4 Laura Street, Seaforth

Geotechnical Comments for Section 4.55 (Formerly Section 96).

We have reviewed the existing geotechnical report, the original plans, and the 5 amended plans by Space Landscape Designs numbered L-01 to 05, Revision E, dated 30/4/19.

The changes are as follows:

- Construct a new inclinator on the W side of the site.
- Alter the layout of the proposed retaining walls on the downhill side of the property to accommodate the inclinator.
- Minor alterations to the other proposed retaining walls on the downhill side of the site.
- Various other minor alterations.

The proposed changes are considered minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the original report carried out by this firm numbered J0220 and dated the 31st July, 2014.

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GEOTECHNICAL INVESTIGATION:

Landscaping at **4 Laura Street, Seaforth**

1. Proposed Development

2.1 Construct a new sea wall and replace the existing dilapidated terracing with new terracing.

2.2 Replace the existing decking and walkway with new.

2.3 Various other alterations.

2.4 Details of the proposed development are shown on 2 drawings by Space Landscape Designs, numbered 141046 L-01 to 02, Rev B and dated 14/07/2014.

2. Site Description

2.1 The site was inspected on the 29th July 2014.

2.2 This residential property is on the low side of the road and has a south easterly aspect. The property encompasses the lower reaches of a steep slope that rises from the waterfront of middle harbour. The slope is controlled by the underlying and outcropping sandstone bedrock that steps up the site forming narrow sub horizontal benches between the steps. At the water front the slope rises steeply to the pool at angles of some 40 degrees. Above the pool the slope eases slightly across the rest of the block.

2.3 Sandstone bedrock is visible at the waterfront and also in the steep slope immediately above. Several loose boulders are scattered along the waterfront (Photo 1). These appear to be in stable positions. One in particular is lodged at a high angle and has come to rest on several other boulders (Photo 2). This boulder has been in place for a long time and is currently considered stable but care should be taken not to disturb its contact points during the construction. The boulder would not be stable should there be a significant seismic movement. The slope above has been landscaped with poorly constructed treated timber retaining walls and timber decks and walkways (Photo 1 & 3). The soldier piles supporting the walls are inadequately embedded and are tilting at angles up to 10 degrees from vertical (Photo 4). The decks and walkways are not all plum and some of the supporting timber posts can be seen to be tilting down slope. These works will be replaced as part of the proposed development.

2.4 Above the landscaped waterfront slope the pool and part three level masonry house steps up the slope with the footprint of these structures covering the upper portion of the block (Photo 5). No signs of movement were observed in the supporting walls of the house or in the pool. A cut behind the lower level of the house is through stable sandstone bedrock (Photo 6).

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Hawkesbury Sandstone that is described as a medium to coarse grained quartz sandstone with very minor shale and laminate lenses.

4. Subsurface investigation

Three DCP (Dynamic Cone Penetrometer) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. The location of the tests are shown on the site plan and the results are as follows:

DCP TEST RESULTS – Dynamic Cone Penetrometer

Equipment: 9kg hammer, 510mm drop, conical tip. Standard: AS1289.6.3.2- 1997

Depth(m) **Blows/0.3m**	**DCP 1**	**DCP 2**	**DCP 3**
0.0 to 0.3	3	4	2
0.3 to 0.6	6	5	6
0.6 to 0.9	5	1	6
0.9 to 1.2	4	3	3
1.2 to 1.5	2	3	4
1.5 to 1.8	8	4	23
1.8 to 2.1	#	#	17
2.1 to 2.4			28
	Refusal @ 1.7m	Refusal @ 1.8m	End of test @ 2.4m

refusal/end of test.

Notes:

DCP1 – refusal @ 1.7m, bouncing off rock, yellow brown sandstone fragments on dry tip.
DCP2 – refusal @ 1.8m, bouncing off rock, white impact dust on dry tip.
DCP3 – End of test @ 2.4m, nothing on damp tip.

5. Geological Interpretation

Sandstone bedrock is exposed at the waterfront and on the slope above at the eastern side and on the neighbouring property to the west. Rock will be encountered from the surface where it is exposed and is expected at variable depths up to ~ 1.8m where it covered by sandy soil. The variability is due to its tendency of the rock to form step like formations below the overlying soil. Where the slope is steeper the steps are larger and the sub horizontal benches between the steps narrower. The opposite is true where the slope eases. The exposed sandstone on the site is estimated to be at least medium strength Sandstone. Similar competent rock is expected to underlie the entire property.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the rock and through the cracks in the rock.

Due to the slope and elevation of the block, the water table in this location is expected to be just above the tide at the base of the slope.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection but it is expected normal sheet wash moves down the slope during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

HAZARDS	Hazard One	Hazard One
TYPE	The slope that rises across the property failing and impacting on the house.	The tilting timber retaining walls below the pool failing.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Minor' (8%)	'Medium' (15%)
RISK TO PROPERTY	'Low'(5×10^{-6})	'Medium'(2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	8.3×10^{-6}/annum
COMMENTS	'Acceptable' level of risk.	'Unacceptable' level of risk. To move risk to 'Acceptable' levels the retaining walls are to be replaced.

(See Aust. Geomech. Jnl. Mar 2007 Vol. 42 No 1, for full explanation of terms)

9. Suitability of the Proposed Development for the Site.

The proposed development is suitable for the site. No geotechnical hazards will be created by the completion of the proposed development provided it is carried out in accordance with the requirements of this report and good engineering and building practice.

10. Excavations.

Apart from those for levelling for footings and removing the existing low terraces no excavations are required.

11. Vibrations.

It is not envisaged excavation through rock will be required. If they are required excavations through rock should be carried out to minimise the potential to cause movement in the loose boulders on the slope or damage to the pool above. Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec due to the loose boulders present on the slope surface. Vibration monitoring will be required to verify this is achieved.

Due to access difficulties it is likely the excavation will be carried out with hand tool (Jack Hammers). If hand tools are used, provided any excavation through loose boulders on the slope are cut with rock saws before breaking no vibration monitoring will be required.

12. Excavation Support Requirements

As the existing retaining walls are dismantled the soil behind is to be battered at angles no greater than 1.0 Vertical to 1.0 Horizontal.

Upslope runoff is to be diverted from the works by sand bag mounds or similar and unsupported batters are to be covered to prevent access of water until retaining walls are in place. The work should be carried out when the outlook is for fine weather and no heavy or prolonged rain is not forecast.

13. Retaining Walls

Free standing cantilever retaining walls can be designed for a triangular lateral earth pressure distribution and an 'active' earth pressure coefficient Ka of 0.35. Assume a bulk density of 20kN/m^3 for soil and clay. Any surcharge loads that may be acting on the wall should be accounted for in the design. These include new or existing footings and existing or new walls.

Passive resistance can be estimated using an ultimate passive earth pressure coefficient of 2.0MPa for low strength rock and 6.0MPa for medium strength rock assuming a level surface. No passive resistance should be assumed for the top 0.3m. These are ultimate values so an appropriate safety factor of no less than 2.0 is to be applied.

All retaining walls are to have sufficient back wall drainage and be backfilled immediately behind the wall with free draining material such as gravel that is wrapped in a non-woven Geotextile fabric (i.e. Bidim A34 or similar), to prevent the drainage from becoming clogged.

14. Site Classification

For footings supported on sandstone bedrock the site classification in accordance with AS2870-2011 is Class A.

15. Foundations

Many of the footings will be supported on rock encountered at shallow depths or at the surface. Where footings are on rock the footing surface is to be levelled. No footing are to be located over undercut rock unless the rock is supported from below at the point load.

Where rock is too deep footings for retaining walls can be supported on the natural slope soils with spaced piers through the footing taken to rock. It is envisaged these could be dug with a post hole digger or similar.

An allowable bearing pressure of 1.0MPa can be assumed for footings supported on medium strength sandstone.

NOTE: If the contractor is unsure of the footing material required it is more cost effective to get the geotechnical engineer/geologist on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over excavation in clay like shaly rock but can be valuable in all types of geology.

17. Inspections

- All footings are to be inspected by the geotechnical engineer/geologist before concrete is placed.

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Photo 1

Photo 2

Photo 3

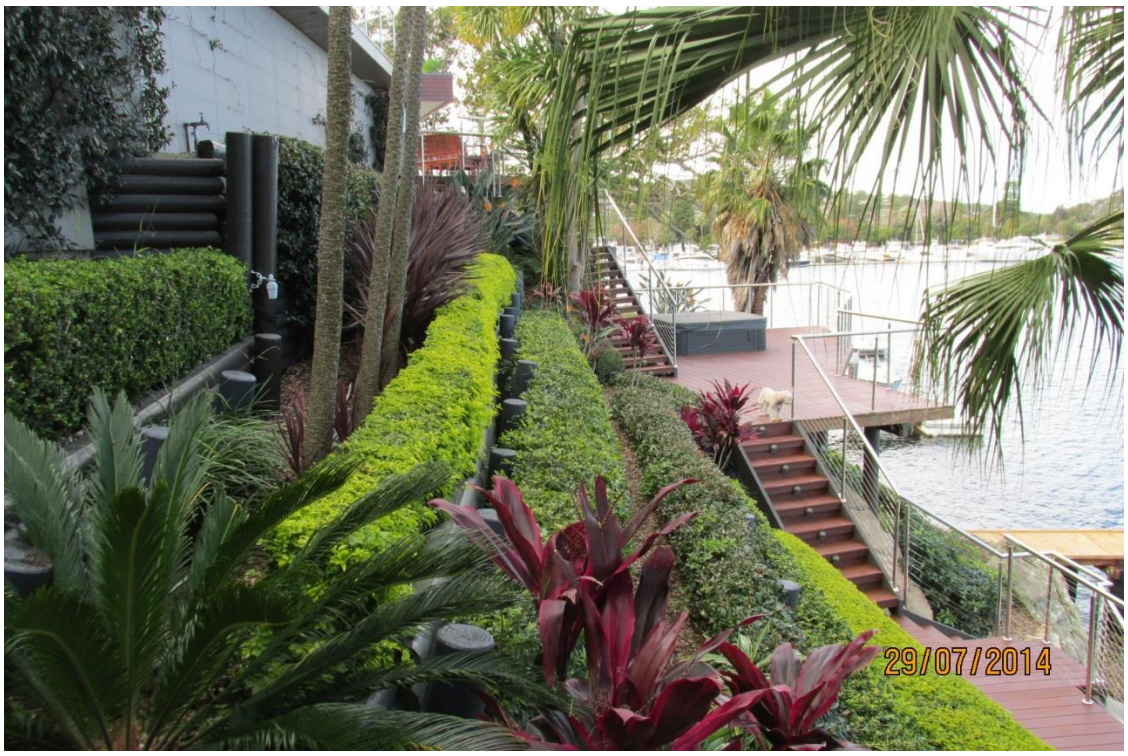


Photo 4

Photo 5

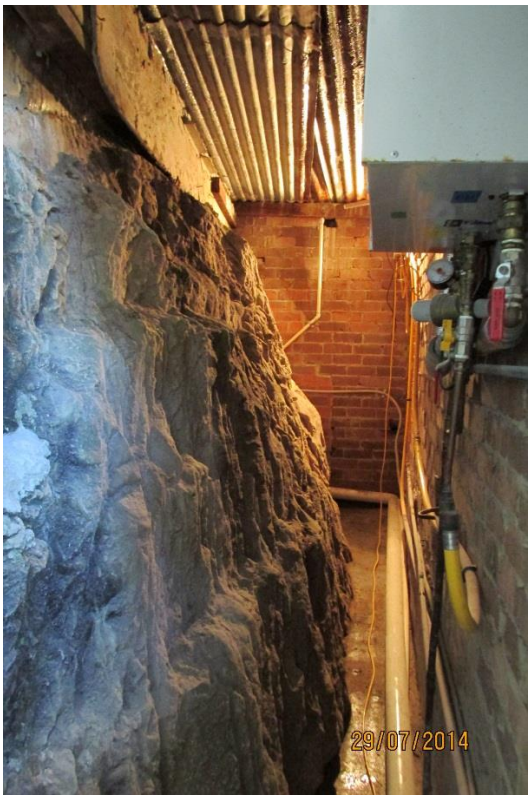


Photo 6

Important Information about Your Report

It should be noted that Geotechnical Reports are documents that build a picture of the subsurface conditions from the observation of surface features and testing carried out at specific points on the site. The spacing and location of these test points can be limited by the location of existing structures on the site or by budget and time constraints of the client. Additionally the test themselves, although chosen for their suitability for the particular project, have their own limiting factors. The testing gives accurate information at the location of the test, within the confines of the tests capability. A geological interpretation or model is developed by joining these test points using all available data and drawing on previous experience of the geotechnical engineer/ geologist. Even the most experienced practitioners cannot determine every possible feature or change that may lie below the earth. All of the subsurface features can only be known when they are revealed by excavation. As such a Geotechnical report can be considered an interpretive document. It is based on factual data but also on opinion and judgement that by its very nature comes with a level of uncertainty. This information is provided to help explain the nature and limitations of your report.

With this in mind, the following points are to be noted:

- If upon the commencement of the works the subsurface ground or ground water conditions prove different from those described in this report it is advisable to contact White Geotechnical Group immediately, as problems relating to the ground works phase of construction are far easier and less costly to overcome if they are addressed early.

- If this report is used by other professionals during the design or construction process any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may longer apply. Contact White Geotechnical if this occurs.

- This report should not be applied to any other project other than that outlined in section 1.0.

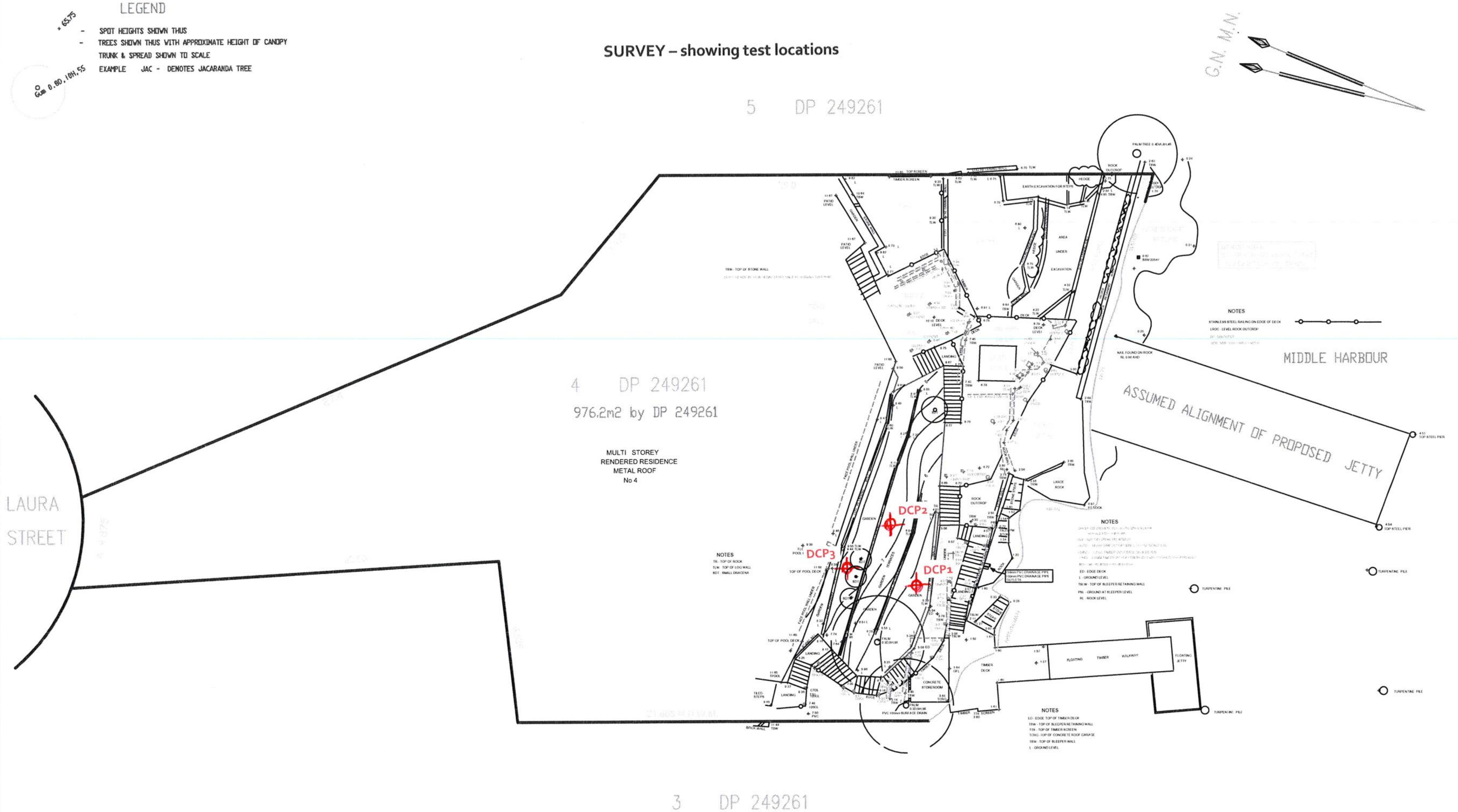
- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report contact White Geotechnical Group. We are familiar with a variety of techniques to reduce risk and can advise if your proposed methods are suitable for the site conditions.

SURVEY – showing test locations

LEGEND

- SPOT HEIGHTS SHOWN THUS
- TREES SHOWN THUS WITH APPROXIMATE HEIGHT OF CANOPY
  TRUNK & SPREAD SHOWN TO SCALE
  EXAMPLE JAC - DENOTES JACARANDA TREE



GENERAL NOTES

1. BOUNDARIES HAVE NOT BEEN INVESTIGATED RELIVANT LOCATIONS ARE SHOWN ON PLAN DIMENSIONS HAVE BEEN TAKEN FROM D.P.249261
2. THIS PLAN IS FOR DESIGN PURPOSES ONLY. THE POSITION OF SERVICES AND STRUCTURES SHOULD BE VERIFIED BY THE RELEVANT AUTHORITIES PRIOR TO EXCAVATION OR CONSTRUCTION. NO SERVICES SEARCH HAS BEEN MADE. ONLY SERVICE STRUCTURES EVIDENT AT THE TIME OF SURVEY HAVE BEEN LOCATED.
3. THE BENCH MARK SHOULD BE VERIFIED PRIOR TO COMMENCEMENT OF ANY EXCAVATION OR CONSTRUCTION.
4. THE POSITION OF FEATURES RELATIVE TO BOUNDARIES ARE DIAGRAMMATIC ONLY AND ARE APPROXIMATE PENDING FURTHER SURVEY DEFINITION.
5. ORIGIN OF LEVELS PREMANENT MARK 1197 SEAFORTH CRESCENT RL 46.54 (AHD)

LANDFORM SURVEYS	LEVELS ON AUSTRALIAN HEIGHT DATUM CONTOUR INTERVAL NA METRES	PROJECT	CLIENT
	SCALES PLAN 1:100 SAI LONGITUDINAL SECTION HOR. 1: NA VERT. 1: NA CROSS SECTIONS NA		
	DATE 14/03/2014 · PLAN NO.	DRAWN BY G.MCG	

BOUNDARY

PROPOSED FENCING

RETAINING WALL

PROPOSED DECK

PROPOSED PLANTING

EXISTING TREE
TO BE RETAINED

21.665 M.H.W.M.

NOTES

UNLESS SHOWN OTHERWISE

New access path. Cantilevered timber steps and landings over black-painted steel frame. All risers 170mm and all treads 340mm

Stone-clad stepped planters to retain soil

Thick line indicates stone-clad retaining wall to act as balustrade 850mm above pathway

Hatched area indicates boatshed extention beneath

Stone clad planter over new boatshed

New decked pathway for access

Seawall to run along underside of timber deck

Paved area at lower level. Cut back existing rock as required to provide walkway to existing boatshed. Shade tolerant planting

Keep rock if possible and create a sheltered grotto entryway. If rock becomes unstable knock it into water below

Urn and planting with feature screen to hide pool wall

Remove existing retaining wall and replace with new stone clad planter wall

New stairs to access proposed deck at slightly lower level

Relocate spa here. Sandstone steppers set in garden bed

New curved deck. Shade tolerant planting in stone planters beneath

New lawn area. Shade tolerant species

Retain existing Cordyline if possible

New curved deck.
Undercroft planting to be determined once stability of existing rock ascertained

Stone-clad stepped retaining walls

Feature element within planting. Raised sea wall to act as planter

600x300x300 Seawall sandstone blocks

New stone sea wall to act as step between new wharf and proposed entry landing

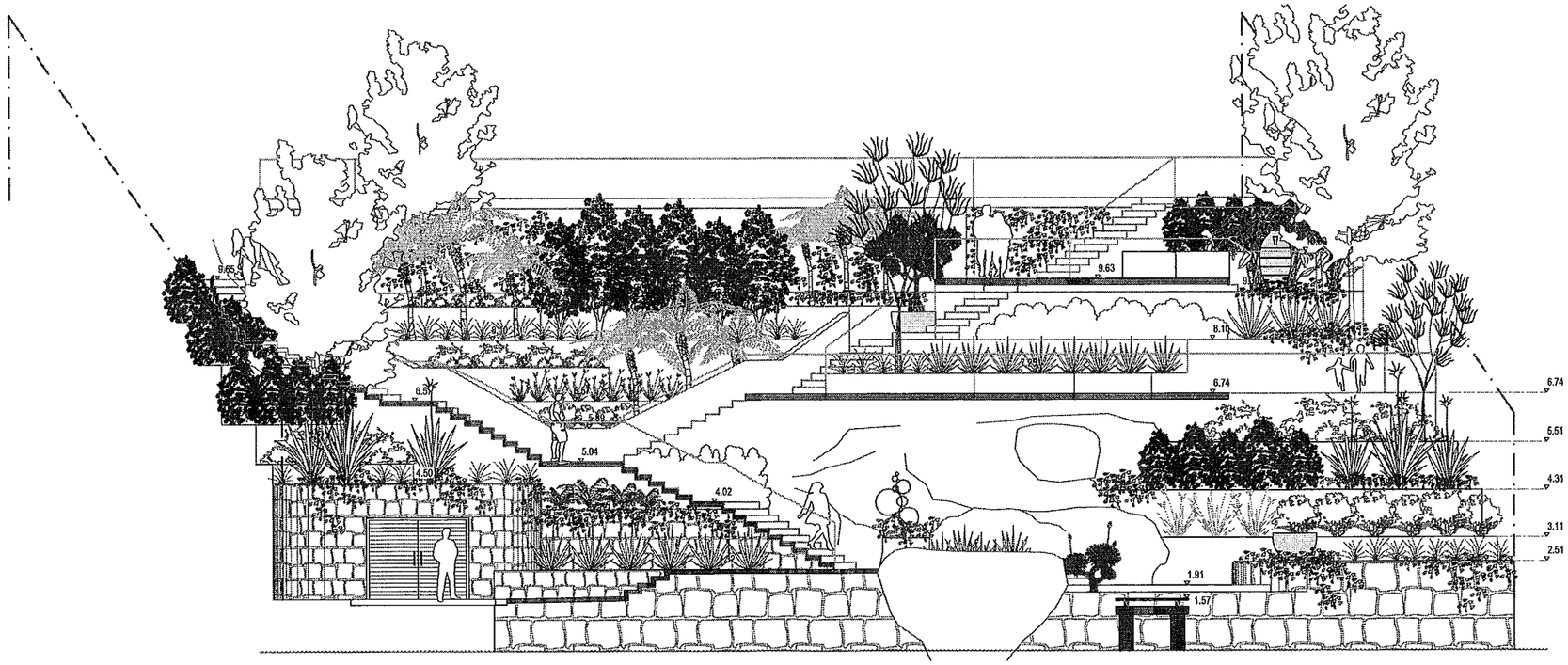
New wharf by others

APPROXIMATE MEAN HIGH WATER

SPA

CONCEPT PLAN

SCALE 1:100



SECTIONAL ELEVATION AA

SCALE 1:100

NOTES:
- Contractors to check and verify all dimensions and all levels on site prior to any works.
- Any discrepancies should be immediately referred to Space Landscape Designs.
- All work to comply with B.C.A. Statutory Authorities and relevant Australian Standards.
- Dimensions recognised over scaling. All measurements are in millimetres.

Rev.	Date	Issue	Checked
A	14/07/14	Preliminary Issue	AE
B	24/07/14	Preliminary Issue	AE

DRAFT

SPACE LANDSCAPE DESIGNS

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DRN: A.Elboz (AILDM 625)

DATE: 14/07/2014

SCALE: 1:100@A2

PROJECT NO: 141046

NORTH

CONCEPT PLAN

L-01 · Rev A