

# Integrated development assessment advice

WAMS request: 13874

WaterNSW reference: IDAS1141680

Plan: Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011 Lodged date: 25 August 2022

Target date: 8 September 2022

Water source: Sydney Basin South Groundwater Source

# Recommendations

The Department of Planning and Environment makes the following recommendations.

- 1 The standard General Terms of Approval for temporary construction (building) dewatering apply as listed in Appendix A.
- 2 WaterNSW should include the following advice on the cover letter that accompanies the General Terms of Approval response.
  - a. Detailed information required to permit a hydrogeological assessment to be carried out is to be provided for any further application related to the subject property—the Minimum requirements for building site groundwater investigations and reporting (DPIE, 2021) describe what data needs to be collected and supplied.
  - b. An extraction limit will be determined by the Department of Planning and Environment following a hydrogeological assessment using the detailed information and that will be included on the conditions applied to the approval for the dewatering activity.
  - c. The approval will be issued for the purpose of temporary construction dewatering only and it does not constitute any form of permission for ongoing pumping of groundwater from basement levels after the building is issued an occupation certificate.
- 3 Once the proponent has made application to WaterNSW for the required approvals, the application must be referred to the Department of Planning and Environment for groundwater impact assessment. This also includes applications that are exempt under any of the existing regulated exemptions from requiring an access licence to take water for these types of developments.

#### Disclaimer

This report is prepared by the Water Group (Department of Planning and Environment) for the benefit of the intended recipient (WaterNSW) only and is an uncontrolled draft if distributed outside these agencies. Information contained in this report is based on knowledge and understanding at the time of writing and is subject to change.

Position	Date
Recommending officer:	16/09/2022

# Application information

### Description

The application seeks development consent for the redevelopment of land as follows (Urbis, 2022).

The proposal comprises the redevelopment of the site as outlined below:

- Demolition of all existing buildings and structures on site, besides the Marcus Clark heritage building façade and The Grand Hotel facade, which will be carefully retained in accordance with specialist advice.
- Removal of 14 trees located internally within the site (the six mature street trees will be retained).
- Excavation to allow three levels of basement car parking. The basement will contain 469 car parking spaces.
- Erection of a series of buildings:
  - Tower 1 (Residential): 117.8m.
  - Tower 2 (Residential): 56.5m.
  - Tower 3 (Residential): 63.15m.
  - Commercial building: 45.01m.
  - Cinema building: 27.9m.
  - Gym/pool building: 21.7m.
- Various ancillary works including landscape/hardscape improvements, including:
  - Publicly accessible central plaza, supported by various stairs, walkways and two public lifts.
  - Various streetscape improvements, including tree planting and provision for a bus shelter.

Application information is provided in Table 1 and the property location is shown on Figure 1.

Table 1 Development application information			
Property address	Council name	Council reference	Development summary
216-222 Keira Street Wollongong	Wollongong City Council	DA-2021/957	Demolition of existing structures, retention of heritage facades, tree removal, excavation for basement car parking and construction of a mixed-use development at the street block bound by Crown, Keira, Burelli and Atchison Streets, comprising three (3) residential towers (shop top housing), one (1) commercial building, retail shops, entertainment facilities (cinema, exhibition/performance space) and a wellness centre (pool, gym, and health services)

#### Figure 1 Property location (Urbis, 2022)



#### Advice request

Assess the proposed works and water take and determine whether or not the application proposes adequate arrangements to ensure that no more than minimal harm will be done to the affected water source(s) or its dependent ecosystems as a result of the proposed works and volume of water take.

In the assessment report provided by DPE WAMs please ensure the following items are addressed:

- Whether the dewatering activity, in your expert opinion, will cause no more than minimal harm.
- Preferred conditions to be included.
- Maximum volume of water take.
- Daily take conditions if required.

## Preliminary assessment

For the purpose of determining General Terms of Approval for the integrated development application referred from WaterNSW, a preliminary assessment of the supplied information has been carried out. A proper hydrogeological assessment of the groundwater impacts from the proposed excavation is not warranted due to the degree of uncertainty applying at this stage of the planning process.

#### **Relevant information**

The preliminary geotechnical investigation report (DP, 2022a) describes the proposed development, site setting and groundwater conditions as follows (emphasis added):

DP has previously undertaken a preliminary geotechnical assessment for the proposed development, with the results presented in a report (Project 89584.00.R.002) dated 1 November 2019. The previous investigation comprised a review of at least 40 previous geotechnical investigations undertaken by DP within 100 m of the site followed by a walkover of the site by an experienced geotechnical engineer, engineering analysis and reporting.

In summary, a review of geotechnical data within the vicinity of the site indicated <u>the</u> <u>expected subsurface profile typically comprised fill to depths of up to about 2 m overlying stiff</u> <u>to very stiff residual clays over sandstone or siltstone bedrock, likely to be encountered at</u> <u>depths of 2 – 6 m</u>. Comments were given within DP's November 2019 report on stability, excavations and support, vibrations, disposal of excavated materials and foundations. <u>Recommendations were also given within on further (subsurface) investigations for the</u> <u>proposed development</u>.

Reference to the NSW seamless geology layer published by the NSW Department of Geoscience indicates that the site is mapped as being underlain by Budgong Sandstone (Broughton Formation) of Permian age, belonging to the Shoalhaven group unit. Shoalhaven group sandstones are described as comprising red, brown and grey lithic sandstone, which weather to form clays of moderate to high plasticity. In the Wollongong CBD, the Budgong Sandstone can be massive and of very high strength. No fault zones are mapped on the broadscale NSW mapping in the vicinity of site, however previous experience on adjacent sites have indicated the presence north to south and northeast to southwest orientated geological faults to the north of the site.

The field work comprised the drilling of five cored boreholes (Bores 1 - 5) to depths in the range 7.6 - 11.4 m using a Hanjin 109 track-mounted drilling rig. The boreholes were advanced through the overburden soils using continuous solid flight augers to depths of 2.5 - 4.0 m then continued using rotary mud-flush techniques to depths of 2.6 - 4.1 m. The boreholes were continued into the underlying bedrock using NMLC (50 mm diameter core) diamond core drilling techniques to termination depths in the range 7.6 - 11.4 m and were logged on site by a geotechnical engineer who collected disturbed samples at regular depth intervals (during auger drilling) to assist in strata identification and for possible laboratory testing.

On completion of the drilling, standpipe piezometers were installed in Bores 2, 4 and 5 for ongoing monitoring of groundwater levels. Well construction details given on the borehole logs in Appendix C. The groundwater wells were cut off at the existing ground level and sealed using a steel gatic cover. Bores 2, 4 and 5 were developed (purged) on 7, 3 and 4 October 2020, respectively.

The groundwater readings taken on 10 and 29 September 2020 indicate that groundwater is typically within the underlying Sandstone bedrock. It must be noted that <u>groundwater levels</u> at the site are transient and would be expected to vary over time with preceding climatic <u>conditions and soil permeability</u>. Locally <u>higher groundwater inflows may be expected if the</u> fault zone intersects the site (as identified in previous investigations to the north of the site, and possibly observed in Bores 4 and 5). Locally lower groundwater may also be expected in the more elevated parts of the site (i.e. along Crown Street).

Based on the results of the investigation (and previous investigations in the vicinity of the site) the geotechnical site model underlying the site is summarised as follows:

- Fill to depths of up to 2 m over the whole site;
- Residual clays, generally 1 to 2 m thick over most of the site, but <u>up to 3 4 m thick</u> in the southern part of the site and near the fault zone (i.e. near Bore 5);
- Weathered sandstone underlying the residual clays with a maximum thickness of typically 1 m, but <u>up to about 2 m in the vicinity of Bores 4 and 5 (related to a</u> <u>geological fault);</u>

- Sandstone of typically medium to high strength below depths of about 2 5 m, but high strength (with stronger bands) at depths of 2.5 – 3.0 m in the northern parts of the site; and
- Groundwater <u>seepage near the fill/clay interface (at relatively shallow depths) and</u> <u>also within the underlying bedrock depths in excess of 3 m</u>.

Excavation for the proposed three-level basement car park will necessitate <u>cuts of up to</u> <u>about 9 – 10 m to achieve basement floor levels to about RL12 – 15 m AHD</u>, with the depth of excavation generally increasing in the northerly and westerly directions. Cross sections (Sections A-A', B-B' and C-C') showing the approximate locations of the existing and proposed basements (floor level of 12 m AHD assumed for the purpose of the sections) are given on Drawings 2 – 4 in Appendix B. Within the depth of excavation proposed, a wide variety of materials will be encountered grading from fill near the surface through stiff to very stiff residual clays into medium to high strength sandstone with some lower and higher strength bands. The majority of the excavation however, will be within rock of typically medium to high strength.

The main considerations for basement excavation will be support/retention of the existing fill/clays/weather rock and the surrounding footpaths and pavements, removal of the high strength unbroken bedrock, the possible presence of a geological fault zone and potential moderate groundwater inflows.

Experience of excavations within the Sydney Basin have shown that there can be <u>high</u> <u>horizontal stresses within the massive (high to very high strength) bedrock units</u>. The magnitude of the horizontal stresses may be twice the vertical stresses and often higher near the ground surface. <u>The main effect of the high horizontal stress is that when excavations</u> <u>are dug into otherwise undisturbed, massive sandstone (of high to very high strength), some</u> <u>stress relief can occur, with the excavated faces tending to move into the excavation</u>.

It is difficult to estimate the magnitude of these potential stress relief movements for the proposed development site, as there is limited historical data available for excavations within the Budgong Sandstone unit. On sites within the Sydney Basin, <u>excavations of up to about 5</u> – 6 m (in high strength or stronger sandstone) have been recorded to move into the <u>excavation (at the top of the sandstone unit) by about 2 – 5 mm</u>. DP recommends that survey/monitoring of the rock faces be undertaken during progressive excavation to determine the magnitude of this possible movement (if it occurs) over time.

The results of the preliminary investigation indicate groundwater levels may be as high as 3.8 m below the existing ground surface (RL15.7 m AHD).

Based on the subsurface profiles and results of monitoring to date, it is considered that drainage behind perimeter walling (including any shotcrete walls) and underfloor drainage (with discharge via a permanent pump system) will be required as part of the final design.

Groundwater recharge rates through existing fill and clay (Unit A material) are expected to be moderate and recharge rates through rock (Unit B and C material) are expected to be relatively slow. Standing groundwater is also possible at depths of 4 – 8 m (i.e. RL7 – 16 m AHD). Notwithstanding this, as groundwater levels are transient and can fluctuate over time, ongoing monitoring of standpipe piezometers installed in Bores 2, 4 and 5 is recommended during the design phase.

It is noted that as the basement is below surrounding ground levels, allowance will need to be made for draining any overland flows which enter the basement excavation via a pumpout system. The results of the hydrogeological investigation (Project 89584.02) indicate that a permanently drained basement design is feasible from the geotechnical viewpoint. If a pump out system is not included in the design, allowance will need to be made for watertight retaining walls in conjunction with a 'tanked' basement.

*Further, more detailed comments on estimated groundwater flows and takes are given in DP's preliminary Hydrogeological investigation (Project 89584.02).* 

Based on the results of the preliminary investigation described within, the site is considered suitable for the proposed development from the geotechnical viewpoint. Information is given within to enable conceptual planning and design to be undertaken, and for submission to Wollongong City Council with a Development Application.

Further investigation including detailed investigations for the design of temporary and permanent support structures and assessment of groundwater levels and potential in-flows will be required as planning and detailed design of the development progresses.

# The hydrogeological investigation report (DP, 2022b) describes the groundwater conditions as follows (emphasis added):

Figure 5 below plots both registered wells (blue triangles) and mapped Groundwater Dependant Ecosystems (GDEs) from the <u>Australia GDE Atlas published by the Australian</u> <u>Bureau of Meteorology</u>. The figure indicates the following:

- There are 19 registered groundwater bores within 1000 m of the site through the Broughton sandstone formation. The remaining registered groundwater bores in proximity to the site are located with alluvial sediments 500 m to the north and 420 m to the south-west. A summary of the 19 registered bores is provided in Appendix B. All of the bores are marked as monitoring bores and as such are not used for groundwater supply.
- Potential GDEs are mapped within the alluvial soils and riparian zone associated with the creek line located at least 1 km to the north west of the site as follows:
  - Red: High Potential GDEs associated with South Coast Grassy Woodland
  - Orange: Moderate Potential GDEs associated with South Coast Grassy Woodland
- Potential GDEs are also mapped within the Pheasants Nest Formation which overlies the Broughton Sandstone at least 1.25 km the south west of the site. These are moderate potential GDEs associated with Illawarra Gully Wet Forest and mapped on undeveloped and forested topographically highs, with elevations typically in the range RL 80 to 100 m AHD.

Hydraulic data loggers were also installed in Bore 2, 4 and 5 for the period 20 March 2022 to 19 May 2022 and the resulting groundwater heads have been plotted against observed rainfall at the Bellambi meteorological station (IDN60801) on Figure B1 in Appendix C.

The results indicate that <u>Bore 5 indicated little response to rainfall events over the period and</u> <u>fell very gradually by about 0.2 m over the monitoring period.</u> <u>Bore 2 showed some response</u> <u>to larger rainfall events, with up to about a 1 m response following an 87 mm rainfall event</u> with a very fast recession and had very little response to smaller events. Bore 4 was relatively responsive with responses to several events that were not recorded at the met station as well as about a 1.1 m response to the 87 mm event and the responsiveness is expected to due to the very low storage of the fractures in the rock. It is noted that the correlation to rainfall is approximate as the rainfall at the actual site will vary from that recorded at the nearest meteorological station (approximately 7.8 km to the north).

Comparison of groundwater levels with the bore logs indicates a correlation with the degree of fracturing and weathering with the <u>water table generally sitting within fractured or slightly</u> <u>fractured rock overlying less fractured and weathered material</u>. This suggests there is a degree of perching of the water table above the underlying tighter rock.

It is noted that groundwater levels are transient and vary depending on preceding climatic conditions. In terms of the readings taken in March through to May 2022, analyses of the cumulative residual mass balance rainfall records at both Darkes Forest and Bellambi indicate close to neutral preceding long term rainfall conditions. The rainfall in the weeks immediately prior were well above monthly average conditions, and therefore likely to represent above average water table levels, although <u>higher water levels may be possible following sustained long term above average rainfall</u>.

Groundwater modelling was undertaken to assess the potential inflow rates into the proposed basements during construction and in the long-term for a drained basement. The drawdown, or cone of depression, likely to be induced by the 'drained' basement was also assessed.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried out using 2D finite element hydrogeological software SEEP/W (a component of Geostudio 2019, Version 10.0.3) developed by GEOSLOPE International Ltd. Both steady-state and transient flow conditions were modelled in the analysis.

At the time of reporting, <u>the design of basement shoring had not commenced</u>, however, <u>it is</u> <u>assumed that the basement shoring wall will comprise non-waterproofing soldier piles with</u> <u>shotcrete in-fill panels and/or vertically cut sandstone faces</u>. The strip drains to be installed behind the shotcrete will essentially collect all groundwater inflow along the basement sidewalls. The shoring wall and the associated strip drains were simulated as 'Seepage Faces' in SEEP/W with zero hydraulic pressure head along the full height.

The subsoil drainage and the sump were simulated by a horizontal boundary condition of 'zero hydraulic pressure head', below the lower basement floor level, at RL 11.5 m to allow for the thickness of the floor slab and the drainage layer/sump underneath.

Groundwater inflow into the 'zero pressure' boundaries representing the strip drains and subsoil drainage layer was monitored throughout the model simulations using a mesh cross section. The inflow rates represent the estimated total rate of groundwater flowing into the excavation and the volume (per unit time) requiring extraction via the de-watering system (sump-and-pump) in order to de-water the basement excavation during construction and in the long-term.

Simulated results are summarised in Table 4. The <u>total flow has been estimated at 240 times</u> <u>the per meter rate, based on the length of the upstream boundary and about half-way down</u> <u>each side</u>. Flow into the excavation is expected to be very limited on the downslope sides of the excavation. During the early stages of construction, inflow rates will be higher and will then gradually decrease as the hydraulic gradient around the excavation decreases. <u>Inflows</u>

during early de-watering works are predicted to be about 14 m3/day or 5 ML/yr. Towards the end of construction, inflows are predicted to be about 2 m3/day and could further reduce in the long term. The cumulative flow of the first year is estimated to be 2.5 mL/yr and will be less in following years.

Elapsed	ed Dewatering Flow Rate				Cumulative Flow
Time	m3/sec/m run	m3/day/m run	m3/day	ML/year	ML
7 days	6.70E-07	0.06	14	5.1	0.1
14 days	5.60E-07	0.05	11.6	4.2	0.2
30 days	4.50E-07	0.04	9.4	3.4	0.3
60 days	3.80E-07	0.03	7.8	2.9	0.6
90 days	3.40E-07	0.03	7.1	2.6	0.8
180 days	3.10E-07	0.03	6.5	2.4	1.4
270 days	3.00E-07	0.03	6.3	2.3	1.9
1 year	3.00E-07	0.03	6.2	2.3	2.5

Table 4: Predictive Model Simulated Inflow Results (ie De-watering Pumping Rates)

The <u>initial inflow rates are sensitive to the nature and frequency of the defects present in the</u> <u>rocks that are to be intersected by the basement excavation</u>. The longer-term flow rates are more controlled by the flux coming from upstream, which is limited by the recharge occurring in the upstream catchment. The rate at which the flows decrease to the longer-term flow rates is based on the storage of the rock.

The estimates of hydraulic conductivity are considered to be moderately conservative and the precision of the results is not a reflection of the accuracy of the analyses. Actual initial flows are expected to be less, especially as the excavation will occur in stages rather than the instant drawdown assumed in the model, although unexpected conditions could lead to larger flows. In terms of long term flow rates, a 5% recharge rate is considered conservative considering the high levels of paving in the catchment upstream and the existing drained basement upstream. If an approximate upstream catchment of 2 ha is considered with a 5% recharge this correlates to an annual flow of 1.1 ML, which suggests the parameters used in the model are likely to overestimate the long term flow rates.

DP has been involved with several nearby basement excavations within similar geology and at similar and also much deeper elevations. These basements have encountered only minor seepage during excavation and have been constructed as drained basements without any reported issues in terms of groundwater management or impacts to surrounding groundwater systems or property.

The minimal consideration impacts relate to impacts on groundwater dependant ecosystems and groundwater users. The proposed excavation on the site is considered to comply with the AIP minimal consideration requirements for the following reasons:

- Water take for the basement does not involve pumping or extraction of large volumes of groundwater. Water seepage through the rock is to be collected in subfloor drainage and directed to the stormwater system (subject to approval by Council);
- It is expected that drawdown in groundwater levels on adjacent properties will be less than 2 m beyond 100 m from the site and any measurable drawdown would be

limited to within the Broughton Sandstone formation. Any settlements due to dewatering are expected to be negligible;

- Registered groundwater wells and groundwater dependant ecosystems are located in a separate alluvial aquifer a substantial distance from the site and impacts on these are expected to be negligible as outlined in Section 8.2 of this report; and
- The take of water can be easily measured during the construction period and in the long term.

#### Assessment of development application

The preliminary geotechnical investigation report (DP, 2022a) suggests an engineered drained basement could be constructed. However, the report also cautions about the potential for impacts on the proposed basement excavation from both stress relief effects within the disturbed ground and the existence of a geological fault zone beneath the site. Both of these geotechnical factors are likely to influence the behaviour of the groundwater system during excavation. The hydrogeological investigation report (DP, 2022b) does not appear to consider any changes brought about by stress relief or the presence of the fault zone that could enhance the material permeability and contribute to higher-than-expected groundwater inflows, particularly under prolonged wet weather. It is also not clear that the hydrogeological investigation report (DP, 2022b) has recognised the effects from raised groundwater levels during wet weather on the pumping and discharge rates required to maintain a dry excavation.

The Department of Planning and Environment has concerns about the potential risks from the proposed development that are not alleviated by the supplied reports. Whilst the information presented is consistent with some of the Department of Planning and Environment minimum requirements for building site groundwater investigations, the threshold for consideration of changes to the standard General Terms of Approval for temporary construction (building) dewatering has not been met. There has not been any compelling site-specific evidence or justification in the supplied documentation that warrants changing the assessment approach for this integrated development application. A high degree of uncertainty remains around the take of groundwater by the proposed development that will not be resolved until more work has been completed.

Assuming the basement is constructed as a tanked structure, then the impacts of the proposed development are expected to be transitory. However, the magnitude and extent of impacts that might be expected from temporary construction dewatering at the site cannot reliably be predicted by the Department of Planning and Environment on the information presented.

### Application of the General Terms of Approval

The General Terms of Approval are appropriate for the temporary dewatering activity, because

- it is not possible to assess whether the dewatering activity will cause no more than minimal harm on the information presented
- the preferred conditions to be included are the standard General Terms of Approval for temporary construction (building) dewatering for consistency with other integrated developments
- the maximum volume of water take has been quantified as 2.5 ML/y—from the geotechnical model results the estimated inflows are 5.1 ML/y initially, declining to 3.4 ML/y after 30 days, 2.6 ML/y after 90 days and 2.4 ML/y after 180 days
- daily take conditions are not required because the pumping rate is likely to change throughout the period over which dewatering is expected to occur.

The Department of Planning and Environment expects that site-specific groundwater-related investigations and monitoring will be continued until an approval application is lodged—and the information reported to WaterNSW at that time—should a development consent be granted by Wollongong City Council. Site-specific

data gathering according to the 'Minimum requirements for building site groundwater investigations and reporting' (DPIE, 2021) needs to be continued for that period to provide the necessary information to be supplied with the approval application and to confirm the volume required for the dewatering activity so an appropriate extraction limit can be determined by the Department of Planning and Environment.

To encourage an outcome of no more than minimal harm from the proposed development by limiting the term of groundwater take to the construction period and preventing long-term pumping, standard General Terms of Approval for temporary construction (building) dewatering are considered appropriate by the Department of Planning and Environment for the project as it is currently presented and are recommended to WaterNSW.

## References

DP, 2022a. Report on Preliminary Geotechnical Investigation, Proposed Mixed-Use Development WIN Grand, Crown Street, Wollongong. Report 89584.01.R.001.Rev4 prepared by Douglas Partners Pty Ltd for Birketu Pty Ltd. June.

DP, 2022b. Report on Hydrogeological Investigation, Proposed Mixed Use Development WIN Grand, Wollongong. Report 89584.02.R.001.Rev0 prepared by Douglas Partners Pty Ltd for Birketu Pty Ltd. June.

DPIE, 2021. Minimum requirements for building site groundwater investigations and reporting – information for developers and consultants. Report PUB20/940, prepared by NSW Department of Planning, Industry and Environment, Water Group. January. ISBN 978-1-76058-419-1.

Urbis, 2021. WIN Grand Statement of Environmental Effects. Report P26492 v05 prepared by Urbis Pty Ltd. August.

# **Appendix A – General Terms of Approval**

For clarity, hyperlinks, report references and advisory notes have not been reproduced in the General Terms of Approval listed below—these are otherwise consistent with standard Water Licensing System dewatering conditions identified by the condition number.

Condition number	Dewatering condition
GT0115-00001	Groundwater must only be pumped or extracted for the purpose of temporary construction dewatering at the site identified in the development application.
	For clarity, the purpose for which this approval is granted is only for dewatering that is required for the construction phase of the development and not for any dewatering that is required once construction is completed.
GT0116-00001	Before any Construction Certificate is issued for any excavation under the development consent, the applicant must:
	(a) Apply to WaterNSW for, and obtain, an approval under the Water Management Act 2000 or Water Act 1912, for any water supply works required by the development; and
	(b) Notify WaterNSW of the programme for the dewatering activity to include the commencement and proposed completion date of the dewatering activity.
GT0117-00001	A water access licence, for the relevant water source, must be obtained prior to extracting more than 3ML per water year of water as part of the construction dewatering activity.
GT0118-00001	If no water access licence is obtained for the first 3ML per year (or less) of water extracted, then, in accordance with clause 21(6), Water Management (General) Regulation 2018, the applicant must:
	(a) Record water taken for which the exemption is claimed; and
	(b) Record the take of water not later than 24 hours after water is taken; and
	(c) Make the record in the approved form; and
	(d) Keep the record for a period of 5 years; and
	(e) Give the record to WaterNSW, (i) not later than 28 days after the end of the water year (being 30 June) in which the water was taken, or (ii) if WaterNSW directs the person in writing to give the record to WaterNSW on an earlier date, by that date.
GT0119-00001	All extracted groundwater must be discharged from the site in accordance with Council requirements for stormwater drainage or in accordance with any applicable trade waste agreement.
GT0120-00001	The design and construction of the building must prevent:
	(a) Any take of groundwater, following the grant of an occupation certificate (and completion of construction of development), by making any below-ground levels that may be impacted by any water table fully watertight for the anticipated life of the building. Waterproofing of below-ground levels must be sufficiently extensive to incorporate adequate provision for unforeseen high water table elevations to prevent potential future inundation; and
	(b) Obstruction to groundwater flow, by using sufficient permanent drainage beneath and around the outside of the watertight structure to ensure that any groundwater mounding shall not be greater than 10 % above the pre-development level; and
	(c) Any elevated water table from rising to within 1.0 m below the natural ground surface.

Condition number	Dewatering condition
GT0121-00001	Construction phase monitoring bore requirements:
	(a) A minimum of three monitoring bore locations are required at or around the subject property, unless otherwise agreed by WaterNSW; and
	(b) The location and number of proposed monitoring bores must be submitted for agreement by WaterNSW with the water supply work application approval; and
	(c) The monitoring bores must be installed and maintained as required by the water supply work approval; and
	(d) The monitoring bores must be protected from construction damage.
GT0122-00001	Construction phase monitoring programme and content:
	(a) A monitoring programme must be submitted, for approval, to WaterNSW with the water supply work application.
	The monitoring programme must, unless agreed otherwise in writing by WaterNSW, include matters set out in any guideline published by the NSW Department of Planning, Industry and Environment in relation to groundwater investigations and monitoring.
	Where no guideline is current or published, the monitoring programme must include the following (unless otherwise agreed in writing by WaterNSW):
	(i) Pre-application measurements—the results of groundwater measurements on or around the site, with a minimum of 3 bore locations, over a minimum period of 3 months in the six months prior to the submission of the approval to WaterNSW; and
	(ii) Field measurements—include provision for testing electrical conductivity; temperature; pH; redox potential and standing water level of the groundwater; and
	(iii) Water quality—include a programme for water quality testing which includes testing for those analytes as required by WaterNSW; and
	(iv) QA—Include details of quality assurance and control; and
	(v) Lab assurance—include a requirement for the testing by National Association of Testing Authorities accredited laboratories.
	(b) The applicant must comply with the monitoring programme as approved by WaterNSW for the duration of the water supply work approval (Approved Monitoring Programme).
GT0123-00001	Reporting arrangements:
	(a) Prior to the issuing of the occupation certificate, and following the completion of the dewatering activity, and any monitoring required under the Approved Monitoring Programme, the applicant must submit a completion report to WaterNSW; and
	(b) The completion report must, unless agreed otherwise in writing by WaterNSW, include matters set out in any guideline published by the NSW Department of Planning, Industry and Environment in relation to groundwater investigations and monitoring.
	Where no guideline is current or published, the completion report must include the following (unless otherwise agreed in writing by WaterNSW):
	(i) All results from the Approved Monitoring Programme; and
	(ii) Any other information required on the WaterNSW completion report form as updated from time to time on the WaterNSW website; and
	(c) The completion report must be submitted using the WaterNSW Completion Report for Dewatering Work form.

Condition number	Dewatering condition
GT0150-00001	The extraction limit shall be set at a total of 3ML per water year (being from 1 July to 30 June).
	The applicant may apply to WaterNSW to increase the extraction limit under this condition.
	Any application to increase the extraction limit must be in writing and provide all information required for a hydrogeological assessment.
GT0151-00001	Any dewatering activity approved under this approval shall cease after a period of two (2) years from the date of this approval, unless otherwise agreed in writing by WaterNSW (Term of the dewatering approval).
GT0152-00001	This approval must be surrendered after compliance with all conditions of this approval, and prior to the expiry of the Term of the dewatering approval.
GT0155-00001	Construction phase monitoring requirements:
	(a) The monitoring bores must be installed in accordance with the number and location shown, as modified by this approval, unless otherwise agreed in writing with WaterNSW; and
	(b) The applicant must comply with the monitoring programme as amended by this approval (Approved Monitoring Programme); and
	(c) The applicant must submit all results from the Approved Monitoring Programme, to WaterNSW, as part of the Completion Report.

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