Acroyali Engineering
ABN 84 625 19 0769

Date: 13 October 2021
Our Ref: AB2004-S01[E]

Attention: Anthony Boskovitz

RE: STRUCTURAL FEASIBILITY REPORT Regarding Excavation & Shoring Required at 142, 142a and 142b Bellevue Road, BELLEVUE HILL, NSW

1.0 Background

This report is to be read in conjunction with the Architectural Design Set by Aleksandar Projects Ref 19025 dated March 2021 (*AP*) and the Geotechnical Investigation Report by Morrow Geotechnics Reference P2007_01rev2 dated 23 June 2021 (*MG*).

This report is to clarify concerns associated with and in response to the following reasons for refusal of development DA216/2021/1. These concerns include the following:

1. **Woollahra Local Environmental Plan, Part 6, Clause 6.2(1)**
   Insufficient information has been provided to demonstrate whether the cumulative impacts of excavation for the proposal will adversely impact land stabilisation, ground water flow, structural risks to adjoining structures and the amenity of adjoining and adjacent properties.

2. **Woollahra Development Control Plan 2015, Chapter B3: General Development Controls, Part B3.4: Excavation**
   In sufficient information has been provided to demonstrate whether the cumulative impacts of excavation for the proposal will adversely impact land stabilisation, ground water flow, structural risks to adjoining structures and the amenity of adjoining and adjacent properties. The proposed excavation will not achieve the relevant Objectives O3, O4 and O5 prescribed in Part B3.4 of Chapter B3 of Woollahra Development Control Plan 2015

Furthermore, this report also clarifies concerns associated with and in response to the statement of facts and contentions under the Land and Environmental Court Case Number 2021/00215500 dated 27 September 2021. These contentions include the following:

Items 4b, 4c, 4e, 6c(iv) & 6c(v).

This report addresses each of the items above directly in our capacity as structural engineers. All other matters are to be addressed by other relevant consultants.

2.0 Introduction

The purpose of this section is to provide structural justification on how the proposed Basement Level 3, Basement Level 2, and Basement Level 1 can be excavated without compromising the structural integrity of the adjacent sites. A brief construction methodology for the safe retention of the adjacent sites and land stabilization as a result of the excavation of these levels is discussed in this report.

It is proposed to construct a new multi storey residential structure at the above address. Details of the proposed structure can be found in the drawings produced by *AP*. In order to meet the architectural intent, a retention system will be required to be constructed along the Northern, Eastern and Western boundaries of the site. An elevation highlighting the existing Ground Level superimposed with the proposed structure is presented in Figure 1 below.

3.0 Preliminary Engineering Methodology & Rationale for <u>Earth Retention for Protection of Neighbouring Structures</u>

It is clear that the battering along the Northern Boundary (adjacent to Bellevue Road) is not possible. Therefore a retaining / shoring design will be required to ~12.5m of soil. Referring to the Borehole log reports conducted by *MG*, the site is underlain by ~8m of sandy deposits. Sandstone Bedrock was encountered beyond this depth.

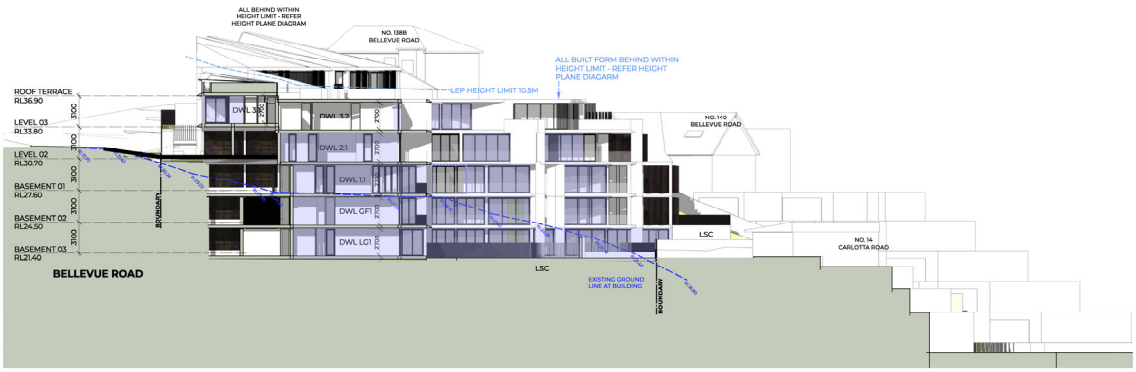


Figure 1 – Elevation highlighting proposed structure and existing ground level

Due to the potentially collapsible nature of the sandy soil profile and the need to control potential movement of neighbouring ground surfaces, roadways, buildings and structures, we consider that bored piles are not suited to this site. Our preference, therefore, is to utilise double rotary (or cased CFA) piling techniques, where casing is drilled into the soil concurrently with auguring.

In relation to the required piling on the Northern Eastern and Western sides, based on our desktop analysis we recommend piles of 450-600mm in diameter for these piles. These piles (along with a steel bracing solution) will need to be designed to temporarily retain ~12.5m of soil. We advise these piles to be embedded into the underlying sandstone. Further details for the piles including the embedment length into the rock profile and reinforcement details can be provided by our office during detailed structural design.

Lateral restraint of the piling system during excavation can be achieved using a structural steel internal bracing system. In this system, after the piles are constructed and cured, the soil is progressively excavated. At approximately 2-3m of excavation, steel waling beams are then connected to the piles. Bracing elements will then be attached to the wailing beams at the required locations. This process shall be repeated again at a depth equal to approx. 7-8m. The innovation of this system is that the force generated by one side of the piling system is used to balance the forces induced by the soil on the other side of the piling system. Once these bracing elements are installed, the excavation may continue until the proposed excavation level is reached.

Permanent lateral restraint for these piles will be generated when the lower ground and ground floor slabs are constructed and tied into these shoring walls.

An allowance must also be made for making good gaps between contiguous piles in order to reduce the loss of retained soils and consequent inducement of adjacent ground surface movements. In this regard, consideration may be given to providing a shotcrete face to the contiguous pile wall. The shotcrete facing (~100mm thick) would need to be applied in 'lifts' of maximum 1.5m vertical height and must be applied on the same day as completion of excavation in front of the contiguous pile wall. The toes of the piles will extend well below the excavation level (and be embedded into rock), in order to satisfy the stability requirements (depth of which is to be confirmed during detailed structural design).

The piling should be designed in such a way that the base of the piles are outside the zone of influence of the neighboring footings. In doing so, no underpinning of the footings at the adjacent properties will required.

4.0 Excavation Monitoring and Contingency Plan in the event of Wall Movement

We also advise continual monitoring of adjacent buildings, and the top and mid points of the piles to be carried out from initial excavation until the structure is constructed. Monitoring of the survey points shall be conducted by a licensed surveyor and be completed at least once a fortnight. If any movements are detected to the piles or to the neighboring properties, the engineer shall be notified immediately. The project manager shall also notify the adjoining property owners. All records shall be kept of all monitoring and be available for inspection at any time. A potential solution, if movements were to occur, would be to introduce additional lateral restraints to the piles as discussed in Section 3 of this Report.

5.0 Compliance with Woollahra Council LEP & DCP

Provided the controls listed above are adhered to, we can confirm that the excavation required for the development at the address above will achieve the following in relation to:

Woollahra Local Environmental Plan, Part 6, Clause 6.2(1)

We confirm that earthworks for the proposed development will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Woollahra Local Environmental Plan, Part 6, Clause 6.2(3)

We confirm that earthworks for the proposed development will have minimal effect on the existing and likely amenity of adjoining properties. Furthermore, appropriate measures have been proposed to avoid, minimise or mitigate the impacts of the development.

Woollahra Development Control Plan 2015, Chapter B3: General Development Controls, Part B3.4: Excavation

We confirm that Objective O4 of the Woollahra Development Control Plan 2015, Chapter B3: General Development Controls, Part B3.4: Excavation will be achieved (that is minimization of structural risks to adjoining structures) if the excavation required at the development is followed in accordance with the details proposed in this report.

Furthermore, Objective O5 of the Woollahra Development Control Plan 2015, Chapter B3: General Development Controls, Part B3.4: Excavation will be achieved (that is the minimization of vibration to adjoining and adjacent properties) if the excavation required at the development is followed in accordance with the details proposed in this report.

It is noted that by including an internal structural steel bracing system, no ground anchors, or the like are required.

We can confirm that the design as nominated by *AP* is compliant with Controls C6-C9 of B3.4 of the Woollahra Council DCP. These controls include no excavation under common party walls, no excavation under footings to free standing boundary walls.

6.0 Response to contentions made Land and Environmental Court Case Number 2021/00215500 dated 27 September 2021

The items contained within the contentions made in Land and Environmental Court Case Number 2021/00215500 dated 27 September 2021 which relate to structural matters are 4b, 4c, 4e, 6c(iv) & 6c(v).

Items 4b and 4c relate to the failure of the development to meet the following 4 objectives of Part B3.4 Excavation of Chapter B3 of WDCP. These include

- O1 To allow buildings to be designed and sited to relate to the topography.
- O3 To ensure the cumulative impacts of excavation do not adversely impact land stabilisation, ground water flows and vegetation.
- O4 To minimise structural risks to adjoining structures.
- O5 To minimise noise, vibration, dust and other amenity impacts to adjoining and adjacent properties.

As detailed above, we can confirm that Objectives O3 and O4 will be met if the procedures explained in this report are followed.

With respect to Item 6c(iv), we confirm that no ground anchors are required on or below any road reserve or other Council property. Indeed no ground anchors are required at all in this development.

With respect to Item 6c(v), we confirm that no underpinning of any neighboring footings is required.

7.0 Presence of Stormwater Absorption Trenches within 3 metres of Proposed Structure

This section of the report is to be read in conjunction with the stormwater management plans developed by Barker Ryan Stewart Ref: PCB 190001DA2[H] dated 22nd September 2021. Two absorption trenches are proposed to be within 3 meters of the proposed development. A typical detail of the absorption trench is provided in Figure 2. We confirm that the structure will not be adversely affected by the presence of the absorption trenches provided a suitably designed footing system is constructed such that the loads of the structure are diverted beyond the zone of influence of the absorption trench. This may be achieved through a piled raft solution and these details can be finalized by our office during detailed design.

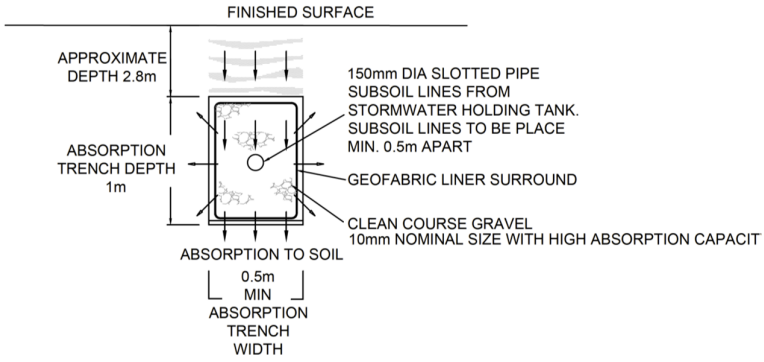


Figure 2 – Typical absorption trench detail

8.0 Conclusion

After review of the documentation provided to us, our office is of the opinion that the excavation required to construct the new multi storey residential structure at the above address is structurally feasible and if designed correctly, will bear minimal influence on adjacent structures and land stabilisation would therefore not be compromised.

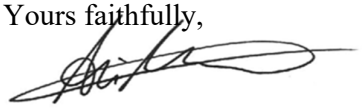
We recommend that a suitably qualified practicing structural Engineer be engaged to develop the detailed design of the shoring system to be adopted. In addition, we advise that the same Engineer (along with the geotechnical consultant) be engaged to undertake periodic inspections at key milestones during construction. We also recommend that the Engineer reviews the detailed construction methodology proposed by the contractor prior to any works commencing and prior to issuance of CC. Our office is available for this, and a fee can be provided on request.

Provided satisfactory execution of this methodology by the contractor, it is believed this system will bear negligible influence on the structural stability of adjoining properties.

Furthermore, we confirm that the presence of the two proposed absorption trenches (which are located within 3m of the proposed development) will not affect the structural capacity of the proposed structure provided a suitably designed footing system is constructed to direct the loads over beyond the zone of influence of the absorption trenches.

Please do not hesitate to contact myself on 0403 684 574 to discuss this matter or any future concerns.

Yours faithfully,



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Reviewed by,

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For, and on behalf of, Acroyali Engineering.