SOIL SURVEYS

GEOTECHNICAL INVESTIGATION

PROJECT NO. 2-15299

FEBRUARY, 2022

NORTHWEST HEALTHCARE PROPERTIES REIT

PROPOSED DEVELOPMENT

NEXUS WAY, SOUTHPORT

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Document Information

Project Number	**2-15299**
Document Title	**GEOTECHNICAL INVESTIGATION - Proposed Development**
Site Address	**Nexus Way, Southport**
Client	**NorthWest Healthcare Properties REIT**
File ref	**2-15299, 2021-13-01, BR VER 3**
Author	**Keelan McNatty**

Review

Ver No.	Document Type	Reviewed By	Approved for Issue	
			Name	Date
1	Draft	Cameron Johnson	Cameron Johnson	17/01/2022
2	Final	Cameron Johnson	Cameron Johnson	31/01/2022
3	Final	Cameron Johnson	Cameron Johnson	02/02/2022

Distribution List

Ver No.	Organisation	Contact	Email	Date Sent
1	NorthWest Healthcare Properties REIT	Cameron McLeish	Cameron.mcleish@nwhreit.com	17/01/2022
2	NorthWest Healthcare Properties REIT	Cameron McLeish	Cameron.mcleish@nwhreit.com	31/01/2022
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1.0 INTRODUCTION

1.1 General

This report presents the results of the geotechnical investigation carried out by Soil Surveys Engineering Pty. Limited for the Proposed Development at Nexus Way, Southport.

The investigation was carried out in accordance with Soil Surveys Engineering Pty Limited proposal 2-15299, 2021-12-15, PR VER 1, following authorisation to proceed from NorthWest Healthcare Properties REIT on the 22nd December, 2021.

1.2 Proposed Development

It is understood that the proposed development will comprise the construction of a seven level health building with a rooftop plant room over three levels of basement car parking.

Building loads are understood to consist of typical column loads in the range of 7,500kN to 8,800kN.

1.3 Scope of Geotechnical Services

The objective of this study was to identify materials and material properties and groundwater conditions to enable geotechnical assessment of the following:-

- Earthworks recommendations
    - trafficability
    - subgrade preparation
    - compaction standards
    - excavatability
    - suitability of cut for use as fill
    - temporary safe batter angles for cuts
    - erosion & sediment control
- Excavation retention system options
- Foundation recommendations
    - recommended foundation type (high & deep support)
    - bearing capacity
    - skin friction
    - site classification (AS 2870)
    - site subsoil class (AS 1170.4-2017)
    - predicted ground surface movement
- Basement retaining wall design parameters
- Construction recommendations (where applicable)
- Site management recommendations

2.0 SITE DESCRIPTION

The site is located at Nexus Way, Southport (refer Figure 1).

FIGURE 1 – SITE LOCATION

At the time of the investigation the site was vacant with varying sized trees and shrubs in garden beds around the boundary. Ground cover typically consisted of gravel fill with some smaller grassed areas.

Gold Coast Council City Plan interactive mapping Version 8 indicates the site falls from approximately RL 21m AHD to RL 19m AHD towards the north east.

The site is bound by Frazer Street to the north, Nexus Way to the east and Hill Street to the south and west.

Photographs 1 and 2 indicate existing site conditions.

PHOTOGRAPH 1 – BH02 LOCATION FACING WEST ACROSS SITE

PHOTOGRAPH 2 – BH03 LOCATION, FACING NORTH ACROSS SITE

3.0 FIELD INVESTIGATION

Subsurface conditions at the site were investigated by drilling and sampling three boreholes to depths of 15.00m, using a truck mounted Hydropower Scout drilling rig.

In the boreholes, insitu testing in the form of Standard Penetration Tests (SPT's) or U50 push tubes were undertaken at 1.50m intervals.

The boreholes were advanced to 3.0m depth using continuous flight augers and extended to the termination depth using either this point using wash boring technique or MNLC coring. NMLC coring was undertaken in BH3 only from 1.60m depth to borehole termination at 15.00m depth.

A groundwater monitoring well was installed to depth of 9.0m at the location of BH01.

The soil classification descriptions, field and laboratory testing were carried out in general accordance with the following Australian Standards:-

- AS 1726-2017 - Geotechnical Site Investigations
- AS 1289 - Methods of Testing Soils for Engineering Purposes

A description of the investigation method, borehole records and a site plan showing the location of the boreholes are included in the Appendices.

Borehole coordinates were recorded using a hand held GPS device, with accuracy consistent with such devices.

3.1 Laboratory Testing

Laboratory testing was carried out on selected samples retrieved from the field investigation programs and was directed towards assessing the following:-

- Particle Size Distribution
- Emerson Class
- Shrink Swell Index
- Soil Aggressiveness
- Point Load Index

Laboratory testing was carried out in accordance with AS 1289 Methods of Testing Soils for Engineering Purposes.

Laboratory test certificates are contained in Appendix C.

3.1.1 Atterberg Limits and Particle Size Distribution

Selected samples retrieved from the field investigation program were submitted for the following testing:-

- Particle Size Distribution - AS 1289.3.6.1

The results of the above laboratory testing are summarised in Table 1.

TABLE 1 CLASSIFICATION TESTING

Borehole No.	Sample Depth (m)	Percent Passing 4.75mm Sieve (%)	Percent Passing 2.36mm Sieve (%)	Percent Passing 0.075mm Sieve (%)
BH02	0.00-0.50	83	77	53
BH02	1.50-1.90	94	90	72

3.1.2 Emerson Class Number

Selected samples retrieved from the field investigation program were tested for dispersiveness using the Emerson Class Number test method, i.e. AS 1289.3.8.1.

The test method AS1289.3.8.1 divides soils into seven classes on the basis of their coherence in water, with one further class being distinguished by the presence of calcium - rich minerals, i.e.:-

Class 1	- slaking and complete dispersion of natural soil crumbs in still water - very high potential for erosion
Class 2	- slaking and some dispersion of natural soil crumbs in still water - very high potential for erosion
Class 3	- slaking but no dispersion of natural soil crumbs in still water - dispersion of moistened, remoulded soil crumbs in still water - high potential for erosion
Class 4	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - calcite or gypsum present - medium potential for erosion
Class 5	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - no calcite or gypsum present - dispersion of soil/water suspension after shaking - medium potential for erosion
Class 6	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - no calcite or gypsum present - flocculation of soil/water suspension after shaking - medium potential for erosion
Class 7	- no slaking and swelling of natural soil crumbs in still water - low potential for erosion
Class 8	- no slaking and no swelling of natural soil crumbs in still water - low potential for erosion

The results of the Emerson Class Number testing are contained in Table 2.

TABLE 2 EMERSON CLASS NUMBER

Borehole No.	Sample Depth (m)	Emerson Class Number	Conductivity (mS/cm)	pH
BH01	0.00-0.50	4	1.39	7.1
BH01	1.50-1.90	4	1.20	3.6
BH02	0.00-0.50	4	0.51	6.3
BH03	0.00-0.50	4	0.49	6.4

As Table 2 indicates, an Emerson Class Number of 4 was recorded for the samples tested, i.e. medium potential for erosion.

3.1.3 Shrink Swell Index

Selected samples retrieved from the field investigation were submitted for shrink swell index testing (AS 1289.7.1.1).

The results for the above laboratory testing are summarised in Table 3.

TABLE 3 SHRINK SWELL INDEX

Borehole No.	Sample Depth (m)	Unit Weight (t/m^3)	Shrink Swell Index (%)	Swell Pressure (kPa)
BH01	1.50-1.90	2.08	2.5	310
BH02	1.50-1.90	2.09	2.9	250
BH03	1.50-1.90	2.05	1.7	220

3.1.4 Point Load Index

Selected rock core samples retrieved from the field investigation were submitted for point load index testing (AS 4133.4.1-1993).

The results for the above laboratory testing are summarised in Table 4.

TABLE 4 POINT LOAD INDEX TESTING

Borehole No.	Depth (m)	Is50 (MPa)	AS 1726 Classification
BH03	11.70	0.1	Low Strength
BH03	13.21	0.08	Very Low Strength

3.1.5 Soil Aggressiveness

Selected samples retrieved from the field investigation program were submitted to assess soil aggressiveness to buried structures (concrete and steel).

The results of this testing are summarised in Table 5.

TABLE 5 SOIL AGGRESSIVENESS

Borehole No.	Depth (m)	Sulfate SO_4 (mg/kg)	Chloride (mg/kg)	pH	E.C (mS/cm)
BH01	9.00-9.45	32	147	4.71	0.26
BH02	10.50-10.79	40	209	4.57	0.41

4.0 GEOTECHNICAL MODEL

4.1 Local Geology

Published geological maps for the local area (Queensland Globe 1:100 000 series - DCf) indicate that the site is underlain by the Neranleigh Fernvale Beds typically comprising Devonian to Carboniferous aged mudstone, shale, arenite, chert, jasper or conglomerate.

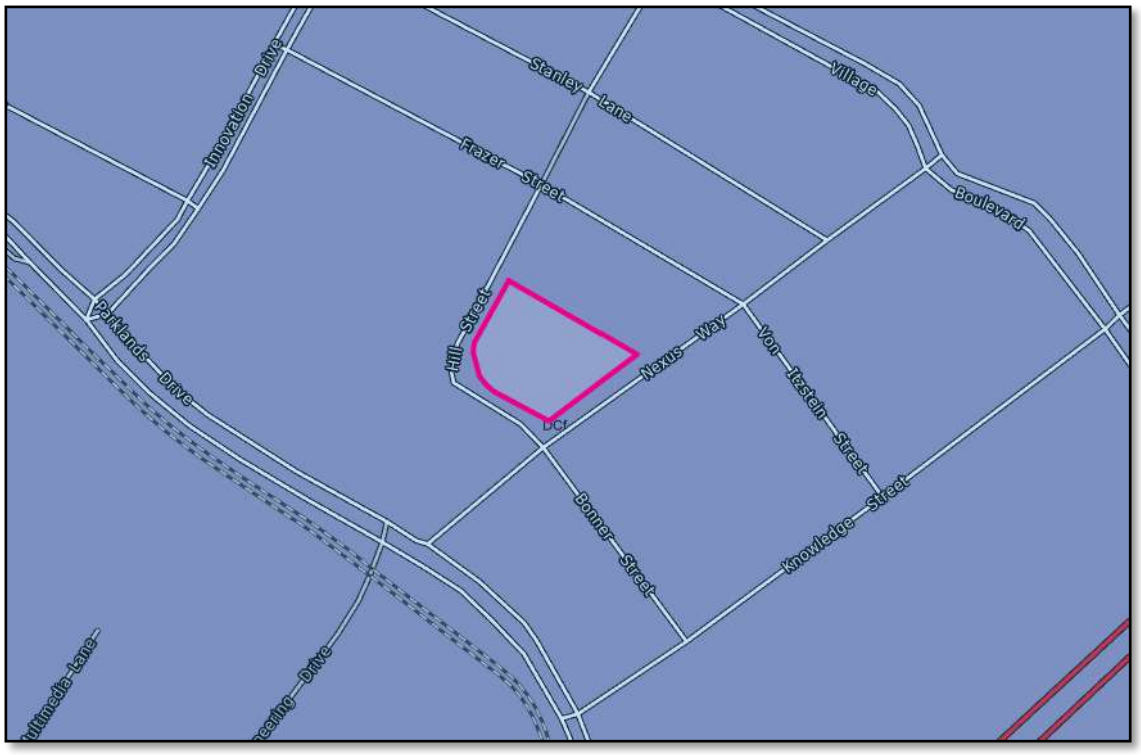


FIGURE 2 – SITE GEOLOGY (QLD GLOBE 1:100K DETAILED SURFACE GEOLOGY

4.2 Subsurface Profile

Subsurface conditions encountered are consistent with conditions described on published geological maps. The subsurface conditions can be broadly grouped into three material types.

- Fill material
- Natural Soils
- Weathered Arenite

Fill Material

Encountered in each borehole to depths of between 0.25m and 0.80m, the fill material comprised Sandy Gravel (GP).

The fill material is considered to be 'uncontrolled'.'

Natural Soils

Natural soils were encountered beneath the fill stratum at each borehole location and comprised Silty Sandy Clay (CH), Silty Clay (CH) and Sandy Clayey Gravel (GC). The clays were typically described as being of high plasticity and very stiff or hard consistency and the gravels were described as being dense and fine to coarse sized.

Weathered Rock

Weathered Arenite was encountered in each of the boreholes at depths of 11.80m (BH01), 10.80m (BH02) and 4.30m (BH03). Assessed as initially extremely weathered (XW), very low strength, and becoming distinctly weathered (DW), very low strength, low strength or medium strength. A strength decrease was noted with increased depth in some of the boreholes.

A summary of the subsurface profile is presented in Table 6 with detailed borehole records included in Appendix B.

TABLE 6 SUMMARY OF THE SUBSURFACE PROFILE

Borehole No.	Fill (m)	Clay (m)	Weathered Rock (m)		Termination Depth (m)
			Extremely weathered	Highly Weathered (or better)	
BH01	0.00-0.30	0.30-4.10 9.30-11.80	4.10-9.30	11.80-TD	15.00
BH02	0.00-0.80	0.80-8.90	8.90-10.80	10.80-TD	15.00
BH03	0.00-0.25	0.25-4.30	NE	4.30-TD	15.00

Notes:-
1. NE = Not Encountered; TD = Termination Depth.
2. All depths below existing ground level at date of drilling.

4.3 Groundwater

Groundwater was not encountered during augering at borehole locations – boreholes were augered to depths of 3.00m. The boreholes were advanced beyond auger depths using washed bore drilling and NMLC rock coring techniques. Groundwater is unable to be detected during washed bore drilling and coring.

A groundwater monitoring well to measure groundwater levels was installed at the location of BH01 to 9.00m.

Monitoring was carried out on the 14th January, 2022 with results presented below.

TABLE 7 GROUNDWATER MONITORING GW1

Well Depth 9.00m	Groundwater Depth (m)
Initial Water Level	8.11
Level after Bailing	8.37
Level 10 minutes post bailing	8.36
Level 20 minutes post bailing	8.36
Level 30 minutes post bailing	8.35

In addition to investigation findings, the following should be considered:-

- Groundwater/seepage levels and inflow rates can vary both seasonally and with prevailing weather conditions.
- The potential to encounter groundwater/seepage within the fill stratum and at the fill/natural and soil/rock interfaces, should be considered (particularly so following rainfall).

5.0 ENGINEERING ASSESSMENT

5.1 Trafficability

Trafficability conditions were considered to be good during the investigation due to the existing gravel surface.

It is recommended that after stripping, clearing and grubbing, the exposed surface in the construction area be proof rolled (where appropriate) to assist in identifying weak areas and to improve trafficability. In areas of cut, proof rolling may be deferred until after the cut operation.

Maintaining adequate drainage conditions is essential. It should be ensured that runoff is diverted away from the construction area to prevent ponding of water. In addition, the construction area should be "sealed" at the completion of each day and in the event of rain.

Nevertheless, the contractor should fully inform himself of the ground conditions on site prior to commencement of earthworks. This requirement should be explicit in any earthworks specifications or contract.

Working Platforms For Tracked Plant and Heavy Construction Vehicles

The scope of Soil Surveys Engineering's study DOES NOT include the design of a working platform for heavy construction vehicles or heavy tracked plant.

Detailed design of a working platform should be carried out considering the operation of actual machinery proposed to be used. This is particularly important when considering the use of heavy piling rigs and heavy cranes - the piling/crane contractor should be consulted regarding their requirements.

5.2 Dilapidation Survey

Existing buildings, roads and underground services are located adjacent to proposed works.

It is recommended that a detailed dilapidation survey of the adjacent buildings, adjoining structures, roads, etc. be carried out in order to establish their present condition prior to commencement of construction.

This survey should include the following:-

- The general condition of the property, i.e. condition of all exposed walls, pavement condition, etc.
- The extent of existing damage (if any)
- Photographs/video as appropriate

Actual locations of underground services and adjacent building foundation systems should be established prior to construction.

5.3 Erosion & Sediment Control

Erosion and Sediment Control Recommendations

An erosion control program should include but not be limited to the following general recommendations:-

- Minimise disturbance - where possible the development should utilise existing topography and avoid extreme land shaping and surface modifications. Minimise the removal or disturbance of trees and ground cover to reduce erosion potential.
- Slope runoff should be diverted around the development site.
- Drainage controls should be installed early in the site development.
- Install sediment barriers as required; barriers to also be positioned around soil stockpiles.
- Entry and exit points are to be minimal and stabilised with coarse gravel and stone. Limit site entry and on-site traffic movement.
- All drainage, erosion and sediment control measures should be regularly checked and maintained throughout the construction period.
- Re-vegetation is to be carried out promptly and progressively during construction.
- It is essential that batters be suitably protected from erosion and scour by the establishment of ground cover and shrubs, installation of surface drains, placement of rock protection, placement of gravel capping, etc. Runoff should not be allowed to discharge directly across unprotected batters.
- Clearly define flow/drainage paths on development drawings. Establishment of vegetation along flow/drainage paths is recommended - vegetation will reduce flow velocity.
- Avoid concentration of flow from multiple drainage paths.
- Where soils/final platform are not protected from erosion by the establishment of vegetation or pavements, placement of “gravel capping” or working platform is recommended.
- Use of dedicated tracks (during and post construction) is recommended to control site traffic; vehicle tracks may trigger erosion.

5.4 Excavation Characteristics

Excavatability Comments

Based on geotechnical knowledge of excavations/earthworks on projects in the local area and with similar rock types, the following comments can be made on excavation characteristics:-

- Bulk Works
    - Excavation of the fill, soil and an extremely weathered rock is expected to be possible using a medium size to large excavator with bucket.
    - Excavation further into the weathered rock (DW) may be possible using a single tyne ripper and hydraulic rock hammers on an excavator.

- Trenching
    - Trench excavations in the fill, soils and extremely weathered rock should be within the capacity of a medium size backhoe or small excavator.
    - Below these levels a larger excavator would be required for excavation further into the weathered rock
- Bored Piers
    - It should be noted that the ability to drill piers in the weathered rock material is not only dependent on material characteristics but also the type (power and size) of the bored pier drilling rig, drilling teeth, size of pier, etc. It is recommended that the drilling contractors be consulted on this matter.
    - It is important that the drilling contractor have a 'clean-out' bucket to ensure adequate cleaning of the pier bases if hand cleaning of the bases is not possible.
- Vibrations
    - The effect of vibrations on adjacent structures from excavation works, particularly use of rock breakers, must be carefully considered. Regardless, adequate vibration monitoring and control is recommended.

5.5 Earthworks

5.5.1 General

It is understood that a three level basement is to be constructed as part of the development with the lower level basement slab expected to be approximately 8.0m to 9.0m below existing ground level. No drawings were available at the time of writing this report illustrating the extent of the basement.

The following general earthworks recommendations are provided for completeness.

5.5.2 Subgrade Preparation

Subgrade preparation procedures should include the following:-

- Clearing, stripping and grubbing should be carried out in areas subject to earthworks (as trafficability conditions allow). Also all soils containing organic matter should be stripped from the construction area; this material is not considered suitable for use as structural fill.
- Depressions formed by the removal of vegetation, underground elements etc. should have all disturbed weakened soil cleaned out and be backfilled with compacted select material.
- The subgrade should be proof rolled (where appropriate) under the supervision of Soil Surveys Engineering in accordance with methods and equipment as per Clause 5.5 of AS 3798-2007. In areas of cut, proof rolling may be deferred until after the cut operation. Areas demonstrating excessive movement should be treated (dried and recompacted) or removed and replaced with compacted fill. Treatment should be to a standard sufficient so that the subgrade passes proof rolling and that compaction can be achieved in the first layer of fill.

- Any fill material encountered should be considered uncontrolled and requiring treatment (i.e. excavate/condition/replace/compact as required).

5.5.3 Material Usage

- The insitu soils, where free of organic and deleterious material, may be used for structural fill provided the moisture content of the soils on placement approximates the optimum moisture content required for compaction. This will require conditioning to bring the soils to optimum. However, it should be noted that the on site soils could be expected to present difficulties in handling, placement and compaction if the appropriate moisture content could not be achieved, particularly if the soils were overly moist.
- The weathered rock, where broken down on extraction, may be used in areas of structural fill provided no rock over 75mm greatest dimension is included above a plane 300mm below the final subgrade/platform. Below this plane, rocks up to 150mm greatest dimension may be used. These rocks should however not represent more than 20% of the fill make-up. Rocks over 150mm greatest dimension, which cannot be broken down, should be removed.
- With use of reactive clay soils, close control of moisture content during placement and compaction is required so as to minimise the potential for swelling and shrinkage movement. A moisture content within the range of OMC (Standard Optimum Moisture Content) -1% to OMC +2% is recommended. Foundation design must reflect the use of the potentially reactive clays if they are used as structural fill.
- Imported select fill (if required) should be cohesive in nature and conform to the following specifications:

Liquid Limit	35%, maximum
Plasticity Index	10%, maximum
Aggregate Size	75mm, maximum
Passing 19mm Sieve	80%, minimum
Passing 0.075mm Sieve	20%, minimum
Shrink/Swell Index	Maximum of 0.5%
Soaked CBR	15%, minimum

- Imported general fill material (if required) should be cohesive in nature and be a good quality low plasticity (Liquid Limit of less than 45%, Plasticity Index of less than 15%, Shrink/Swell Index of less than 1.0%) select fill material with a Soaked CBR >10% and a maximum particle size of 75mm.
- Quality testing to confirm imported fill quality should be carried out prior to delivery to site; frequency of testing is subject to assessment by Soil Surveys Engineering, however, a sufficient number of tests should be carried out so that all parties are confident of material characteristics. Quality test results should be reviewed by Soil Surveys Engineering.

5.5.4 Compaction Procedures & Specifications

- Provided the placement moisture content of the imported fill or select insitu material approximates the optimum moisture content for compaction, suitable compaction should be achievable using typical compaction machinery. The fill material should be

compacted in layers not exceeding 250mm, loose thickness. However, layer thicknesses will be dependent on the compaction plant type and size, use of vibration, material type and condition. Final maximum placement layer thicknesses will need to be determined when compaction plant as well as material type and conditions are known. Fill batters should be overfilled and cut-back to design batter angles.

- Guidelines for minimum relative compaction values for insitu soils and imported general fill for the building and pavements are presented in Table 8.

TABLE 8 MINIMUM RELATIVE COMPACTION

Location	Minimum Dry Density Ratio (%)
General Fill/Subgrade	98
Base Course	98 (2)
Subbase	98 (2)

Notes:
1. The recommended compactions are percentages of the maximum dry density determined by Australian Standard 1289 (Standard Compaction).
2. For processed pavement gravels, minimum density requirements should be a percentage of maximum dry density in accordance with AS 1289 5.2.1, Modified Compaction.

- Field density testing should be carried out to check the standard of compaction achieved and the placement moisture content. The frequency and extent of testing should be as per guidelines in AS 3798-2007, Section 8.0.
- Backfilling for service trenches, etc. should use good quality material. The backfill should be placed in uniform layers over the full width of the excavations with the layers not exceeding 200mm thickness, loosely placed using wheeled plant and 100mm loose thickness using hand held vibrating plates. The backfill material should be compacted to the specifications outlined above for insitu or imported cohesive material.

5.5.5 Earthworks Supervision

Engineering supervision of the earthworks operations by Soil Surveys Engineering Pty Limited is recommended.

Following production of AS 3798-2007, the terms "Level 1 and 2 Supervision" have been adopted in earthworks specifications to describe what could also be termed Engineering Supervision. Whilst there is no particular problem with using these terms, there does not seem to be wide agreement as to what Level 1 or 2 Supervision actually means or entails.

Regardless of terminology, it should be made clear in any earthworks specification as to what is actually required in terms of certification.

It is recommended that the following objectives (as a minimum) be incorporated into the earthworks specification:-

- Engineering certification that all general earthworks operations (i.e. stripping, proof rolling of subgrade, subgrade treatment, etc.) have been carried out in accordance with the earthworks specification.
- Engineering certification that fill has been placed and compacted to the required minimum density in accordance with the earthworks specification.
- If required, engineering certification that the controlled fill material is suitable to support a conventional slab on ground floor.

- Engineering certification that the quality of any imported fill complies with the earthworks specification requirements.

Engineering certification should be provided by a Registered Professional Engineer of Queensland.

Compaction testing (alone) by a testing authority which does not include inhouse RPEQ certification (supported with adequate Professional Indemnity insurance coverage) that geotechnical engineering requirements associated with earthworks operations have been met, is considered inadequate and unacceptable.

5.5.6 Dewatering - Construction

The potential to encounter groundwater exists (refer Section 4.3).

For construction works a drainage system, comprising a gravel blanket, side drains etc., grading to a sump pump, could be considered.

However, a groundwater study is recommended. Our opinion is that a groundwater study (consistent with Authority requirements) will assess matters such as dewatering options (pre and post construction), the effect of groundwater on foundation construction works, inflow/pumping rates, chemical composition of groundwater (to allow assessment of groundwater disposal options), zone of influence of proposed dewatering works (i.e. groundwater cone of depression), etc. Please note that it is important that dewatering operations limit the extent of the groundwater cone of depression such that the hydrological regimes that operate are not affected beyond the site.

5.6 Excavation/Boundary Retention

5.6.1 General

Considering proposed earthworks, including up to 9.0m excavations adjacent to the site boundaries, excavation support will be required: A pier and panel, secant pile or diaphragm wall system could be considered. The retention system must be installed prior to excavation works.

5.6.2 Detailed Design

DETAILED RETENTION SYSTEM DESIGN IS REQUIRED; a detailed soil-structure analysis must be carried out to determine an effective retention support system. This design would follow the detailed geotechnical investigation.

The requirement to limit deflections to acceptable levels should be explicit in the brief to retention system designers.

The effect of potential vertical and horizontal movements (resulting from deflection of the retention system) on existing adjacent structures, services, road etc. must be carefully considered. Services locations and adjacent building foundation systems must be considered in the retention system design.

The design of a support system should take into account overexcavation possibly associated with foundation construction, earthworks, services installation, etc.

UNSUPPORTED EXCAVATIONS ARE NOT RECOMMENDED.

Further, it is recommended that several monitoring stations be set up to check for movement during excavation. A regular monitoring program of these stations should be implemented e.g. twice daily during excavation and daily at any other time.

5.6.3 Pier and Panel System

In this option, piers are drilled (either at close spacing or more widely spaced, up to four diameters), with infill panels; piers are joined at the surface using a capping beam.

The following general construction procedure would be applicable:-

- Install bored piers **with a suitable embedment** below basement excavation level. This pier and panel option is dependent on suitable pier embedment below final platform level being achieved.
- Construct panels - excavate, install reinforcement between piers and spray with shotcrete.
- Install either temporary ground anchors through each pier or an internal bracing system.
- Continue panel construction (i.e. excavation, installation, reinforcement and shotcrete).

To reduce size (or need) of anchors, the pier spacing could be reduced. Please note that permission to install anchors into adjacent properties would be required.

It is recommended that a capping beam be incorporated into the design. A capping beam has the advantage of:-

- Provides a convenient location for the first row of anchors (if required), allowing an increase in anchor spacing and not restricting the anchor points to the post positions only.
- Provides a larger bearing surface for the top row of anchors and allows the adoption of larger anchors in the top row.
- Joins the tops of the posts together thereby reducing the possibility of excessive movement of the top of a single post which could increase the potential for toe “kick out” before the placement of the lower anchor. This movement would also reduce the tension within the anchor thereby down grading its effectiveness at minimising movement within the wall of the excavation.

A minimum pier diameter of 0.60m should be adopted for anchored piers, however, pier diameter is dependent on the moment capacity of the pier section, lateral deflection requirement, boundary conditions, etc.

5.6.4 Anchor Design

Anchor design should consider the following:-

- Anchor free length should extend from the anchor head to 0.15H (H is total excavation height) behind the design failure plane drawn up at 60° from the base of the cut with a minimum length of 3.0m (temporary only).
- Anchor bond length will depend upon desired anchor capacity, drill hole size and material parameters of intersected material. An allowable bond stress of 60kPa for the very low strength rock and 100kPa for the low strength rock (or better) could be

adopted. It is recommended that pull out tests be carried out during excavation to better assess these values. It is possible that greater values could be used, subject to test results.

- Anchors are designed as temporary.

5.7 Basement Retaining Walls

5.7.1 General

It is recommended that any retaining structure be designed in accordance with AS 4678-2002 'Earth Retaining Structures'. Section 3 of this code outlines the design requirements for retaining structures which specifically includes both Ultimate and Serviceability Limit Modes. It is recommended that the retaining structures be assessed for each of these modes.

Please note that the following section provides general recommendations with respect to some of these limit modes, however, it doesn't provide a detailed assessment in full accordance with the above mentioned modes for AS 4678. A detailed assessment can be undertaken of the geotechnical aspects of the Limit Modes for the proposed retaining structures once details of the wall have been provided.

Lateral pressure assessment must also consider hydrostatic pressure and surcharge loadings.

The following parameters (unfactored) may be adopted for wall design (Table 9).

TABLE 9 PARAMETERS FOR USE IN RETAINING WALL DESIGN

Material	Density (kN/m^3)	Earth Pressure Coefficient			Long Term Drained Ø (degrees)
		Vertical Wall			
		Ka	Ko	Kp	
Fill	17	0.41	0.58	NR	25
Very Stiff Clay	18	0.39	0.56	2.55	26
Hard Clay	19	0.36	0.53	2.80	28
Arenite very low strength	21	0.31	0.47	3.25	32
Arenite low strength	22	0.27	0.43	3.30	35

Any backfill placed behind the wall should be loose granular material. The backfill should not be heavily compacted since research has shown that compaction can raise the earth pressure to above the 'at rest' pressure.

The placement of a filter fabric between the retained soil and the drainage material (e.g. granular backfill) for protection against silting of the drainage material is recommended. The outlets to subsoil pipe drains must be located beyond the ends of the walls and connected to a proper drainage system. It is suggested the pipes be wrapped in filter fabric to minimise silting.

Due to possible long term problems with blocking of gravel filters and drains and short term storm conditions that could flood the fill behind retaining walls, it is recommended that all retaining walls be designed for some water pressure distribution.

5.7.2 Design Comments

As noted previously, **detailed retention system design is required**; Soil Surveys Engineering would be pleased to assist with the geotechnical engineering aspects of the design process following the detailed geotechnical investigation.

However, please note that Soil Surveys Engineering do not produce engineering drawings; our geotechnical engineering retention design will be provided in a report which sets out sufficient detail to allow the drafting (by others) of engineering drawings for construction. These drawings should (at least) consist of an elevation showing anchor installation locations (if required) as well as typical sections and other design/construction parameters. Soil Surveys Engineering can provide geotechnical design review of the drawings.

It should be noted that as well as geotechnical design review of drawings, construction inspections (i.e. inspection of piers associated with pier and panel system, inspections during bulk earthworks, etc. - please contact Soil Surveys Engineering for advice) will also be required. **Soil Surveys Engineering is however not able to provide construction inspection services unless we have reviewed and approved any drawings prepared from our report PRIOR TO CONSTRUCTION COMMENCING**.

Further, vertical and lateral movement of soils will occur for any non-anchored system; movements occur as a result of stress release caused by the excavation.

The effect of potential vertical and horizontal movement on the adjacent road, services etc. must be carefully considered. Service location must be considered in the retention system design. The construction methods described may need to be modified following detailed design.

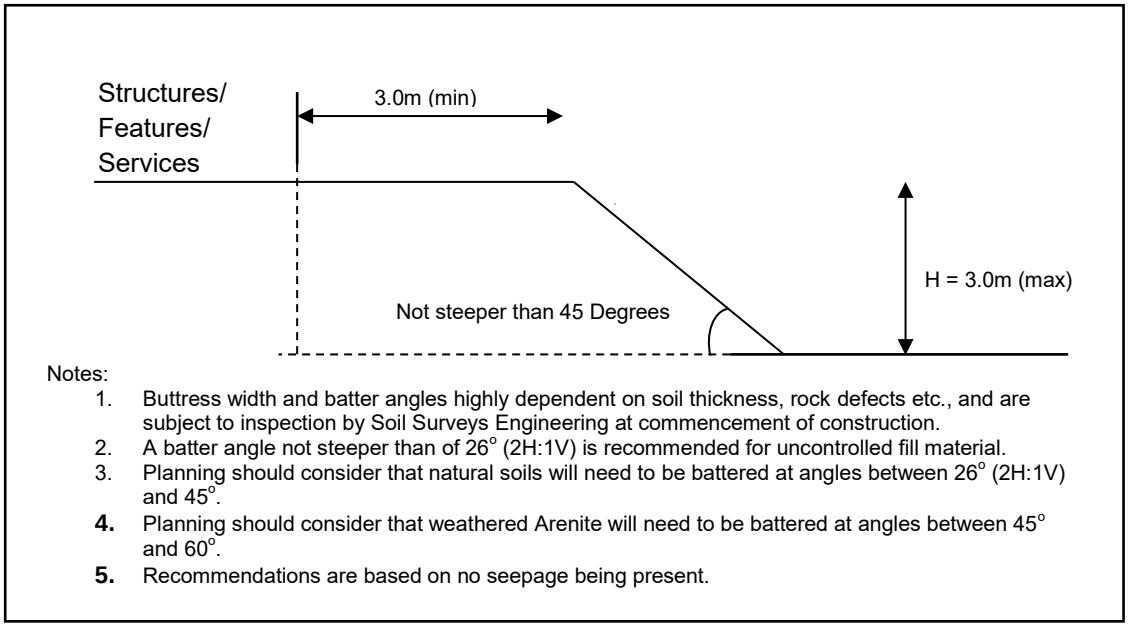
5.8 Temporary Cut Batter

In areas where excavation is minor, or the opportunity to adopt a temporary cut battered excavation is available, the requirement excavation support could be relaxed, i.e. a temporary cut battered excavation could be considered where the profile as per Figure 3 can be accommodated and where surcharge conditions are favourable. However, the suitability of a temporary cut battered excavation is highly dependent on surcharge conditions, encountered profile, available space, proximity of structures and services, etc.

The following general recommendations are made for short term stability of unsurcharged batters on this site.

- Overall batter angle not steeper than 45°.
- Top of batter minimum of 3.0m from any structure, feature, services, etc.
- Height of temporary cut batter not to exceed 3.0m.

Figure 4 refers.



Notes:

1. Buttress width and batter angles highly dependent on soil thickness, rock defects etc., and are subject to inspection by Soil Surveys Engineering at commencement of construction.
2. A batter angle not steeper than of 26° (2H:1V) is recommended for uncontrolled fill material.
3. Planning should consider that natural soils will need to be battered at angles between 26° (2H:1V) and 45°.
4. Planning should consider that weathered Arenite will need to be battered at angles between 45° and 60°.
5. Recommendations are based on no seepage being present.

FIGURE 4

The suitability of this temporary cut batter system is subject to on site assessment by Soil Surveys Engineering prior to commencement of earthworks and following review of survey/sections, review of advice regarding adjacent structures footing systems, determination of service locations/depth, etc.

Further, inspection of cut batters would need to be carried out by Soil Surveys Engineering, at the commencement of, and during, bulk excavation works, to further assess the stability of temporary cut batters.

Please note that vertical and lateral movement will occur with this option (stress release caused by excavation). The temporary batter option will not be suitable in movement sensitive areas.

5.9 Site Classification AS 2870 'Residential Slabs and Footings'

While a site classification in accordance with AS 2870 'Residential Slabs and Footings' relates to residential type construction and is not directly applicable for this development, it is, however, a valuable method of classification.

In assessing the site classification in accordance with AS 2870 'Residential Slabs and Footings', the following has been considered:-

- The subsurface profile (as per borehole records).
- Geotechnical data held by Soil Surveys Engineering.
- That the site is considered to be a reactive site (as per AS 2870-2011).
- That the site is subject to abnormal moisture conditions due to the presence of trees (on the building site and adjacent sites) and or proposed removal of trees (as per Clause 1.3.3 of AS 2870-2011).
- The presence of uncontrolled fill deeper than 0.4m.
- Likely future development.

Considering the above, and other factors, the site is classified Class 'P'.

5.10 Site Reactivity

If this reactive site had been assessed to be subject to ground surface movement predominantly due to soil reactivity **under normal moisture conditions** the following characteristic surface movement would apply:-

- Clay profile. Class M (y_s = 35mm to 40mm)
- Rock profile. (i.e. basement excavation) Class A to Class S

5.11 Building Foundations

5.11.1 Foundation Options

Following bulk excavations to create the basement levels, it is expected that the basement subgrade will comprise weathered very low strength Arenite and natural clays.

Basement excavation depths in the order of 8.00m to 9.00m are expected.

A high level foundation system founding in the weathered rock and hard clays could be considered.

5.11.2 High Level Footings

High level strip/pad footings should found a minimum of 300mm into weathered rock or natural clays; footings will need to be deepened in areas of uncontrolled fill material (if any). Deepened footings, may be constructed over mass concrete poured to the underside of the footing.

Table 10 outlines recommended allowable bearing capacities for high level footings.

TABLE 10 ALLOWABLE BEARING CAPACITIES

Material		Allowable Bearing Capacity (kPa)	
		Strip Footing	Pad Footing
Fill		NR	NR
Clays	-Very Stiff - Hard	NR 350	NR 400
Weathered Arenite	- Very low strength - Low strength	500 600	550 650

Notes:-
1. All capacities subject to inspection by Soil Surveys Engineering.
2. NR = Not Recommended.

5.11.3 Deep Foundations

Bored piers could be considered.

The design of a deep foundation system should consider the following:-

- Capacity
- Construction considerations

It is recommended that the deep foundation system on this project be designed in accordance with AS 2159-2009 'Piling - Design and Installation'. This code uses the limit state design method.

Compressional Capacity

The design of a single pile or a pile group must be such that both the geotechnical design strength $R_{d,g}$ and the structural design strength $R_{d,s}$ are greater than or equal to the design action effect E_d*, i.e.

$$R_{d,g} \geq E_d \text{ and } R_{d,s} \geq E_d$$

The design geotechnical strength ($R_{d,g}$) can be calculated as the ultimate geotechnical design strength ($R_{d,ug}$) multiplied by the geotechnical strength reduction factor $Ø_g$. Ultimate design geotechnical strength ($R_{d,ug}$) parameters for the materials encountered on the site are outlined in Table 11.

TABLE 11 ULTIMATE GEOTECHNICAL STRENGTH (R_{ug}) PARAMETERS

Material		f_b - Base Bearing (kPa)	$f_{m,s}$ - Skin Friction (kPa)
Fill Material		NR	NC
Clays	- Very Stiff - Hard	NR 1800	30 60
Weathered Arenite	- Very Low Strength - Low Strength	2200 2700	75 90

Notes:
1. NR = Not Recommended; NC = Not Considered in skin friction calculations.
2. Ultimate geotechnical strength for compression can be determined from $R_{d,ug} = f_b A_B + A_s f_{m,s}$.
3. Recommended geotechnical strength reduction factor ($Ø_g$) - Refer Table 4.3.2(c) AS 2159.
4. Considering limit state analysis (AS 2159-2009), the design geotechnical strength R^*_g is calculated by multiplying the ultimate design geotechnical strength $R_{d,ug}$ by the geotechnical strength reduction factor $Ø_g$, i.e. $R^*_{d,g} = R_{d,ug} \times Ø_g$.
5. Should a "working stress" approach be adopted, a minimum factor of safety of 3.0 on base and 2.0 on skin friction is recommended.
6. Skin friction contribution from clays in the upper 1.8m of the profile should be ignored.
7. Piers should found at a minimum depth of four times the pier diameter below platform level.
8. The above parameters are for single piers. If piers are spaced at closer than three diameters, a reduction factor (Group Efficiency Ratio) may apply.
9. Base bearing and skin friction parameters to be confirmed by inspection by Soil Surveys Engineering.

Construction Considerations

Some difficulty with fall-in may occur with bored piers, particularly when drilling through fill material. It should be ensured that all loose material is removed from the base of piers prior to pouring of concrete. The use of a 'clean-out' bucket should be explicit in instructions to the drilling contractor. The practice of 'using water and spinning the augers' to remove loose material from the pier base is generally unacceptable.

Groundwater was not encountered in boreholes (refer Section 4.3) at the time of the investigation. Should a bored pier foundation system be adopted, an allowance for dewatering and the use of liners should be made. **In addition, it may be prudent to drill a "trial pier" to fully assess construction difficulties.**

5.11.4 Basement Slab

For design purposes, it is recommended that the basement slab be designed adopting principles as contained in the Cement & Concrete Association of Australia, Industrial Floors & Pavements, Guidelines for Design, Construction & Specification.

It is envisaged that a weathered Arenite and hard Silty Sandy Clay subgrade will be exposed at basement level over the site. For design (but subject to inspection), a design CBR value of 5%

may be adopted where the sandy clay forms the subgrade increasing to 8% for the extremely weathered Arenite.

Inspections and testing should be carried out during bulk excavation work to fully assess subgrade conditions and CBR values.

The basement slab will need to be designed for groundwater/seepage. A drained basement comprising an under slab drainage system with permanent pumps could be considered subject to water quality issues, long term maintenance of pumps, etc. A fully tanked basement, designed for hydrostatic uplift, could also be considered. Please note that groundwater may need to be treated (prior to discharge) to bring water quality criteria to acceptable levels in accordance with Authority requirements.

5.11.5 Adjacent Feature/Excavation Considerations

Where proposed or existing (e.g. neighbouring property) footings/piers are located adjacent to proposed or existing feature/excavations (e.g. retaining walls, underground service trenches, unsupported batters etc.), the effect of the feature/excavation on proposed or existing footings/piers must be carefully considered. Deepening of proposed footings/piers is expected to be required in such circumstances.

Soil Surveys Engineering and the Structural Engineer should be consulted on this matter prior to construction.

For underground service trenches (as a general guide) proposed footings and piers should extend to base a minimum of 500mm and 1.0m respectively below the feature/excavation base level for a distance of 1.0m out from the feature/excavation. Beyond 1.0m the footings and piers should be taken a minimum of 500mm and 1.0m respectively below an imaginary line (influence line) drawn up at 45° (1H:1V) from the feature/excavation base level. Note that actual depths (Soil Surveys Engineering should be consulted on this matter prior to construction) below the influence line will depend on footing/pier capacity and possible uplift considerations. Figure 5 refers.

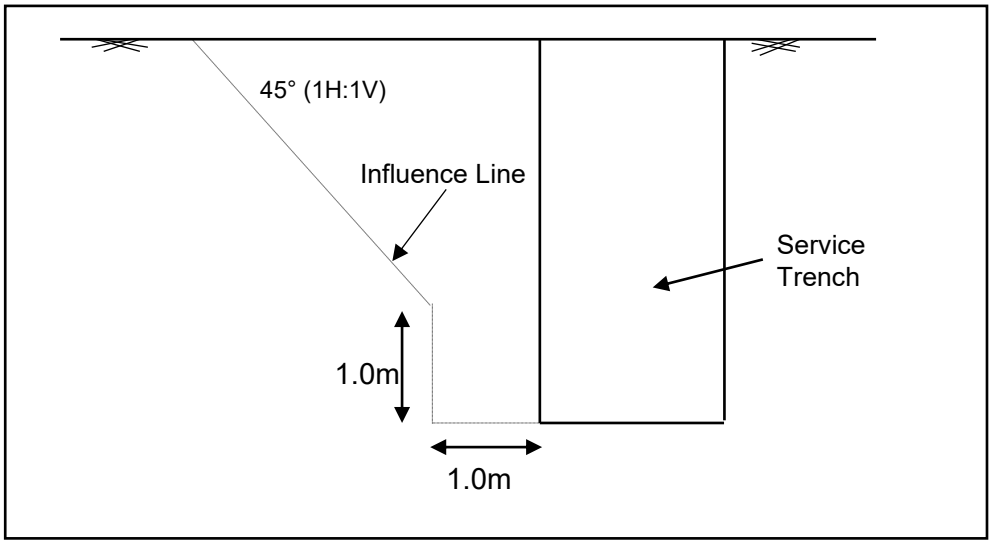


FIGURE 5

For all other feature types, Soil Surveys Engineering and the Structural Engineer should be consulted prior to construction.

Surveys Engineering and the Structural Engineer should also be consulted prior to construction.

5.11.6 Inspections

It is recommended that inspections be undertaken by an experienced and qualified geotechnical engineer from Soil Surveys Engineering following footing and during pier excavations to confirm the adequacy of the founding soils. Inspections should be carried out prior to placement of reinforcing steel and ordering of concrete.

5.12 Earthquake Design

With respect to structure design, the following would apply in accordance with AS 1170.4-2007:-

- Earthquake Hazard Factor – 0.08 (refer Figure 3.2 [F] of AS 1170.4-2007).
- Site Subsoil Class - Class 'Ce', Shallow Soil Site (refer Section 4.2 of AS 1170.4-2007).

5.13 Soil Aggressiveness

Durability shall be allowed for in the design of buried concrete and steel structures by assessment of the exposure classification (soil aggressiveness) in accordance with Clause 6.4.2 and 6.5.2 of AS 2159-2009 Piling-Design and Installation.

Exposure classifications are summarised below in Table 12.

TABLE 12 SOIL AGGRESSIVENESS

Location	Depth (m)	Concrete Exposure Classification (AS 3600)	Pile Exposure Classification (AS 2159)	
			Concrete	Steel
BH01	9.00-9.45	A2	Mild	Non-aggressive
BH02	10.50-10.79	A2	Mild	Non-aggressive

5.14 Articulation and Detailing

It is recommended that any masonry walls be articulated. This articulation may be achieved by the use of full height (footings to eaves) openings or vertical construction joints at regular intervals. Guidelines on articulation are contained in the Cement and Concrete Association's Technical Note 61, 'Articulated Walling'.

6.0 LIMITATIONS

We have prepared this report for the use of **NorthWest Healthcare Properties REIT**, for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than **NorthWest Healthcare Properties REIT**; it may not contain sufficient information for purposes of other parties or for other uses. Please note that any third party relying on the information contained in this report for any purpose whatsoever does so entirely at its own risk, and any duty of care to that third party is excluded.

Any interpretation or recommendation given by Soil Surveys Engineering shall be understood to be based on judgement and experience and not on greater knowledge of the facts than the

reported investigations would imply. The interpretation and recommendations are therefore opinions provided for our Client's sole use in accordance with the specific brief. As such they do not necessarily address all aspects of ground behaviour on the subject site. Information provided by others has been taken in good faith, but no liability can be accepted for information provided by others.

Your attention is drawn to 'Appendix A', 'Notes Relating to this Report'. Interpretation of factual data given in this report is based on judgement, not a greater knowledge of facts other than those reported.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing and depth of boreholes, the method of drilling, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes. Subsurface conditions between and below boreholes may vary significantly from conditions encountered at the borehole locations.

Please note, if following detailed design, the founding depth of any footings or piers/piles is within 3B (B = footing width/pier diameter) above the termination depth of the boreholes or if any excavations extend below the borehole termination levels, then Soil Surveys Engineering should be contacted immediately.

If the above were to occur then the geotechnical data in this report should be considered preliminary only; additional investigation is likely to be required.

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company strongly recommends that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, after the event. Should Soil Surveys Engineering not be notified or if this notification is delayed, then Soil Surveys can not be held responsible for the effect that any variation has on any aspect of the development.

Soil Surveys Engineering consider that a documentation review service (during the design phase and prior to construction) to verify that the intent of geotechnical recommendations is properly reflected in the design, along with construction inspections, forms a very important component of the geotechnical engineering design service/process.

The geotechnical review ensures geotechnical risks to our Client and their project are minimised at the design and tender stage of the project. Further, with Soil Surveys Engineering being commissioned to carry out geotechnical construction inspections, an opportunity at the time of construction to confirm any assumptions made in the preparation of the report and allow the effect of any normally occurring variation in ground conditions to be assessed with respect to construction becomes available.

The above statements are not intended to reduce the level of responsibility accepted by Soil Surveys Engineering in accordance with our commission, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so and the risks they accept should they decline to have Soil Surveys Engineering carry out a geotechnical documentation review and geotechnical construction inspections.

It is highly recommended that the Client avail themselves of these review and inspection services; our standard rates will apply.

K. MCNATTY
GEOTECHNICAL ENGINEER

C.P. JOHNSON (RPEQ 7052)
PRINCIPAL GEOTECHNICAL ENGINEER

For and on behalf of
SOIL SURVEYS ENGINEERING PTY LIMITED

APPENDICES

APPENDIX A

NOTES RELATING TO THIS REPORT

INTRODUCTION

These notes are provided by Soil Surveys Engineering Pty Limited (the Company) to complement the geotechnical report in regard to classification methods and field procedures. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited information about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such information obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and at the time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

Soils - The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-2017 (Geotechnical Site Investigations), where appropriate. In general, descriptions cover the following properties - soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the dominant particle size and behaviour as set out in AS 1726-2017.

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, shear vane, laboratory testing or engineering examination. The strength terms are defined in AS 1726-2017 Table 11.

Non-cohesive soils are classified on the basis of relative density usually based on insitu testing or engineering examination (see AS 1726-2017 Table 12).

Rocks - Rock types are classified by their geological names (AS 1726-2017 Tables 15 to 18), together with descriptive terms regarding weathering (AS 1726-2017 Table 20), strength (AS 1726-2017 Table 19), defects (AS 1726-2017 Table 22), etc.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon sample disturbance, (information on strength and structure).

Undisturbed samples are taken by pushing a thin walled sample tube, usually 50mm diameter (U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength, volume change potential and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

SAMPLE STORAGE – SOIL, ROCK AND WATER SAMPLES

Soil samples (not subject to testing) are not stored beyond a period of 90 days of taking or receiving said soil sample. Rock core (not subject to testing) is not stored beyond a period of six months of taking or receiving said rock core.

Should any party require that soil samples (not subject to testing) be stored beyond 90 days, or rock core (not subject to testing) be stored beyond six months, please contact Soil Surveys Engineering.

Water samples (not subject to testing) are not stored beyond a period of seven days of taking or receiving water samples.

TEST LOCATIONS

Test locations (e.g. boreholes, CPT's, test pits etc.) were based on available access at the time of testing. Test locations may have been shifted if access was not suitable.

Unless noted otherwise, accuracy of test locations are to the accuracy of hand held GPS equipment.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application.

Test Pits - These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to approximately 3.0m for a backhoe and up to 6.0m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling - A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the augers can occur on a variety of materials such as hard clay, gravel or rock fragments and does not necessarily indicate rock level.

Continuous Spiral Flight Augers - The borehole is advanced using 75mm to 300 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the augers. Information from the drilling (as distinct from specific sampling) is of relatively lower reliability due to remoulding, inclusion of cuttings from above or softening of samples by groundwater, or

uncertainties as to the original depth of the samples. Augering below the groundwater table has a lower reliability than augering above the water table. Various drill bits are attached to the base of the augers during the drilling. The depth of refusal of the different bit types can provide information as to the strength of the material encountered. Generally the 'TC' bit (a tungsten carbide tipped screw type bit) is used.

Wash Boring - The borehole is usually advanced by a rotary bit with water or fluid pumped down the hollow drill rods and returned up in the space between the rods and the soil or casing, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration. More accurate information on soil strata is gained by regular testing and sampling using the Standard Penetration Test (SPT) and undisturbed thin walled tube samples (U50).

Mud Stabilized Drilling - Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilize the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from regular intact sampling (e.g. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling - A continuous core sample is obtained using a diamond or tungsten carbide tipped core barrel. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable method of investigation. In rocks, NMLC coring (nominal 52 mm diameter) is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses is determined on site by the supervisor. If the location of the loss is uncertain, it is placed at the top end of the run, when the core is placed in a storage tray and recorded on the log.

Standard Penetration Tests - Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" - Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm, the upper 150 mm being neglected due to possible disturbance from the drilling method. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued at a reduced penetration.

In the case where full penetration is obtained with successive blow counts for each 150 mm of, say 4, 6 and 7 blows, the record shows,

4, 6, 7 N = 13

In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm, the record shows:

15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, it is noted on the borehole logs.

A modification to the SPT test is where the same driving system is used with a solid 600 tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid SPT are shown as "N_c" on the borehole logs, together with the number of blows per 150 mm penetration.

Cone Penetration Tests - Test Method - Cone Penetration Tests (CPT) are carried out in accordance with AS 1289 Test 6.5.1-1999, using an electrical friction-cone penetrometer.

The test essentially comprises the measurement of resistance to penetration of a cone of 35.7 mm diameter pushed into the soil at a rate of 10-20 mm per second by hydraulic force. The resistance to penetration is recorded in terms of pressure on the end area of the cone (cone resistance, q_c, in MPa) and friction on the side of the 135 mm long sleeve immediately above the top of the cone (friction resistance, f_s, in kPa). These forces are measured by electrical transducers (strain gauges) within the cone device. The ratio between friction resistance and cone resistance is also calculated as a percentage, i.e.-

$$\textbf{Friction Ratio (FR)} = \frac{Friction\ Resistance,\ f_s\ (kPa)\ x\ 100}{cone\ resistance,\ q_c\ (kPa)}$$

The friction ratio, FR, is generally low in sands (less than 1% or 2%) and generally higher in clays (say 3% or more). The interpretation of sandy clays, clayey sands and material with a high silt content is more difficult, but intermediate values (between 1% and 3%) would be expected. Highly organic clays and peats generally have a friction ratio in excess of 5%.

Static cone data is recorded in the field on disc for later presentation using computer aided drafting.

The equipment can be operated from any conventional drill rig. A total applied load in the range of 4 to 10 tonnes is required for practical purposes, although lighter loads may be used. The cone penetrometers are available with various capacities of cone resistance ranging up to 100 MPa for general purpose investigations, while a range of 0 to 10 MPa can be used where more sensitive investigations of soft clay are required.

The cone resistance value provides a continuous measure of soil strength or density, and together with the friction ratio, provide very useful indications of the presence of narrow bands of geotechnically significant layers such as thin, soft clay layers or lenses of sand which might otherwise be missed using conventional drilling methods.

The lithology of the encountered soils is interpreted from static cone data and is generally presented on the static cone log sheets.

It is important to note that the lithology is interpreted information and is based on research by Schmertmann (1970), Sanglerat (1972), Robinson and Campinalli (1986), modified to suit local conditions as indicated by borehole information and laboratory testing.

As soils generally change gradually it is sometimes difficult to accurately describe depths of strata changes, although greater accuracy is obtained with the static cone compared with conventional drilling. In addition, friction ratios decrease in accuracy with low cone resistance values, and in desiccated soils. As a result, some overlap and minor discrepancies may exist between static cone and nearby borehole information.

Portable Dynamic Cone Penetrometers - Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration.

The DCP comprises a Cone of 20 mm diameter with 30 degree taper attached to steel rods of smaller section.

The cone end is driven with a 9 kg hammer falling 510 mm (AS 1289 Test 6.3.2). The test was developed initially for pavement subgrade investigations, and empirical correlations of the test results with California Bearing Ratio have been published by various Road Authorities. The Company has developed their own correlations with Standard Penetration tests and Density Index tests in sands.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems.

- Although groundwater may be present in lower permeability soils, it may enter the hole slowly or perhaps not at all during the time the hole is open.
- A localized perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be bailed out of the bore and mud must be washed out of the hole or "reverted" if water observations are to be made.

More reliable measurements can be made by use of standpipes which are read after stabilizing at periods ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (e.g. bricks, steel, etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is important to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms and the attached explanatory notes summarize important aspects of the Laboratory Test Procedures adopted.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. The information provided in Soil Surveys Engineering reports is opinion and interpretation and not factual. The client/contractor increases their risk by not retaining the person who authored the geotechnical report, to carry out site inspection and review (overseeing role) during construction, to confirm opinion and interpretation expressed in the report is accurate. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. If this happens, the Company will be pleased to

review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. Since the test sites in any exploration represent a very small proportion of the total site and since the exploration only identifies actual ground conditions at the test sites, even under the best circumstances actual conditions may vary from those inferred to exist. No responsibility is taken for:-

- Unexpected variations in ground and/or groundwater conditions.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of other persons.
- Any work where the company is not given the opportunity to supervise the construction using the Companies designs/recommendations.

If differences occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, well after the event.

Extreme events including but not limited to the results of climate change, e.g. flood levels above previously identified levels, beach scour or erosion beyond normal expectations (as identified by local authorities) extreme rainfall events, war, espionage, sabotage may result in different conditions between time of investigation and time of construction.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document “Guidelines for the Provision of Geotechnical Information in Construction Contracts (1987)”, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances, where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are propose or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer. We would be happy to assist in this regard as an extension of our investigation commission. Construction drawings should be reviewed by Soil Surveys Engineering, with sufficient time to allow changes if required, prior to inspections. Otherwise Soil Surveys Engineering reserves the right to refuse to carry out inspections.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

i. Site visits during construction to confirm reported ground conditions
ii. Site visits to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, the stability of a filled or excavated slope; or
iii. Full-time engineering presence on site.

In the vast majority of cases it is advantageous to the principal for the geotechnical engineer who wrote the investigation report to be involved in the construction stage of the project.

The geotechnical engineer cannot take responsibility for variations in encountered conditions, where he is not given the opportunity to review plans for the proposed development with sufficient time to allow review and make changes to the proposed development if required, and where he is not given the opportunity to inspect the site and oversee construction methods with regard to site conditions with sufficient time to observe all relevant site conditions and operations.

RESPONSIBLE USE OF GEOTECHNICAL INFORMATION

Recommendations in our report are for design purposes only and provided on the basis that inspections are carried out to allow finalisation of opinions and recommendations contained in our report.

The geotechnical investigation consisting of field and laboratory testing has been carried out to indicate typical conditions by indicating conditions and parameters at the specific locations of boreholes/test pits. Subsurface conditions are indicated at these locations only and the inference of conditions between or away from these locations (interpolation and extrapolation) involves a certain degree of risk. Persons inferring such conditions or carrying out such inferences should do so with a degree of caution and conservatism which is commensurate with the consequences of the risk of error.

Estimates of volumes based on our findings require interpolation and extrapolation between test locations and as such may be significantly different from actual volumes.

APPENDIX B

BOREHOLE RECORD SHEETS

Soil Surveys Engineering Pty. Limited
Specialists in Applied Geotechnics
PO Box 317, Paddington, 4064
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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 01

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 10/01/2022

Easting: 537881 Northing: 6906988 RL:
Logger: JA Operator: RON Machine: HP SCOUT

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.30		FILL Sandy GRAVEL (GP): Inferred, medium dense, fine to coarse sized, light grey, fine to medium grained sand, moist	D
	0.70		NATURAL Silty CLAY (CH): Very stiff, high plasticity, red brown, moist	
	1.0		Silty Sandy CLAY (CH): Hard, high plasticity, red brown, fine to medium grained sand, moist	U50 PP=>600 Rec = 95%
	2.0			
	2.30		Silty CLAY (CH): Very stiff, high plasticity, light grey red brown mottled orange brown, moist	
	3.0			SPT 6, 10, 12 N=22
	4.0			
	4.10		Extremely weathered Arenite (XW) recovered as Sandy CLAY (CH): Hard, high plasticity, light grey mottled red brown	
	5.0			SPT 9, 21, 29 N=50
	6.0			
				SPT 20, 30, 30 N=60
	7.0			
	7.80			SPT 11, 29, 30/100mm N=R
	8.0		Extremely weathered Arenite (XW) recovered as Clayey GRAVEL (GC): Dense to very dense, fine to coarse sized, light grey mottled orange brown, medium plasticity clay	
	9.0			
	9.30		Sandy CLAY (CH): Hard, high plasticity, orange brown mottled very light grey, fine to medium grained sand	SPT 4, 10, 17 N=27
	10.0			

Comments:
1. Groundwater not encountered during augering.

Water First Noted Water Steady Level Water Loss

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: KM
Date: 14/01/2022

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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 01

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 10/01/2022

Easting: 537881 Northing: 6906988 RL:
Logger: JA Operator: RON Machine: HP SCOUT

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
			Sandy CLAY (CH): Hard, high plasticity, orange brown mottled very light grey, fine to medium grained sand *(continued)*	SPT 10, 15, 22 N=37
	10.90		Sandy CLAY (CH): Hard, high plasticity, orange brown mottled very light grey, fine to medium grained sand, trace fine to medium sized gravel	
	11.80		ARENITE (DW): Distinctly weathered, very low strength, orange brown mottled light grey	SPT 30/140mm N=R
	13.50		ARENITE (DW): Distinctly weathered, low strength, orange brown mottled light grey	SPT 30/50mm N=R
	15.00		BOREHOLE BH 01 TERMINATED AT 15.00 m	SPT 30/60mm N=R

Comments:
1. Groundwater not encountered during augering.

Water First Noted Water Steady Level Water Loss

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
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Samples
U50
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Disturbed Sample
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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 02

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 11/01/2022

Easting: 537914 Northing: 6906936 RL:
Logger: JA Operator: RON Machine: HP SCOUT

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.00		FILL Sandy GRAVEL (GP): Inferred, medium dense, fine to coarse sized, light grey, fine to medium grained sand, moist	D
	0.80		NATURAL Silty CLAY (CH): Very stiff, high plasticity, red brown, moist	
	1.20		Silty Sandy CLAY (CH): Hard, high plasticity, red brown, very fine grained sand, moist	U50 PP=>600 Rec = 100%
	2.80		Silty CLAY (CH): Hard, high plasticity, very light grey orange brown, moist	SPT 7, 14, 18 N=32
	5.30		Silty Sandy CLAY (CH): Hard, high plasticity, orange brown mottled very light grey, very fine grained sand	SPT 8, 14, 18 N=32
	8.90		Extremely weathered Arenite (XW) recovered as Sandy CLAY (CH): Hard, high plasticity, light grey mottled red brown	SPT 13, 9, 15 N=24
	10.0			SPT 18, 21, 22 N=43
				SPT 10, 20, 23 N=43

Comments:
1. Groundwater not encountered during augering.

Water First Noted Water Steady Level Water Loss

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: KM
Date: 14/01/2022

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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 02

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 11/01/2022 Page: 2 OF 2

Easting: 537914 Northing: 6906936 RL:
Logger: JA Operator: RON Machine: HP SCOUT

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
WB			Extremely weathered Arenite (XW) recovered as Sandy CLAY (CH): Hard, high plasticity, light grey mottled red brown *(continued)*	SPT 27, 30/140mm N=R
WB	10.80			
WB	11.0		ARENITE (DW): Distinctly weathered, very low strength, orange brown	
WB	12.0	12.00		SPT 30/70mm N=R
WB			ARENITE (DW): Distinctly weathered, low strength, orange brown	
WB	13.0			
WB	13.70			SPT 30/100mm N=R
WB	14.0		ARENITE (DW): Distinctly weathered, very low strength, orange brown	
WB	15.0	15.00		SPT 30/120mm N=R
			BOREHOLE BH 02 TERMINATED AT 15.00 m	
	16.0			
	17.0			
	18.0			
	19.0			
	20.0			

Comments:
1. Groundwater not encountered during augering.

Water First Noted Water Steady Level Water Loss

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
L - Low
M - Medium
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VH - Very high
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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: KM
Date: 14/01/2022

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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 03

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 10/01/2022

Easting: 537883 Northing: 6906932 RL:
Logger: JA/JD Operator: RON Machine: HP SCOUT

Depth	Description	Weathering	Strength (Estimated)	Defect Spacing	TCR (%)	RQD	Samples and Remarks
0.25	FILL Sandy GRAVEL (GP): Inferred, dense, fine to coarse sized, light grey, fine to medium grained sand, moist						D
1.30	NATURAL CLAY (CH): Very stiff, high plasticity, red brown mottled very light grey, moist						
1.90	CLAY (CH): Hard, high plasticity, red brown mottled very light grey, moist						U50 PP=>600 Rec = 100%
2.70	Sandy CLAY (CH): Hard, high plasticity, very light grey mottled red brown, fine grained sand, moist						
4.30	Sandy CLAY (CH): Hard, high plasticity, very light grey mottled red brown, fine grained sand, moist						SPT 7, 10, 19 N=29
9.50	ARENITE (DW): Distinctly weathered, very low strength, light grey mottled orange brown						SPT 25, 29, 30/110mm N=R SPT 26, 30/100mm N=R SPT 30/140mm N=R SPT 30/90mm N=R
10.0	ARENITE (DW): Distinctly weathered, low strength, light grey mottled orange brown						

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater not encountered during augering.

Water First Noted — Water Steady Level — Water Loss

Defects - 1.54m : F,60°,P,R,O,C

Depth (m) | Type | Dip (deg) | Planarity | Roughness | Aperature | Infill
B - Bedding | C - Curvilinear | L - Slickensides | C - Closed | C - Clay
C - Clay seam | D - Discontinuous | P - Polished | F - Filled | F - Iron Oxide
F - Foliation | P - Planar | R - Rough | N - Clean | K - Calcite
H - Schistosity | S - Subplanar | S - Smooth | O - Open | L - Limonite
J - Joint | T - Stepped | V - Very rough | S - Stain | Q - Quartz
L - Cleavage | U - Undulating | | | S- Secondary mineral
R - Fracture | | | | U - Unidentified mineral
S - Shear zone | | | | W - Weathered rock
T - Contact | | | | X - Carbonaceous
V - Vein | | | | Z - Clean
Z - Decomposed Zone

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: KM
Date: 14/01/2022

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SOIL SURVEYS

BOREHOLE RECORD SHEET

Location Number: BH 03

Project Number: 2-15299
Project Name: Proposed Development
Location: Nexus Way, Southport
Client: Northwest Healthcare Properties
Date: 10/01/2022

Easting: 537883 Northing: 6906932 RL:
Logger: JA/JD Operator: RON Machine: HP SCOUT

Depth	Graphic	Description	Weathering	Strength (Estimated) RS VL L M H VH EH	Defect Spacing 20 60 200 600	TCR (%)	RQD	Samples and Remarks
10.50		ARENITE (DW): Distinctly weathered, low strength, light grey mottled orange brown *(continued)*						
		CORE LOSS 0.70m (10.50-11.20)						SPT 30/30mm N=R
11.20		ARENITE: fine grained, light yellow brown, massive, closely to moderately spaced fractures, limonite in some joints	XW - HW			38	15	11.32 m; J, **5°,** S, R, O, Z 11.44 m; J, **20°,** S, R, O, L 11.53 m; J, **10°,** S, R, O, L 11.56 m; J, **15°,** S, R, O, L 11.7m, Is50 = 0.1 MPa 11.64 m; J, **10°,** P, R, O, L 11.83 m; J, **20°,** S, R, O, L 11.88 m; J, **5°,** S, R, O, L 11.90 m; J, **10°,** S, R, O, Z
12.00		CORE LOSS 1.00m (12.00-13.00)						
13.00		ARENITE: light grey yellow brown, laminated, closely spaced fractures, limonite in joints	XW - HW			42	6	13.06 m; J, **15°,** S, R, O, Z 13.21m, Is50 = 0.08 MPa 13.16 m; J, **15°,** S, R, O, L 13.28 m; B, **15°,** S, R, O, L 13.35 m; B, **15°,** S, R, O, L 13.43 m; J, **5°,** P, R, O, L
14.00		CORE LOSS 1.00m (14.00-15.00)						
15.00		BOREHOLE BH 03 TERMINATED AT 15.00 m						

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater not encountered during augering.

Water First Noted Water Steady Level Water Loss

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperature: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S- Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
HW - Highly weathered
DW - Distinctly weathered
MW - Moderately weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
RS - Residual Soil
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: KM
Date: 14/01/2022

Client: NorthWest Healthcare Properties REIT
Project: Proposed Development
Location: Nexus Way, Southport
Project no: 2-15299

SSE Borehole: 3
Depth: 10.50m - 15.00m
Box: 1 of 1

SOIL SURVEYS

TITLE

Northwest Healthcare Properties
Nexus Way, Southport
Proposed Development
Core Photo - BH 03

DRAWN	JD	DATE	17/01/2022
CHECKED	GB	DATE	28/01/2022
SCALE	Not To Scale		A4
PROJECT No	2-15299	FIGURE No	1/1

APPENDIX C

LABORATORY TEST CERTIFICATES

SOIL SURVEYS

SOIL SURVEYS ENGINEERING PTY LIMITED
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GOLD COAST
Unit 8, 140 Millaroo Drive
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PH:07 55026795 FAX:0755026724

www.soilsurveys.com.au info@soilsurveys.com.au

PARTICLE SIZE DISTRIBUTION

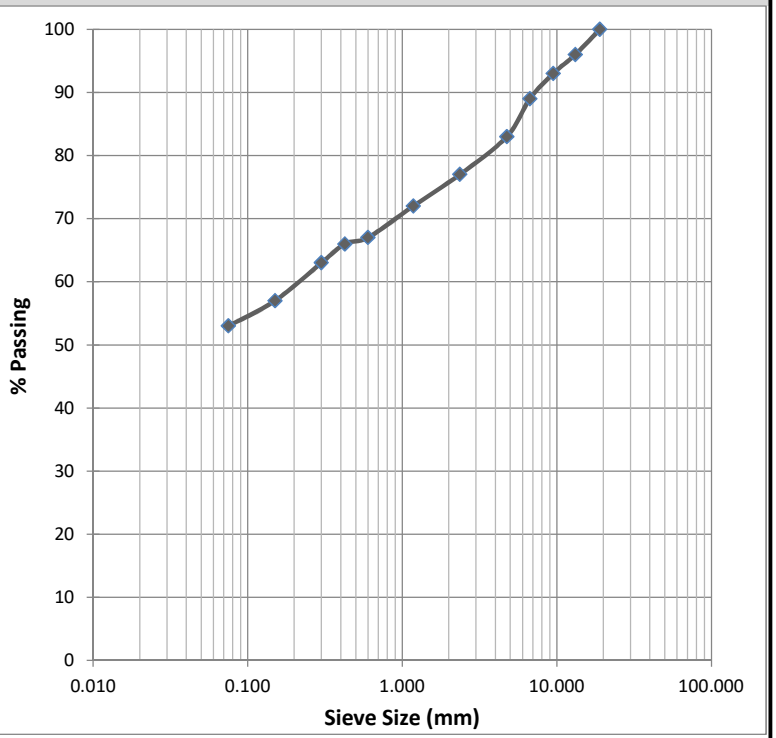
Client :	**Northwest Healthcare Properties REIT**	Report No:	WHL22-0011-S2
Client Address :	**C/O 8/140 Millaroo Drive, Helensvale, 4212**	Report Date:	28/01/2022
Project Number :	**2-15299**	Issue Number:	1
Project :	**Proposed Development**	Page 1 of 1	
Location :	**Nexus Way, Southport**		

SAMPLE DETAILS:

Sample ID:	WHL22-0011-S2
Date Sampled:	11/01/2022
Date Tested:	21/01/2022
Soil Description:	Silty Clay (CH) With Sand & Gravel, Red Brown with Grey Mottle
Sampling Method:	As Supplied
Sampled by:	SSE
Sample Location:	**BH02**
Depth (m):	**0.0-0.50**
Source:	Borehole
Material:	Unknown
Test Methods	AS1289.3.6.1

TEST RESULTS:

Sieve Size(mm)	Passing (%)
75.0	
37.5	
26.5	
19.0	100
13.2	96
9.5	93
6.7	89
4.75	83
2.36	77
1.18	72
0.600	67
0.425	66
0.300	63
0.150	57
0.075	53



Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

APPROVED SIGNATORY
Mark Rutten

NATA Accred No:15301

END OF DOCUMENT

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PH:07 55026795 FAX:0755026724

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PARTICLE SIZE DISTRIBUTION

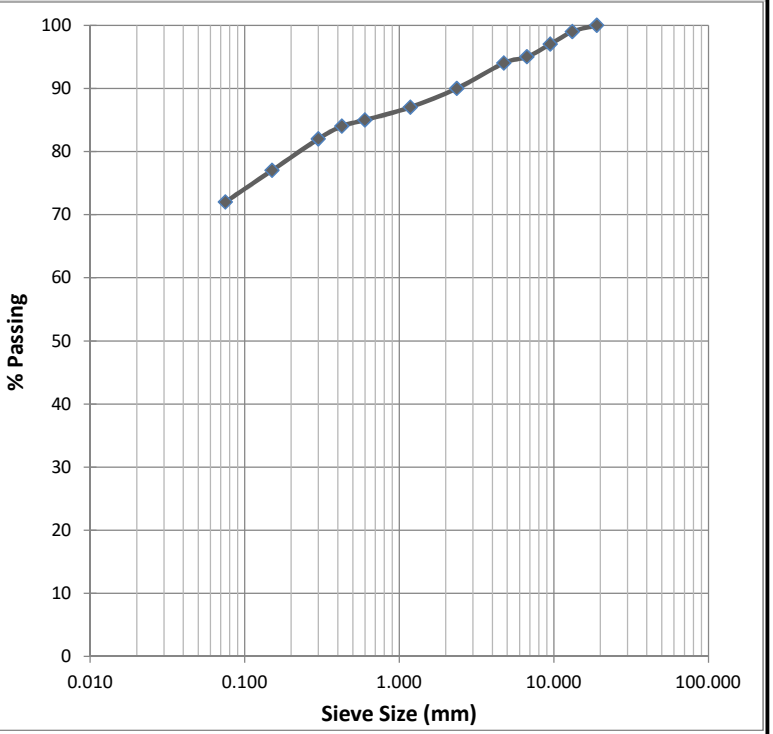
Client :	**Northwest Healthcare Properties REIT**	Report No:	WHL22-0011-S5
Client Address :	**C/O 8/140 Millaroo Drive, Helensvale, 4212**	Report Date:	28/01/2022
Project Number :	**2-15299**	Issue Number:	1
Project :	**Proposed Development**	Page 1 of 1	
Location :	**Nexus Way, Southport**		

SAMPLE DETAILS:

Sample ID:	WHL22-0011-S5
Date Sampled:	11/01/2022
Date Tested:	21/01/2022
Soil Description:	Silty Clay (CH) With Sand, Trace of Gravel, Red Brown with Grey Mottle
Sampling Method:	As Supplied
Sampled by:	SSE
Sample Location:	**BH02**
Depth (m):	**1.50-1.90**
Source:	Borehole
Material:	Unknown
Test Methods	AS1289.3.6.1

TEST RESULTS:

Sieve Size(mm)	Passing (%)
75.0	
37.5	
26.5	
19.0	100
13.2	99
9.5	97
6.7	95
4.75	94
2.36	90
1.18	87
0.600	85
0.425	84
0.300	82
0.150	77
0.075	72



Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

APPROVED SIGNATORY
Mark Rutten

NATA Accred No:15301

END OF DOCUMENT

SOIL SURVEYS

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info@soilsurveys.com.au

SHRINK SWELL INDEX REPORT

Client :	**Northwest Healthcare Properties REIT**	Report No:	WHL22-0011-S4-S6
Client Address :	**C/O 8/140 Millaroo Drive, Helensvale, QLD, 4212**	Report Date:	28/01/2022
Project Number :	**2-15299**	Issue Number:	1
Project :	**Proposed Development**	Page 1 of 1	
Location :	**Nexus Way, Southport**		

SAMPLE DETAILS:					
Sample ID:	WHL22-0011-S4	WHL22-0011-S5	WHL22-0011-S6		
Date Sampled:	10/01/2022	11/01/2022	10/01/2022		
Date Tested:	18/01/2022	18/01/2022	18/01/2022		
Soil Description:	Silty Clay (CH) Red Brown with Grey Mottle	Silty Clay (CH) With Sand, Trace of Gravel, Red Brown with Grey Mottle	Silty Clay (CH) Grey with Brown Mottle		
Sampling Method:	As Supplied	As Supplied	As Supplied		
Sampled by:	SSE	SSE	SSE		
Sample Location:	**BH01**	**BH02**	**BH03**		
Depth (m):	**1.50-1.90**	**1.50-1.90**	**1.50-1.90**		
Source:	Borehole	Borehole	Borehole		
Material:	Unknown	Unknown	Unknown		
TEST RESULTS:					
Swell Test (AS1289.7.1.1)					
Swell on Saturation(%)	**5.9**	**4.6**	**4.2**		
Moisture Content Before(%)	18.9	17.0	18.6		
Moisture Content After(%)	25.0	23.1	24.2		
Shrink Test (AS1289.7.1.1)					
Shrink on Drying(%)	**1.6**	**2.9**	**0.9**		
Shrinkage Moisture Content(%)	17.9	19.9	18.1		
Est. Inert Material(%)	0	10	0		
Crumbling	None	None	None		
Cracking	Slight	Slight	Slight		
Results:					
Shrink Swell Index - Iss (%):	**2.5**	**2.9**	**1.7**		
Swell Pressure (kPa)	310	250	220		
Unit Weight (t/m^3):	2.08	2.09	2.05		

Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

APPROVED SIGNATORY
Mark Rutten

Nata Accreditation number: 15301

END OF DOCUMENT

SOIL SURVEYS ENGINEERING P/L
Gold Coast
8/140 Millaroo Dr, Helensvale, QLD. 4212.
Phone: (07) 5502 6795; Fax: (07) 5502 6724
SOIL SURVEYS

Soil pH, Chloride and Sulfate Analysis

Client: NorthWest Healthcare Properties REIT
Address: C/O 8/140 Millaroo Drive, Helensvale, QLD, 4212
Project: Proposed Development
Location: Nexus Way, Southport

Certificate Number: WHL22-0011-S7-S8
Issue Number: 1
Reference Number: 2 - 15299

Date: 17-Jan-22

Sample Number	WHL22-0011-S7	WHL22-0011-S8	
Identification	BH01 @ 9.00-9.45m	BH02 @ 10.50-10.79m	
Date Sampled	10-Jan-22	11-Jan-22	
Date Received	13-Dec-22	13-Dec-22	
Date Tested	17-Jan-22	17-Jan-22	
			TEST METHOD
pH	4.71	4.57	**AS1289.4.3.1**
E.C. (mS/cm)	0.26	0.41	**IN HOUSE**
Chloride (mg/kg)	147	209	**IN HOUSE**
Sulphate (mg/kg)	32	40	**IN HOUSE**

Signed: _____ for and on behalf of Soil Surveys Engineering P/L
Craig Ferguson-Hannah BSc - Laboratory Supervisor - Acid Sulphate Soils and Waters

1. Samples tested in 'as received' condition
2. Tests herein were performed according to Soil Surveys Engineering Quality Management System. This report shall not be reproduced, except in full.
3. Chloride and Sulphate assessed using Photometer
4. pH tested to AS1289.4.3.1
5. EC measured using TPS WP 81 Conductivity Meter

Form Number:REP-PHCS-01 V1

SOIL SURVEYS ENGINEERING PTY LIMITED
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Soil pH & EMERSON CLASS NUMBER REPORT

Client :	**Northwest Healthcare Properties REIT**			Report No:	WHL22-0011-S1-S4
Client Address :	**C/O 8/140 Millaroo Drive, Helensvale, QLD, 4212**			Report Date:	28/01/2022
Project Number :	**2-15299**			Issue Number:	1
Project :	**Proposed Development**			Page 1 of 1	
Location :	**Nexus Way, Southport**				
SAMPLE DETAILS:					
Sample ID:	WHL22-0011-S1	WHL22-0011-S2	WHL22-0011-S3	WHL22-0011-S4	
Date Sampled:	10/01/2022	11/01/2022	10/01/2022	10/01/2022	
Date Tested:	19/01/2022	19/01/2022	19/01/2022	19/01/2022	
Soil Description:	Silty Clay (CH) Trace of Gravel & Sand, Red Brown with Grey Mottle	Silty Clay (CH) With Sand & Gravel, Red Brown with Grey Mottle	Silty Clay (CH) Trace of Gravel & Sand, Red Brown with Grey Mottle	Silty Clay (CH) Red Brown with Grey Mottle	
Sampling Method:	As Supplied	As Supplied	As Supplied	As Supplied	
Sampled by:	SSE	SSE	SSE	SSE	
Sample Location:	**BH01**	**BH02**	**BH03**	**BH01**	
Depth (m):	**0.0-0.50**	**0.0-0.50**	**0.0-0.50**	**1.50-1.90**	
Source:	Borehole	Borehole	Borehole	Borehole	
Material:	Unknown	Unknown	Unknown	Unknown	
TEST RESULTS:					
Emerson Class Number (AS1289.3.8.1)					
Emerson Class Number:	**4**	**4**	**4**	**4**	
Type of water:	Distilled	Distilled	Distilled	Distilled	
Water Temperature (°C)	24	24	24	24	
Soil pH (AS1289.4.3.1)					
Soil pH:	7.1	6.3	6.4	3.6	
Conductivity(mS/cm):	1.39	0.51	0.49	1.20	

Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

APPROVED SIGNATORY
Mark Rutten

NATA Accred No:15301

END OF DOCUMENT FORM NUMBER **REP-ECN-02** V2 13/1/20

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SOIL SURVEYS

POINT LOAD INDEX TEST REPORT

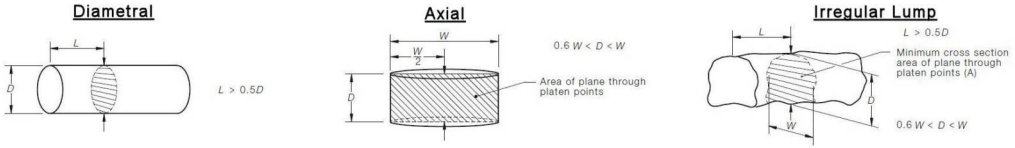
as per AS4133.4.1-2007

Project Number : 2-15299 **Project Name : Proposed Development**

Project Location : Nexus Way, Southport

Project Client : Northwest Healthcare Properties

Borehole	Depth	Rock Type	Weathering Grade	Moisture Condition	Test Method	Core Size (mm)	Date Drilled	Date Tested	Failure Type	Failure Load (kN)	Is (MPa)	Is50 (MPa)	AS1726 Classification	Operator
BH 03	11.70	ARENITE	XW-HW	Field	Diametral	52	10/01/2022	17/01/2022	Bedding plane	0.3	0.1	0.1	LOW	JD
BH 03	13.21	ARENITE	XW-HW	Field	Diametral	52	10/01/2022	17/01/2022	Bedding plane	0.2	0.07	0.08	VERY LOW	JD



APPENDIX D

SITE PLAN

CLIENT NORTHWEST HEALTHCARE PROPERTIES			TITLE PROPOSED DEVELOPMENT BOREHOLE LOCATION PLAN
LOCATION NEXUS WAY, SOUTHPORT			
SCALE NOT TO SCALE			SOIL SURVEYS SOIL SURVEYS ENGINEERING PTY LIMITED CONSULTING GEOTECHNICAL ENGINEERS
A4	DRAWING NO. 2-15299-01	DATE 10/01/2022	CHECKED KM