

Douglas Partners Pty Ltd ABN 75 053 980 117 www.douglaspartners.com.au 96 Hermitage Road West Ryde NSW 2114 PO Box 472 West Ryde NSW 1685 Phone (02) 9809 0666

SJB Architects c/- SJB Planning Level 2, 490 Crown Street Surry Hills NSW 2010

Project 99751.00 23 February 2021 99751.00.R.005.Rev0 DIH

Attention: Michael Baker

Email: mbaker@sjb.com.au

Requested Additional Information Proposed Pool and Park Redevelopment 78 Carwar Avenue, Carss Park Development Application Number DA2020/0405

This letter provides a response by Douglas Partners Pty Ltd (DP) to Georges River Council's (Council) letter dated 3 February 2021 and subsequent email dated 7 February 2021 requesting additional information in support of the Carss Park Pool development application (DA2020/0405).

From the information provided, DP understands Council requires further clarification on the following:

-) Potential for changes in groundwater levels and associated potential impact on the proposed works, in particular a rise in groundwater levels due to tides and sea level rise associated with climate change;
-) Potential for groundwater seepage into the pool area and Kogarah Bay;
-) Management of differential settlement;
- Management and disposal of groundwater during works; and
- *J* Future costs associated with the erosion protection contingency measures.

Groundwater Levels and Seepage

Groundwater levels at the site can be influenced by seasonal weather events, such as following periods of low or high precipitation that may cause groundwater to fall and rise respectively. In this regard, given the site's proximity to Kogarah Bay and hence the connection between the site's and bay's water levels, should an increase in groundwater levels be caused by a precipitation event, the resulting increase is only likely to be periodic.



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As outlined in DP's erosion protection letter¹, the erosion protection measures address the eastern site boundary and lower areas in the north-eastern corner of the site where the final site level is less than relative level (RL) 2.5 m Australian Height Datum (AHD). This approach takes into account wave run up and changes in water levels due to climate change. The approach would also address high tides, noting that high tides do not exceed 2.1 m in 2021.² Hence potential impacts from tidal inundations associated with climate change and sea level rise are considered to be addressed by both the remediation approach through the installation of a compacted cap and surface covering (e.g. turf) and the erosion protection measures, whilst providing a balance to not adversely impact the health of existing trees that are to be retained on and adjacent to the site.

As shown on the Maps & Survey Pty Ltd Drawing: Site Feature & Level Survey and dated 10 August 2020 the depth of the pool is RL 2.33 m AHD at the northern end of the pool and RL 1.76 m AHD at the southern end of the pool. During groundwater sampling on 27 July 2020 as part of DP's previous contamination investigation³, groundwater wells 108, 109 and 110 located adjacent to the pool and located from north to south respectively recorded groundwater at RL 1.59 m AHD, RL 1.33 m AHD and RL 1.19 m AHD. Moreover, it is noted that the morning low tide on 27 July 2020 was 0.51 m and that low tides below 0.51 m are commonly encountered at Carss Park.⁴

Groundwater seepage into the existing pool area can be managed, if encountered during works, through implementation of appropriate site management practices including inter alia:

- J Undertaking works in this area during low tide periods and not after rain events;
- J Pumping any ponding water to a holding tank for appropriate disposal; and
- J Use of geofabric and a well graded granular fill for backfilling any water softened fill (if encountered) at the base of the pool.

The following comments provided in Section 5 of DP's geotechnical report;⁵ 'It should be noted that groundwater levels are potentially transient and that fluctuations may occur in response to climatic and seasonal conditions and to a lesser extent due to tidal influence' do not suggest the requirement for additional investigation, but rather an acknowledgement of expected fluctuations. With regard to estimates of differential settlement the effect of groundwater fluctuations on settlement are expected to be minor and are considered to be covered by the upper bound settlement estimates provided in DP's geotechnical report.

With respect to seepage into Kogarah Bay, any seepage that would occur is via the groundwater table. As such, this would not change the existing seepage processes, albeit at a potentially higher RL AHD in the future (associated with potential sea level rise). Furthermore, it is noted that the site does

Australian Bureau of Meteorology, 2021 Tides for Sydney (Fort Denison) - New South Wales,

http://www.bom.gov.au/ntc/IDO59001/IDO59001_2021_NSW_TP007.pdf (accessed 18 February 2021). ⁵ Douglas Partners Pty Ltd, 'Report on Additional Geotechnical Investigation, Proposed Pool and Park Redevelopment, 78

¹ Douglas Partners Pty Ltd, 'Review of Erosion Protection Requirements, Proposed Pool and Park Redevelopment, 78 Carwar Avenue, Carss Park', DP ref: 99751.00.R.004.Rev2 dated 13 October 2020 (DP, 2020d).

Australian Bureau of Meteorology, 2021 Tides for Sydney (Fort Denison) - New South Wales,

http://www.bom.gov.au/ntc/IDO59001/IDO59001_2021_NSW_TP007.pdf (accessed 18 February 2021).

Douglas Partners Pty Ltd, 'Report on Detailed Site (Contamination) Investigation, Proposed Pool and Park Redevelopment, 78 Carwar Avenue, Carss Park', DP ref: 99751.00.R.001.Rev0 dated 14 September 2020. (DP2020a)

Carwar Avenue, Carss Park', DP ref: 99751.01.R.001.Rev1 dated 14 September 2020 (DP, 2020b).



not bound the bay with the foreshore armoury measures present between the site's eastern boundary and Kogarah Bay. Therefore, seepage into the bay would also be attributable to this off-site area to the east, along with other off-site areas of Carss Park, such as the car park area to the west and oval area to the north.

Moreover, as indicated by the results of the contamination investigation (DP, 2020a), the impact on groundwater quality due to leaching of contaminants from fill above the water table is not considered to be of significant concern. In this regard, as supported by the results of the contamination investigation (DP, 2020a), soils below the existing groundwater table and off-site to the west in the car park area (e.g. samples BH102/2.5-3.0 and BH111/4.5-5.0) generally have higher contaminant concentrations than those currently on the site above the water table and to be retained post-works. Therefore, impact on groundwater quality due to the generally more contaminated soils is already reflected in the existing groundwater conditions. Consequently, it is considered unlikely that a potential future rise in groundwater levels at the site would have an adverse impact on existing groundwater quality (or seepage) that enters Kogarah Bay.

Additionally, excavation and off-site disposal of some existing site soils to meet design levels coupled with the controls for imported soils to be used on the site (refer to Section 10.3 of the remediation action plan (RAP)⁶) further support the above opinion, i.e. that redevelopment the site would not increase the contamination risk to Kogarah Bay associated with seepage via groundwater.

Management of Differential Settlement

As outlined in Section 7.2 of DP 2020b (Additional Geotechnical Investigation Report), the majority of the settlement is likely to occur within the existing and new fill, soft to firm clay and very loose to loose sand layers which are generally within a depth of about 6.5 m of the existing ground levels. Based on the proposed site works the potential for differential settlement has been estimated to be within the order of 5 mm over 10 m at 1 year (or a grade of 1:2000), 20 mm over 10 m at 10 years (1:500) and 30 mm at 50 years (~1:300). These are upper bound values as outlined in the DP 2020b.

The level of management for settlement and differential settlement will be dependent on what the tolerable or acceptable limits are for the intended use of the site. It is expected that the estimated (upper bound) differential settlements provided in Section 7.2 of DP's DP 2020b (reproduced above) will be acceptable for the intended use of the site as a recreational open space given that this use is unlikely to be particularly settlement sensitive. Therefore, the ground treatment methodology outlined in Section 7.3 of DP 2020b is considered to be an appropriate level of control for the current intended use of the site.

⁶ Douglas Partners Pty Ltd, 'Remediation Action Plan, Proposed Pool and Park Redevelopment, 78 Carwar Avenue, Carss Park', DP ref: 99751.00.R.002.Rev1 dated 29 September 2020 (DP2020c).



Water Disposal

Regarding comments provided by Council's independent contamination and RAP review that 'Any groundwater that has collected in deep excavation areas of the pool should not be discharged to local stormwater networks or the nearby estuary until the water is demonstrated to meet the outlined performance criteria', DP notes that this is commonly made as a condition of a development application approval and subsequently included in the construction environmental management plan. Nevertheless, DP has included the following in the RAP as an added Section 13.8 Water Management (subject to approval by the Site Auditor).

Section 13.8 Water Management (of RAP)

Water quality impacts associated with the project are to be managed during construction works. The objectives of the groundwater, surface water, stormwater management are to:

-) Contain groundwater, surface water and stormwater encountered during earthworks so that water is appropriately collected and stored;
-) Assess and remove collected groundwater, surface water and stormwater from the site in accordance with the POEO Act; and
-) Manage stormwater run-off so that it is not allowed to migrate off-site such as through erosion and sedimentation control measures.

Any groundwater, surface water or stormwater that has contacted contaminated soils or contaminated groundwater, during site works should be treated as contaminated (unless testing shows otherwise) and cannot be directly disposed of, to stormwater or sewer, without first being assessed.

Depending on the quality of the water requiring disposal, disposal could be via one or more of the following options:

- *Pump to stormwater;*
-) Tanker off-site for disposal at an aqueous treatment plant; and
-) Pump to the sewer.

13.8.1 Disposal to Stormwater

If the visual assessment and chemical analysis of the groundwater confirms contamination levels are within the NSW EPA and Council requirements, water may be able to be disposed to stormwater subject to Council's approval for the project. Whilst not anticipated for the project, should disposal over significant time periods be required, this would likely require an ongoing monitoring program to confirm the continued suitability of the water for disposal to stormwater.

The screening levels for disposal to stormwater are to be based on the following primary guidance (or as stipulated otherwise by the stormwater disposal approval):

-) ANZG, 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018' (ANZG 2018); and
-) National Environment Protection Council, 'National Environment Protection Measure 1999, as amended' (NEPC (2013)).

The adopted screening criteria will assume a slightly/moderately disturbed receiving ecosystem (water) at a general protection level of protection of 95%, noting that Kogarah Bay would be considered a moderately to highly disturbed water system.

13.8.2 Off-Site Disposal to Treatment Plant

This disposal option allows relatively quick disposal of water and may be suitable for small volumes or water that, following analysis, is deemed unsuitable for disposal to stormwater or sewer or for treatment on-site. For large volumes of water this option may be relatively costly. Testing frequency and contaminant analysis are to be determined and confirmed by the disposal contractor as required by their Environment Protection Licence.

13.8.3 Disposal to Sewer

Whilst not anticipated to be undertaken for the project, waters being disposed to sewer require a Trade Waste Agreement with Sydney Water as well as payment of a fee for the service, based on level of contaminants and disposal volumes. Analysis must be undertaken, and a flow meter installed at the discharge point. An advantage of disposal to sewer is that higher levels of contaminants are allowed.

Costs of Contingency Erosion Protection Measures

Apropos the note in the Site Audit Statement raised in Council's comments regarding the future costs associated with the contingency measures (DP assumes these refer to the erosion protection measures outlined in DP 2020c) the following is highlighted:

-) The use of imported non-dispersive clay along the eastern site boundary is not considered to have a significant additional cost for the overall project given the limited area of use and long term benefit;
-) The proponent (Council) is already required to undertake maintenance of the foreshore armoury measures as part of their general maintenance of Carss Park/Carss Park Flats; and
-) Maintenance of the site surface, such as turf coverage and mulch around the base of trees, is not anticipated to have a relatively high cost compared to current requirements given that the area already requires maintenance of the existing landscaping by Council.



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The proponent (Council) would be able to provide further information on allowances for and management of future maintenance costs for the site as an open space and for the related the erosion protection measures.

DP trusts the above information provides the necessary clarification required. Please do not hesitate to contact the undersigned if you have any questions on this matter.

Yours faithfully Douglas Partners Pty Ltd

Alexander Hanna Geotechnical Engineer

David Holden Environmental Scientist

Reviewed by

Fiona MacGregor Principal

J M Nash Principal