

19 November 2025

Your Ref:
Our Ref: H24023Av2

Urban Resources
c/o Element
Level 18, 191 St George Terrace
Perth WA 6000
ATTENTION: Daniel Lewis

Dear Daniel,

LOT 59 GODEL RD NOWERGUP, GROUNDWATER INVESTIGATION

Hyd2o was commissioned by Urban Resources in May 2024 to conduct a groundwater investigation for Lot 59 Godel Rd, Nowergup (herein referred to as the site), to support the establishment of extraction depths and site levels for a proposed sand mine.

This report presents the compilation and review of Department of Water and Environmental Regulation (DWER) groundwater monitoring data to establish maximum groundwater levels (MGL) and average annual maximum groundwater levels (AAMGL) across the site.

Results are discussed in the context of DWER's Water Quality Protection Note 15: Basic Raw Materials Extraction (DWER, 2019) and DWER's Gnangara Groundwater Allocation Plan (DWER, 2022). The results are also discussed in the context of the site's relationship to Lake Nowergup, a Conservation Category Wetland (CCW) located 260 m south west of the site and its previous hydrological studies.

1. MGL/AAMGL CALCULATION

Eleven long term DWER monitoring bores in the superficial aquifer in proximity to the site were selected within a 6 km radius to be used for reference in groundwater calculations. Sites are shown in Figure 1 with long term hydrographs provided in Appendix A. All bores are noted to show a considerable decline in water table levels since the 1970's.

With respect to regional mapping, Figure 2 shows DWER's historical maximum groundwater contour dataset and Gnangara Jandakot 2019 maximum water table elevation contours. These contours represent the most current DWER regional groundwater mapping publicly available on the Perth Groundwater Map (DWER, 2025).

Advice from DWER indicates these revised 2019 contours account for the declines and rises in water tables in recent decades and the impacts of current climate trends. These contours are understood to be based on the contouring of the actual recorded maximum and minimum groundwater level data at DWER bores in 2019. Figure 2 shows the 2019 maximum to be approximately 5.5 m below the long-term historical maximums at the site, with groundwater flow in a west south west direction at the site.

Refined groundwater mapping for the site was undertaken by Hyd2o using the eleven DWER bores shown in Figure 1, as detailed in Table 2. While historical records for the bores extended to the mid 1970's for some bores, the period of record from 2000 was used for this analysis as representative of current climate conditions. Note that this refined local

groundwater analysis includes more recent groundwater level data than DWER’s 2019 mapping dataset, using historical data to the end of 2023 in its assessment.

Refined mapped groundwater contours over the site based on MGLs and AAMGLs are shown in Figure 3 with arrows included showing the groundwater flow direction at the site in relation to Lake Nowergup. Based on the refined mapping, groundwater flow was predominantly found to occur in a west north west direction across the site, with the MGL ranging from 17.3 mAHD to 19.1 mAHD and the AAMGL ranging of approximately 15.8 mAHD to 17.3 mAHD. The MGL was found to be approximately 1.5 to 1.8m above the AAMGL.

DWER 1m LIDAR topography contours indicate site elevations ranging from 24 mAHD in the south western corner to 49 m AHD in the north eastern corner.

This indicates a maximum clearance from natural surface to AAMGL ranging from 7.7 mAHD in the south western corner to 31.7 mAHD in the north eastern corner. The clearance above MGL ranges from 6.0 mAHD in the south western corner to 30.0 mAHD in the north eastern corner.

Table 2: Nearby DWER Bore AAMGL and MGL

Bore	Coordinates GDA94 MGA Zone 50	Monitoring Period	Period used for Calculation of MGL and AAMGL	MGL (mAHD)	AAMGL (mAHD)
LN8/89	380101 E / 6499297 N	1990 – 2024	2000 - 2023	17.02	15.76
LN14/89	380200 E / 6499885 N	1989 – 2024	2000 - 2023	18.37	16.62
LN17/89	380050 E / 6499803 N	1989 – 2024	2000 - 2023	17.27	15.93
LN19/89	379949 E / 6499721 N	1989 – 2024	2000 - 2023	17.00	15.83
JP15	377573 E / 6500472 N	1974 – 2022	2000 - 2021	1.95	1.59
JP16	383391 E / 6499266 N	1975 – 2024	2000 - 2023	28.84	26.39
JP17	380202 E / 6499908 N	1974 – 2024	2000 - 2023	18.10	16.55
JP19	378161 E / 6502987 N	1974 – 2024	2000 – 2023	11.80	9.93
PM31	380400 E / 6502355 N	1976 – 2024	2000 - 2023	18.87	16.40
PM33	381173 E / 6498583 N	1976 – 2024	2000 - 2023	19.96	17.89
PCM21	385581 E / 6503882 N	1976 - 2024	2000 - 2023	40.82	38.60

With respect to future groundwater levels, DWER's Gnambarra Groundwater Allocation Plan (DWER, 2022) provides future predictions on water level changes to the superficial aquifer as a result of abstraction allocation changes and expected land use change. Mapping is shown in Appendix B and shows a predicted rise in level locally between 0.5 and 1.0 m.

DWER (2022) also provides specific site management objectives for various areas. For Lake Nowergup, the objective is to improve its groundwater levels to increase area of permanent deep-water habitat for fauna and maintain fringing vegetation to support macroinvertebrate diversity and nutrient retention.

Based on DWER (2022), Hy2do therefore considers that a future increase in groundwater levels of 1m should be considered when establishing the sites maximum excavation level.

2. SAND MINING LEVEL

Water Quality Protection Note 15: Basic Raw Materials Extraction (DWER, 2019) requires adequate vertical separation between the base of extraction and groundwater to protect water quality and prevent evaporation loss, both during and after extraction.

Setting of any mining excavation level also requires consideration of future land use following the completion mining works. As such considerations should be made based on the zoning of the site as 'rural' in the City of Wanneroo's latest planning scheme (District Planning Scheme No. 2) (City of Wanneroo Intramaps, 2024). It is important to note this land use supports a lesser clearance to groundwater than other potential future land uses.

The acceptable vertical separation distance and mining level will be determined by relevant agencies via the planning and approval process and should be supported by the groundwater levels documented in this report.

Ongoing regular monitoring of groundwater levels at the site and nearby DWER bores during the mining period will similarly ensure adequate groundwater clearance is maintained at the site in accordance with separation requirements.

3. POTENTIAL IMPACT ON LAKE NOWERGUP

This advice is provided in relation to the potential for the proposed activity at the site to impact the hydrology at Lake Nowergup, the CCW located 260 m south west of the site.

- In 2015, Global Groundwater undertook a detailed hydrological study of Lake Nowergup on behalf of the then Department of Water (now DWER). The study reported water levels at the lake had declined significantly over time and by more than 5 m since the 1970's. The water table decline was largely attributed to groundwater abstraction for horticulture and public water supplies as key factors.
- Since 1990 the lake has been supplemented artificially by water pumped from the Leederville Aquifer to maintain water levels in the lake. DWER have a Leederville Aquifer licence for 1,200,000 kL/yr (1.2 GL/yr) for this purpose. In this context and given its surrounding market gardens, Lake Nowergup is considered a highly modified hydrological environment.
- Refined groundwater contours as mapped in Figure 3 shows the groundwater flow direction from the site to be west north-west and away from the lake. The Global Groundwater (2015) report supports this finding and presents a similar groundwater

flow direction in its groundwater mapping at the site in relation to the lake. The Global Groundwater (2015) mapping is included as Appendix C.

- This groundwater flow direction locally is explained as a combination of the influence of local mounding created by lake water supplementation from the Leederville Aquifer, and also the extensive superficial aquifer extraction currently occurring in the immediately vicinity east of the lake. DWER's Online Water Register indicates more than 1,000,000 kL/yr (1 GL/yr) is abstracted in the immediate area of the lake.

As the groundwater flow is found to not be toward the lake, any influence on the lake due to the proposed site activities which will remain well above groundwater and will not change groundwater flow direction is therefore considered negligible.

To further confirm groundwater flow directions, Hyd2o mapped and contoured October 2025 groundwater level data based on DWER bores and DWER recorded data near the site. This mapping is shown in Figure 4, with the groundwater flow direction found to be consistent to the previous Hyd2o MGL and AAMGL mapping in Figure 3 and the Global Groundwater (2015) mapped groundwater flow direction shown in Appendix C.

4. CONCLUSIONS/RECOMMENDATIONS

This report has been prepared by Hyd2o to support the proposed sand excavation at Lot 59 Godel Rd, Nowergup. Refined groundwater mapping within the site has been undertaken based on long term DWER groundwater monitoring bores around the site. Mapping of bore data from 2000 onwards considered representative of current climate conditions indicates an AAMGL for the site ranging from approximately 15.8 mAHD to 17.3 mAHD. The MGL is 1.5 to 1.8m above this AAMGL.

A future increase in groundwater levels of 1m should be considered when establishing the sites maximum excavation level to reflect changes in abstraction volume and land use change as detailed in the Gngangara Groundwater Allocation Plan DWER (2022).

As the groundwater flow at the site is not toward the lake, any influence on the lake due to the proposed site activities which will remain well above groundwater and will not change groundwater flow direction is therefore considered negligible.

5. REFERENCES

City of Wanneroo (2024), Intramaps System (online, viewed May 2024)

Department of Water and Environmental Regulation (2022), Gngangara Groundwater Allocation Plan

Department of Water and Environmental Regulation (2024a), Water Information Reporting (online, viewed May 2024)

Department of Water and Environmental Regulation (2024b), Environmental Management of Groundwater from the Gngangara Mound Groundwater Resources Annual Compliance Assessment Report July 2022–June 2023, January 2024

Department of Water and Environmental Regulation (2025), Perth Groundwater Map (online, viewed November 2025)

Department of Water and Environmental Regulation (2019), Water Quality Protection Note 15: Basic Raw Materials Extraction

Global Groundwater (2015) Lake Nowergup Factors in declining lake and groundwater levels, report prepared for Department of Water Government of Western Australia, November 2015

Landgate (2023) Landgate Map Viewer (online, viewed May 2024)

Searle, JA, Hammond, MJ and Bathols, G 2011, Perth Shallow Groundwater Systems Investigation: Lake Nowergup, Hydrogeological record series HG 40, Department of Water, Perth.

Should you have any queries regarding this submission, please do not hesitate to contact Sasha Martens of this office.

Yours sincerely,



**Sasha Martens,
Principal Engineering Hydrologist**

Attachments

Figure 1: DWER Bores Location Map

Figure 2: Historical Maximum GW Contours & 2019 Maximum WTE Map

Figure 3: AAMGL & MGL Map

Figure 4: October 2025 Groundwater Map

Appendix A: DWER Bore Long Term Hydrographs



Appendix B: Projected Changes in GWL

Appendix C: Global Groundwater (2015) Groundwater Mapping

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FIGURES

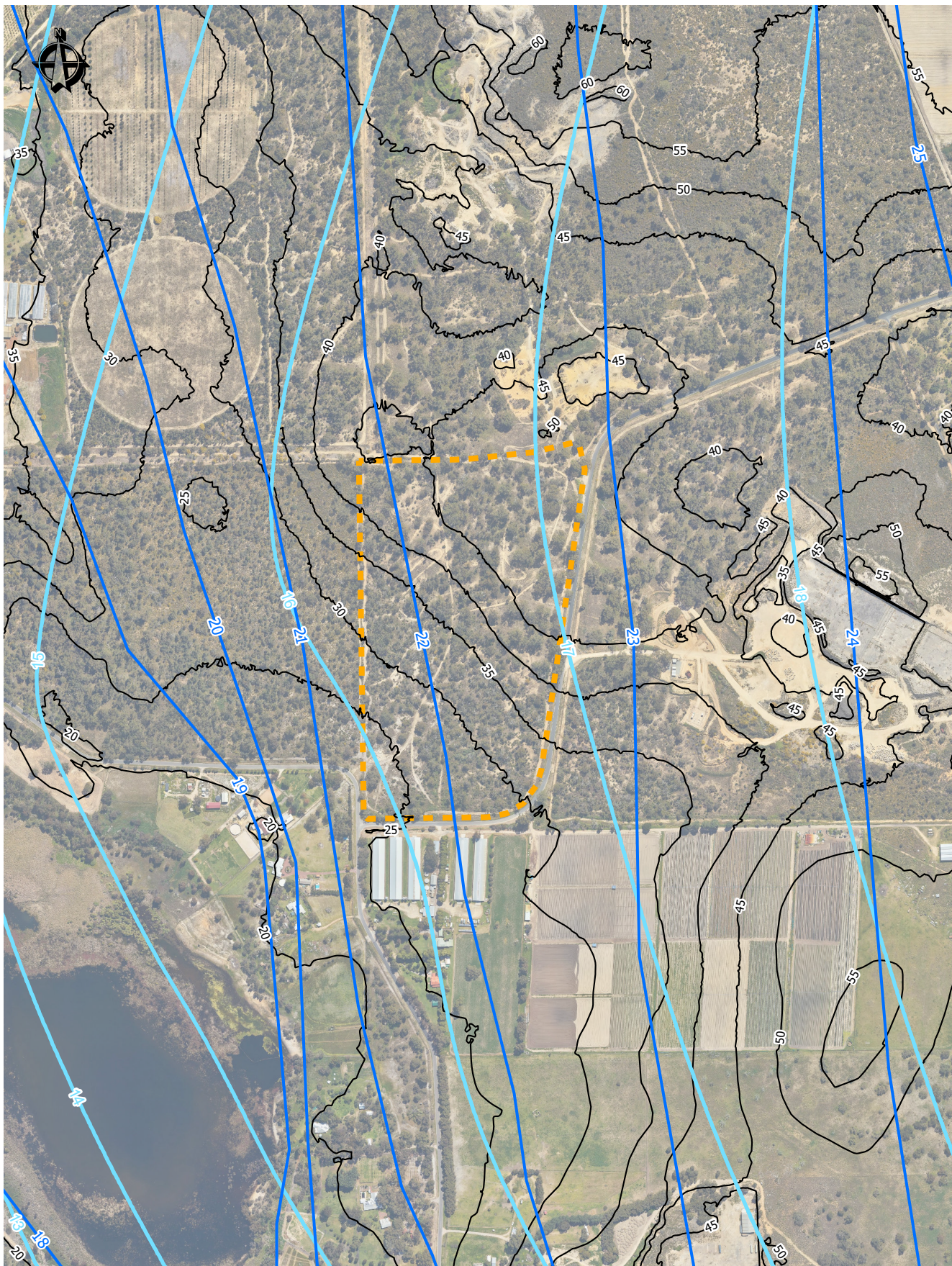


-  Site Boundary
-  DWER Bores



Source of Data: Water Information Reporting - DWER

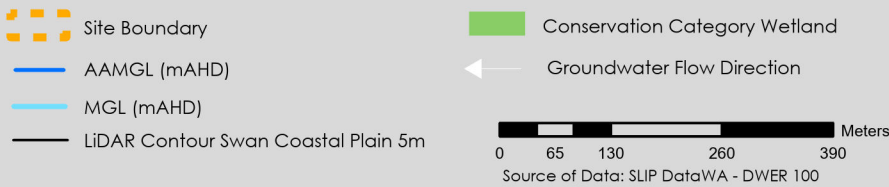
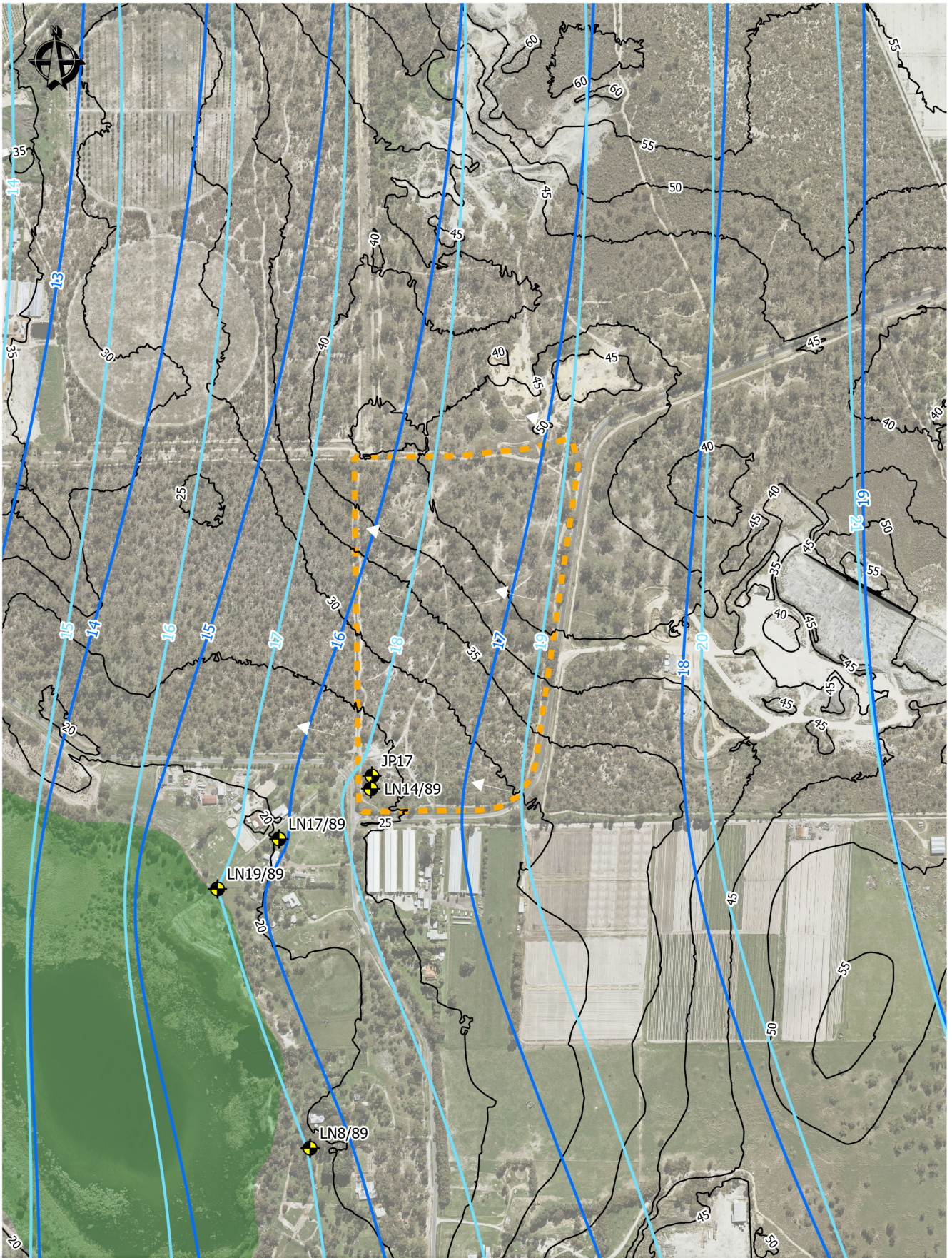

 Lot 59 Godel Rd
 Groundwater Investigation
DWER Bores Location Plan
Figure 1



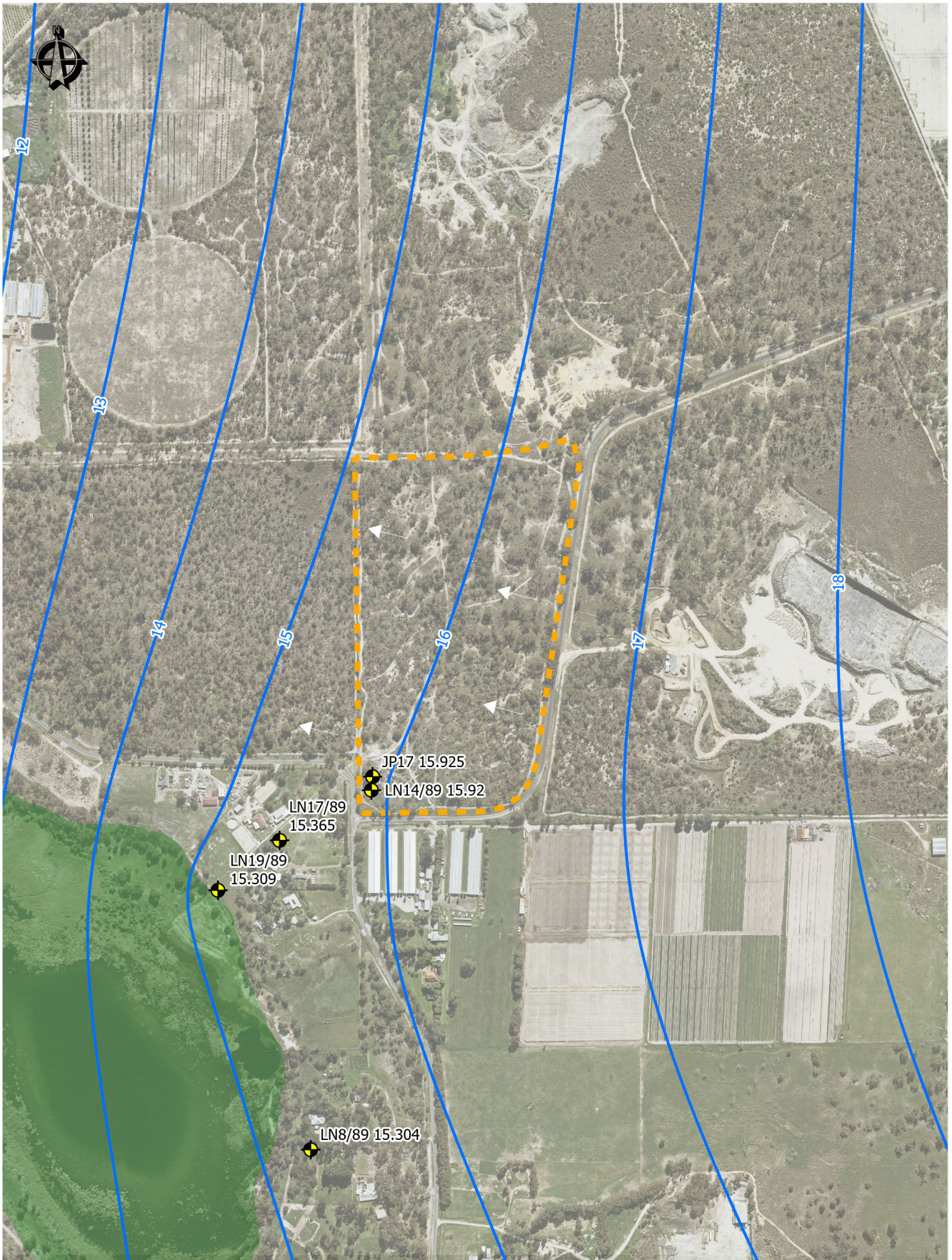
- Site Boundary
- Historical Maximum GW Contours (mAHD)
- Gnaragara Jandakot Water Table Elevation 2019 Maximum (mAHD)
- LiDAR Contour Swan Coastal Plain 5m

0 62.5 125 250 375 Meters
 Source of Data: SLIP DataWA - DWER 100

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 Lot 59 Godel Rd
 Groundwater Investigation
**Historical Maximum GW Contours
 & 2019 Maximum WTE Map**
Figure 2



hyd2o
 Lot 59 Godel Rd
 Groundwater Investigation
AAMGL & MGL Map
Figure 3



Site Boundary



October 2025 GW Contour



LiDAR Contour Swan Coastal Plain 5m



Groundwater Flow Direction



Conservation Category Wetland

0 65 130 260 390 Meters

Source of Data: SLIP DataWA - DWER 100

hyd2o

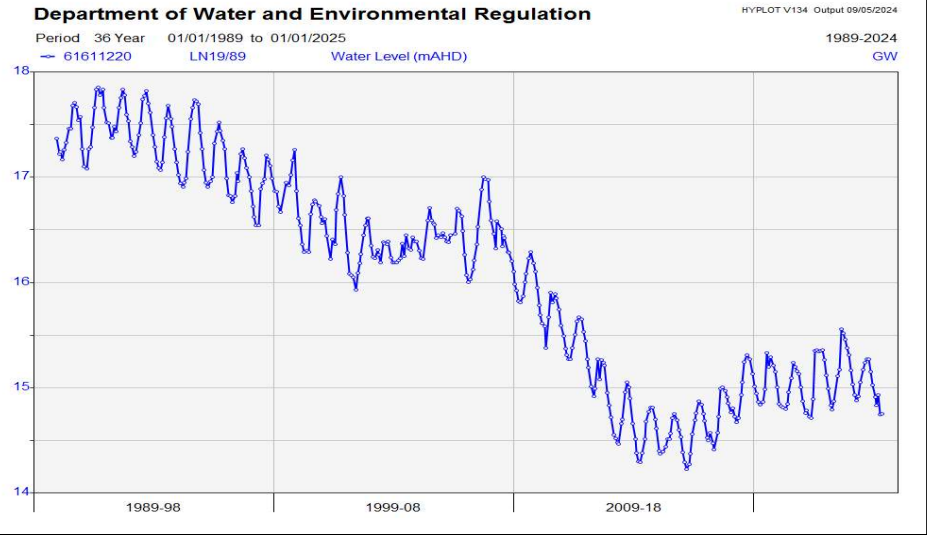
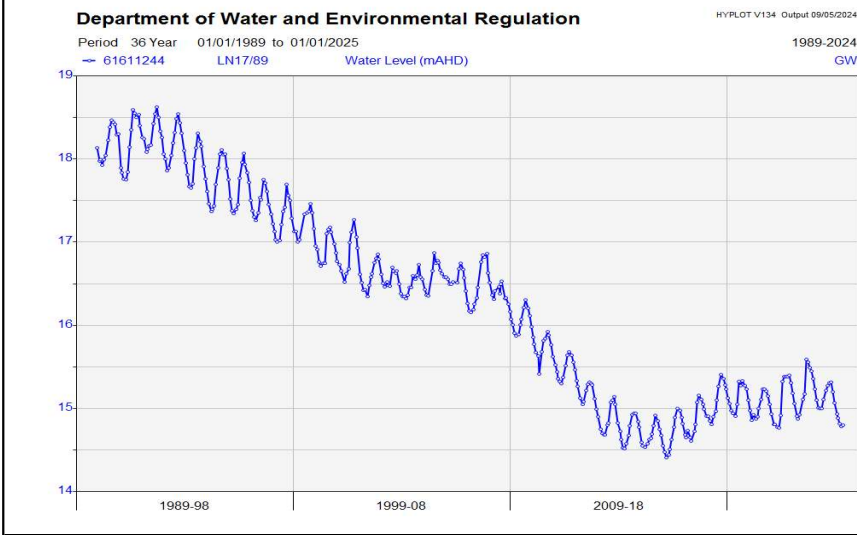
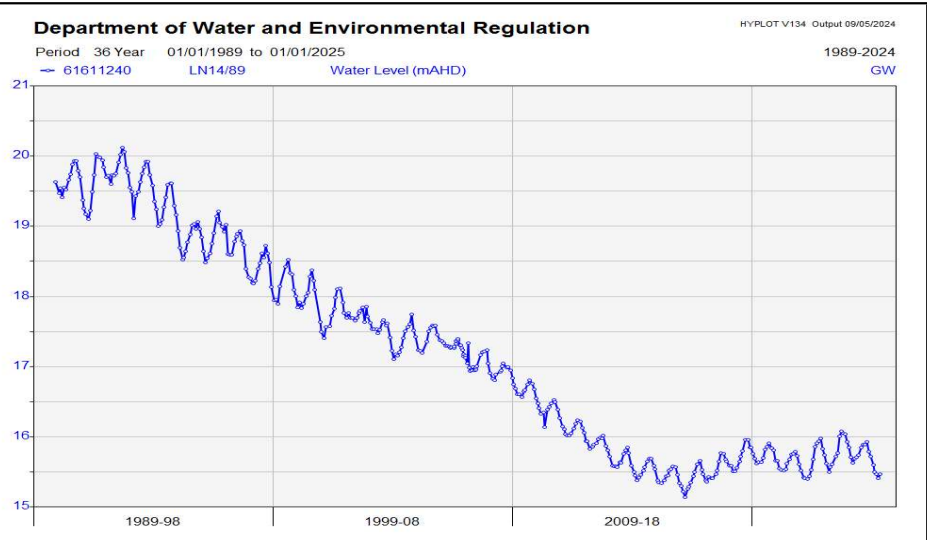
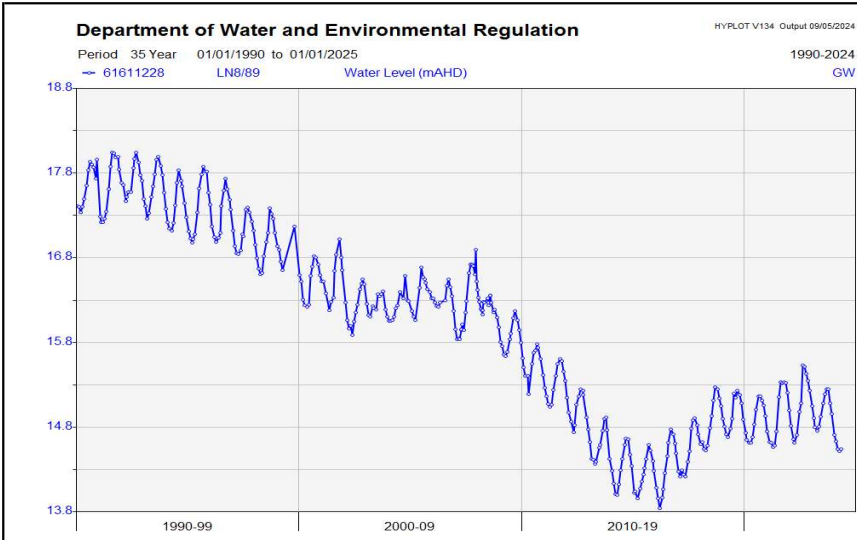
Lot 59 Godel Rd
Groundwater Investigation

October 2025 Groundwater Map

Figure 4

APPENDIX A

DWER Bore Long Term Hydrographs



Department of Water and Environmental Regulation

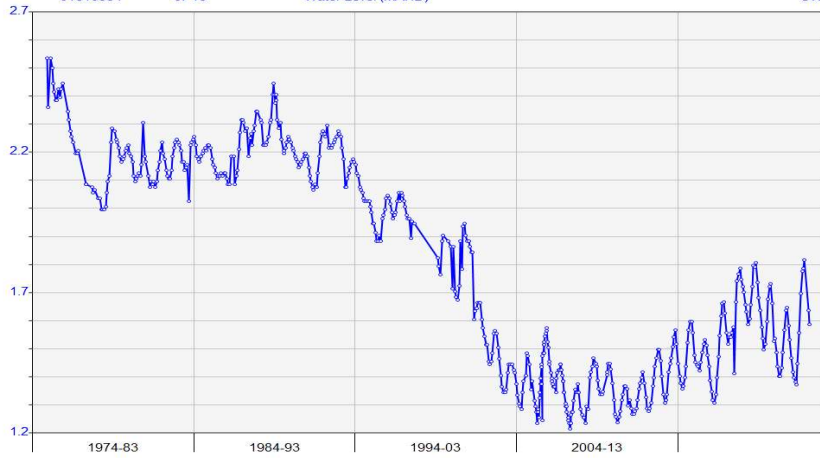
HYPLOT V134 Output 13/08/2023

Period 49 Year 01/01/1974 to 01/01/2023

1974-2022

61610584 JP15 Water Level (mAHD)

GW



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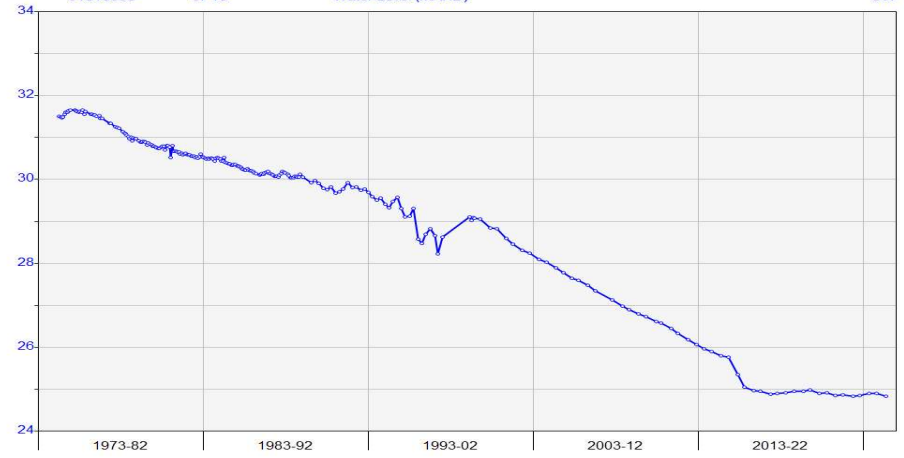
HYPLOT V134 Output 18/05/2024

Period 52 Year 01/01/1973 to 01/01/2025

1973-2024

61610638 JP16 Water Level (mAHD)

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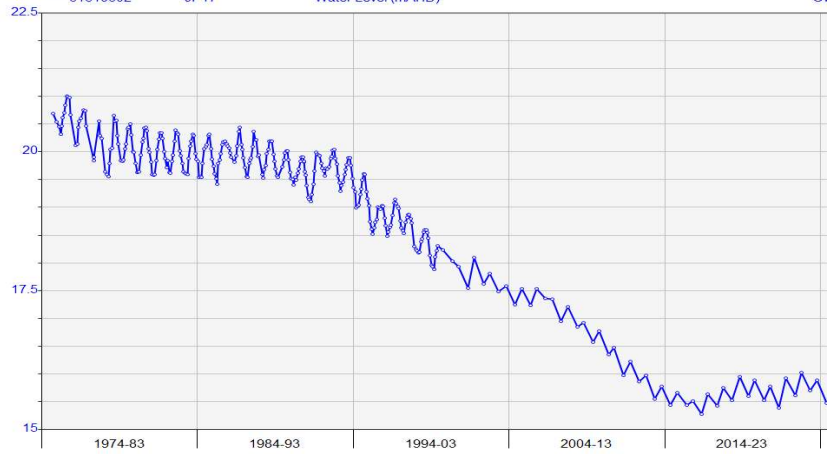
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Period 51 Year 01/01/1974 to 01/01/2025

1974-2024

61610602 JP17 Water Level (mAHD)

GW



Department of Water and Environmental Regulation

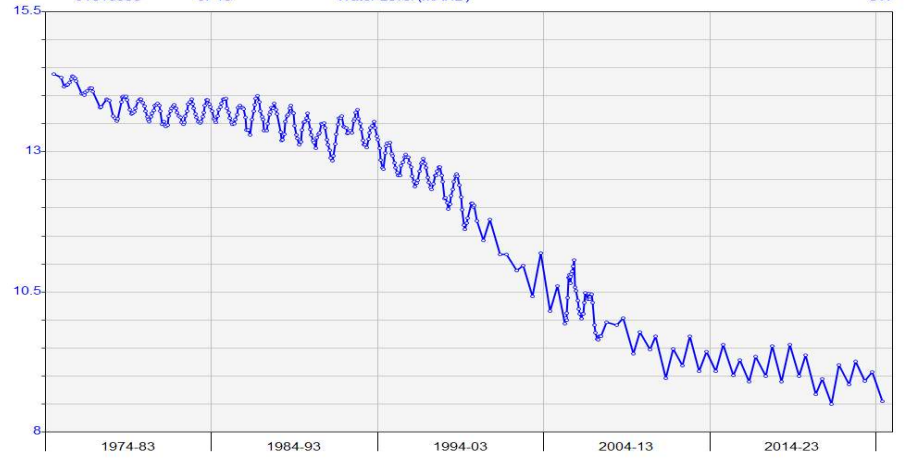
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Period 51 Year 01/01/1974 to 01/01/2025

1974-2024

61610585 JP19 Water Level (mAHD)

GW



Department of Water and Environmental Regulation

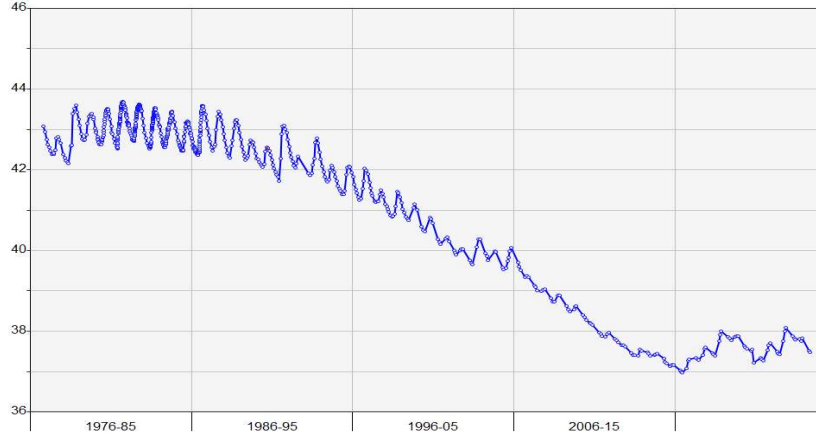
HYPLOT V134 Output 22/05/2024

Period 49 Year 01/01/1976 to 01/01/2025

1976-2024

61610671 PCM21 Water Level (mAHD)
61610671 PCM21 Water Level (mAHD)

GW
A



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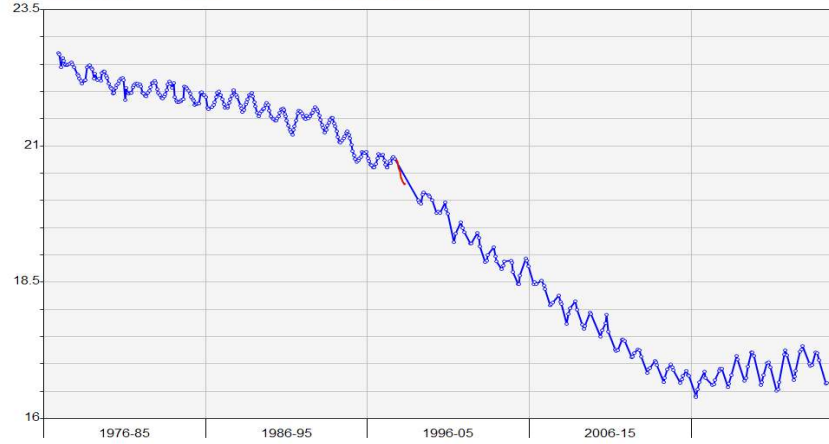
HYPLOT V134 Output 18/05/2024

Period 49 Year 01/01/1976 to 01/01/2025

1976-2024

61610601 PM33 Water Level (mAHD)
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GW
A



Department of Water and Environmental Regulation

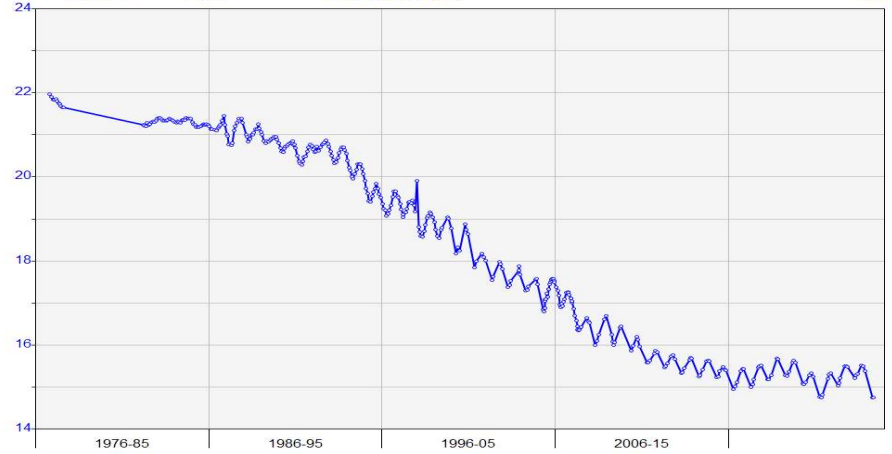
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Period 49 Year 01/01/1976 to 01/01/2025

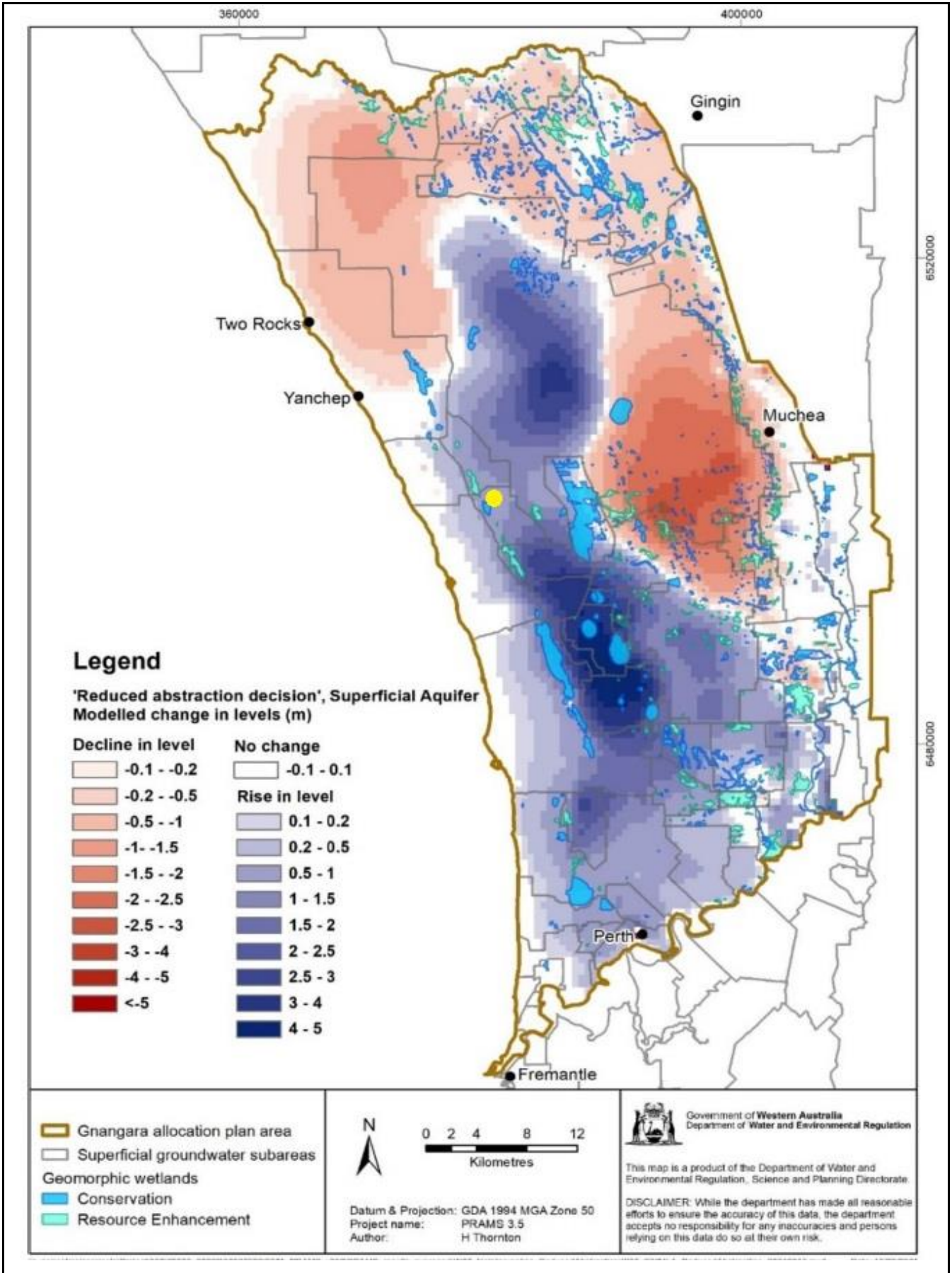
1976-2024

61610603 PM31 Water Level (mAHD)

GW



APPENDIX B
Projected Changes in GWL



● Site Location

APPENDIX C

Global Groundwater (2015) Groundwater Mapping

groundwater flow direction at site annotated by red arrow

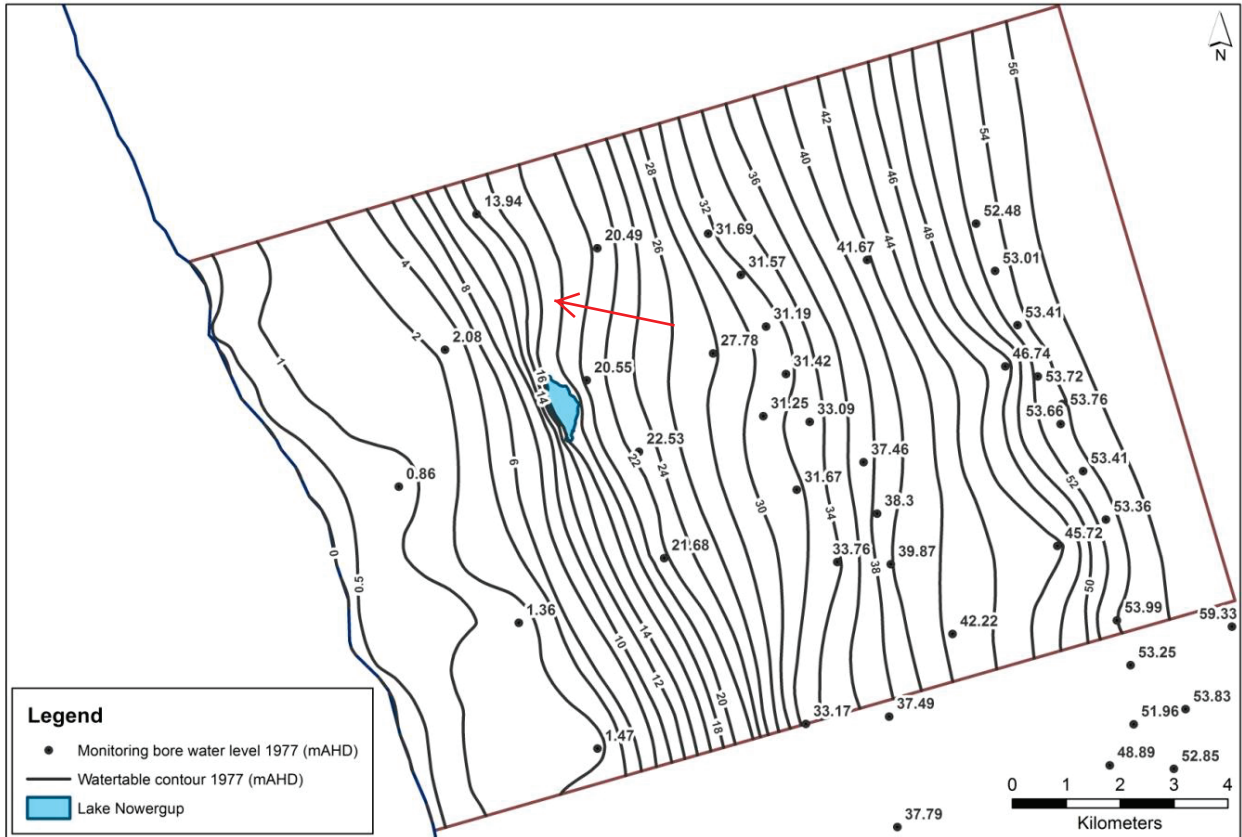


Figure 5-1 Watertable contours - Winter- spring maximum, 1977.

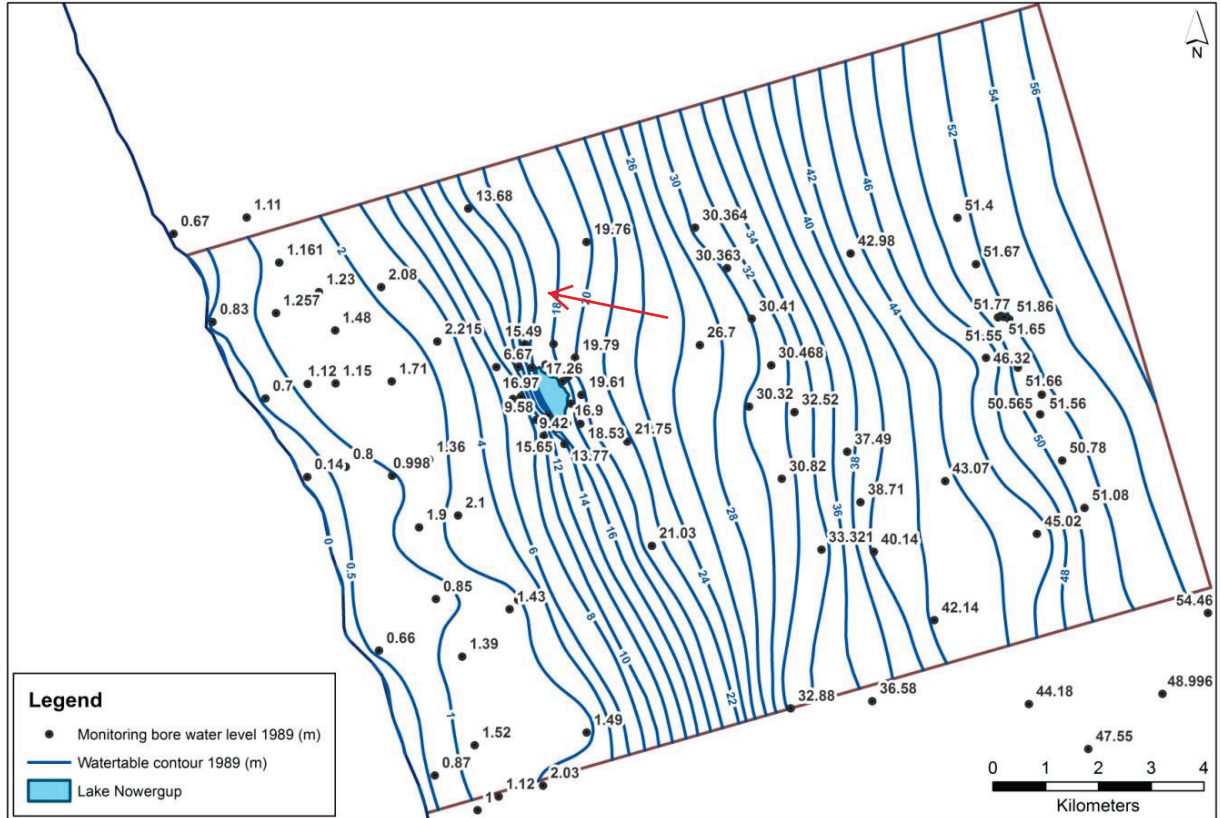


Figure 5-2 Watertable contours - Winter - spring maximum, 1989.

groundwater flow direction at site annotated by red arrow

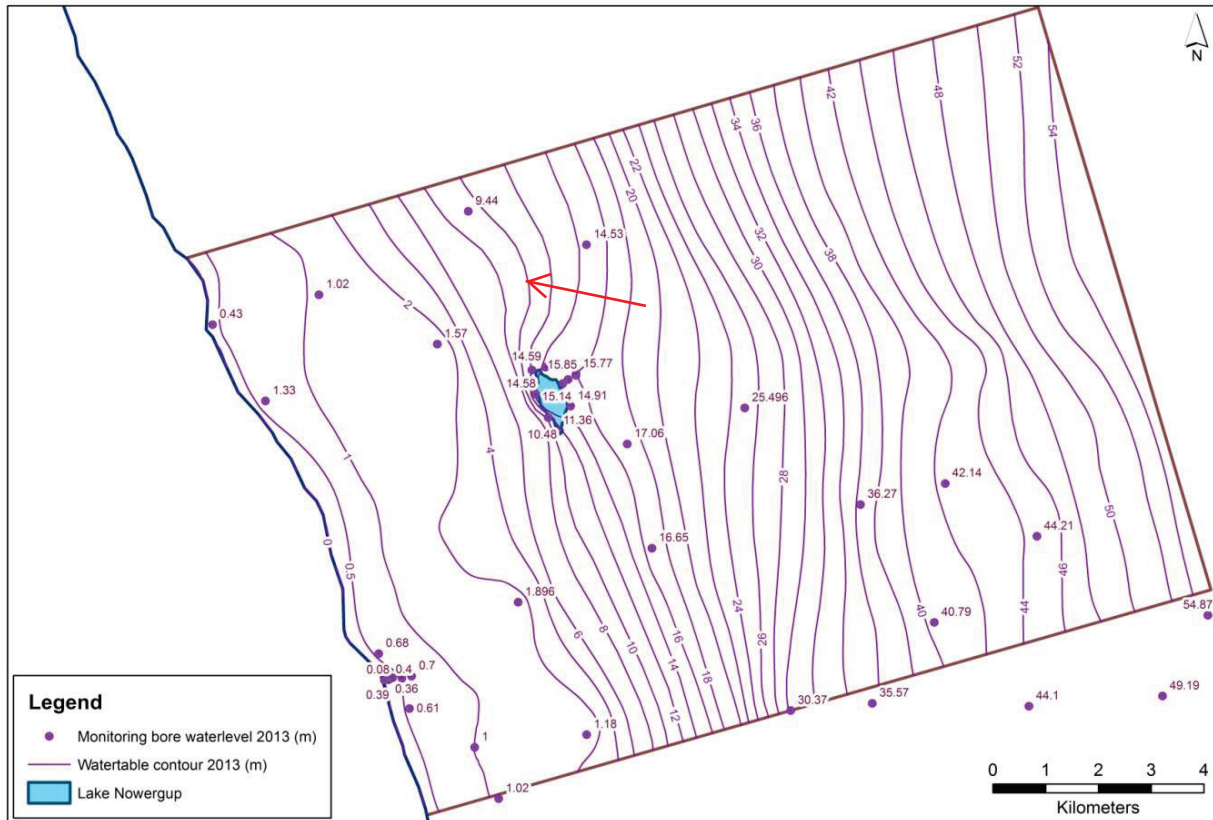


Figure 5-3 Watertable contours - Winter - spring maximum, 2013.