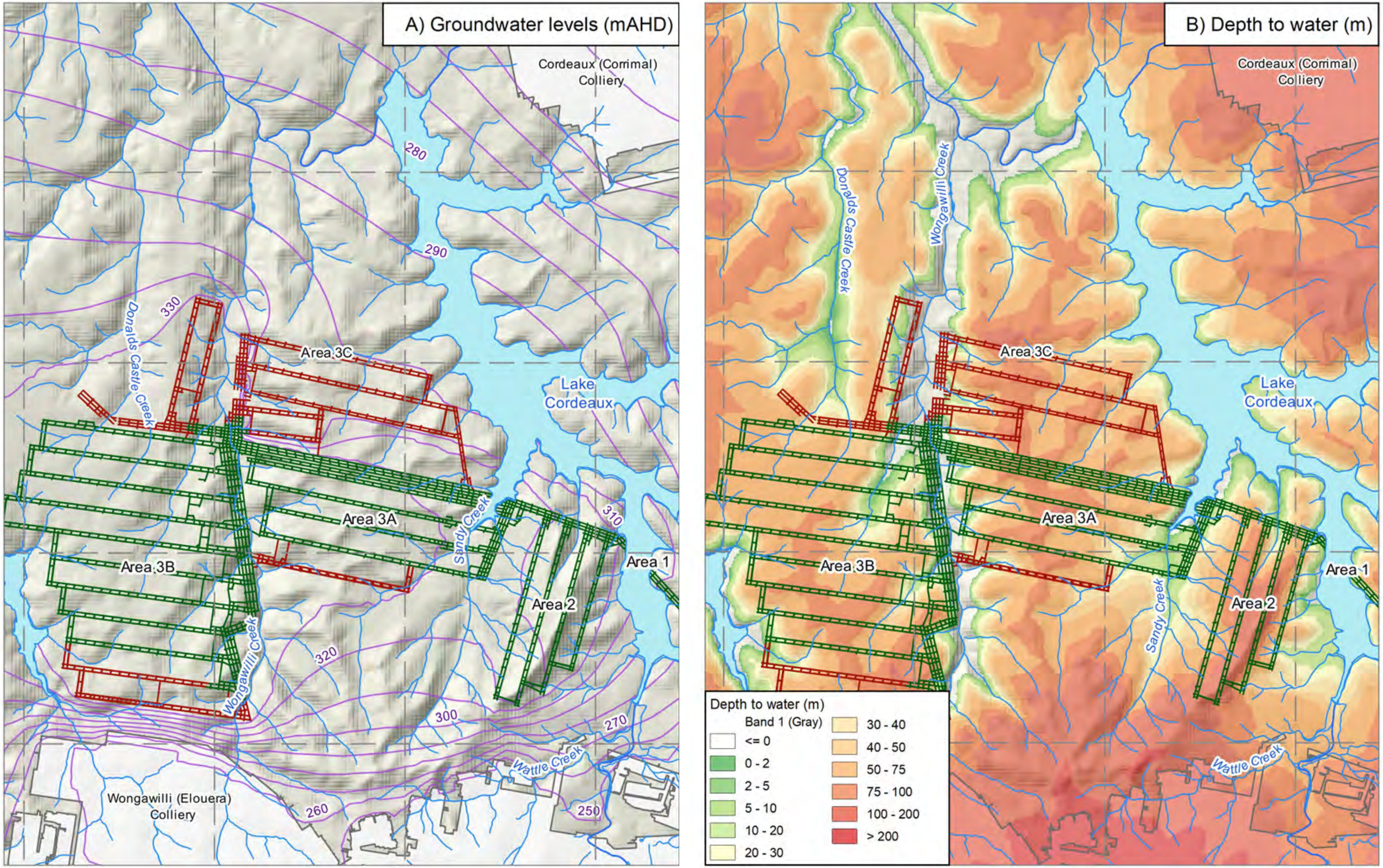
- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

Modelled groundwater levels and depth to water: Bulgo Sandstone - 2200

Figure G-15



N 0 0.5 1 1.5 km

Map Scale: 1:65,000 @ A4

GDA 1994 MGA Zone 56

- Dendrobium - Existing Workings
- Dendrobium - Future Workings
- Groundwater level contour (mAHD)
- River
- Creek
- Lake / reservoir
- Mined area
- Model domain extent
- Inactive model cells

WATERSHED HYDROGEO

IMC | Dendrobium Mine

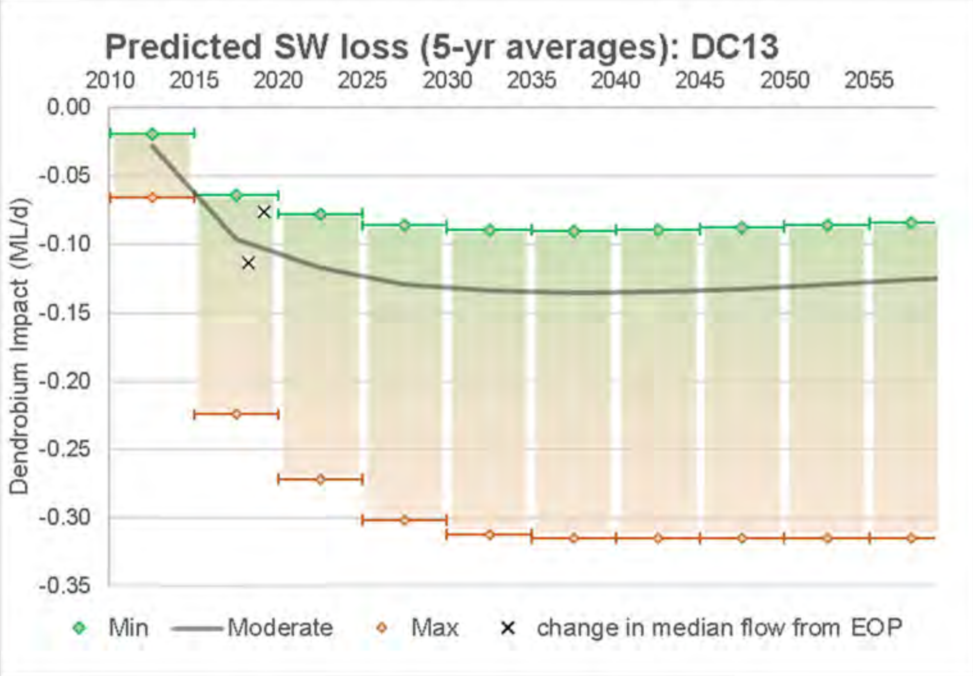
Modelled groundwater levels and depth to water: Wongawilli Coal Seam - 2200

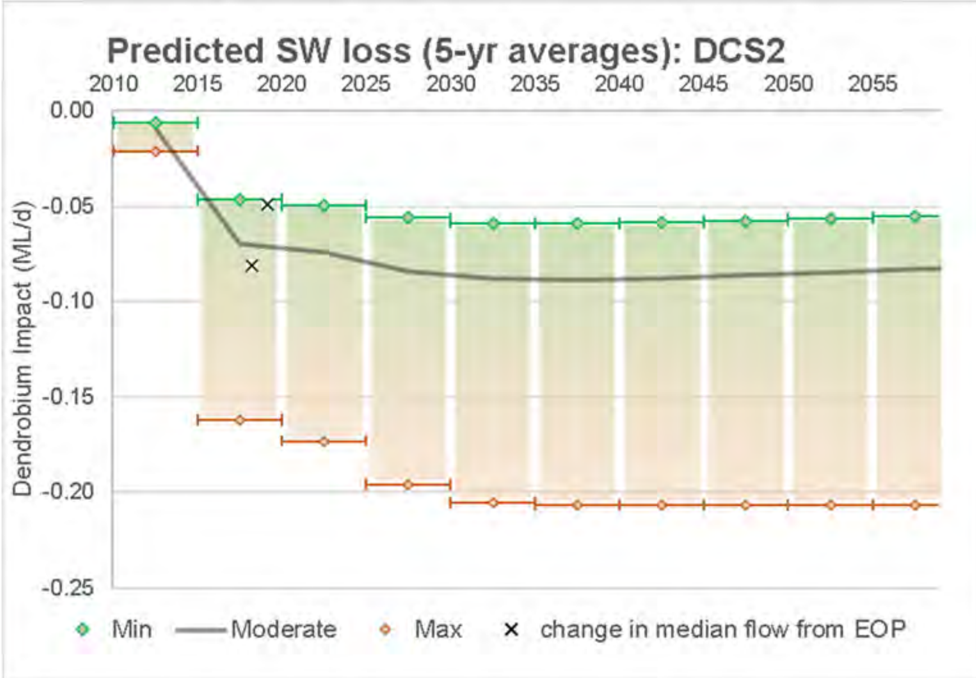
Figure G-16

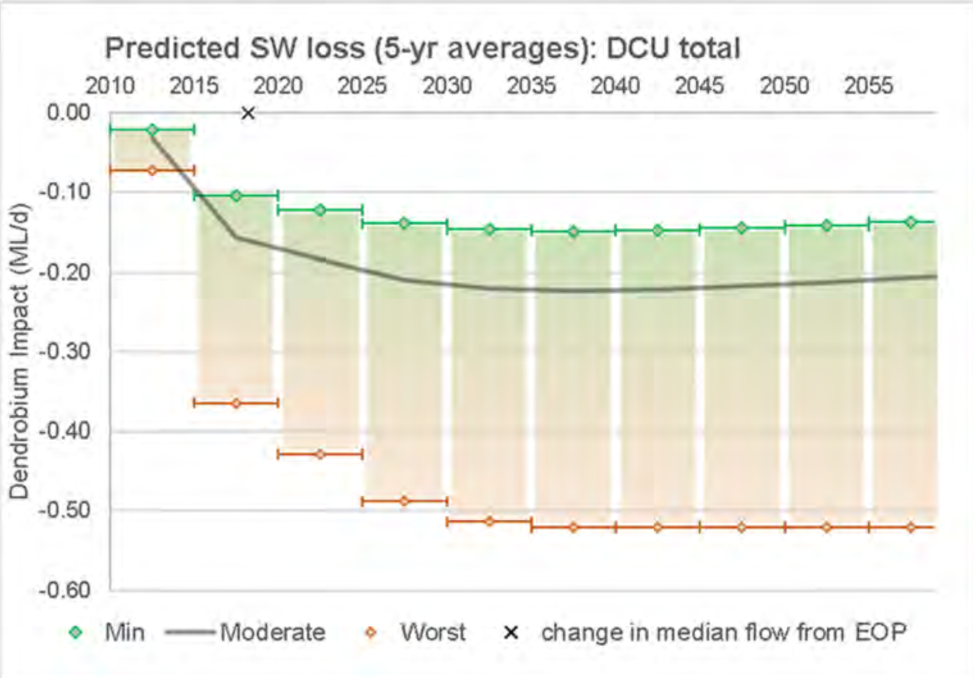
Appendix H: Predicted surface water losses

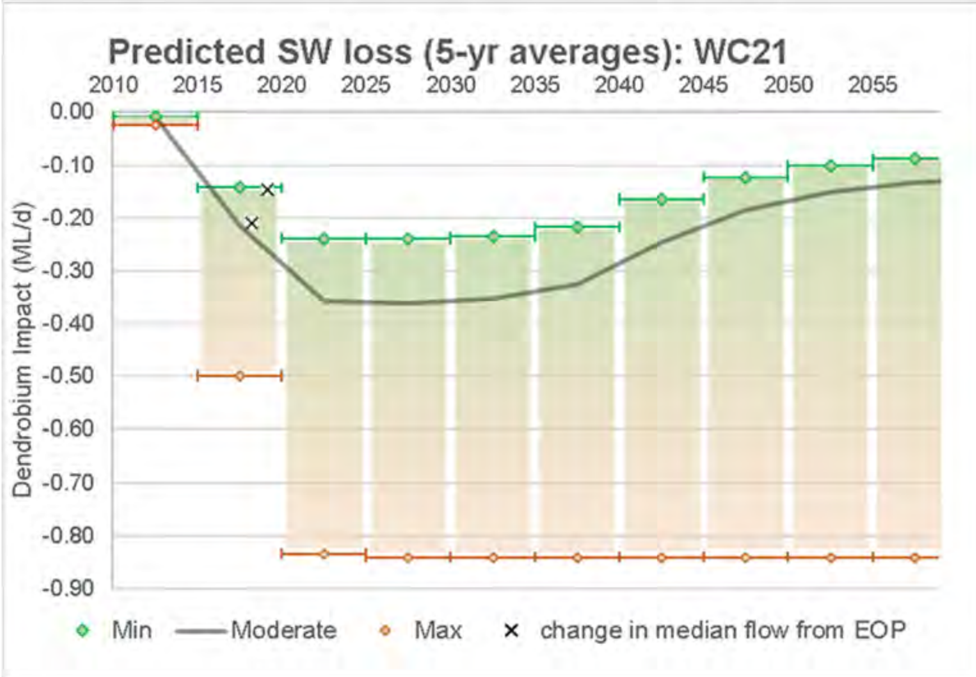
Surface Water losses – Dendrobium whole-of-mine effect

Surface Water losses – Dendrobium whole-of-mine effect

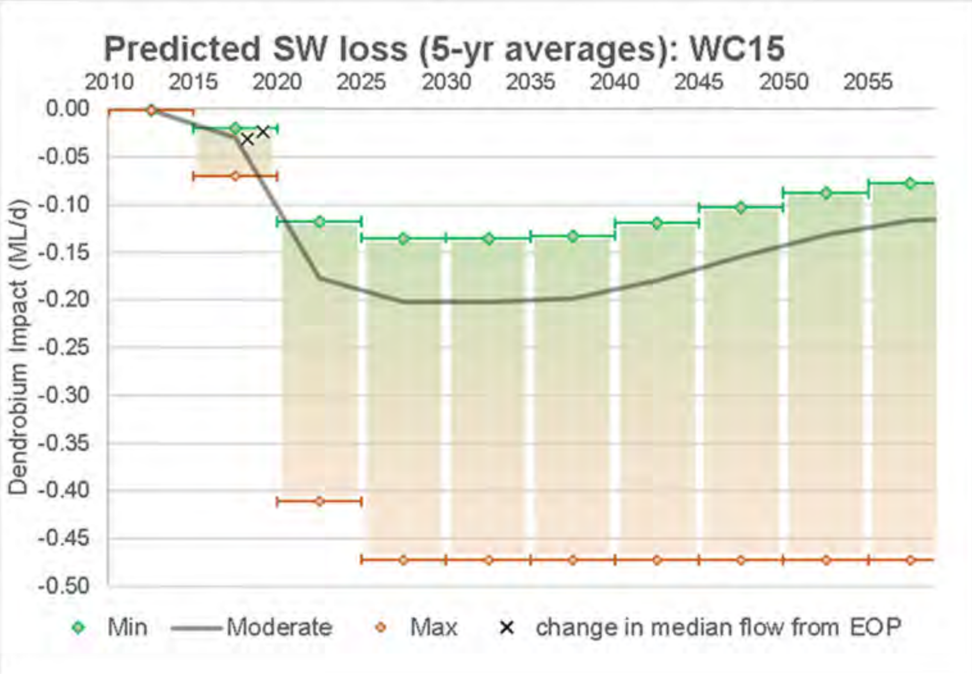


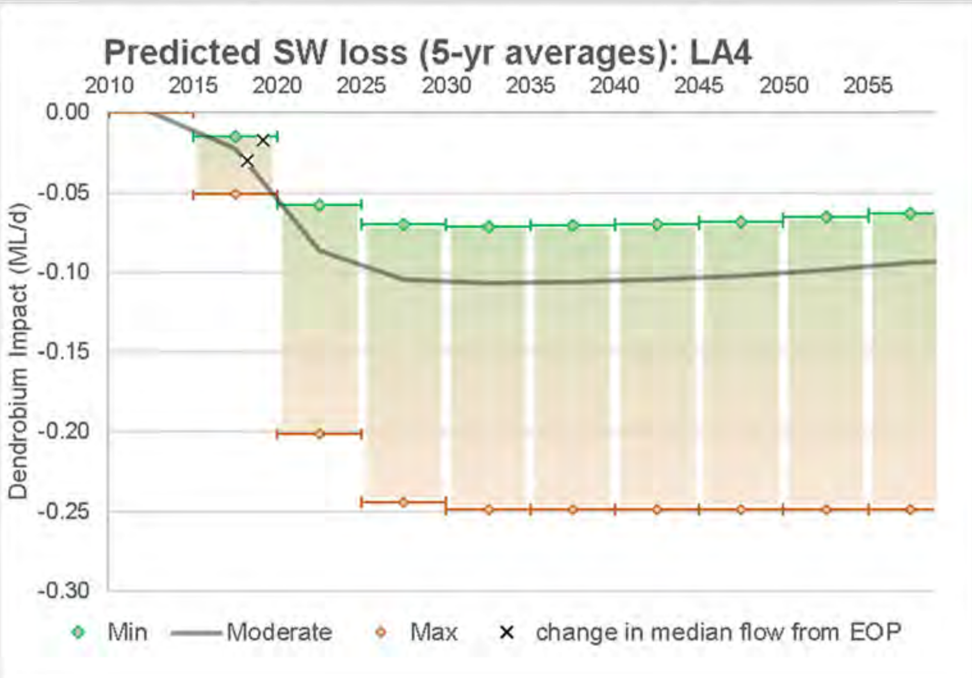




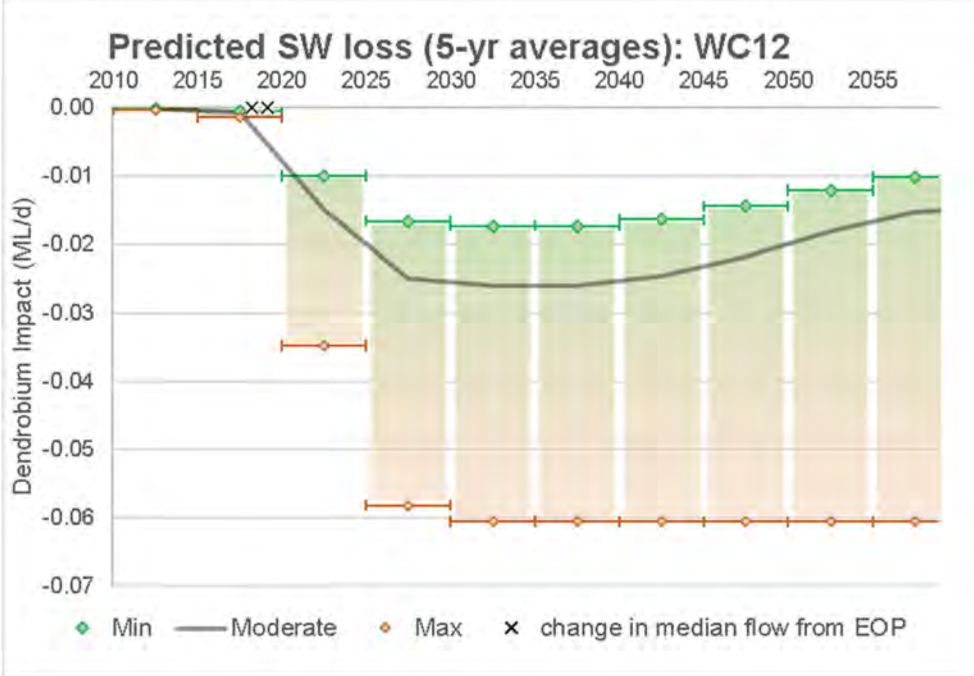


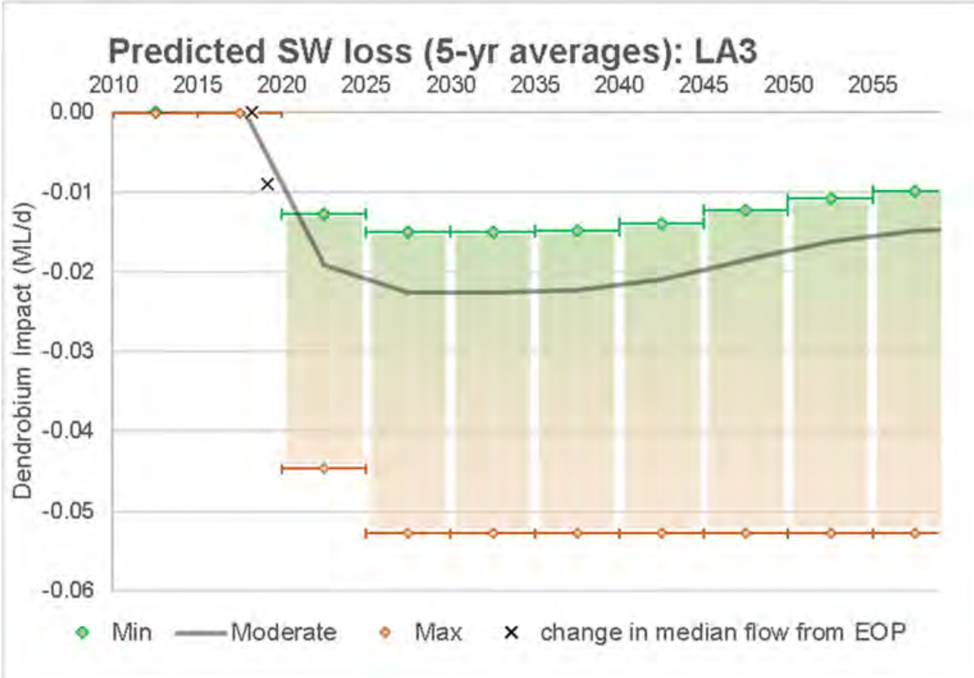
Surface Water losses – Dendrobium whole-of-mine effect





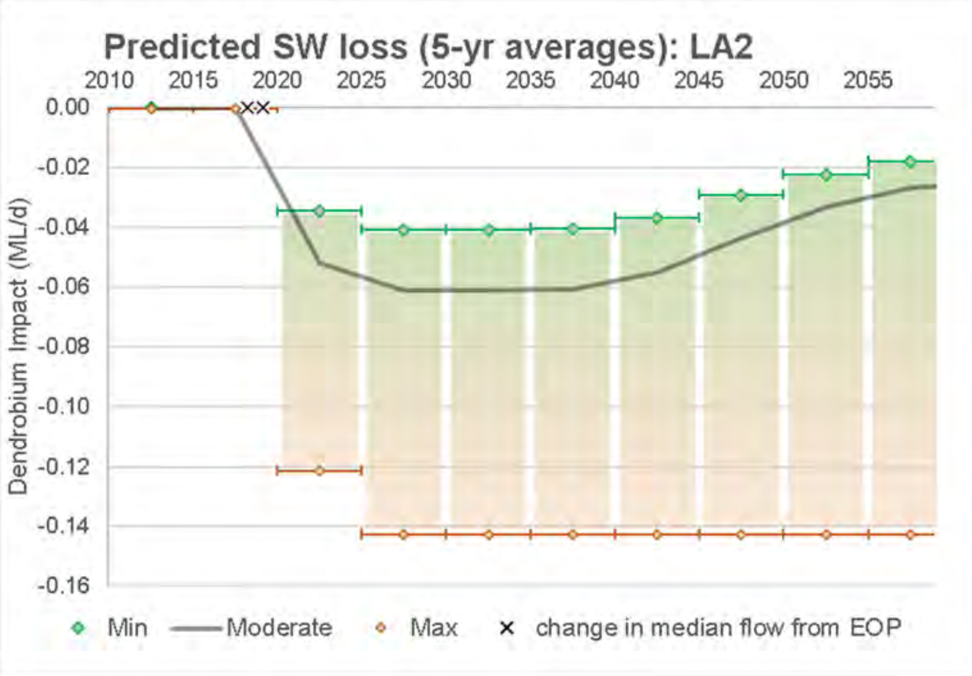
Surface Water losses – Dendrobium whole-of-mine effect

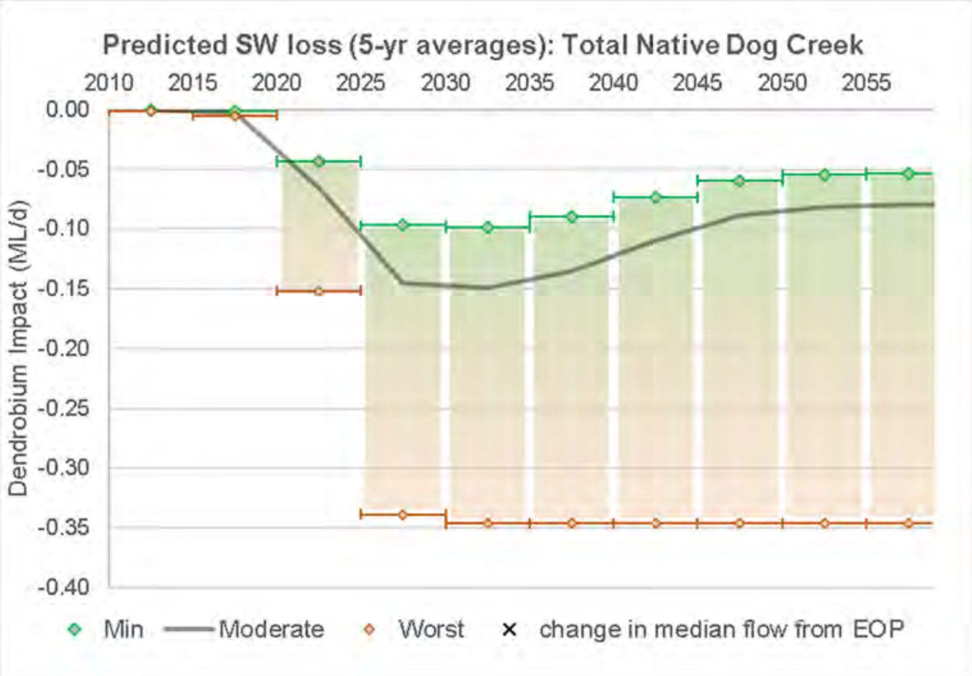




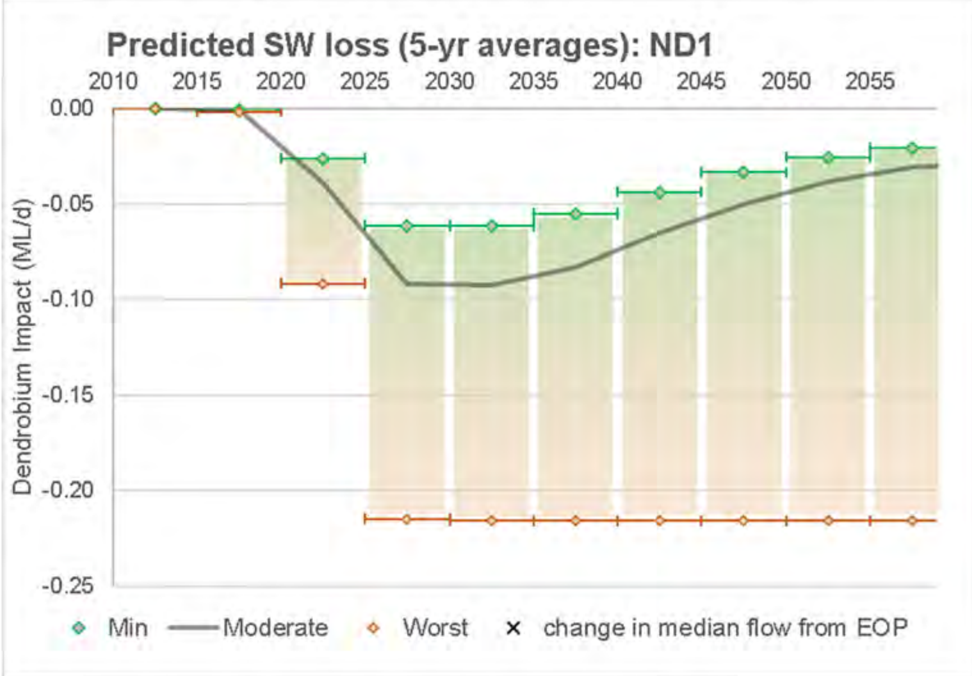
E:\DENDROBIUM\Model\GWmodel\Processing\Zonebudget\SWtake\
Riv&Lake_BaseflowCapture_CalcSWImpactsV2_Dend_DND5TR55-61_LW22.xlsx

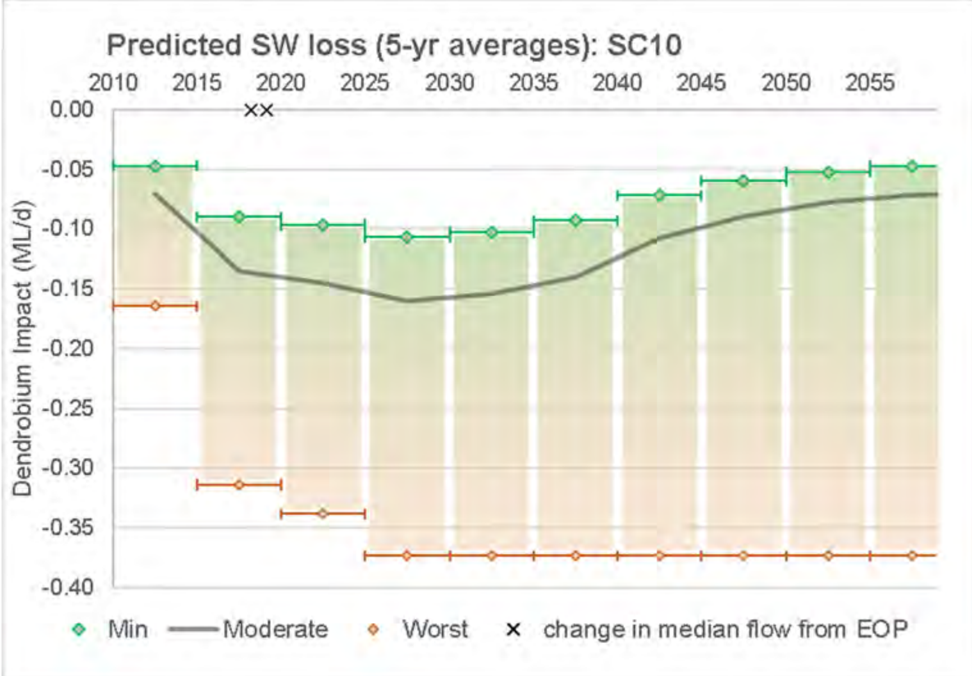
Surface Water losses – Dendrobium whole-of-mine effect





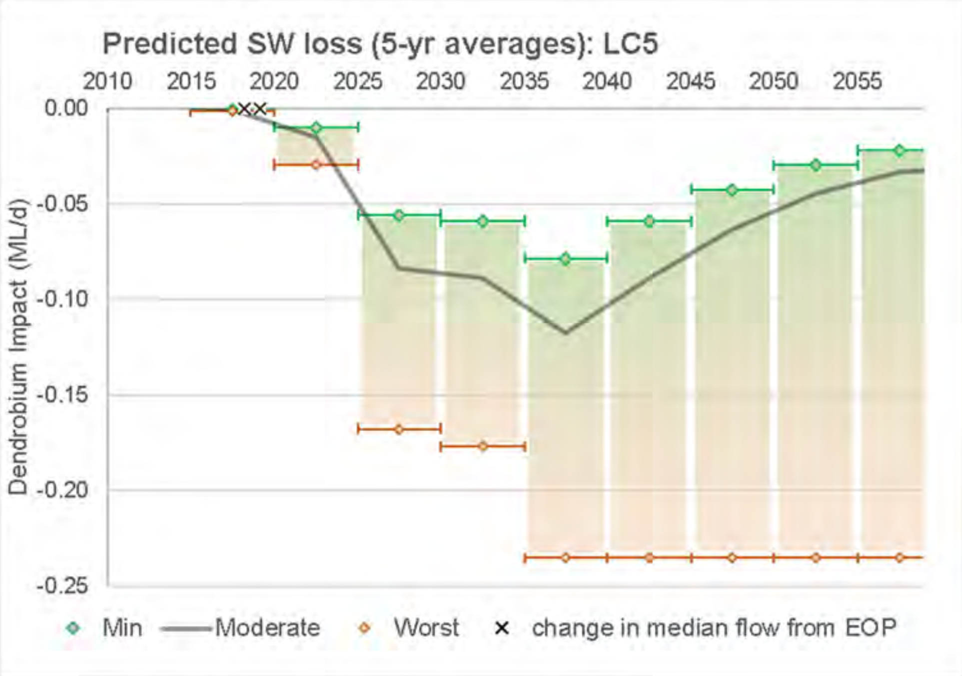
Surface Water losses – Dendrobium whole-of-mine effect

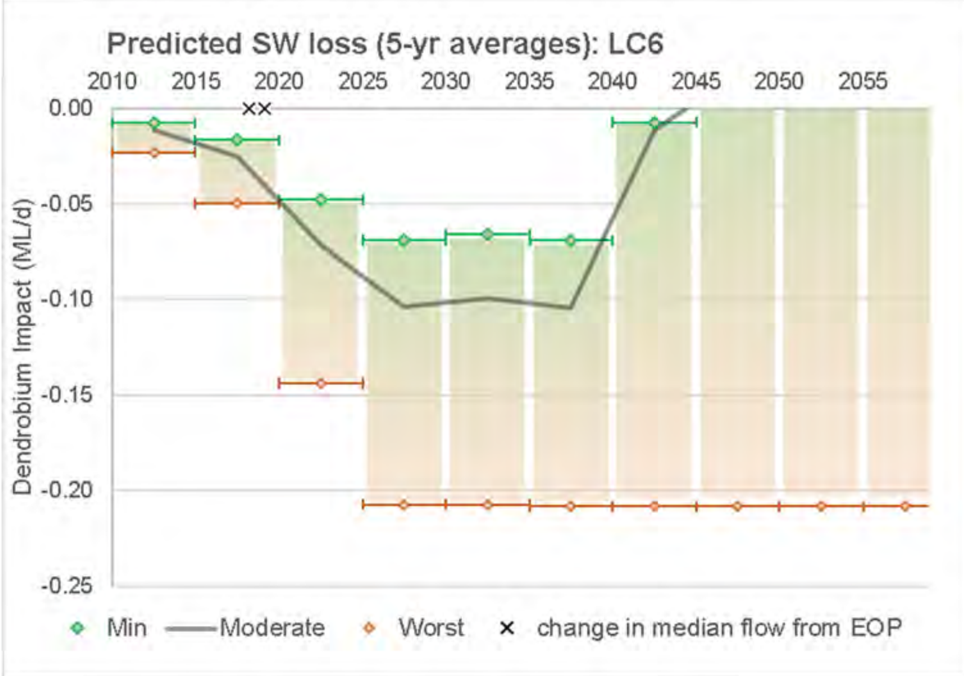


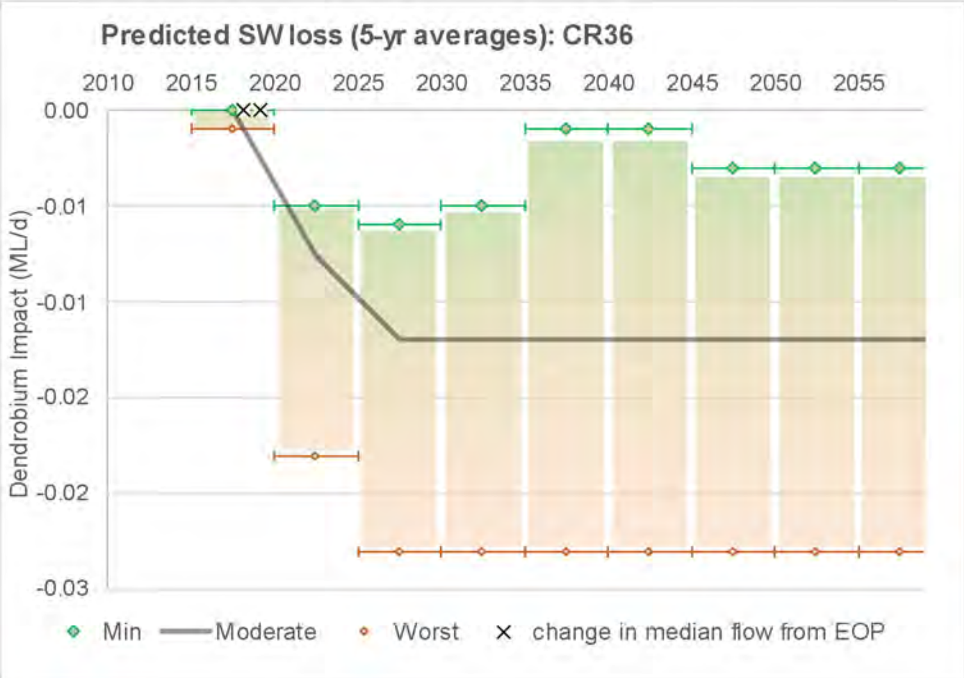


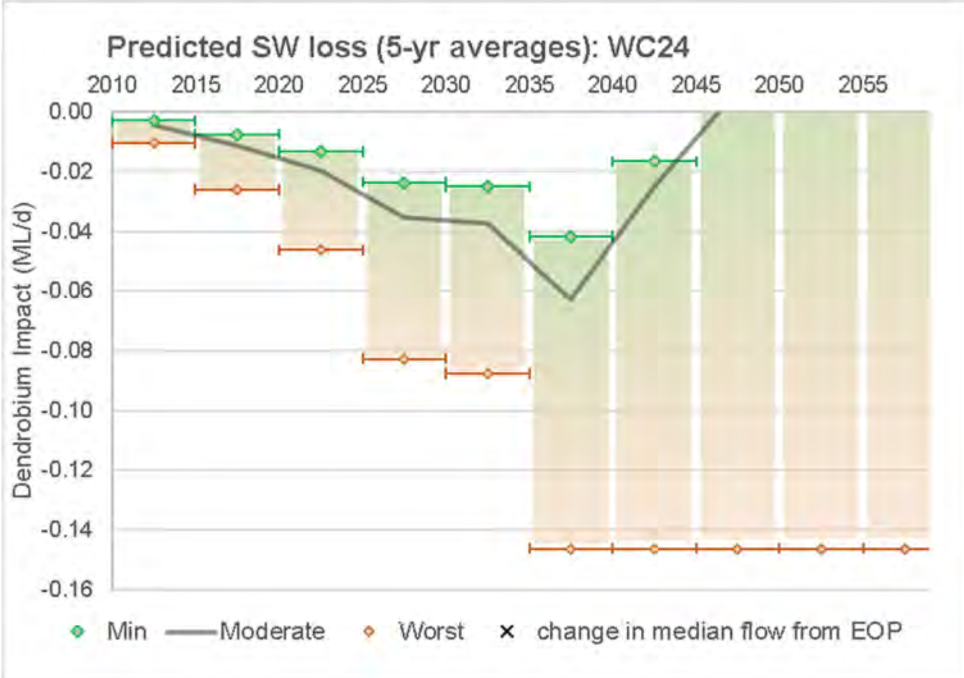
E:\DENDROBIUM\Model\GWmodel\Processing\Zonebudget\SWtake\Riv&Lake_BaseflowCapture_CalcSWImpactsV2_Dend_DND5TR55-61_LW22.xlsx

Surface Water losses – Dendrobium whole-of-mine effect	Surface Water losses – Dendrobium whole-of-mine effect

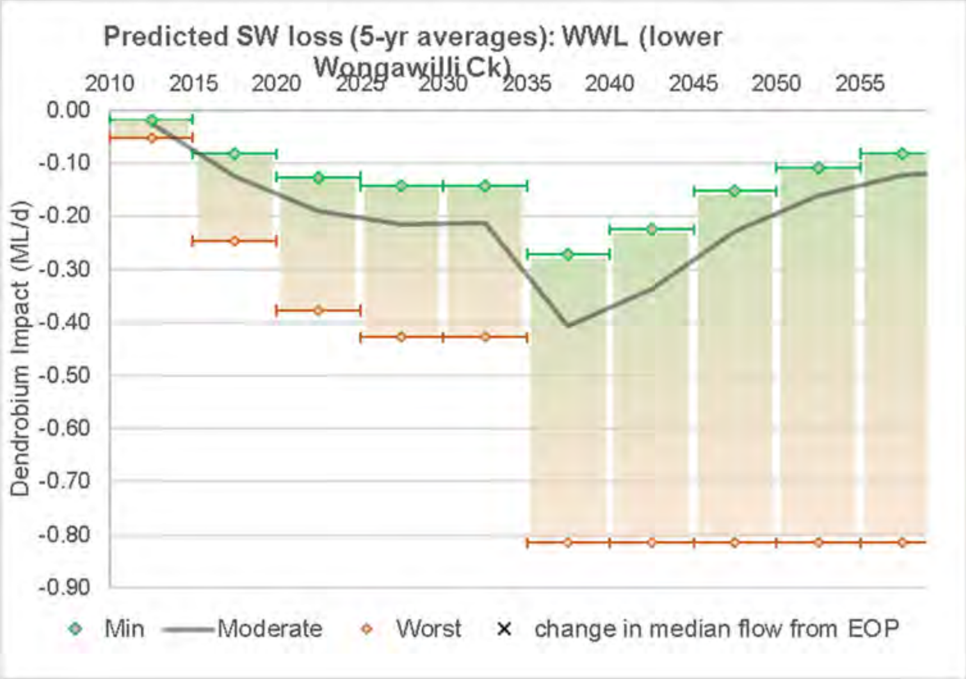








Surface Water losses – Dendrobium whole-of-mine effect	Surface Water losses – Dendrobium whole-of-mine effect



(just in the lower Wongawilli Ck zone, d/s WC21)