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Northern Beaches Council
Attention: Mr Daniel Milliken
(submitted online at the NSW Planning Portal at https://www.planningportal.nsw.gov.au/)

17 February 2023

Response to Request for Information on Survey and Mean High Water Mark Matters for DA2021/1612, Relating to Construction of Upgraded Coastal Protection Works at 1190-1196 & 1204 Pittwater Road Narrabeen

1. INTRODUCTION AND BACKGROUND

On 5 September 2022, Northern Beaches Council (in an email from Daniel Milliken to Peter Horton) requested a response to the following matters:

1. The Applicant must provide Council with a Survey, prepared by a suitably qualified Surveyor, prior to the approval of any works, which shows the exact location of the proposed works.
2. All Surveys are to show relevant boundaries in accordance with Part 2 of the *Surveying and Spatial Information Regulation 2017* and identify each of, the existing mean high water mark, the original mean high water mark and any former mean high water mark by reference to bearings and distances from the boundary. Note: If there is a difference between the existing mean high water mark and any former mean high water mark, Council will rely on the most westerly of those lines, so as to ensure proposed works are constructed wholly within privately owned land.
3. The survey is to be accompanied by a Report from the Surveyor which certifies that the survey has been prepared in accordance with Part 2 of the *Surveying and Spatial Information Regulation 2017* and if there is a new mean high water mark shown in the survey document, the reasons for the change.

Specific responses to these items are set out in turn in Section 5. Prior to this and to provide supporting information to these responses, a definition of Mean High Water Mark (MHWM) is provided in Section 2, analysis to determine MHWM positions seaward of the subject properties since 1941 is presented in Section 3, and discussion on boundary surveys is provided in Section 4.

2. DEFINITION OF MHWM

In Clause 5 of the *Surveying and Spatial Information Regulation 2017*, "mean high-water mark means the line of mean high tide between the ordinary high-water spring and ordinary high-water neap tides". A diagram of various tidal planes as applies in the ocean offshore of the subject properties, derived from the *NSW Tide Charts 2023* (Manly Hydraulics Laboratory, 2022), is presented in Figure 1.

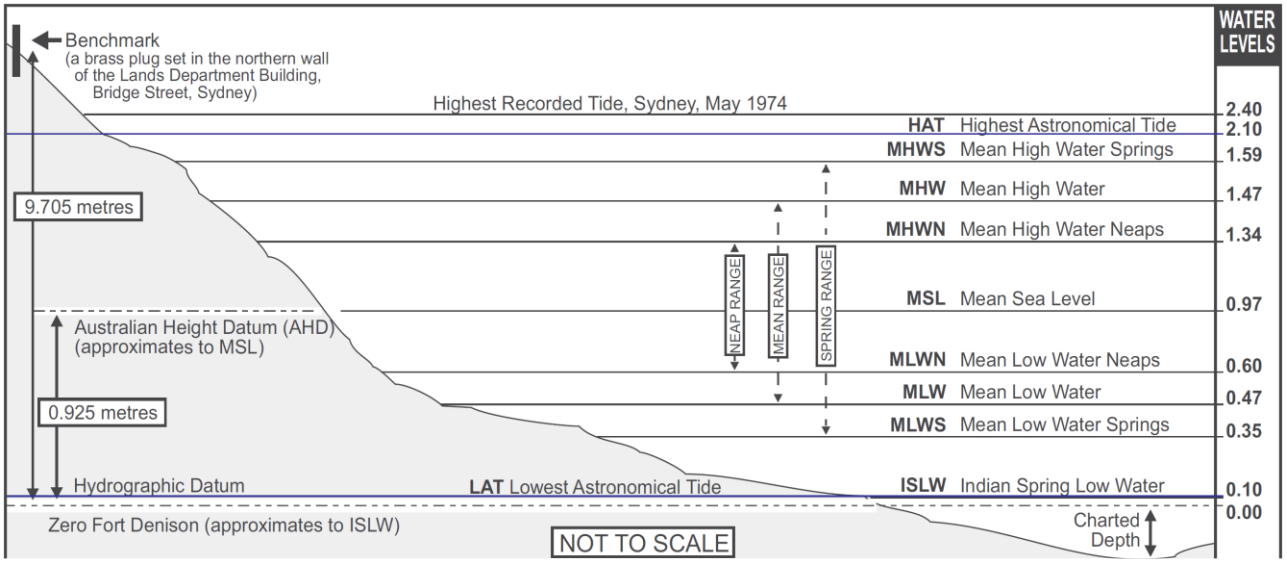

Figure 1: Tidal planes in Sydney from *NSW Tide Charts 2023*

The MHWM as defined in the *Surveying and Spatial Information Regulation 2017* is represented by the intersection of the MHW water level in Figure 1 with adjacent land, which is between MHWS and MHWN as per that definition. In Figure 1, MHW is equal to 1.47m relative to Chart Datum. To express this relative to Australian Height Datum (AHD), it is necessary to subtract 0.925m, as depicted in Figure 1. Therefore, MHW is equal to 0.55m AHD at present based on the *NSW Tide Charts 2023*, which can be considered as a reliable and up-to-date source of this information.

In Table 1, published MHW values in the last nine annual versions of the Manly Hydraulics Laboratory *NSW Tide Charts* are listed. It is evident that there has only been minor (up to 30mm) variation in reported MHW values over the last decade.

Table 1: MHW from NSW Tide Charts from 2014 to 2022

Year	Period of analysis	MHW (m AHD)
2014	1990-2010	0.53
2015	1990-2010	0.53
2016	1990-2010	0.53
2017	1990-2010	0.53
2018	1990-2010	0.53
2019	1990-2010	0.53
2020	1990-2010	0.53
2021	2001-2020	0.58
2022	2001-2020	0.55

Sand levels on Narrabeen Beach seaward of the subject properties vary constantly in response to varying ocean water levels, wave and wind conditions. At any instant of time, a MHWM can be defined as the location of the 0.55m AHD contour on the beach, where a 0.55m AHD water level would extend to on the sand[1]. These instantaneous MHWMs are not considered to represent the

[1] It is recognised that with sea level rise recorded in Sydney over the last century, MHW generally would generally get lower moving back in time over timescales of decades.

single adopted MHWM as per the *Surveying and Spatial Information Regulation 2017*. In the same way that MHW is determined by Manly Hydraulics Laboratory based on analysis periods in the order of 20 years, it is considered that any single adopted MHWM seaward of the subject properties should be based on the average of many instantaneous MHWMs determined over a long period of at least many decades, to account for the constant variability in sand levels on the beach[2].

3. ANALYSIS OF MHWM POSITIONS SEAWARD OF SUBJECT PROPERTIES FROM NSW BEACH PROFILE DATABASE

A total of 26 beach profile dates have been captured at and seaward of the subject properties in the NSW Beach Profile Database since 1941, up to 2022. This data has Map Grid of Australia (MGA) coordinates and AHD levels. Eight cross section locations were analysed for the report herein, with an alongshore spacing of 20m, to determine the position of 0.55m AHD on each date (giving 208 data points). This position was determined by linear interpolation between elevations above and below 0.55m AHD, or if the profile did not extend down to 0.55m AHD it was extrapolated based on continuing the profile at the same slope as the previous two more landward data points (combined with a check that the slope was realistic). The 26 MHWM positions at various dates from the NSW Beach Profile Database are depicted in Figure 2[3], with the 8 beach profile locations depicted in black.

The average MHWM determined from the 26 NSW Beach Profile Database MHWM positions is depicted in red in Figure 2. This average MHWM is located about 41m to 46m seaward of the subject properties, increasing moving north, and so happens to be similar to the 2011 MHWM.

LCG Global Pty Ltd (registered surveyor Shane Lawrence) has investigated available historical MHWMs, and did not find any MHWMs defined as part of Deposited Plans or otherwise. However, based on the analysis depicted in Figure 2, it can be confidently asserted that the long-term average MHWM in the vicinity of the subject properties is located well seaward of the properties, in the order of 44m[4].

Note also that some of the MHWMs determined from the NSW Beach Profile Database, such as in June 2016, were derived at times of severe storm erosion. Given that the change in sand levels due to erosion in this storm was perceptible (as opposed to being so slow and gradual as to be, in a practical sense, imperceptible to the naked eye), it is considered to be arguable that such a MHWM would be a valid consideration in assessing the long-term average MHWM at this location[5].

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[2] As stated by Gordon (2022), "the 'location' of MHWM is, due to beach fluctuations, a probabilistic distribution rather than a single line; a zone rather than a unique location. So, seeking to establish a true 'mean' position of a 'water mark' for an open-coast beach would require extensive observations aimed at generating a statistical distribution which could be used to establish the modal, most likely, location of MHWM". Extensive observations over 28 dates have been used herein to established the mean (average) MHWM position from 1941-2022 (a period of 81 years) seaward of the subject properties.

[3] Note that although the 26 NSW Beach Profile Database MHWMs in Figure 2 only show a year (eg 1941) or a month and year (eg Apr 2021), they are not averaged over a month or year. They are all instantaneous MHWMs captured at an instant of time on a particular day in that year or month/year.

[4] It can be noted that if MHW had been corrected for historical sea level rise, then the oldest MHWMs determined would likely have been based on a lower MHW value, and hence would be slightly further seaward.

[5] If a property boundary is defined on the basis of MHWM, which does not actually apply at the subject properties, if a change in the position of the MHWM did not arise from natural, gradual and imperceptible erosion then the boundary is not changed, as per Clause 48(3) of the *Surveying and Spatial Information Regulation 2017*. It is postulated that the corollary of this is that a MHWM should not be determined after perceptible storm erosion, if it is to be valid. This corollary has been ignored herein, and all 26 MHWMs from the NSW Beach Profile Database were used to define the average.

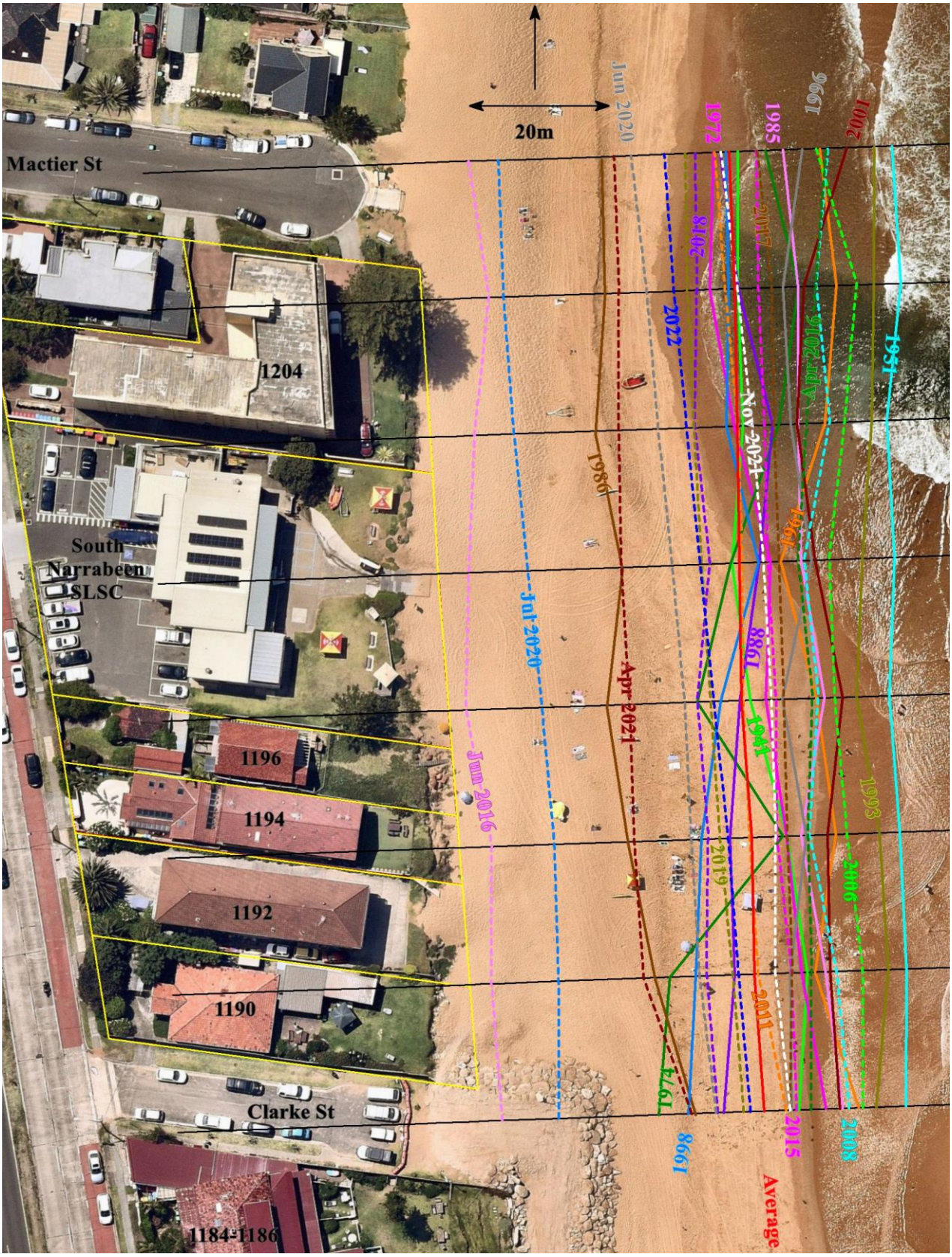


Figure 2: MHWM positions seaward of the subject properties from 1941 to 2022 (aerial photograph taken 22 November 2022)

4. BOUNDARY SURVEYS

Note that there are two property boundaries depicted in Figure 2, namely:

- the original DA survey boundary defined by Detailed Surveys on 24 October 2017 (red), with this survey submitted to the Planning Portal on 16 July 2021; and
- an updated survey boundary defined by LCG Global Pty Ltd on 1 September 2021 (yellow), with this survey submitted to the Planning Portal on 2 September 2021.

The LCG Global survey, and a letter responding to Council's requests, are provided as Appendix A and Appendix B respectively. The LCG Global survey was commissioned at the request of Council, who in a letter dated 6 August 2021 required a boundary identification/definition survey to be provided. As noted on that survey, "the boundaries have been identified by field survey".

It is evident from Figure 2 that the 2017 and 2021 surveyed boundaries are essentially indistinguishable. The distance between the NE corner of the boundary in the two surveys is 36mm, and it is a 29mm difference at the SE corner. The two seaward boundaries are generally within 10mm of each other. In Appendix B, it is noted that the boundaries in the 2021 survey have been defined as accurately as possible, so can be considered to be exact boundaries.

5. RESPONSE TO COUNCIL REQUESTS

5.1 Item 1

With regard to Item 1, the DA engineering drawings have been prepared using real world MGA coordinates, based on the 2017 survey. It is suggested that Council issues a consent condition that the Construction Certificate Drawings are set out using the 2021 survey boundaries. That stated, a tolerance of say 50mm will be applied to the works on the seaward boundary (that is, setting out the works say 50mm within the subject properties), to reduce the risk of construction variances causing any encroachment beyond the boundaries.

It is considered to be cumbersome and unnecessary for a survey to show the location of the works, when the DA engineering drawings have been set out using the 2017 survey, and the 'for construction' drawings will be set out using the 2021 survey, so by definition will show the exact location of the works and will be within the exact boundaries. The 2017 and 2021 survey boundaries were supplied by the surveyor as dwg files to MGA coordinates, so no boundary interpretation whatsoever was and is required for the engineering drawings.

5.2 Item 2

In Appendix B, the surveyor has confirmed that the 2021 survey (in Appendix A) was prepared in accordance with Part 2 of the *Surveying and Spatial Information Regulation 2017*, and also noted that the boundaries in the survey have been defined as accurately as possible, so can be considered to be exact boundaries. There are no surveyed MHWMs, as there are no historical Deposited Plans that depict any MHWMs, and there was no requirement to define MHWM as part of the 2021 survey (or any survey at this location for that matter) as boundaries are not related to MHWM.

It is not considered to be appropriate for Council to refer to an instantaneous MHWM as potentially defining the property boundaries, as can be inferred by "if there is a difference between the existing mean high water mark and any former mean high water mark, Council will rely on the most westerly of those lines, so as to ensure proposed works are constructed wholly within privately owned land". As discussed in Section 2 and Section 3, the long-term average MHWM is relevant to this matter and to boundary definition, not any single instantaneous MHWM[6].

5.3 Item 3

In Appendix B, the surveyor has confirmed that the 2021 survey was prepared in accordance with Part 2 of the *Surveying and Spatial Information Regulation 2017*. The MHWMs derived from the NSW Beach Profile Database do not alter the current right line boundaries in the property titles, as the long-term average MHWM (red line in Figure 2) is in the order of 44m seaward of the subject properties.

6. REFERENCES

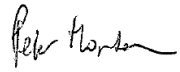
Gordon, Angus (2022), "Who Owns the Beach? Living with Increasing Uncertainty", *29th NSW Coastal Conference*, Kingscliff, 31 May – 2 June

Manly Hydraulics Laboratory(2022), *NSW Tide Charts 2023*, published by the NSW Department of Planning and Environment, December, ISSN 1039-1231

7. SALUTATION

Should you require any additional information or clarification, please do not hesitate to contact Peter Horton via mobile on 0407 012 538, or via email at peter@hortoncoastal.com.au.

Yours faithfully
HORTON COASTAL ENGINEERING PTY LTD



Peter Horton
Director and Principal Coastal Engineer

[6] Gordon (2022) considered that right line boundaries were lost when land "permanently falls below MHWM" (underline added herein). This is consistent with the view expressed herein that any single MHWM on a variable sand level beach cannot be used to validly define what is the MHWM for assessing such matters.

APPENDIX A: LCG GLOBAL SURVEY

DENOTES:

TOP OF BANK

TOE OF BANK

Notes:

The Boundaries have been identified by field survey.

Bearings relate to MGA 2020.

Services shown are indicative only. Positions are based on service diagrams provided by the relevant authorities. Field confirmation of the exact position should be made prior to any excavation work. Other services may exist which are not shown.

Services shown are indicative only. Positions are based on surface indicator(s) located during field survey. Confirmation of the exact position should be made to the relevant authorities prior to any excavation work. Other services may exist which are not shown.

Levels are based on Australian Height Datum (AHD) using PM 3989

Ridge, Eave, Gutter, Parapets, Windows & Doors heights have been obtained by an indirect method and are accurate to ± 0.05m.

Adjoining buildings have been plotted for diagrammatic purposes only.

Contours are an indication of landform and should not be taken in preference to spot levels shown.

Contour interval 0.5m

This plan is of an Identification Survey only and as such is not registered by the Registrar of Titles. Subsequent registered or other surveys in this area may affect the boundary definition shown on this plan are beyond the control of LCG Global Pty. Ltd, who can accept no responsibility for such differences.

SHANE LAWRENCE
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REGISTERED SURVEYOR

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Issue	Amendment	Date

LEGEND

CLIENT
DELANEY CIVIL

PROJECT
NARRABEEN SEA WALL
1190-1204 PITTWATTER ROAD,
NARRABEEN

DRAWING TITLE
DETAIL & LEVEL SURVEY

TITLE INFORMATION
Lot: -
Plan No.: -
Title / Folio: -
L.G.A.: -
Parish: -
County: -

QUALITY ASSURANCE
Surveyor: SS
Drawn: PL
Checked by: SL Date: 01.09.2021
Approved by: SL Date: 01.09.2021
COMPLETION OF QUALITY ASSURANCE IS EVIDENCE THAT THE SURVEY WORKS UNDERTAKEN AND THE DRAWING HAVE BEEN VERIFIED AS CONFORMING WITH THE REQUIREMENTS OF THE QUALITY PLAN. WHERE THE QUALITY ASSURANCE IS INCOMPLETE ALL INFORMATION ON THIS DRAWING IS INTENDED FOR PRELIMINARY PURPOSES ONLY AS IT IS UNCHECKED.

Date of Survey: 26.08.2021
Date of Plan: 31.08.2021
Datum: AHD
Co-ords: MGA 2020
Scale: 1:200
(Original size A1)
Cad ref : 201345-DETL-001A
Sheet 1 of 2

JOB NUMBER
201345

DRAWING NUMBER / ISSUE
DETL-001 / A

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Sheet 2 of 2

JOB NUMBER
201345

DRAWING NUMBER / ISSUE
DETL-001 / A

APPENDIX B: LCG GLOBAL LETTER

LAWRENCE CONSULTING GROUP

20/02/2023

Northern Beaches Council

Attention: Mr Daniel Milliken

Response to Request for Information on Survey and Mean High Water Mark Matters for DA2021/1612, Relating to Construction of Upgraded Coastal Protection Works at 1190-1196 & 1204 Pittwater Road Narrabeen

Our survey 201345 DETL-001/A dated 1 September 2021 shows relevant boundaries in accordance with Part 2 of the *Surveying and Spatial Information Regulation 2017*. The boundaries in this survey have been defined as accurately as possible, so can be considered to be exact boundaries at the time of the survey. No MHWM was defined as part of this survey, as the seaward boundaries of the subject properties are fixed Torrens title boundaries which are unrelated to MHWM. No MHWM was delineated in the subject Deposited Plans 7417, 312655, 111254 and Strata Plans 65303, 2808 that were used as part of the boundary definition.

I have reviewed the report of Horton Coastal Engineering entitled "Response to Request for Information on Survey and Mean High Water Mark Matters for DA2021/1612, Relating to Construction of Upgraded Coastal Protection Works at 1190-1196 & 1204 Pittwater Road Narrabeen" and dated 17 February 2023, and LCG Global concurs with this report.

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