11-01-2023 Project No. PS135469

Hunny Churcher

Dixon Sand Pty Ltd

REVIEW OF MAXIMUM EXTRACTION DEPTH FOR OLD NORTHERN ROAD QUARRY - DA 250-09-01 MOD 5

Dear Hunny,

1.0 INTRODUCTION

Dixon Sand Pty Ltd (Dixon Sand) operates the Old Northern Road Quarry at Maroota, north of greater Sydney. The site covers 58.4 ha and includes extraction on Lot 29 DP752025, Lot 196 DP752025, Lot 1 and Lot 2 DP547255 (refer Figure).

The Old Northern Road Quarry DA250-09-01 Mod 5 was approved on 17th November 2017. The last revision of quarry maximum extraction depths were undertaken in March 2020. An independent environmental audit of this quarry site was completed on 18th October 2022, thus triggering a revision of the Maximum Extraction Depth Map in accordance with Condition 23 of the Development Consent (refer Table 1).

Table 1: Description of Developments

Development Consent	Description of Development	Relevant Section of Development Consent
DA 250-09-01 (Old Northern Road)	The operation of an extractive industry on Lots 1 and 2, DP 547255, and Lots 29 and 196, DP 752025; the continued use of the existing central processing plant on Lot 196 DP 752025; and water management and rehabilitation operations over Lots 1 and 2, DP 547255, and Lots 29 and 196, DP 752025, as described more particularly in Annexures “B” and “C”.	Schedule 2 – Condition 21(c) The applicant must submit a Maximum Extraction Depth Map (contour map or similar) for the development, which demonstrates compliance with Schedule 2 Conditions 17 to 20 (inclusive), to the Secretary for approval within 3 months of the approval of Modification 5.
		Schedule 2 – Condition 23. Within 3 months of the completion of the Independent Environmental Audit, the Applicant must review and update the Maximum Extraction Depth Map for the development to the satisfaction of the Secretary.

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This review and revision of the Maximum Extraction Depth Map is undertaken to fulfil the above requirement.

The extraction areas are within Lot 196, Lots 1 and 2 and Lot 29 (Figure 1). Extraction limits are defined by the following:

- Outside of the MTSGS buffer zone, extraction depths are restricted to 2 m above the wet weather elevation of the Sydney Basin Central Groundwater Source (SBCGS),
- Within the MTSGS buffer zone extraction is restricted to 2 m above the wet water level of the perched zone in the upper weathered portion of the SBCGS.

Other extraction limits are related to land use buffer zones uses rather than for hydrogeological assessment.

Extraction Area Consent Conditions

The following consent conditions apply to the extraction areas on Lot 196, 29, 1 and 2 (Figure 1).

- Condition 17 of Schedule 2: Extraction below a depth of 15.24 m below original ground level is restricted to Lot 196 DP 752025 within the shaded area shown in Appendix 2 of DA 250-09-01 (see Figure 1 of this document) and to a depth not greater than 127.5 m AHD.
- Condition 18 of Schedule 2: Extraction on Lot 29 DP 752025 is limited to a depth not greater than 15.24 m below original ground level.
- Condition 19 of Schedule 2: Extraction on Lots 1 and 2 DP 547255, with the exception of the MTSGS buffer zone, is limited to a depth not greater than 170 m AHD in the east, gradually reducing to 153 m AHD in the west, and as shown conceptually in the figure in Appendix 4 of DA 250-09-01.
- Condition 20 of Schedule 2: The Applicant must ensure that no extraction occurs with 2 m of the highest recorded wet weather groundwater level within the MTSGS buffer zone.

Main operational changes since previous maximum extraction depth assessment (March 2020)

A summary of the current site status is provided, with key information presented on Figure 1.

Lot 196

Extraction on Lot 196 originally occurred to 15.24m below ground level and paused until Crown Land lease was granted for deeper extraction. Crown lease was granted in mid-2021 and extraction recommenced within the pink shaded area on Figure 1. Dixon Sand are restricted to extract down to 127.5 mAHD within this area, current operations are still several metres from reaching this final depth.

Lot 29 Native Vegetation Corridor

The area shaded in green has undergone vegetation rehabilitation and final landform levels reached. No extraction has occurred here since March 2020.

Lot 29 Sediment ponds

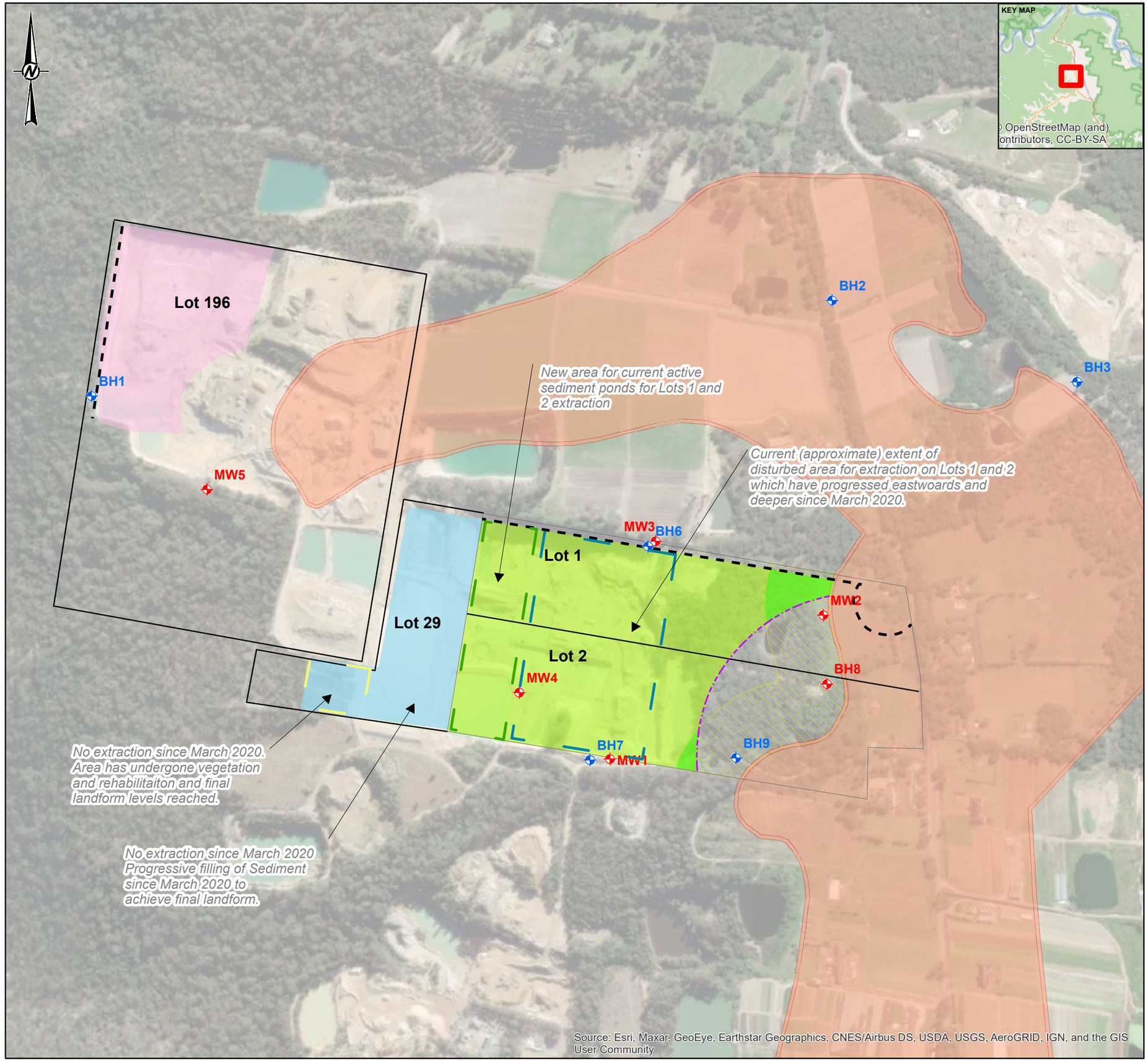
Sediment ponds on Lot 29 have been progressively filled since March 2020 to achieve final landform. No extraction has occurred here since March 2020.

Lots 1 and 2 New sediment ponds

Current active sediment ponds for Lots 1 and 2 operates are now located within Lots 1 and 2

Lots 1 and 2 Current extraction and operations area

Extraction at Lots 1 and 2 has progressed eastwards and deeper since March 2020.



LEGEND

- SBCGS Monitoring Bore
- Perched GW Monitoring Bore
- Boundary_buffers
- Maroota public school buffer
- Property boundary
- Lot 29
- Lot 1 and 2 extraction area within MTSGS buffer
- Lot 1 and 2 extraction area outside MTSGS buffer
- NW Pit extraction area (Cons Hill)
- MTSGS (Etheridge 1980)
- MTSGS Buffer Zone (100m)

0 225 450

1:7,000 METRES

NOTE(S)
1. AERIAL PHOTOGRAPH SOURCED FROM ESRI.

REFERENCE(S)
1. NA

CLIENT
DIXON SAND (PENRITH) PTY LTD

PROJECT
2023 MAXIMUM EXTRACTION GROUNDWATER ASSESSMENT

TITLE
SITE PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	09-01-2023
DESIGNED	TDS
PREPARED	TDS
REVIEWED	JVDA
APPROVED	JVDA

PROJECT NO.	CONTROL	REV.	FIGURE
PS135469	001-R	0	1

2.0 MAXIMUM GROUNDWATER LEVEL ASSESSMENT

The wet weather groundwater elevations for SCBHS were calculated based on the maximum water level recorded in the month following a rainfall event greater than 50 mm.

Historical daily rainfall records for the nearest Bureau of Meteorology rainfall recording station at Maroota (station ID 67014) were used to identify the wet weather events. Since 2005, the recorded rainfall have observed 39 events with rainfall exceeding 50mm. It should be noted in some instances the wet weather event/s occurred over multiple days, these have been considered as a single event.

Table 1 presents the determined peak groundwater level measured for each of the bores completed in the SBCGS (primarily the BH series wells) and in the MTSGS buffer zone (based on BH8 and MW2 bores). Both current and past monitoring bores are included in the table. Groundwater levels for shallow monitoring bores that target the perched groundwater (MW1, MW3, MW4 and MW5) are excluded from the assessment as they are not considered reflective of the wet weather elevation of the regional SBCGS. Results from the previous 2020 assessment are included for comparison

An interpolated groundwater level contour map has been generated for the SBCGS bores, using the krigging interpolation method. The map is presented in Figure 2 and shows the maximum wet weather groundwater level surface beneath the quarry areas at 5 m contour intervals.

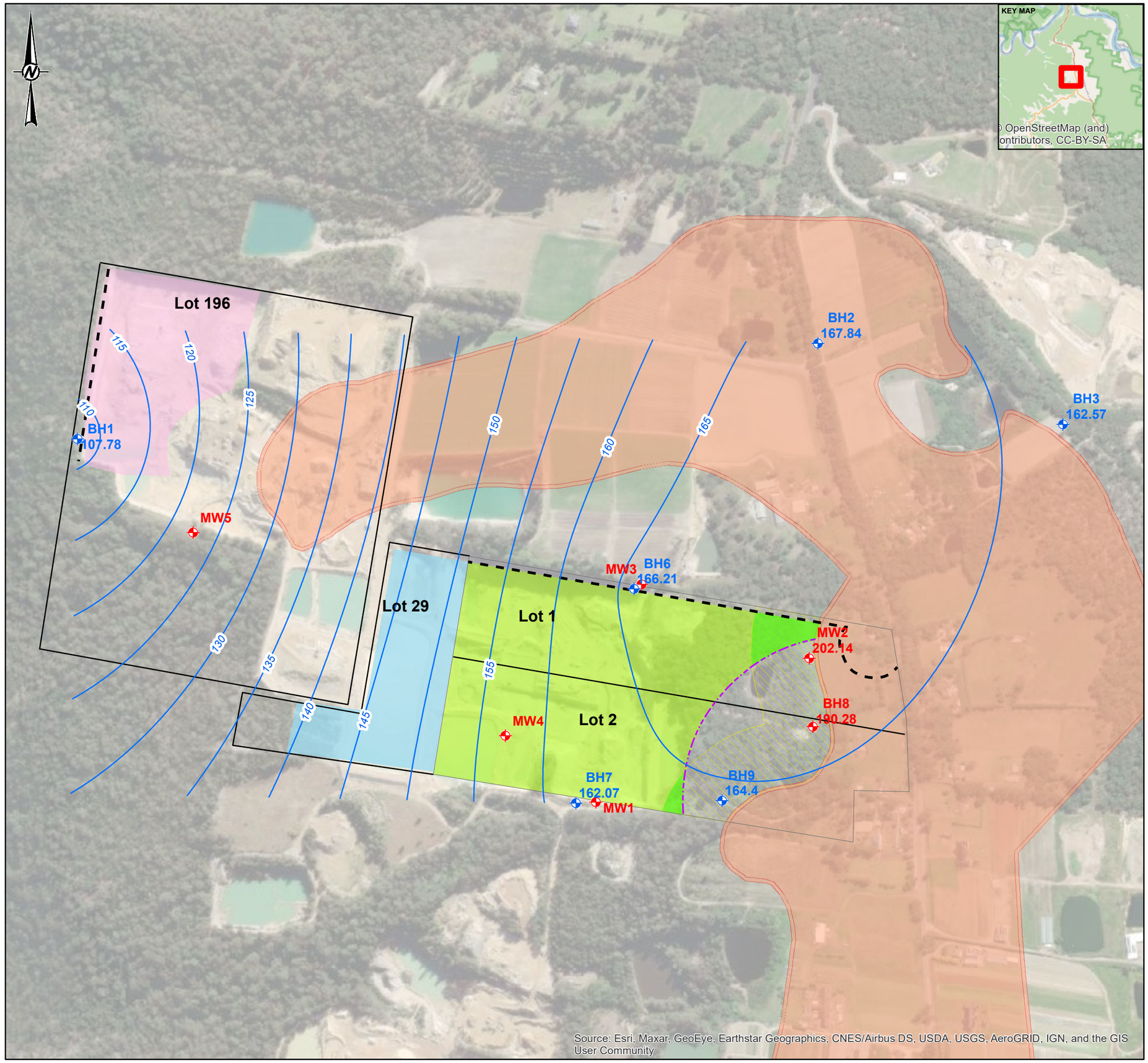
Table 2: Wet weather groundwater elevations (maximum)

Monitoring Bore	Aquifer	Wet weather groundwater elevation (mAHD)		Monitored since
		2020	2023	
BH1	SBCGS	107.4	107.8	JUN-2011
BH2	SBCGS	167.9	167.9	JUN-2011
BH3	SBCGS	162.1	162.6	JUN-2011
BH6	SBCGS	166.2	166.2	JUN-2011
BH7	SBCGS	162.07	162.1	JUN-2011
BH8	Weathered SBCGS (perched water table)	190.0	190.3	SEP-2015
BH9	SBCGS	164.4	164.4	SEP-2015
MW2	Weathered SBCGS (perched water table)	202.14	202.1	JUL-2003

3.0 DETERMINATION OF MAXIMUM EXTRACTION DEPTH

Interpolated maximum extraction depth has been assessed by generating 1 m contours for the maximum groundwater wet weather surface and adding 2 m to each contour level. The results are present in Figure 3, the following key points are noted:

- Maximum extraction depth across Lot 1 and Lot 2, outside of the MTSGS buffer zone, based on revised groundwater level contours should be limited to no greater than 170 m AHD in the east, gradually reducing to 154 m AHD in the west.
- Maximum extraction depth on Lot 1 and Lot 2 within the MTSGS buffer zone is 204 m AHD, which is based on the wet weather groundwater elevation measured at MW2 only. It has previously been noted that whilst BH8 is positioned with the MTSGS buffer area, it records a much deeper groundwater level not considered reflective of actual perched conditions.
- The maximum extraction depth on Lot 196 within the Cons Hill area remains 127.5 m AHD which is defined by Condition 17 of Schedule 2. The remaining area on Lot 196 is subject to the groundwater wet weather surface assessment.
- Maximum extraction depth across Lot 196 outside of the Cons Hill area, based on revised groundwater level contours should be limited to 144 m AHD in the southeast, reducing to 112 m on the western boundary.
- The maximum extraction depth on Lot 29 is limited to a depth not greater than 15.24 m below original ground surface, a condition not related to groundwater levels. It is noted that no extraction has occurred in this area of the site since the previous assessment.



LEGEND

- SBCGS Monitoring Bore
- Perched GW Monitoring Bore
- 2022 Interpolated maximum wet weather groundwater levels
- Boundary_buffers
- Maroota public school buffer
- Property boundary
- Lot 29
- Lot 1 and 2 extraction area within MTSGS buffer
- Lot 1 and 2 extraction area outside MTSGS buffer
- NW Pit extraction area (Cons Hill)
- MTSGS (Etheridge 1980)
- MTSGS Buffer Zone (100m)

Labels

BORE ID

GWL in mAHD

0 225 450

1:7,000 METRES

NOTE(S)

1. AERIAL PHOTOGRAPH SOURCED FROM ESRI.

REFERENCE(S)

1. NA

CLIENT

DIXON SAND (PENRITH) PTY LTD

PROJECT

2023 MAXIMUM EXTRACTION GROUNDWATER ASSESSMENT

TITLE

MAXIMUM GROUNDWATER RELATIVE WATER LEV ELS AND INTERPOLATED CONTOURS IN SCBGS

CONSULTANT

WSP GOLDER

YYYY-MM-DD	09-01-2023
DESIGNED	TDS
PREPARED	TDS
REVIEWED	JVDA
APPROVED	JVDA

PROJECT NO.	CONTROL	REV.	FIGURE
PS135469	001-R	0	2

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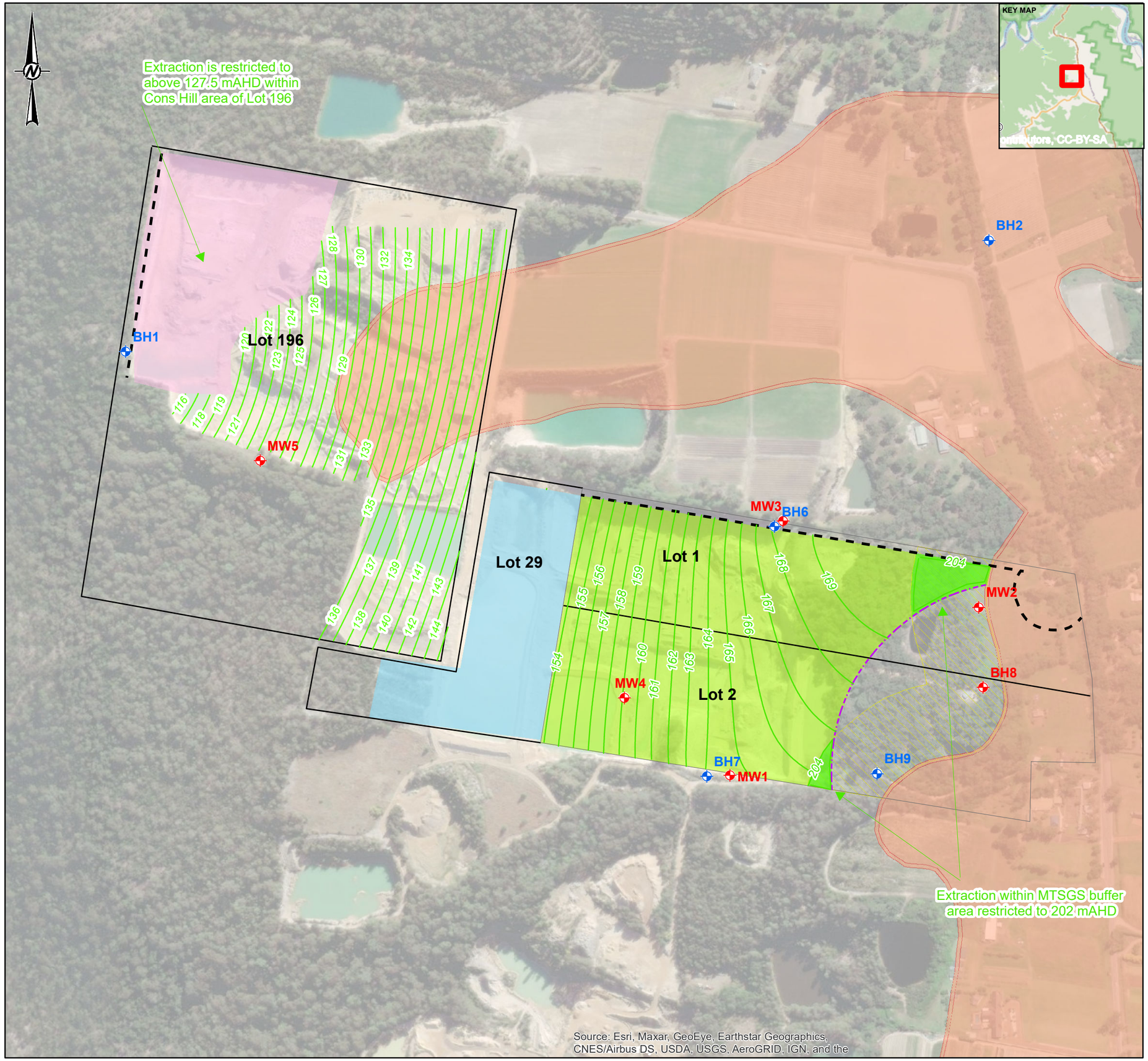

LEGEND

- SBCGS Monitoring Bore
- Perched GW Monitoring Bore
- 2022 Maximum Groundwater Wet Weather Surface 1m Contours
- Boundary_buffers
- Maroota public school buffer
- Property boundary
- Lot 29
- Lot 1 and 2 extraction area within MTSGS buffer
- Lot 1 and 2 extraction area outside MTSGS buffer
- NW Pit extraction area (Cons Hill)
- MTSGS (Etheridge 1980)
- MTSGS Buffer Zone (100m)

0 190 380

1:6,000 METRES

NOTE(S)
1. AERIAL PHOTOGRAPH SOURCED FROM ESRI.

REFERENCE(S)
1. NA

CLIENT
DIXON SAND (PENRITH) PTY LTD

PROJECT
2023 MAXIMUM EXTRACTION GROUNDWATER ASSESSMENT

TITLE
MAXIMUM EXTRACTION DEPTH (M AHD)

CONSULTANT
WSP GOLDER

YYYY-MM-DD	10-01-2023
DESIGNED	TDS
PREPARED	TDS
REVIEWED	JVDA
APPROVED	JVDA

PROJECT NO.	CONTROL	REV.	FIGURE
PS135469	001-R	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

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4.0 CLOSING

Thank you for considering WSP Golder to assist with this project. We trust the above assessment satisfies your requirements, please contact the undersigned if you would like to discuss the findings.

Important Information

Your attention is drawn to the document Important Information Attachment B of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by WSP Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Regards,

Golder Associates Pty Ltd

Timothy Smith
Senior Hydrogeologist

Jason van Den Akker
Principal Hydrogeologist

TS/JVDA/

Attachments: A – Wet Weather Groundwater Level Calculations
B – Important Information

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APPENDIX A

Wet Weather Groundwater Level Calculations

Maroota Daily Rainfalls for events exceeding 50 mm 2006 to 2022				Peak water level after >50 mm rainfall event							
				SCBGS						MTSGS Buffer Zone	
Year	Date	Rainfall amount (mm)	Comment	BH1	BH2	BH3	BH6	BH7	BH9	BH8	MW2
2006	07 Sep	65									192.29
	13 Feb	52.2									192.80
	09 Jun	172									202.14
	20 Aug	136.5									198.30
2007	06 Dec	50.6									197.85
2008	05 Jun	51									200.40
	02 Apr	51									199.10
2009	22 May	78									199.09
2010	07 Feb	75									200.55
2011	20 Aug	74.6		106.18	164.63	160.84	164.16	160.44			199.05
2012	18 Apr	52		106.18	165.18	160.79	164.21	160.17			199.70
	29 Jan	118		106.18	166.08	161.54	164.89	161.37			200.20
	23 Feb	72	154mm over 2 days 23-24 Feb	106.18	165.98	160.44	164.91	160.47			200.80
2013	24 Feb	82.4	2013	106.18	165.98	160.44	164.91	160.47			200.80
	19 Aug	52.6		106.18	166.58	161.14	165.11	160.57			199.30
2014	07 Dec	55		106.18	165.68	161.04	164.71	160.17			198.70
	21 Apr	161	279 mm over 2 days 21-22 Apr								
	22 Apr	118	2015	106.18	166.08	161.04	165.11	159.67			199.00
2015	22 Dec	63.6		106.18	165.38	160.64	164.91	160.67	163.00	189.90	199.00
	05 Jan	108	221 mm over 4 days 4 - 7 Jan								
	06 Jan	68	2016	106.18	165.88	161.34	165.31	161.17	163.40	189.90	199.30
	05 Jun	69	147.4 mm over 3 days 4-6 June								
2016	06 Jun	68	2016	107.38	167.38	162.14	166.21	162.07	164.40	190.00	198.90
	18 Mar	54.8		107.28	167.08	161.94	165.81	161.87	164.10	189.90	199.20
2017	31 Mar	55		107.28	167.08	161.94	165.81	161.87	164.10	189.90	199.20
	26 Feb	66		107.38	165.88	160.94	164.81	160.87	162.90	189.80	197.70
2018	05 Oct	55		106.81	165.08	160.63	164.06	160.31	162.23	189.60	196.10
			86mm over 3 days (16-18 Mar								
	16 Mar	86	2022)	106.99	0.00	160.43	163.81	159.98	161.65	189.35	194.32
	30 Aug	50		106.86	164.08	159.73	163.14	158.97	160.12	189.28	193.01
2019	18 Sep	67		106.79	163.97	159.82	162.97	158.75	159.79	189.23	193.91
	07 Feb	38.4	308mm over 3 days (8-10 Feb								
	08 Feb	77	2022)								
	09 Feb	82									
	10 Feb	111		106.30	162.61	158.91	161.69	156.99	157.80	190.28	195.06
	26 Mar	68		106.06	163.14	159.39	161.90	157.14	158.34	189.78	193.18
	26 Jul	13.2	152mm over 3 days 26-28 Jul								
	27 Jul	116	2020)								
	28 Jul	23.2		105.96	163.82	160.01	162.56	158.12	159.73		194.58
	25 Oct	31.4	96mm over 3 days (25-27 Oct								
	26 Oct	52.2	2020)								
2020	27 Oct	12.6		106.04	164.09	160.18	162.85	158.52	160.05	189.28	195.18
	14 Mar	10	378mm over 11 days (14-24								
	15 Mar	18	Mar 2021)								
	16 Mar	9									
	17 Mar	9.4									
	18 Mar	17									
	19 Mar	73									
	20 Mar	56									
	21 Mar	103									
	22 Mar	49.6									
	23 Mar	33									
	24 Mar	8		106.10	164.31	160.04	163.11	159.02	160.57	188.20	194.97
	06 May	6.4									
	07 May	21									
	08 May	22									
	09 May	5	54mm over 4 days (6-9 May 2021		164.90	161.45	163.64	159.54	161.36	188.45	195.34
	24 Aug	35									
	25 Aug	27	62mm over 2 days (24-25 Aug 2(	106.54	165.29	160.69	163.84	160.82	161.70	189.25	195.86
2021	10 Dec	58		106.58	165.05	160.66	163.67	159.58	161.42	189.35	196.09
	06 Jan	21.2									
	07 Jan	1.6									
	08 Jan	19.6	62 mm over 4 days (6-9 Jan								
	09 Jan	20.4	2022)	106.69	165.18	160.65	163.77	159.77	161.68	189.37	196.30
	22 Feb	6	632mm between 22 Feb and 9								
	23 Feb	73	Mar 2022								
	24 Feb	3									
	25 Feb	19									
	26 Feb	39									
	27 Feb	9.6									
	28 Feb	8.8									
	01 Mar	13									
	02 Mar	114									
	03 Mar	92									
	04 Mar	27									
	05 Mar	13.6									
	06 Mar	66									
	07 Mar	55									
	08 Mar	48									
	09 Mar	45		106.73	165.43	161.05	163.99	160.25	162.10	189.84	196.50
	08 Apr	63.2			166.42	161.89	164.82	160.70	162.96	189.72	196.82
	03 Jul	68	332mm over 4 days (3-6 July								

Maroota Daily Rainfalls for events exceeding 50 mm 2006 to 2022				Peak water level after >50 mm rainfall event							
				SCBGS						MTSGS Buffer Zone	
Year	Date	Rainfall amount (mm)	Comment	BH1	BH2	BH3	BH6	BH7	BH9	BH8	MW2
	04 Jul	70	2022)								
	05 Jul	148									
	06 Jul	46			167.18	162.32	165.53	161.35	163.85	189.85	197.88
2022	09 Oct	58		107.78	167.84	162.59	166.07	161.70	164.37	189.72	198.80
Average peak water level after a >50mm rainfall event				106.55	160.11	160.86	164.27	160.11	161.81	189.54	197.43
Highest peak water level after a >50mm rainfall event				107.78	167.84	162.59	166.21	162.07	164.40	190.28	202.14

APPENDIX B

Important Information

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder's Client and persons acting on the Client's behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification