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Ref: 141106_JN14-00171-Harbord Public School_DA_Supporting_FE_Letter.docx

6 November 2014

Government Architect's Office
Level 19, McKell Building
2-24 Rawson Place
Haymarket NSW 2000

Attention: **Cathy Kubany**

Re: **Fire Engineering Letter in support of Development Application**
Project: **New Classroom and Library Building**
Address: **Harbord Public School, Freshwater**

This letter has been prepared by RED Fire Engineers for Government Architect's Office to support the Development Application of the proposed New Classroom and Library Building.

It is understood that the proposed library building will be part of the Harbord Public School located at Oliver St, Freshwater NSW 2096.

The building consists of 3 levels (Ground, First and Second Floors) and therefore it has a rise in storey of 3 and would required to be of Type A construction.

A preliminary fire engineering review of the proposed design has been undertaken by RED Fire Engineers based on the Building Code of Australia 2014 Report for DA Submission (Ref:14-203643, dated 6th November 2014) prepared by Philip Chun & Associates Pty Ltd.

Based on the above BCA report, the proposed development is anticipated to have the BCA Deemed-to-Satisfy (DtS) departures listed in the table below, which would require to be addressed as Alternative Solutions:

BCA DtS Clause	BCA DtS Departure	Relevant Performance Requirements
C2.6	To permit the area near the non-required stair interconnecting 3 levels and various areas in throughout the building not to have the required spandrel separation as per the requirement in BCA Clause C2.6.	CP2 & CP8
D1.4	To permit the special programs office within the library on the second floor to have a travel distance of up to 21.5m to a point of choice in lieu of 20m, if required.	DP4 & EP2.2
D1.12	To permit the non-required stair to interconnect 3 storeys despite a sprinkler system is not provided in the building.	CP2, DP5 & EP2.2

The intent of the fire engineering review is to determine whether RED Fire Engineers believe it is feasible to undertake a fire engineering assessment to develop Alternative Solutions for the above DtS departures.

As part of the fire engineering process, relevant stakeholders will be approached for comments and calculations/assessments will be carried out before the Fire Engineering Report (FER). However, based on our experience, RED Fire Engineers is of the opinion that the above DtS departures can be addressed as Alternative Solutions to demonstrate compliance with the relevant Performance Requirements of the BCA without major changes to the proposed design.

Specific details of the Required Fire Safety Measures for the above DtS departures will be listed after a comprehensive fire engineering assessment is completed. The Alternative Solutions will be developed as part of the on-going design and development process.

If you have any queries in regard to the above, please do not hesitate to contact the undersigned.

Yours sincerely,

Prepared by:

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ARBORICULTURAL ASSESSMENT REPORT

OF

HARBORD PUBLIC SCHOOL

WYADRA AVENUE
HARBORD NSW

PREPARED FOR

DEPARTMENT OF EDUCATION AND COMMUNITY

BY

NSW PUBLIC WORKS
A division of the Department of Finance and Services

LANDSCAPE URBAN ENVIRONMENT DESIGN

NOVEMBER 2014

TABLE OF CONTENTS

HARBORD PUBLIC SCHOOL

ARBORICULTURAL ASSESSMENT REPORT

1. INTRODUCTION

Harbord Public School (the site) is addressed at Wyandra Avenue, Harbord, NSW.

The Department of Finance and Services, Programs Group for the Department of Education and Training requested this arborist report, to comment on the impacts of the existing subject trees for the proposed construction of new buildings, paving, steps and covered ways, provided with associated works including drainage, seating and landscaping.

This report will:

- Assess and comment on the current health and condition of the trees and identify any structural deficiencies of the trees inspected;
- Assess the trees significance and environmental qualities;
- Comment on the impacts from the proposed works;
- Recommend measures for the retention, protection, remediation or removal of the subject trees.

The study area is located within Warringah Local Government Area (LGA) jurisdiction where Councils' Tree Preservation Order applies.

Each tree has been provided with an identification number for reference purposes located on Tree Survey Plan TS01 (Appendix C) and some Site Images (Appendix B).

2. METHODOLOGY

A Visual Tree Assessment[1] (VTA) was carried out at ground level on the subject trees on the 23rd October 2014.

The method of assessing the trees is adapted using the principles developed by "AS 4970 – Section 2 - Protection of trees on development sites" and undertaken using standard tree assessment criteria based on the values above and implemented as a result of one site inspection.

[1] Mattheck, C. Breloer, H.
The Body Language of Trees
A handbook for failure analysis, The Stationary Office, London, 1994

The tree survey plan was developed from the site survey carried out by "Surveying & Spatial Information Services 16.6.2014" showing crown spread and the tree height. Dimensions for the trunk diameter at breast height (DBH) measurement, is calculated at approximately 1.4m above ground level from the base of the tree.

No soil/tissue pathology or root mapping assessment, Resistograph® or aerial inspections of the subject trees were carried out during the time of the inspections.

The "Age Class" given for each tree is approximate and gives no indication of life expectancy.

The "Health" of the tree takes in consideration the trees vigour being its form/shape and structural integrity and condition classified into the following categories good, average and poor and is referred to in Glossary of Terms Appendix A.

The SULE rating refer Appendix E gives an indication of life expectancy of the trees in their present state. Changes to the surrounding environment from the proposed works will result in changes to the SULE rating which has been considered and reflected in the Action code.

Comments relating to the subject trees are summarised in item 4 below and on the attached Tree Survey Schedule (Appendix D), with corresponding tree numbers as indicated on the Tree Survey Plan TSP-01 (Appendix C).

Photographs were taken as an aid to provide visual support and information.

3. SITE OBSERVATIONS

3.1 General

The site is an existing school bounded by three roads, Oliver St (west), Wyadra Ave (south) and Corella St to the east. Residential properties are located on the northern boundary and south eastern corners of the site.

The subject area is currently occupied by brick building and demountables', linked by paths and paved surfaces. Left over green spaces are occupied by garden beds, some grass or individual trees in raised garden beds.

4. TREE ASSESSMENT

4.1 General

Twenty (20) subject trees/groups were inspected for the purpose of producing this report.

Of the twenty trees inspected Nineteen (19) are located within the proposed area of works consisting of cultivated Australian native and exotic species.

The remaining tree is located outside the proposed area of the development being a cultivated Australian native species.

Age class of trees ranged from young to mature, with heights ranging between 6 to 20 m.

The trees within the subject area have been planted, apart from trees 11 and 12 propagated by seed and sucker regrowth. The trees within the centre of the school #14 to #19 provide good shade within the space and should be retained.

There was no indication of any natural understorey/regrowth.

Generally the health – trees condition and vigour of the trees ranged from good to average-poor.

No trees within the development area was identified as having local heritage significance. It was noted fig trees in the car park and hoop pines along Wyadra Ave were identified as having some historic significance. These trees are outside the scope of works.

4.2 Impact of construction works and discussion

The construction will require regrading and level changes to the western half of the site, while the east/north eastern side of the site levels will be retained, including the rock shelves and for new planting.

The work will impact on trees numbered 1, 2, 3, 4, 5, 6, 9, 10 and 11 are recommended for removal as the whole tree or greater than 30% of the trees root zone will be significantly impacted on, taking into consideration the trees trees current health and SULE.

Overall, for the tree to function and survive, it is important to maintain the balance of the trees functions i.e. root system, crown (leaves), trunk (stem) by avoiding or minimising damage to these parts. Tree protection measures will need to be in place during the construction, to protect the trees and ground to be retained on site.

All other tree work and tree management is to be carried out as specified in Recommendations, Tree Protection and Management and Tree Survey Schedule – "Action Code".

All other tree work and tree management is to be carried out as specified in Recommendations, Tree Protection and Management.

5. RECOMMENDATIONS

- Remove trees 1, 2, 3, 4, 5, 6, 9, 10 and 11.
- Trees to be retained as shown on Tree Survey Schedule including other work eg. pruning etc as indicated in the "Action Code".

- Protective fencing will be required to protect all trees within the site and council street trees outside the construction area.

- Approval must be sought from the Local Council's (TPO) Tree Preservation Order regarding working (root or canopy pruning) of council street trees and removal of additional trees during construction not indicated in this report.
- The proposed landscape design is to provide new plants suitable for the altered environment, adding to the aesthetics to the school for the long term, which should be seen as beneficial and an asset to the school and community.
- All tree protection and management as set out in clause 6 below.

6. TREE PROTECTION AND MANAGEMENT

Standard
General: Comply with the recommendations of those parts of AS 4970 which are referenced in this section.

Trees to be retained
Extent: All trees NOT marked for removal.
Tree protection
Any work on council trees will require prior approval from Warringah Council in compliance with their 'Tree Preservation Order'.
Tree protection zone: To AS 4970 Section 3 for trees not marked with protection fencing.
Tree protective measures: To AS 4970 Section 4.
Extent: Tree enclosures for trees to be retained.
Prior to any construction or demolition, provide temporary tree protection fencing as instructed by the project/site arborist. Appropriate signage must be erected at the same time. Do not disturb areas within the canopy dripline.
Trunk protection: If space is not available for tree enclosures provide trunk protection comprising 2000 mm long planks of 100 mm x 50 hardwood stacked vertically around the trunk and secured with 10 gauge wire over hessian protective padding. Give notice to Principal's Authorised Person prior to carrying out works.
Work on trees: If it is proposed to perform work on trees to be retained, give notice and obtain instructions. All pruning is to be to AS 4373.
Removal: If a tree to be retained is damaged and repair work is considered impractical, or is attempted and fails, give notice and obtain instructions.

Work near trees
A work method statement is to be provided by the project/site arborist followed by written approval from the Authorised Person before proceeding with the following works;
Work under trees: Do not remove topsoil from, or add topsoil to, the area within the dripline of the trees.
Earthworks: Do not raise or lower soil levels within the nominated protection zone. If excavation or filling is required near trees to be retained, give notice

and obtain instructions. Obtain written approval before proceeding with the construction.
Excavation: Open up excavations under tree canopies for as short a period as possible.
Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged.
Services: Services must be routed around the Tree Protection Zone. Where such services are required submit details of the proposed changes to the Authorised Person and gain written approval before proceeding with the construction.
Drainage: Do not alter surface drainage within the Tree Protection Zone unless directed to do so in writing by the Authorised Person.
Roots: Do not cut tree roots exceeding 50 mm diameter unless directed to do so in writing by the Authorised Person.
Compacted ground: Do not compact the ground or use skid-steel vehicles under the tree dripline. If compaction occurs, give notice and obtain instructions.
Compaction protection: Protect areas adjacent the tree dripline. Submit proposals for an elevated platform to suit the proposed earthworks machinery.
Harmful materials: Keep the area within the dripline free of sheds and paths, construction material and debris. Do not place bulk materials and harmful materials under or near trees. Do not place spoil from excavations against tree trunks. Prevent wind-blown materials such as cement from harming trees and plants. Manage excess slurry from concrete pours and the like such that waste is kept clear of driplines of all trees to be retained.
Damage: Prevent damage to tree bark. Do not attach stays and guys to trees.

Qualifications and requirements for personnel
Arborist:
Engage a qualified project\site arborist to carry out the remedial tree works recommended in the Tree Protection and Management Plan.
The Contractor's Arborist must carry out the recommended tree works within a reasonable time frame.
Management Plans:
A tree management plan is required on trees to be impacted on.
Photographic Record: Take photographs of the site and trees to be retained prior to commencement of any tree work or building construction works, to provide a record of their health and condition prior to the commencement of site clearing, demolition and construction work.
Retention of records: Keep a copy of the Tree Management Plan and the photographic record on Site for reference and implementation of recommended remedial works.

Tree Work
Tree work must be carried out, coordinated and supervised by a qualified Arborist.
The Contractor's Arborist must be suitably qualified and employ qualified Arboricultural personnel consistent with the requirements of the Australian Standard AS 4373 and as follows:
Arborist; AQF Level 5 qualifications or equivalent, including five (5) years postgraduate arborist and/ or landscape management experience with relevant demonstrated experience in tree protection and management.

Tree workers; Australian Qualifications Framework (AQF) Certificate Level 2 (Tree Worker) for tree removal work, AQF Certificate Level 3 (Trade Level) for large pruning works.
Tree workers working on the ground; WorkCover NSW recommended minimum qualification in Horticulture (Arboriculture),
Tree workers climbing; WorkCover NSW recommended minimum qualification of Certificate Level 3 in Horticulture (Arboriculture).

The Contractor's Arborist must:

- meet the requirements of the current Occupational Health and Safety Legislation comply with the WorkCover NSW Code of Practice for the Amenity Tree Industry 2007;
- provide proof of insurances, including Workers Compensation and Public Liability.
- have knowledge of Council's Tree Management Order and the National Standard for Pruning of Amenity Trees AS 4373.

Felling Trees
Trees to be removed from the site must be felled only by a qualified Arborist. Trees must be cut to near ground level, grubbed out and backfilled with soil.

Trees to be retained must not be removed from within Tree Protection Zones.

Cut trees to be removed in such a way that trees in Tree and Vegetation Protection Zones are not damaged.
Trees to be removed that have branches extending into the canopy of adjoining trees to remain must be removed by a qualified Arborist and not by Demolition or Construction Contractors. The Arborist must remove the tree in a manner that causes no damage to the other trees and with minimal damage to any understorey vegetation.
Trees to be removed must be felled so as to fall away from the Tree Protection Zones and stump removed to avoid pulling and breaking of tree roots that may be attached to adjoining trees. If the roots are grafted or entwined, the Arborist may specify severing the major woody root mass before extracting the trees. This must be accomplished by cutting through the roots by hand or other approved root pruning equipment.

7. CONCLUSIONS

The trees to be affected by the proposed development were not identified as remnant plants of the local surrounding vegetation. The plant species within the subject area were Australian native and exotic species.

It is important to protect the remaining existing trees during the construction phases of the project without impacting on the trees long-term health.

The proposed landscape design will provide new trees suitable for the altered environment, providing shade and aesthetics to the school for the long term, which should be seen as beneficial and an asset to the school and community.

DISCLAIMER

This assessment has been prepared for the exclusive use of the client and Department of Services, Technology and Administration.

This assessment was carried out from the ground and covers what was reasonably able to be assessed and available to the assessors at the time of the inspections. No aerial or subterranean inspections were carried out.

The opinions, advice or recommendations expressed or given in the report, are based on the analysis carried out and other reports obtained by Department of Services, Technology and Administration and referred to in the assessment. The client should rely on the assessment and on its contents, only to that extent.

This report is to be utilised in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

All care has been undertaken to obtain information from reliable sources. All data has been verified where possible, however Department of Services, Technology and Administration can neither guarantee nor be responsible for the accuracy of the information provided by others.

Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspections, furthermore the inspection was limited to a visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.

Anthony Popovich
Hort. Cert., Post. Cert. Landscape Design,
Consulting Arborist – AQF Level 5
Landscape Technical Specialist
Landscape Design Group

Appendix A

Glossary

Age Classes:

(Y) = **Young** refers to a well established but juvenile to young tree.

(S) = **Semi mature** refers to a tree at growth stages between immaturity and full size.

(M) = **Mature** refers to a full sized tree with some capacity for further growth.

(O) = **Over mature** refers to a tree about to enter decline or already declining.

Good (G): Tree is generally healthy and vigorous; free from the adverse effects of predation by pests, diseases, instability, structural weakness, or fungal, bacterial or insect attack. The tree is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly.

Average (A): Tree is generally vigorous but has some indication of decline due to the early effects of predation by pests, diseases or fungal, bacterial or insect infestation. Furthermore, a tree may have suffered physical injury or modification to its environment leading to instability or structural weakness. A tree that may recover with remedial works or, without direct intervention, may regain some vigour and stabilise over time in response to the implementation of beneficial changes to its local environment.

Poor (P): Tree exhibits symptoms of advanced and irreversible decline such as fungal or bacterial infestation, major dieback of branches and foliage crown, structural deterioration from termite infestation, storm damage, lightning strike, or ring barking from borer activity in the trunk. Root damage may cause instability of the tree. Damage from physical wounding impacts, abrasions or from effects of an altered local environmental conditions may lead to continual tree decline regardless of remedial works or other modifications to the local environment. Deterioration is often characterised by a gradual and continuos reduction in vigour, and a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot sustain itself.

Vigour: Ability of a tree to sustain its life processes. This is independent of the condition of a tree but mat impact upon it.

Condition: The tree's root crown form and growth habit, as modified by its environment, stability and viability of the root plate, trunk and structural branches, including structural defects such as wounds, cavities, weak trunk/branch unions and effects from the predation of pests and diseases.

Dead, dying, dangerous (D): Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

Aerial Inspection: Refers to climbing a tree to get more accurate information.

Crown: Refers to the position of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Stem: Refers to an organ which supports branches, leaves, flowers and fruits.

Native: A plant naturally found to occur growing in Australia.

Exotic: A plant introduced from another country.

Decline - Progressive decrease in health of organs or the entire plant usually caused by a series of interacting factors.

Photosynthesis - The transformation in the presence of chlorophyll and light, of carbon dioxide from (the air) and water (primarily from soil) into a simple carbohydrate and oxygen.

Root Mapping Assessment: Refers to the hand excavation of soil within the root zones of a tree to ascertain radial root spread, depth and health.

Mycorrhizal Fungi: Refers to species of fungi that co-exist with the root system of a tree to form a symbiotic relationship and enhance the tree's ability to uptake nutrients.

Resistograph® Drill: Refers to a specialised arboriculture tool used for drilling a tree to ascertain structural integrity.

AS4373: Refers to the Australian Standard for the Pruning of Amenity Trees (1996). The standard provides technical specifications to ensure safety and on-going tree health.

Dead wooding – The removal of dead branches from a tree's crown, usually of a specified size (in diameter).

Dieback – The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively.

Decay - refers to the break down tissues within the tree. There are numerous types of decay that affect different types of tissues, spread at different rates & have different affect on both the tree's health & structural integrity.

Co-dominant stems/trunk – Are forked branches or trunks of nearly the same size in diameter and lacking a normal branch union.

Compacted soils – Soils in which the air space (oxygen space) has been reduced or eliminated, reducing water infiltration and percolation, reducing root presence and inhibiting new root development.

Crown Raising – The removal of the lowest branches of a tree canopy to allow clearance and increase height between the ground and the tree's lowest branches.

Defoliation – The loosing of plants foliage

Heartwood – Inner non functioning tissues that provide structural support to trunk.

Primary Roots – Roots of a tree that provides structural support and anchorage to a tree, also aiding in storage of essential starches and sugars used in tree growth.

Fine Roots – Lower order of non-woody roots usually less than 1-2mm long 0.2-1mm or less in diameter. Fine fibrous water and nutrient absorbing roots located in the outer root system.

Root Crown – The area where the trunk turns into the roots, usually at soil level, the trunk tapers out at the base.

Epicormic growth/shoots - refers to growth/shoots that are/have sprouted from axillary buds within the bark. Epicormic growth/shoots are a survival mechanism that often indicates the presence of a current or past stress even such as fire, pruning, drought etc.

AUSTRALIAN STANDARDS – '*Pruning of Amenity Trees*' - a guide to explain the Australian Standards of how trees are to be pruned correctly.

Crown Class

Is the differing crown habits as influenced by the external variables within the surrounding environment? They are:

D – Dominant Crown is receiving uninterrupted light from above and sides, also known as emergent.

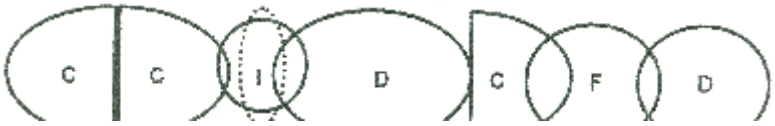
C – Codominant Crown is receiving light from above and one side of the crown.

I – Intermediate Crown is receiving light from above but not the sides of the crown.

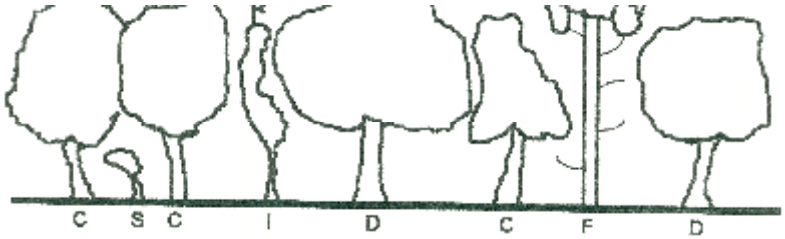
S – Suppressed Crown has been shadowed by the surrounding elements and receives no light from above or sides.

F – Forest Characterised by an erect, straight stem (usually excurrent) with little stem taper and virtually no branching over the majority of the stem except for the top of the tree which has a small concentrated branch structure making up the crown.

Top View



Side View



D C, I & S and side view, after (Matheny, N. & Clark, J. R. 1998, Trees Development, Published by International Society of Arboriculture, P.O. Box 3129, Champaign IL 61826-3129 USA, p.20, adapted from the Hazard Tree Assessment Program, Recreation and Park Department, City of San Francisco, California).

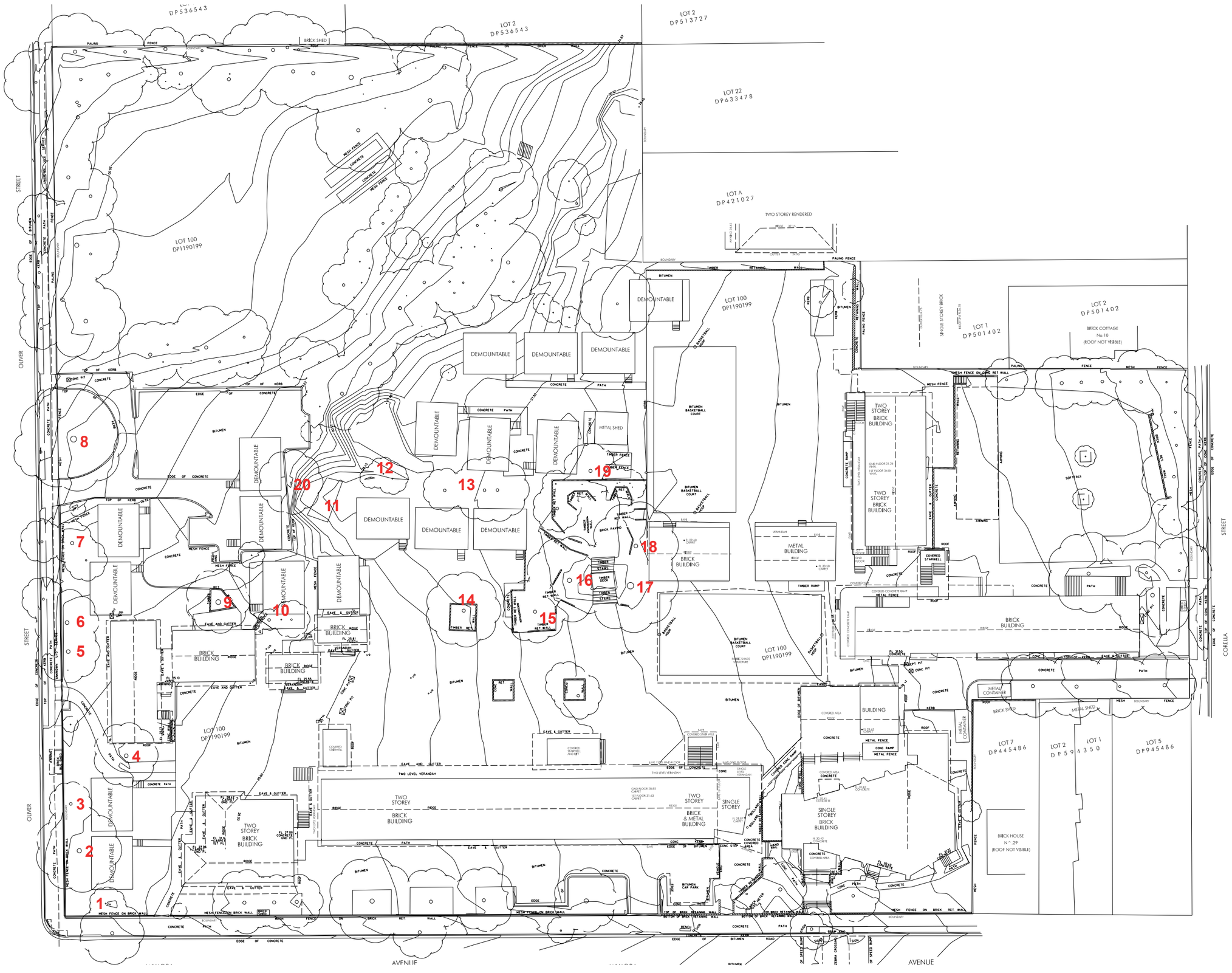
Appendix B

SITE IMAGES

Image 1: Shows canopy form of trees numbered #5 and 6, overhanging the council footpath along Oliver Street, looking north west.

Appendix C

TREE SURVEY PLAN TSP-01



1 The Government Architect's Office, a division of the Department of Finance & Services (the Department) shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program to any other format or medium, or arising out of any modification or changes that occur in the handling or use of the electronic document, data or program.

2 The recipient or user of any electronic document, data or program is solely responsible for ascertaining its accuracy and its suitability for their purposes.

3 The Department uses virus scanning software to prevent file and system virus attacks but gives no warranty. The recipient or user is solely responsible for their own virus protection.

LEGEND

-	20.11.14	DA SUBMISSION
ISS	DATE	COMMENT

SIGNED

STRUCTURAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8230 F 9372 8399	ARCHITECTURAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8411 F 9372 8399
ELECTRICAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8253 F 9372 8133	LANDSCAPE GOVERNMENT ARCHITECT'S OFFICE T 9372 8428 F 9372 8444
MECHANICAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8253 F 9372 8133	QUANTITY SURVEYOR GOVERNMENT ARCHITECT'S OFFICE T 9372 8311 F 9372 8444
HYDRAULIC GOVERNMENT ARCHITECT'S OFFICE T 9372 8202 F 9372 8133	PROJECT MANAGEMENT PROJECT MANAGEMENT GROUP T 9372 8555 F 9372 8566

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LAURIE GLANFIELD
Director General

NSW GOVERNMENT Education & Communities

HARBORD PS
OLIVER ST FRESHWATER
TREE SURVEY PLAN

PLAN RM NO	CONTRACT NUMBER
SCALES 1:750@A3	SHEET NO TSP 01
DESIGNED	PLOT DATE 20/11/2014
DRAFTED GM	VERIFIED TP
	ISSUE -

B1 USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING — CHECK ALL DIMENSIONS ON SITE — 200MM — 300MM ON ORIGINAL

Appendix D

TREE SURVEY SCHEDULE

TREE SURVEY SCHEDULE

Job Name: Harbord Public School **Date: 23rd October 2014**

Plant No.	*Genus Species* and (Common Name)	Age Class	Health	Description	Development Implications	Significance	SULE Action code
1	*Cinnamomum camphora*	Y	A	Tree located in grassed area. Original tree appears to have been removed with 2 new suckers emerging from below ground.	Yes. Construction of new grass/seating area with level changes	No. Regrowth	Removal
2	*Eucalyptus botryoides*	M	A-P	Tree located in grassed area with little trunk tapper due to increased soil levels. Canopy form is poor previously cut to remove storm damaged branches and also preventative pruning by means of crown reduction (lopping) to the height of the tree. This has resulted in exposing large wounds open to decay in the future, which may result in cavity formation, structural problems and decline of tree. Some wounds are not clearly visible. The main leader has been removed, with new leader formed from epicormic growth, which will develop around the wound become weaker and vulnerable to high winds. Old wounds scar x 2 south side sealing. Stubs and large secondary branch north side previously ripped or poorly pruned producing epicormic growth. The foliage is health with high volume of epicormic growth.	Yes. Construction of new grass/seating area with level changes	No. C	Short Removal
3	*Ficus obliqua or Ficus rubiginosa*	M	A-P	Tree located in grassed area with little trunk tapper due to increased soil levels. Tree stressed and in decline indicated by droopy foliage, epicormic growth, dieback in upper crown. Canopy form is poor /stunted with main leader over hanging road/ council path previously cut back and old stubs. Power lines above crown.	Yes. Construction of new grass/seating area with level changes	No. C	Short Removal

Codes:

Age Class:	Y = Young	S = Semi-Mature	M = Mature	O = Over Mature
Plant Condition Class:	G = Good	A = Average	P = Poor	D = Dead, Dying, Dangerous
Significance:	H = Heritage	C = Cultivated	I = Indigenous (local)	E = Endangered

Action Code:

1 = Engage qualified arborist	7 =Crown reshape/renew	13 = Treat insect problem
2 = Engage qualified horticulturists	8 = Selective pruning required	14 = Remove mistletoe
3 = Further assessment	9 = None	15= Check for habitat
4 = Carry out further recommendations	10 = Cut down & retain stump	16 = Impact zone (construction)
5 = Investigate cavity/decay and structural integrity	11 = Cut down & Grub out roots	17 = Stump grind and remove sawdust. Backfill hole.
6 = Remove deadwood, stubs & damaged wood	12 = Aerate root zone	

TREE SURVEY SCHEDULE

Job Name: Harbord Public School **Date: 23rd October 2014**

Plant No.	*Genus Species* and (Common Name)	Age Class	Health	Description	Development Implications	Significance	SULE Action code
4	*Pinus radiata*	M	A-P	Tree located in garden bed, 0.5m from new concrete path and 2m north of existing building. Canopy asymmetrical (6m overhang to the east) due to removal of secondary branches on the west side and sealing. Lower branches east side removed. Tree showing signs of stress. Expected damage to root zone from new concrete paving.	Yes. Construction of new building and grass area with level changes	No. C	Short Removal
5	*Pinus radiata*	M	A-P	Tree located in grassed area with little trunk tapper due to increased soil levels, 1m off western boundary fence. Co dominant canopy, asymmetrical with moderate lean to the south/west, with top of crown correcting back to the north. Dead wood and stubs with large branch overhanging council footpath. Depression in turf on north side exposed secondary root >50mm which has been cut.	Yes. Construction of new grass area/new tree planting with level changes	No. C	Short Removal
6	*Pinus radiata*	M	A-P	Tree located in grassed area with little trunk tapper due to increased soil levels, 1m off western boundary fence. Co dominant canopy, asymmetrical with cross over branch, dead wood and stubs. Tree stressed indicated by dieback in foliage, browning/yellowing of leaves and smaller sized leaves to upper crown. 3m AGL on branch wound north eastern side, possible development of fungal fruiting body. To be monitored.	Yes. Construction of new grass area/new tree planting with level changes	No. C	Short Removal
7	*Araucaria heterophylla*	SM	G	Tree located in grassed area.	Yes. Construction of new grass area/new tree planting with minor level changes	No. C	Long Retain Protect from construction

Codes:

Age Class:	Y = Young	S = Semi-Mature	M = Mature	O = Over Mature
Plant Condition Class:	G = Good	A = Average	P = Poor	D = Dead, Dying, Dangerous
Significance:	H = Heritage	C = Cultivated	I = Indigenous (local)	E = Endangered

Action Code:

1 = Engage qualified arborist	7 =Crown reshape/renew	13 = Treat insect problem
2 = Engage qualified horticulturists	8 = Selective pruning required	14 = Remove mistletoe
3 = Further assessment	9 = None	15= Check for habitat
4 = Carry out further recommendations	10 = Cut down & retain stump	16 = Impact zone (construction)
5 = Investigate cavity/decay and structural integrity	11 = Cut down & Grub out roots	17 = Stump grind and remove sawdust. Backfill hole.
6 = Remove deadwood, stubs & damaged wood	12 = Aerate root zone	

TREE SURVEY SCHEDULE

Job Name: Harbord Public School **Date: 23rd October 2014**

Plant No.	*Genus Species* and (Common Name)	Age Class	Health	Description	Development Implications	Significance	SULE Action code
8	*Eucalyptus microcorys*	M	A	A grand specimen tree located in garden bed. Tree showing signs of stress in upper crown indicative by thinning of foliage and dieback, with some dead wood. Likely due to root damage from construction of loop road.	No	No. C	Medium Retain Protect from construction
9	*Lophostemon confertus*	M	G	Tree located in raised sleeper garden bed, paving surround.	Yes. Construction of new building	No. C	Long Removal
10	*Casuarina glauca* x 3	Y	G	Tree located in garden bed with demountable 1m to the north and paving to the south. Forming co dominant canopy. Tree roots visible under sleeper edge and lifting concrete.	Yes. Construction of new building	No. C	Long Removal
11	*Casuarina glauca* (clump)	Y	G	Regrowth/suckers emerging from rock face.	Yes. Construction of accessible ramp	No. C	Long Removal
12	Appears to be *Ficus macrophylla*	Y	A	Appears to have grown by natural seed germination. Growing in bare soil near rock shelf.	Yes Landscaping	No. C	Long Retain Maintain as a mulched area. Protect from construction
13	*Casuarina glauca* x 3	SM	A	Trees growing in bare soil, self- mulched surface. Roots visible at minimum 4m radius.	Yes Landscaping	No. C	Long Retain Maintain as a mulched area. Protect from construction

Codes:

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TREE SURVEY SCHEDULE

Job Name: Harbord Public School **Date: 23rd October 2014**

Plant No.	*Genus Species* and (Common Name)	Age Class	Health	Description	Development Implications	Significance	SULE Action code
14	*Lophostemon confertus*	M	G	Tree located in raised sleeper garden bed, paving surround. Tree in bare soil. Tree stunted form.	Yes Landscaping	No. C	Medium Retain Maintain as a mulched area. Protect from construction
15	*Lophostemon confertus*	M	G	Tree located in raised sleeper/rock garden bed, paving surround. Tree area mulched. Co dominant stem at 2m AGL. Surface roots visible in bed.	Yes Landscaping	No. C	Medium Retain Maintain as a mulched area. Protect from construction
16	*Allocasuarina littoralis*	M	A	Tree located in raised sleeper/rock garden bed, paving surround. Tree multi stemmed in mulched area. Surface roots visible and extending to lower tier. Dead wood within canopy especially east side.	Yes Landscaping	No. C	Medium Retain 1,6 Maintain as a mulched area. Protect from construction
17	*Cinnamomum camphora*	M	A	Tree located in raised rock garden bed, paving/step surround. Tree multi stemmed and overhanging class room to the east. Surface roots visible within inner rock ring. Tree appears to have been under stress with high volume (>50%) of epicormic growth forming tree canopy. Leaves are well formed. Some old stubs with dead wood, particularly north side of canopy. Monitor health of tree.	Yes Landscaping	No. C	Medium Retain 1,6 Maintain as a mulched area and monitor tree health. Protect from construction

Codes:

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Plant Condition Class:	G = Good	A = Average	P = Poor	D = Dead, Dying, Dangerous
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Action Code:

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TREE SURVEY SCHEDULE

Job Name: Harbord Public School **Date: 23rd October 2014**

Plant No.	*Genus Species* and (Common Name)	Age Class	Health	Description	Development Implications	Significance	SULE Action code
18	*Jacaranda mimosifolia*	M	A	Tree located in garden bed, paving surround. Tree asymmetrical and overhangs to the west due to class room to the east. Multi stemmed at ground level.	Yes Landscaping	No. C	Medium Retain Maintain as a mulched area and monitor tree health. Protect from construction
19	*Lophostemon confertus*	M	A	Trees growing in bare soil, near compost bin to the east and 3m from demountable to the west. Roots visible and heading beneath demountable.	Yes Landscaping	No. C	Medium Retain Maintain surface level. Protect from construction
20	*Eucalyptus saligna*	Y	A	Appears to have grown by natural seed germination. Growing in soil near base of rock shelf.	Yes Landscaping/ accessible ramp	No. C	Long Retain Protect from construction

Codes:

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Appendix E

SAFE USEFUL LIFE EXPECTANCY

S.U.L.E. (after Barrell 1996, updated 01/04/01)

	1. Long	2. Medium	3. Short	4. Removal	5. Small, young or regularly pruned
	Trees appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees appeared to be retainable at the time of assessment for 15 –40 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees appeared to be retainable at the time of assessment for 5-15 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees which should be removed within the next 5 years.	Trees that can be moved or replaced
A	Structurally sound trees located in positions that can accommodate future growth.	Trees which may only live from 15 and 40 years.	Trees which may only live between 5 and 15 years.	Dead, dying suppressed or declining trees.	Small trees less than 5m in height.
B	Trees that could be made suitable for retention in the long term by remedial tree care.	Trees which may live for more than 40 years but would be removed for safety or nuisance reasons.	Trees which may live for more than 15 years but would be removed for safety or nuisance reasons.	Dangerous trees through instability or recent loss of adjacent trees.	Young trees less than 15 years old but over 3m in height.
C	Trees of special significance which would warrant extraordinary efforts to secure their long term retention.	Trees which may live for more tan 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees which may live more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form	Formal hedges and trees intended for regular pruning to artificially control growth
D		Trees which could be made suitable for retention in the medium term by remedial care.	Trees which require substantial remediation and are only suitable for retention in short term	Damaged trees that are clearly not safe to retain.	
E				Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.	
F				Trees which are damaging or may cause damage to existing structures within 5 years.	
G				Trees that will become dangerous after removal of other trees for reasons given in A) to F)	
H				Trees in categories (A) to (G) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.	

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Harbord Public School – New Classroom and Library Building

Oliver Street, Freshwater NSW 2096

Building Code of Australia 2014 Report for DA Submission

Report prepared for:	**NSW Public Works** **Government Architect's Office** McKell Building Level 19, 2-24 Rawson Place Sydney NSW 2000 Attention: Cathy Kubany
Report prepared by:	Philip Chun Building Code Consulting Suite 404, 44 Hampden Road Artarmon NSW 2064 Contact: Mark Maxwell
Report Ref:	14-203643_HarbordPublicSchool_OliveStFreshwater_BCACapStatR01_061114
Job Number:	14-203643
Date:	6 November 2014

CONTENTS

DOCUMENT ACCEPTANCE

	Name	Signed	Date
Prepared by	Mark Maxwell		06/11/14

REVISION HISTORY

Revision No.	Prepared by	Description	Date
R01	Mark Maxwell	Building Code of Australia 2014 Report for DA Submission	06/11/14

1.0 Introduction and Documentation

This report contains a design philosophy review concerning the capability of the design to meet Building Code of Australia 2014 (BCA) requirements. We have reviewed the submitted architectural documentation (provided to date) for compliance with the deemed-to-satisfy provisions of the BCA 2014. Where compliance with the deemed to satisfy provisions is not possible, a schedule of alternate solutions will be required.

We have made every attempt to cover the main issues under Parts B, C, D, E, F, G, H, I and J of the Building Code of Australia. Areas of the design are still being refined so that resolution will be possible prior to the issue of a S109R Design Certificate for the works.

This report is for the exclusive use of the client and cannot be used for any other purpose without prior permission from Philip Chun & Associates Pty Ltd. The report is valid only in its entire form. "Philip Chun and Associates accepts no responsibility for any loss suffered as a result of any reliance upon such assessment or report other than as being accurate at the date the property was inspected for the purposes of the assessment or report."

The Site and Contexts

The school is located on the corner of Oliver Street and Wyadra Ave, Freshwater NSW 2096.

Figure 1 - Site Location

Documentation available and assessed
The Development Application scheme assessed comprises of the following design drawings as per the attached drawing schedule as issued the NSW Public Works - Government Architect's Office

Drawing No.	Titled	Dated
-	Ground Floor Plan	-
-	First Floor Plan	-
-	Second Floor Plan	-
-	Elevation - East	-
-	Elevation - North	-
-	Elevation - South	-
-	Sections	-

2.0 Use and Class of Building

According to the Building Code of Australia the following definitions assist in the classification of the buildings and their various parts.

Def - A3.1 Principles of classification
The classification of a building or part of a building is determined by the purpose for which it is designed, constructed or adapted to be used.

Def - A3.2 Classifications

The different parts of the building are classified as follows as they relate to the complex:

Class 9b:
An assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another Class.

Class and use of the various levels of the building are as follows:-

Level	Proposed Use	BCA Class
Ground Floor Plan	Classrooms, common learning space, sanitary facilities	Class 9b
First Floor Plan	Classrooms, common learning space, library, staff offices, storerooms, sanitary facilities	Class 9b
Second Floor Plan	Classrooms, common learning space, library, sanitary facilities	Class 9b

The building's will be documented so that it will comply with the requirements of Type A Construction. The required fire ratings are specified in the following report.

Rise in Storey
The rise in storey of the building is 3, according to BCA C1.2, and as stated above Type A Construction is therefore required. The effective height of the building is less than 25m.

3.0 Construction and fire resistance ratings

3.1 Structure

Structural Provisions
- All new works are to comply with BCA – structural engineer to provide plans and design certification prior to issue of a S109R Design Certificate.

Fire resistance and Stability
- All new works to be in accordance with the requirements of Table 3 of Specification C1.1 for Type A Construction. Where compliance with Class 9b requirements is not met, a fire engineered alternate solution is required to justify the deviation from the DtS provisions of the BCA.
- In accordance with BCA Spec C1.1 Clause 3.5, the roof need not be provided with an FRL as the building has a rise in storeys or 3 or less - structural engineer to note.
- Note: For a building with an effective height of not more than 25m and having a roof without an FRL in accordance with Clause 3.5, in the storey immediately below that roof, internal columns other than those

referred to in Clause 3.1(f) and internal walls other than fire walls and shaft walls may have - with rise in storeys not exceeding 3 requires no FRL – structural engineer to note.

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

Building element	Class of building — FRL: (in minutes)			
	Structural adequacy/Integrity/Insulation			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any *fire-source feature* to which it is exposed is—				
For *loadbearing* parts—				
less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120	240/240/180
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90	240/180/ 90
For non-*loadbearing* parts—				
less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 60	–/ 90/ 90	–/180/120	–/240/180
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an *external wall*—				
For *loadbearing* columns—				
	90/–/–	120/–/–	180/–/–	240/–/–
For non-*loadbearing* columns—				
	–/–/–	–/–/–	–/–/–	–/–/–
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	120/120/120	180/180/180	240/240/240
INTERNAL WALLS—				
Fire-resisting lift and stair *shafts*—				
Loadbearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding *public corridors*, public lobbies and the like—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding *sole-occupancy units*—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Ventilating, pipe, garbage, and like *shafts* not used for the discharge of hot products of combustion—				
Loadbearing	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/ 90/ 90	–/120/120	–/120/120
OTHER LOADBEARING INTERNAL WALLS, INTERNAL BEAMS, TRUSSES				
and COLUMNS—	90/–/–	120/–/–	180/–/–	240/–/–
FLOORS	90/ 90/ 90	120/120/120	180/180/180	240/240/240
ROOFS	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30	240/ 90/ 60

BCA 2014 Specification C1.1 – Clause 3 - Table 3

- Fire hazard properties of all new floor linings, wall linings & finishes i.e. carpet, vinyl, timber etc must comply with Specification C1.10 – details required with the S109R Design Certificate or alternatively prior to issue of an Occupation Certificate.

Compartmentation and separation

- Class 9b – 8,000m² - The proposed building is one fire compartment being approx. 3,643m² - complies

- Any new plant rooms, running essential equipment, are to be fire separated in 2-hour construction as required by C2.12, likewise any main switchboard located within the building which sustains emergency equipment operating in emergency mode must be separated by construction having an FRL of not less than 120/120/120. Architect and service consultants to note. Details to be provided with an application for S109R Design Certificate.

Vertical separation of openings in external walls (Spandrels)

- Spandrel separation under C2.6 is required as the building is not proposed to be sprinkler protected; details of all proposed spandrels are required for compliance i.e. not less than 900mm in height, extends not less than 600 mm above the upper surface of the intervening floor and is of non-combustible material having an FRL of not less than 60/60/60.
  From the drawings assessed it appears that the required spandrel separation is not provided

throughout the building – further details required prior to issue of S109R Design Certificate; certain non-compliances / alternate spandrel details may be addressed via RED Fire Engineers as part of the fire engineering alternate solution prior to issue of S109R Design Certificate.
Note if the window/spandrel is to be amended this change should occur now for DA submission to ensure a further S96 is not required.

4.0 Access and Egress

4.1 Provision for escape - Basic Principles

Number of Exits:

- The proposed building is provided with 2 fire rated stairs connecting all 3 floors, the library is provided with an exit to the Eastern façade via double swinging doors, and the ground floor is provided with several entrances/exits – complies.

Dimensions of exits and paths of travel to exits:

- In accordance with BCA Clause D1.6, if the storey or mezzanine accommodates more than 200 persons, the aggregate unobstructed width, except for doorways, must be increased to—
  - (i) 2 m plus 500 mm for every 60 persons (or part) in excess of 200 persons if egress involves a change in floor level by a stairway or ramp with a gradient steeper than 1 in 12; or
  - (ii) in any other case, 2 m plus 500 mm for every 75 persons (or part) in excess of 200

The proposed exit widths are as follows:

Level	Exit Widths Provided
Ground Floor Plan	Approx 5.6m of exit width is provided = max 725 persons (D1.6(d)(ii))
First Floor Plan	Approx 5.6m of exit width is provided = max 620 persons (D1.6(d)(i))
Second Floor	Approx 3m of exit width is provided = max 320 persons (D1.6(d)(i))

The currently proposed exit widths will adequately cater for the maximum allowable population under BCA Clause D1.13.

Number of Persons Accommodated:

- The proposed building will have a population in accordance with D1.13 as per the following table:

Level	Population
Ground Floor Plan	**Classrooms** (2m²/person): 383m² / 2m² per person = **191 persons**
First Floor Plan	**Classrooms** (2m²/person): 377m² / 2m² per person = 188 persons **Library Area**: • Library: 204m² / 2m² per person (Reading Space as per D1.13) = 102 persons • Staff Room (Teacher Collaboration Space): 28.15m² / 10m² per person = 2 persons • Office (Office/Workroom): 25m² / 10m² per person = 2 persons **Total: 294 persons**
Second Floor	**Classrooms** (2m²/person): 377m² / 2m² per person = 188 persons **Library Area**: • Library: 132m² / 2m² per person (Reading Space as per D1.13) = 66 persons • Office (Special Programs): 66m² / 10m² per person = 6 persons **Total: 260 persons**
TOTAL	**745 persons**

Fire Isolated Exits:

- The proposed building is provided with 2 fire rated stairs connecting all 3 floors – complies
- The fire isolated stairs are to discharge externally at the ground floor – further details required prior to issue of CC

Exit travel Distances:

- No point on a floor must be more than 20m from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40m – ***The special programs office within the library on the second floor has approx. 21.5m to a point of choice in lieu of 20m in accordance with D1.4; amend design to comply or include as part of the Fire Engineered Alternate Solution.***

- Alternate exits must not be less than 9m apart - complies.
- Alternate exits must not be more than 60m apart - complies.
- Located so that alternative paths of travel do not converge such that they become less than 6m apart - complies.

Travel by non-fire-isolated stairways and ramps:

- In accordance with BCA Clause D1.9, in a Class 5, 6, 7, 8 or 9 building, the distance from any point on a floor to a point of egress to a road or open space by way of a required non-fire-isolated stairway or non-fire-isolated ramp must not exceed 80m – the required non-fire isolated stair within the library area complies.
- In a Class 9b building, a required non-fire-isolated stairway or non-fire-isolated ramp must discharge at a point not more than 20 m from a doorway providing egress to a road or open space or from a fire-isolated passageway leading to a road or open space – complies.

Non-fire-isolated stairways, ramps or escalators:

- A non-required non fire-isolated stairway must not connect more than 3 storeys if each of those storeys is provided with a sprinkler system complying with Specification E1.5 throughout; or 2 storeys in any other case. ***As the building is not to be provided with sprinkler system, the open stair connecting 3 storeys is to form part of a Fire Engineered Alternate Solution from Red Fire – to be provided prior to issue of S109R Design Certificate***

Dimensions of Exits:

- Paths of travel are to have a minimum clear width of 1000mm, including throughout the stairways where handrails are installed on both sides – compliance readily achievable, further details required prior to issue of S109R Design Certificate.

4.2 Construction of Exits:

- The construction and discharge of stairs, landings, thresholds, balustrades and handrails will need to meet the requirements of the BCA. Detailed drawings required for compliance. Further assessment required prior to issue of a S109R Design Certificate.
- In accordance with BCA Clause D2.8, he space below a required non fire-isolated stairway (including an external stairway) or non fire-isolated ramp must not be enclosed to form a cupboard or other enclosed space unless—
  (i) the enclosing walls and ceilings have an FRL of not less than 60/60/60; and
  (ii) any access doorway to the enclosed space is fitted with a self-closing –/60/30 fire door.

  The underside of the 3 storey open stair is proposed to be enclosed at the ground floor, furthermore a comms room is proposed to the first floor under the open stair connecting the two library levels – details required prior to S109R Design Certificate.
- Any new EDB and communication boards should be enclosed in non-combustible construction and suitable sealed against smoke spreading from the enclosure. Compliance achievable.
- In accordance with BCA Clause D2.20 swinging doors in a required exit or forming part of a required exit must not otherwise impede the path or direction of egress.
- All door hardware to required exits, forming part of a required exit or in the path of travel to a required exit must be readily openable without a key from the side that faces a person seeking egress and swing in the direction of egress as per Clause D2.21 of the BCA. Details to be provided prior to issue of S109R Design Certificate.
- Doorways that open to fire-isolated stairways, and are not doorways opening to a road or open space, must be protected by –/60/30 fire doors that are self-closing, or automatic-closing.

4.3 Access for people with Disabilities

Lift:

- The lift must be provided with statutory signage stating DO NOT USE LIFT IF THERE IS A FIRE.
- The proposed lift is to comply with BCA Clause E3.6 and have accessible features in accordance with Table E3.6b
  Details to be provided prior to issue of S109R Design Certificate.

Table E3.6b APPLICATION OF FEATURES TO PASSENGER LIFTS

Feature	Application
Handrail complying with the provisions for a mandatory handrail in AS 1735.12	All lifts except— (a) a *stairway platform lift*; and (b) a *low-rise platform lift*.
Lift floor dimension of not less than 1400 mm wide x 1600 mm deep	All lifts which travel more than 12 m.
Lift floor dimensions of not less than 1100 mm wide x 1400 mm deep	All lifts which travel not more than 12 m except a *stairway platform lift*.
Lift floor dimensions of not less than 810 mm wide x 1200 mm deep	A *stairway platform lift*
Minimum clear door opening complying with AS 1735.12	All lifts except a *stairway platform lift*.
Passenger protection system complying with AS 1735.12	All lifts with a power operated door.
Lift landing doors at the upper landing	All lifts except a *stairway platform lift*.
Lift car and landing control buttons complying with AS 1735.12	All lifts except— (a) a *stairway platform lift*; and (b) a *low-rise platform lift*.
Lighting in accordance with AS 1735.12	All enclosed lift cars.
(a) Automatic audible information within the lift car to identify the level each time the car stops; and (b) audible and visual indication at each lift landing to indicate the arrival of the lift car; and (c) audible information and audible indication *required* by (a) and (b) is to be provided in a range of between 20–80 dB(A) at a maximum frequency of 1 500 Hz	All lifts serving more than 2 levels.
Emergency hands-free communication, including a button that alerts a call centre of a problem and a light to signal that the call has been received	All lifts except a *stairway platform lift*.

Stairways:

- All stairways (except fire-isolated stairways) are to comply with the requirements of Clause 11 of AS1428.1-2009. Fire stairs are to comply with Clause 11.1(f) and (g) of AS 1428.1 i.e. nosing strip. TGSI's are to be provided to the top and bottom of each stairway and ramp (excluding fire-isolated stairways) complying with AS/NZS1428.4.1 - Details to be provided prior to issue of S109R Design Certificate.

Sanitary Facilities:

- An accessible sanitary facility is to be provided to each level where a bank of sanitary facilities is provided. Furthermore, in addition to an accessible unisex sanitary compartment at that bank of toilets, a sanitary compartment suitable for a person with an ambulant disability in accordance with AS 1428.1 must be provided for use by males and females - Details to be provided prior to issue of S109R Design Certificate. For more information, refer also to the sanitary facility section below.

Hearing Augmentation:

- A hearing augmentation system must be provided where an inbuilt amplification system, other than one used only for emergency warning, is installed in a room in a Class 9b building – confirmation of installation of inbuilt amplification system / hearing augmentation prior to issue of S109R Design Certificate.

Signage:

- Braille and tactile signage complying with Specification D3.6 must—
  - (i) incorporate the international symbol of access or deafness, as appropriate, in accordance with AS 1428.1 and identify each—
    - (A) sanitary facility; and
    - (B) space with a hearing augmentation system; and
  - (ii) identify each door required by E4.5 to be provided with an exit sign and state—
    - (A) " Exit "; and
    - (B) " Level " followed by the floor level number; and

Carparking:

- 1 space for every 100 carparking spaces or part thereof is to be an accessible parking space complying with AS/NZS2890.6 – Client to confirm if new parking spaces are to be provided.

Glazing:

- On an accessway, where there is no chair rail, handrail or transom, all frameless or fully glazed doors, sidelights and any glazing capable of being mistaken for a doorway or opening, must be clearly marked in accordance with AS 1428.1 - Details to be provided prior to issue of S109R Design Certificate.

Where compliance with Part D3 and AS1428.1-2009 is not possible, an Access Consultant may be appointed to provide alternate solutions / dispensation reports to justify the deviations from the DtS provisions of the BCA.

5.0 Fire Services & Equipment

5.1 Fire services

Fire Hydrants	Internal fire hydrants are to be provided throughout the building to comply with BCA Clause E1.3 and AS 2419.1-2005. Hydrant points are to be located within the fire stairs. The booster is to be located more than 10m from the building or is to be fire rated in accordance with Clause 7.3 (c) (ii) of AS2419.1-2005 i.e. 90 minute fire rated walls and must extend 2m either side of the booster and 3m above ground level. It is noted that the pressures and flows in the street do not meet current requirements, hence it is likely that tanks and pumps will be required in accordance with AS2419.1-2005. ***Location of fire hydrants, booster assembly, tanks and pumps is to be confirmed - Further details required for compliance prior to issue of a S109R Design Certificate***
Fire Hose-Reels	Fire hose-reels should be arranged to provide for coverage to the library components of building in accordance with AS 2444.1-2005.Fire hose-reels are to be located within 4 metres of an exit or a fire hydrant. Further details required for compliance prior to issue of a S109R Design Certificate Note - Fire hose-reels are not required to be provided in classrooms and associated corridors in a primary or secondary school.
Sprinklers	N/A to proposed building
Portable fire extinguishers	Required in accordance with Table E1.6 of the BCA i.e. To cover Class A fire risks in classrooms and associated corridors in primary and secondary schools not provided with fire hose reels.. Details to be provided with application for a S109R Design Certificate.
Emergency Warning and Intercommunication Systems (EWIS)	N/A to a Class 9b school building not exceeding 3 storeys
Automatic fire detection and alarm system	*An automatic fire detection and alarm system is not specifically required by BCA, however it is our understanding that RED Fire Engineers will be requesting a 1670 detection system be installed throughout the building to address various alternate solutions.* *Further details required for compliance prior to issue of a S109R Design Certificate*
Exit and emergency lighting	The location of emergency lighting and exit should be installed throughout the building in accordance with the requirements of BCA Clauses E4.2 & E4.4 and AS 2293.1-2005. Further details required for compliance prior to issue of a S109R Design Certificate

5.1 Smoke hazard management

N/A to a Class 9b school building not exceeding 3 storeys.

6.0 Health and Amenity Issues

Sanitary facilities

Class 9b Schools – Students
Whilst the exact number of proposed sanitary facilities is still to be confirmed, the following table shows the required sanitary facilities based on the population as noted above:

Patrons	WC's (Max. Pop)	Urinals (Max. Pop)	WB's (Max. Pop)
Male (372)	6 (400)	5 (400)	7 (400)
Female (372)	11 (400)	———————	7 (400)

Notes:
1. Staff and students must not use the same facilities, hence separate staff facilities are required, client to confirm proposed number of staff and location of adequate sanitary facilities to cater for staff.
2. 1 of the cubicles in each of the male and female student sanitary facilities at each level are required to be ambulant cubicles in accordance with BCA F2.4 and AS1428.1-2009 - further details required prior to issue of S109R.
3. A unisex accessible facility is proposed to each level i.e. 3 total accessible sanitary facilities. Each facility may count once towards each sex for a WC and for a washbasin (note it may count once as either a male WC of a urinal)

Class 9b Schools – Staff
Staff and students must not use the same facilities, hence separate staff facilities are required, client to confirm proposed number of staff and location of adequate sanitary facilities to cater for staff.

Patrons	WC's (Max. Pop)	Urinals (Max. Pop)	WB's (Max. Pop)
Male Staff	TBA	TBA	TBA
Female Staff	TBA	———————	TBA

Accessible Sanitary Facilities
A unisex accessible sanitary facility is proposed to each level i.e. 3 in total. These facilities are to be design and constructed in accordance with AS1428.1-2009 - Internal dimensioned elevations are required for assessment prior to issue of S109R Design Certificate.

Ambulant Sanitary Facilities
At each bank of toilets where there is one or more toilets in addition to an accessible unisex sanitary compartment at that bank of toilets, a sanitary compartment suitable for a person with an ambulant disability in accordance with AS 1428.1 must be provided for use by males and females.
Internal dimensioned elevations are required for assessment prior to issue of S109R Design Certificate

Swing and operation of doors to the WC's
Doors to fully enclosed sanitary compartments must open outwards, or slide or have 1.2m clear space between door and closet plan or be readily removable from the outside of the sanitary compartment – details required prior to issue of S109R Design Certificate.

Room Heights
In a Class 9b building—
- A ceiling minimum height of 2.4m is required to all classrooms, whilst the corridors and library area requires a ceiling height of not less than 2.7m.
- A bathroom, shower room, sanitary compartment, airlock, tea preparation room, pantry, store room, garage, car parking area, or the like requires a minimum height of 2.1 m.
- Above a stairway, ramp, landing or the like requires a minimum height of 2 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like.

Compliance is readily achievable – details to be provided prior to issue of a S109R Design Certificate

Light and Ventilation
In a Class 9b building all general purpose classrooms in primary or secondary schools is required to be provided with natural light. Required natural light must be provided by the following:
(i) windows, excluding roof lights, that—
  (A) have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 10% of the floor area of the room; and

(B) are open to the sky or face a court or other space open to the sky or an open verandah, carport or the like; or

(ii) roof lights, that—

(A) have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 3% of the floor area of the room; and

(B) are open to the sky; or

(iii) a proportional combination of windows and roof lights required by (i) and (ii).

The classrooms are provided with large glazed elements in the external façade – compliance readily achievable – details required prior to issue of S109R Design Certificate.

The artificial lighting system must comply with AS/NZS 1680.0 - Details to be provided prior to issue of S109R Design Certificate

Natural ventilation or an air-conditioning system complying with AS1668.2 is required – Details of method of compliance is to be provided prior to issue of S109R Design Certificate.

7.0 Energy Efficiency

The new building must be designed in accordance with the requirements of Part J of the BCA in terms of Energy Efficiency. The architectural drawings must note compliance with J0, J1, J3 and J3, we recommend an Energy Efficiency consultant is appointed to provide a report prior to issue of a S109R Design Certificate.
The services drawings particularly the electrical, hydraulic and mechanical drawings must include compliance with Parts J5, J6, J7 & J8 of BCA. Details to be provided prior to prior to issue of a S109R Design Certificate.

Access for maintenance
The following criteria must be observed in the special design of the plant areas.

NSW J8.2 Access for maintenance
Access for maintenance must be provided to—

(a) adjustable or motorised shading devices; and
(b) time switches and motion detectors; and
(c) room temperature thermostats; and
(d) plant thermostats such as on boilers or refrigeration units; and
(e) motorised air dampers and control valves; and
(f) reflectors, lenses and diffusers of light fittings; and
(g) heat transfer equipment; and
(h) plant that receives a concession under JV3(b) for the use of energy obtained from—
(i) an on-site *renewable energy* source; or
(ii) another process as reclaimed energy.

8.0 Alternate Solutions / Fire Engineering

Where compliance with the deemed to satisfy provisions is not readily achievable, performance based assessment and alternative solutions will be used to demonstrate compliance with the BCA.

This comes about due to the generic and prescriptive nature of the BCA with respect to the deemed to satisfy provisions and the inability for the document to be ultimately flexible for all building types and applications. This is the main reason the document allows alternate solutions, where meeting the performance requirements, are deemed to also be compliant with the BCA.

1. Spandrel separation in accordance with C2.6 is unlikely to comply with the DtS provisions of the BCA; certain non-compliances / alternate spandrel details may be addressed via RED Fire Engineers as part of the fire engineering solution prior to issue of S109R Design Certificate.

2. The special programs office within the library on the second floor has approx. 21.5m to a point of choice in lieu of 20m in accordance with D1.4; amend design to comply or include as part of RED Fires Fire Engineered Alternate Solution.

3. In accordance with D1.12, a non-required non fire-isolated stairway must not connect more than 3 storeys if each of those storeys is provided with a sprinkler system complying with Specification E1.5 throughout; or 2 storeys in any other case. As the building is not to be provided with sprinkler system, the open stair connecting 3 storeys is to form part of a Fire Engineered Alternate Solution from Red Fire Engineers – to be provided prior to issue of S109R Design Certificate.

4. Any non-compliances, in accordance with AS2419.1-2005 associated with the hydrant booster, pumps or tanks may be addressed as part of RED Fire's Fire Engineering Alternate Solution Report - further details required for compliance prior to issue of a S109R Design Certificate.

9.0 Approval from the New South Wales Fire Brigade

At this point in the design there is no proposed alternative fire engineered solutions that will need to be submitted to FRNSW for approval.

10.0 Conclusion

We have assessed the architectural design to date with respect to the Building Code of Australia 2014. The design is at a point where the inherent BCA philosophies have been checked and development consent can be sought. The finer details with respect to BCA 2014 compliance can be finalised prior to the issue of a S109R Design Certificate.

Public Works
NSW Water Solutions

Harbord Public School
New Development
Geotechnical Investigation

Report number: 14-GS58A

November 2014

NSW Public Works – Project Management

Public Works
Project Management

A division of the Office of Finance and Services

Harbord Public School

New Development

Geotechnical Investigation

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November 2014

Document Control

Issue / Revision	Author	Reviewer	Approved for Issue	
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1 Introduction

1.1 General

Project Management (PM), NSW Public Works commissioned the Geotechnical and Environmental Section ("Section") to undertake a Geotechnical Investigation for the proposed new development within the existing complex of Harbord Public School, in Harbord, NSW, hereafter referred to as the "Site".

A concurrent report titled "*Harbord Public School – New Development – Stage 1 Preliminary Contamination Investigation*" is being prepared by the Section (Rep No: *14-GS58B*). The contamination investigation report should be read in conjunction with this current geotechnical report. The contamination investigation has also covered a nominated "inspection area".

The current report presents the data obtained from this investigation and discusses relevant geotechnical aspects for design and construction of the proposed development.

1.2 Proposed Development

On 19/8/2014, GAO provided a site option plan (Option B_1, dated 4/7/2014) showing the proposed school development (see **Figure 2**). Based on this plan, the proposed development will comprise construction of a three-storey high building and a COLA. Also, a possible small carpark may be constructed near the north-western corner of the school site. Fieldwork was undertaken on the basis of this plan.

On 21/10/2014, subsequent to the completion of the fieldwork, GAO provided a revised site plan. Based on this revised plan, the footprint of the originally planned COLA has been replaced by a two storey building with an undercroft.

The proposed ground floor levels of the three storey and two storey parts of the building will be 24.75m AHD and 28.25m AHD, respectively. The building will be constructed of frames, concrete floor and metal roofing. The finished level of the possible carpark is yet to be finalised.

It is understood that, in a strip of land immediately on the northern side of the proposed building area, NSW Department of Education and Training ("DEC") has arranged the design and construction of a new access road. This area proposed for the new road is not covered in the current geotechnical investigation. However, the Section has been requested to conduct only a visual site inspection of this area, as part of the separate contamination investigation.

1.3 Location and Site Conditions

The school site is located in Harbord, at the intersection of Oliver Street and Wyadra Avenue (see **Figure 1**). The Site is located within the western part of the school site. Access to the Site is available from either Oliver Street or Corella Street.

The general site topography is shown on **Figure 3**.

Building Area

The area proposed for the three storey building generally slopes gently towards the west. The area is currently occupied by a brick building (Block A) in part and a number of demountables (see **Plate 1**). The areas surrounding the building/demountables is mostly bitumen or concrete paved with some grassed areas and patches of bare ground. The existing carpark is located in the northern part of the area (see **Plate 2**) and the surface appears to be in a stable condition.

The area proposed for the two storey building is elevated at the eastern end and is currently occupied by two demountables (see **Plate 3**). Sandstone outcrop occurs near the middle of the area.

A number of bonded fibre-cement fragments (which could contain asbestos) were observed on the ground surface at various locations (see **Figure 3**).

Carpark Area

The area proposed for a possible new carpark is generally grass covered with bare patches (see **Plate 4**).

1.4 Objectives of the Investigation

The objectives of the investigation were to report on:

- site conditions;
- subsurface conditions within the investigated depths;
- properties of subsurface materials;
- suitable footing systems, founding depths and allowable bearing capacities; and
- excavation characteristics of the encountered strata and earthwork requirements.

1.5 Terminology

The methods used in this report to describe the subsurface profiles, and visual classification of material types encountered at discrete borehole locations are in accordance with AS1726 - 1993 Geotechnical Site Investigation. The definitions of terminology used are presented in **Appendix A**.

1.6 Limitations

The Geotechnical and Environmental Section has conducted an investigation and prepared this report in response to specific instructions from the client to whom this report is addressed. This report is intended for the sole use of the client, and only for the purpose which it was prepared. Any third party who relies on the report or any representation contained in it does so at their own risk.

2 Geology, Mine Subsidence and Flooding

2.1 Geology

The Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1 - 1983) shows that the school site is underlain by Hawkesbury Sandstone, which is Triassic in age. The formation comprises medium to coarse-grained quartz sandstone with very minor shale and laminite lenses.

The Sydney 1:100,000 Soil Landscape Series Sheet 9130 (1989) shows that site lies within the Lambert soil landscape grouping, which comprise undulating to rolling rises and low hills on Hawkesbury Sandstone. The soils within the Lambert group are shallow, discontinuous earthy sands and yellow earths on crests and inside of benches; shallow siliceous sands/lithosols on leading edges; shallow to moderately deep leached sands, grey earths and gleyed podzolic soils in poorly drained areas; localised yellow podzolic soils associated with shale lenses. The limitations of soils in this landscape grouping are very high soil erosion hazard; rock outcrop; seasonally perched water tables; shallow, highly permeable soil; very low soil fertility.

The field investigation revealed that the subsurface profile generally comprises a layer of fill, underlain by residual soil and weathered sandstone.

2.2 Mine Subsidence

The Site does not lie within a proclaimed Mine Subsidence District (coal mining), and hence is not affected by associated subsidence.

2.3 Flood Vulnerability

A Planning Certificate issued under Section 149 of the Environmental Planning and Assessment Act 1979 (“EP&A Act”) and Warringah Local Government Plan 2011 (applicable to Lot 100 DP 1190199) by Warringah Council indicates that the land is not subject to flood related development controls. The planning certificate is presented in the separate contamination report.

3 Fieldwork

Fieldwork was carried out on 17/9/2014, and comprised drilling of nine (9) boreholes (BA1 to BA9) to depths of 0.9m to 5.9m within the Site. Borehole drilling was somewhat restricted due to the presence of the existing building and demountables. A number of fibre-cement fragments were collected from the ground surface within the Site for subsequent laboratory asbestos identification, as a part of separate contamination investigation.

The boreholes were drilled by Terratest Pty Ltd using a truck-mounted Geoprobe drill rig. Each borehole was advanced using a continuous push tube sampler. In boreholes BA3 to BA6, upon registering tube refusal, augering continued with a TC bit. In borehole BA4, coring of rock was carried out at depths of 3.0m to 5.9m using NMLC diamond coring technique. The retrieved rock core was delivered to our Geotechnical Centre laboratory and logged by an engineering geologist.

The fieldwork was supervised by an engineering geologist from the Section, who carried out field logging and sampling. Locations of boreholes and fragments are shown on **Figure 3**. The borehole logs are presented in **Appendix B**.

4 Geotechnical Testing

One (1) soil sample (BA1, 1.0-1.45m) was selected for testing in accordance with the relevant method in AS 1289 for the determination of particle size distribution. The testing was performed by our Geotechnical Centre laboratory at Manly Vale.

The results of the above test are presented in **Appendix C**.

5 Chemical Testing

5.1 Topsoil Testing

One (1) topsoil sample was sent to Sydney Environmental and Soil Laboratory Pty Ltd to determine it's suitability for landscaping purposes. The selected sample was from borehole BA4 (0.0-0.15m).

The test results indicate that the soil is between slightly acidic and neutral pH, and has very low saline, sodic and chlorine levels. The chemistry of the soil may be improved with addition of chemicals/fertilisers.

Full results of the tests from the laboratory are presented in **Appendix D**.

5.2 Soil Corrosion and Scaling Assessment

One (1) soil sample was sent to Sydney Environmental and Soil Laboratory Pty Ltd for the purpose of corrosion and scaling assessment of the soil. The selected sample was from boreholes BA3 (0.5-0.95m).

The results of the chemical tests indicate that the soil shows moderate alkalinity, low salinity, low sulphate and low chloride. The pH is considered to be non-aggressive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel. Overall, the likelihood of aggressive corrosion is low.

Full results of the chemical tests are presented in **Appendix E**.

6 Subsurface Conditions

6.1 General

The proposed building area was investigated by four (4) boreholes (BA3 to BA6). BA5 was located in the area of elevated ground (eastern part). The possible carpark area was investigated by two (2) boreholes (BA1 and BA2).

The subsurface conditions encountered in the boreholes are summarised in the subsequent sections.

6.2 Ground Conditions

Building Area

As revealed by four boreholes (BA3 to BA6), the subsurface profile comprises a layer of fill (0.5m to 0.85m thick) underlain by residual soil (only encountered in boreholes BA3 and BA4) to depths of 1.4m/1.5m. The fill / residual soil is underlain by weathered sandstone to the borehole termination depths of 1.4m to 3.2m. The residual soil comprises sand / clayey sand and is generally yellow-brown / light grey, medium dense, and moist to very moist.

The sandstone encountered comprises extremely weathered sandstone (EW, extremely weak or behaves as dense sand/clayey sand) to depths of 0.7m (BA6) to 2.2m (BA3), then underlain by highly weathered (HW, very weak) sandstone to depths of 1.4m (BA5) to 3.2m (BA3). In borehole BA4, based on rock coring, the sandstone is moderately weathered (MW, medium strong) from 3.0m to the borehole termination depth of 5.9m. In three (3) boreholes (BA3, BA5 and BA6), TC bit refusal was registered at the borehole termination depths of 1.4m to 3.2m, where MW sandstone is inferred to have been encountered.

The fill generally comprises a thin layer of bitumen on roadbase (0.25-0.35m thick) or topsoil (0.15m thick, sandy silt) underlain sand to silty sand / gravel to sandy gravel (loose to medium dense, moist), with trace of brick, concrete and bitumen fragments.

Carpark Area

As revealed by two boreholes (BA1 and BA2), the subsurface profile comprises a layer of fill (0.3m to 0.55m thick) underlain by residual soil to the borehole termination depth of 1.45m.

The residual soil comprises sand / clayey sand, which is generally yellow-brown / yellow-grey-brown, loose to medium dense, and moist. In borehole BA2, a thin, very moist zone was encountered at 0.8m depth.

The Section's 2004 geotechnical investigation (Report No: 04-GG28C) of the school site included excavation of two (2) test pits (T9 and T10), which appear to be within the current proposed carpark area. These test pits revealed the presence of a layer of fill (0.2-0.4m thick) underlain by silty sand with trace of clay (loose, moist) to the pit termination depths of 0.8/0.9m.

6.3 Groundwater Conditions

At the time of fieldwork, groundwater was not encountered within the depth of investigation. It should be noted that the presence of groundwater/inflow will depend on seasonal weather changes and prevailing weather conditions at the time.

7 Discussion and Recommendations

7.1 Site Classification

In the proposed building area, the subsurface profile comprises a layer of fill underlain by residual soil and weathered sandstone. Because of the presence of the fill, in accordance with Australian Standard AS 2870-2011 “Residential Slabs and Footings”, the area should be designated as Class “P”, in the current state.

The Site may be given a less severe classification if assessed in accordance with engineering principles, with consideration of the final site works proposed.

7.2 Earthquake Site Sub-Soil Class

Earthquake sub-soil class for the Site, in accordance with AS.1170.4-2007 : Structural Design Actions - Part 4: Earthquake Actions in Australia, may be taken as Class C_e. For the above site sub-soil class, it is assumed that all fill placement, where required, will be controlled.

7.3 Earthworks

The proposed finished ground floor levels of the building will be generally above the existing ground surface. Hence, minor excavation would only be required.

The excavated local soil (clayey sand / sand with clay) is generally considered to have fair compaction characteristics for use as controlled fill. If used, subject to environmental requirements, the materials should be placed in maximum 200mm (loose) layers, and be compacted to the following minimum dry density ratios (AS 1289.5.4.1 – 1993) at a moisture content within 2% of optimum.

Fill under building floor	=	98%	
Fill under pavement	=	100%	(< 0.3m depth)
		95%	(> 0.3m depth)
General fill around Site	=	95%	

If imported fill materials are required, suitable materials (preferably granular for controlled fill) as described in Section 4 of AS 3798-2007 "*Guideline on Earthworks for Commercial and Residential Development*" should be used. Also, imported material should be validated in accordance with the EPA *Sampling Design Guidelines* (1995) and *Guidelines for Assessing Service Station Sites* (1994); and DEC *Guidelines for NSW Site Auditor Scheme* (2nd Edition, April 2006) and ASC NEPM (2013). The fill material should not contain asbestos, and not be acid sulfate soil or saline soil. The imported fill material should be ‘virgin excavated natural material’ (VENM) or ‘excavated natural material’ (ENM), as defined in the DECC’s waste guidelines because of their low risk of contamination.

During the course of soil filling, “Level 1 Inspection and Testing” should be conducted in accordance with AS 3798-2007 "*Guideline on Earthworks for Commercial and Residential Development*". On completion of the earthwork, the report prepared by the “Geotechnical Inspection and Testing Authority” should be submitted to the Principal for review.

In the future development, upon removal of the demountables and complete site clearing such as removal of vegetation, the sandstone outcrop should be inspected and assessed by an experienced geotechnical engineer or engineering geologist for its stability.

Conventional earthmoving equipment such as backhoes and small to medium sized bulldozers should be capable of excavating the local soils and EW rock. Excavation of highly weathered or better quality rock for the purposes of say trenching for the installation of underground services, is likely to be more difficult and a larger hydraulic excavator may be required.

7.4 Footings

In the proposed building area, in view of the fact that sandstone bedrock is expected to be generally encountered at a shallow depth, it is considered that pier-and-slab may be adopted with piers carried down to highly weathered (HW, very weak) or moderately weathered (MW, medium strong) sandstone with a minimum embedment of 0.5m. In the area in the immediate vicinity of the sandstone outcrop, where bedrock is expected to be encountered near the surface, pad /strip footing on weathered sandstone may be considered.

HW sandstone is expected to be generally encountered at depths of 1.0m to 2.5m below the existing ground surface. MW sandstone is generally expected to be encountered at the TC bit refusal level. The recommended design parameters are as follows:

	HW Sandstone	MW Sandstone
Allowable end bearing pressure (kPa)	800	1500
Allowable adhesion (kPa)	60	100

It is recommended that excavations for foundations and pier augering be inspected by an experienced geotechnical engineer or engineering geologist in order to confirm the target founding materials and depths that are required to achieve the strength parameters given above.

For detailing and construction requirements, reference should be made to Sections 5 and 6 of AS 2870-2011, respectively. For foundation performance and maintenance, reference should be made to Appendix B of the above standard.

7.5 Pavement

It is understood that the finished level of the new possible carpark is yet to be determined.

As revealed by the two boreholes (BA1 and BA2), the subsurface profile comprises a layer of fill (0.3m to 0.55m thick) underlain by residual soil to the borehole termination depth of 1.45m. Residual soil comprises sand / clayey sand (loose to medium dense). Considering ground variability and our experience on similar material, a CBR value of 5% is recommended for the purpose of pavement design.

The following recommendations are also made:

- Strip the existing fill and residual soil to a minimum depth of 0.8m below the base of the proposed pavement.
- The excavated surface will be carefully examined and proof rolled to ensure subgrade strength and consistency.
- Backfill with locally excavated suitable soil (free from organic matter), or suitable imported fill materials (preferably granular). The imported fill material should satisfy the requirements as stated in **Section 7.3**.
- Adequate subsoil drainage should be provided to prevent ingress of water into the subgrade.

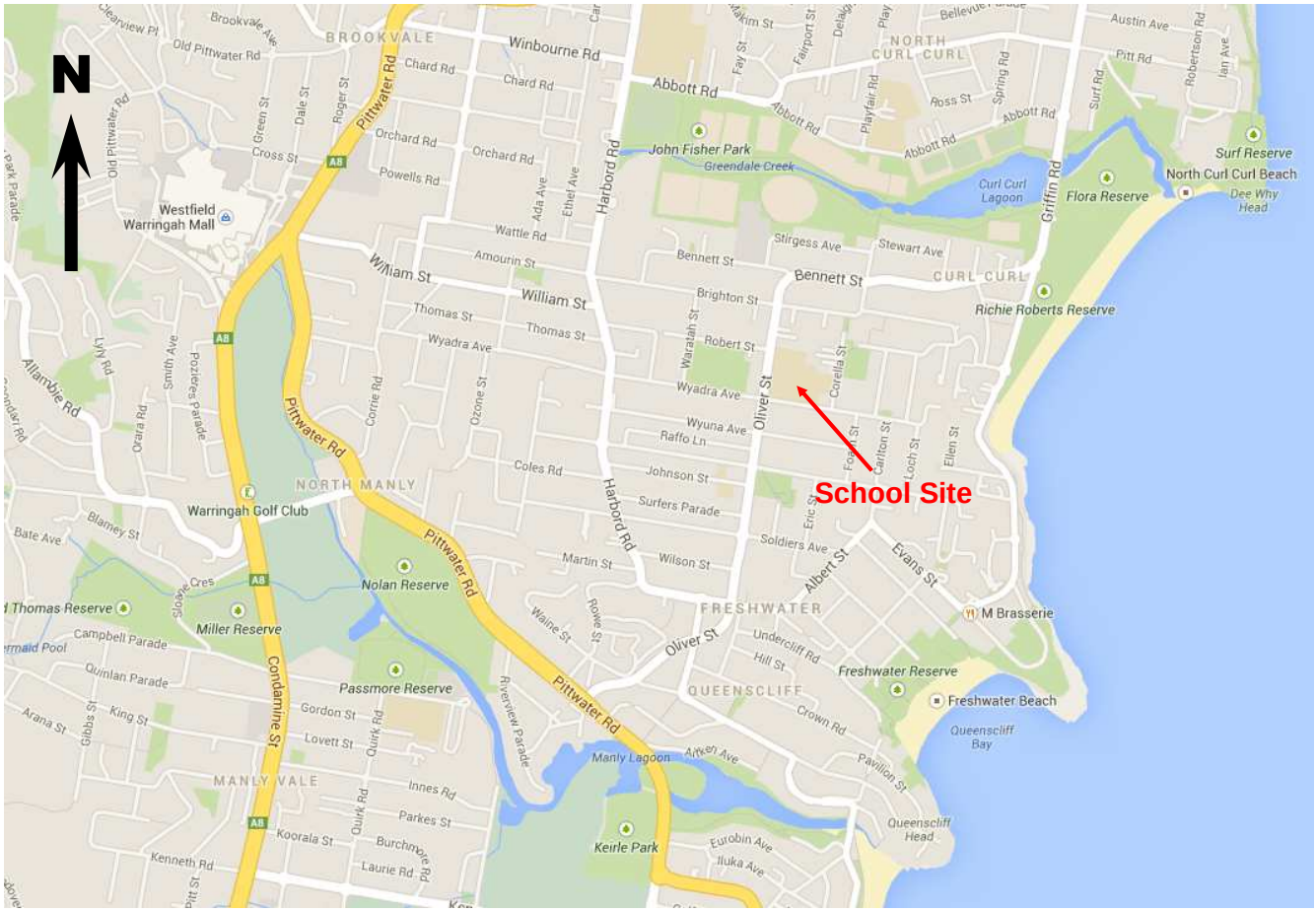
The thickness of pavement will depend on the design traffic loading (equivalent standard axles, ESA) and the type of pavement selected. The final design selected will also depend on the economy and life expectancy of the pavement.

Depending on the final finished level of the new carpark, if soil material other than the above is used as the subgrade, then further investigation should be undertaken in order to determine the appropriate CBR value and foundation preparation.

8 General Remarks

It should be noted that this report is based on interpolation of data from discrete boreholes and may not represent actual conditions between them.

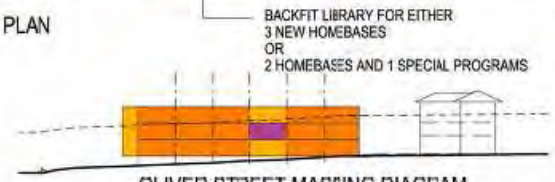
FIGURES



HARBORD PUBLIC SCHOOL **Site Location Plan**	**Job No:** GS58A **Figure No:** 1

SITE & GROUND FLOOR PLAN

TOTAL SITE	26,822
RETAINED BLDGS	3,695
NEWBUILD	1,090
OUTDOOR AREA	22,037



OLIVER STREET MASSING DIAGRAM

OPTION B_1

PRIMARY FEATURES

- 18 new homebases
- retain and reposition 6 demountables
- backfit existing Library for 2 homebases and 1 special programs
- improve curtilage to heritage building
- East /west oriented building along Oliver Street
- new Library oriented north/south with COLA under

PROS

- increased outdoor connectivity Cola integrated in outdoor play
- provides street presence along Oliver Street
- minimal site disturbance during construction
- creates improved street address and curtilage to heritage building
- provides appropriately sized library as school focus
- Library becomes focus of the school

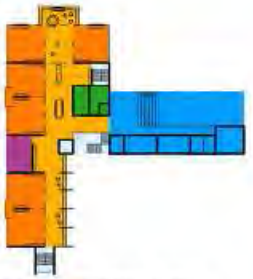
CONS

- primary building orientation is east west

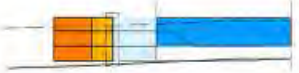
LEGEND

- STRUCTURED LEARNING SPACES
- LEARNING COMMONS
- LIBRARY
- STAFF COLLABORATIVE ROOM
- COVERED OUTDOOR LEARNING
- CIRCULATION
- TOILETS
- COLA'S
- BUILDINGS TO BE DEMOLISHED / REMOV
- VEGETATION
- LANDSCAPE ZONES
- CONNECTIONS

FIRST FLOOR PLAN



SECOND FLOOR PLAN



STACKING DIAGRAM

Public Works
Government Architect's Office

HARBORD PUBLIC SCHOOL

DATE: 04.07.14

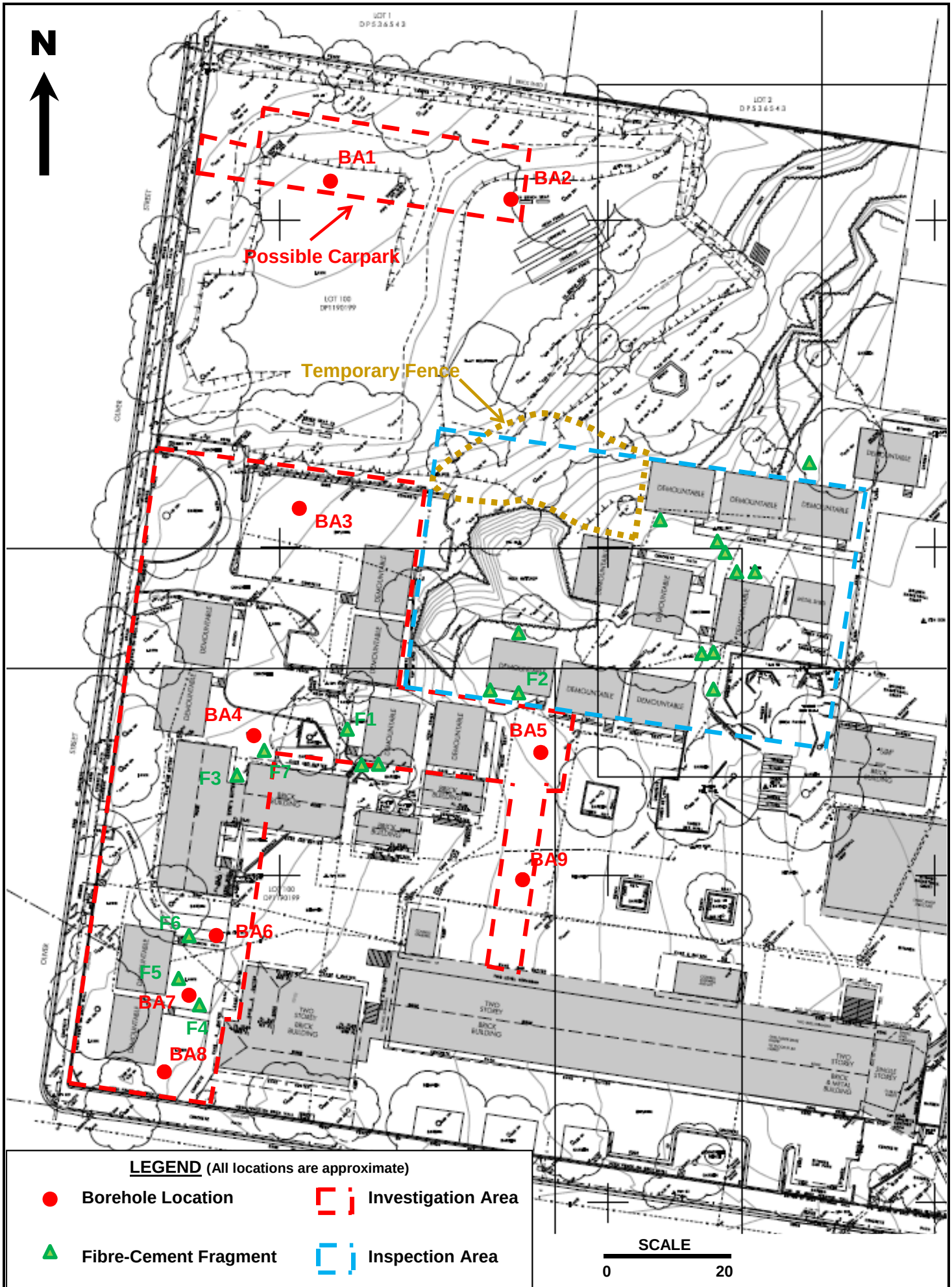
1:1000 @ A1

HARBORD PUBLIC SCHOOL

Site Plan

Job No: GS58A

Figure No: 2



HARBORD PUBLIC SCHOOL Borehole Location Plan	Job No: GS58A Figure No: 3

PLATES

PLATE 1 : View towards the North of the Investigation Area. The proposed new building will be located to the north (the area on the far side) of the demountables. Block Q is on the right. Block A is visible in the background to the right.

PLATE 2 : View towards the south of the Investigation Area. The existing carpark is seen in the foreground and Block A, visible in the background, will be demolished to make way for the construction of a new building.

PLATE 3 : View towards the west of the Investigation Area. The demountable in the middle appears to be supported on sandstone outcrop.

PLATE 4 : View towards the east of the area possibly proposed for a small new carpark.

APPENDIX A

Geotechnical Terminology and Technical Aids

CHARACTERISATION OF GEOTECHNICAL DATA

Geotechnical data generally fall into the categories of fact, interpretation and opinion, as defined by the Institution of Engineers, Australia, 1987 - Guidelines for the Provision of Geotechnical Information in Construction Contracts.

Facts are defined as the materials, statistics and properties which may be seen, measured or identified by means of accepted and preferably standardised criteria, classifications and tests. Examples of facts include: exploration locations, outcrop locations, samples and drill core, lithological names/descriptions of soils and rocks, measured water levels, laboratory test results and seismic time/distance plots.

Interpretative data is defined as information derived from competently made interpretation of facts using accepted and proven techniques, or reasonable judgement exercised in the knowledge of geological conditions or processes evident at the site. Examples of interpretative data are: borehole and test pit logs, inferred stratigraphy and correlations between boreholes or test pits, material and rock mass properties used in analysis (e.g. permeability), and seismic interpretation (yielding velocity and layer depths).

Opinion is derived from consideration of relevant available facts, interpretations and analysis and/or the exercise of judgement. Examples of opinions based on geotechnical/geological interpretations include bearing capacity and foundation suitability, need for foundation treatment, settlements, potential for grouting, excavation stability, ease of excavation, and suitability of construction materials.

SOIL DESCRIPTION

The methods of description and classification of soils are based on Australian Standard 1726, the SAA Site Investigation Code. The description of a soil is based on particle size distribution and plasticity as shown in the "GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS".

SOIL CLASSIFICATION

The basic soil types and their subdivisions are defined by their particle sizes:

MAJOR SOIL CATEGORIES

Soil Classification	Particle Size
Boulders	Greater than 200mm
Cobbles	63 - 200mm
Gravel	2.36 - 63mm
Sand	0.075 - 2.36mm
Silt	0.002 - 0.075mm
Clay	Less than 0.002mm

MINOR SOIL CONSTITUENTS

As most natural soils are combinations of various constituents, the primary soil is further described and modified by its minor components:

Coarse grained soils			**Fine grained soils**		
% Fines		**Modifier**	**% Coarse**		**Modifier**
	≤ 5	Omit, or use 'trace'		≤ 15	Omit, or use 'trace'
> 5	≤ 12	Describe as 'with clay/silt', as applicable	> 15	≤ 30	Describe as 'with sand/gravel', as applicable
> 12		Prefix soil as 'silty/clayey', as applicable	> 30		Prefix soil as 'sand/gravelly', as applicable

COHESIVE SOILS

Clay and silt may be described according to their plasticity:

Descriptive Term	**Range of liquid limit (percent)**
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

MOISTURE CONDITION

Term	Description
Dry (D)	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist (M)	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet (W)	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere.

CONSISTENCY - NON-COHESIVE SOILS

Term	Density index %		SPT "N" value
Very loose		≤ 15	< 5
Loose	> 15	≤ 35	5 - 10
Medium dense	> 35	≤ 65	10 - 30
Dense	> 65	≤ 85	30 - 50
Very dense	> 85		> 50

CONSISTENCY - COHESIVE SOILS

Term	Undrained shear strength (kPa)		Field guide to consistency	SPT "N" value
Very soft		≤ 12	Exudes between the fingers when squeezed in hand.	< 2
Soft	> 12	≤ 25	Can be moulded by light finger pressure.	2 - 4
Firm	> 25	≤ 50	Can be moulded by strong finger pressure.	4 - 8
Stiff	> 50	≤ 100	Cannot be moulded by fingers; can be indented by thumb	8 - 16
Very stiff	> 100	≤ 200	Can be indented by thumb nail.	16 - 32
Hard	> 200		Can be indented with difficulty by thumb nail.	> 32

GRAPHICAL SYMBOLS USED FOR GEOTECHNICAL BOREHOLE AND TEST PIT LOGS

SOIL - COARSE GRAINED


GW


GP


GM


GC

SW


SP


SM


SC

SOIL - FINE GRAINED


CH


CI

CL


MH


ML


OH


OL


Pt

ROCK


Sedimentary rock


Igneous rock


Metamorphic rock

FILL MATERIAL


Fill

GROUNDWATER


Level


Inflow

NGE No Groundwater Encountered

SOIL HORIZON BOUNDARIES

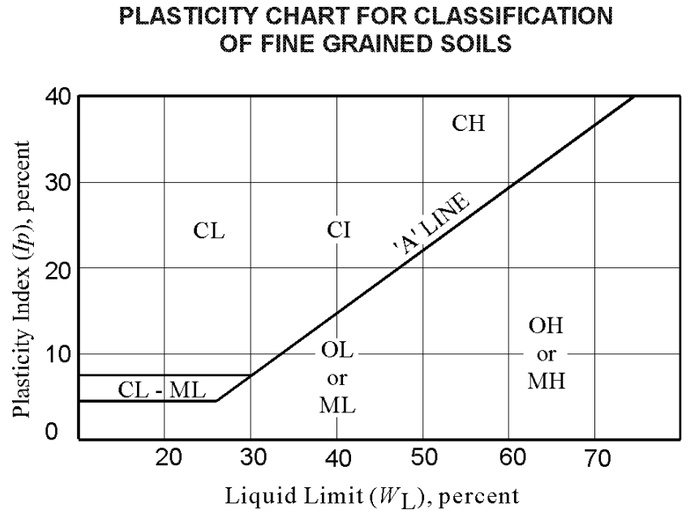
Boundary measured or determined from drilling conditions

Diffuse or uncertain boundary

GUIDE TO THE DESCRIPTION IDENTIFICATION AND CLASSIFICATION OF SOILS

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification Sand and Gravels	Laboratory Classification				
							% < 0.06mm (see note 2)	Plasticity of Fine Fraction	$C_u = \frac{D_{50}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{D_{10}D_{60}}$	Notes
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	**BOULDERS**	200				Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	—	—	—	—	
	COBBLES	63					—	—	—	—	
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	coarse 20	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 4	between 1 and 3	1. Identify lines by the method given for fine grained soils.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	—	
		medium 6	GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below 'A' line or $I_p < 4$	—	—	2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%.
			GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above 'A' line or $I_p > 7$	—	—	Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
		fine 2.36									
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	coarse 0.6	SW	Well graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 6	between 1 and 3	3. I_p = Plasticity Index
			SP	Poorly graded sands and gravelly sands; little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	Fails to comply with above	
		medium 0.2	SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below ‘A’ line or $I_p < 4$	—	—	
		fine 0.075	SC	Clayey sands, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above ‘A’ line or $I_p > 7$	—	—	

GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS (CONT.)

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification			Laboratory Classification			Notes
					Dry* Strength	Dilatancy†	Toughness ‡			Plasticity of Fine Fraction	
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	**SILTS & CLAYS** (liquid limit < 50%)	<0.075	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to low	Quick to slow	None	Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	More than 50% passing 0.06 mm	Below 'A' line	
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium			Above 'A' line	
			OL ⌖	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low			Below 'A' line	
	SILTS & CLAYS (liquid limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, clastic silts	Low to medium	Slow to none	Low to medium			Below 'A' line	
			CH	Inorganic clays of high plasticity, fat clays	High to very high	None	High			Above 'A' line	
			OH ⌖	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium			Below 'A' line	
	HIGHLY ORGANIC SOILS		Pt ⌖	Peat and other highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture					—	⌖ Effervesces with H_2O_2

PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

FIELD IDENTIFICATION PROCEDURE FOR FINE GRAINED SOILS OR FRACTIONS

THESE PROCEDURES ARE TO BE PERFORMED ON THE MINUS 0.2MM SIZE PARTICLES. FOR FIELD CLASSIFICATION PURPOSES, SCREENING IS NOT INTENDED, SIMPLY REMOVE BY HAND THE COARSE PARTICLES THAT INTERFERE WITH THE TESTS.

*** Dry strength (Crushing characteristics)**

After removing particles larger than 0.2mm size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity. High dry strength is characteristic for clays of the CH group.

A typical inorganic silt possesses only very slight dry strength.

Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

† Dilatancy (Reaction to shaking)

After removing particles larger than 0.2mm size, prepare a pat of moist soil with a volume of 10 cm³. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles.

The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, shows a moderately quick reaction.

‡ Toughness (Consistency near plastic limit)

After removing particles larger than 0.2mm size, a specimen of soil about 10cm³ in size is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. The specimen is then rolled out by hand on a smooth surface or between the palms into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together with a slight kneading action continued until the lump crumbles. The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil.

Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line. Highly organic clays have a very weak and spongy feel at the plastic limit.

EXPLANATION OF LOGGING TERMS FOR ENGINEERING GEOLOGY BOREHOLE LOGGING

ROCK SUBSTANCE WEATHERING CLASSIFICATION

RS	Residual soil
EW	Extremely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
F(s)	Fresh (stained defects)
F	Fresh

ESTIMATED STRENGTH CLASSIFICATION

EW	Extremely weak
VW	Very weak
W	Weak
MS	Medium strong
S	Strong
VS	Very strong
ES	Extremely strong

DEFECTS

Defects include all joints, bedding planes, fracture zones, seams, veins and cleavage partings.

RQD

Rock quality designation:

$$RQD = \frac{\text{length of core in pieces 100mm or longer}}{\text{length of run}} \times 100\%$$

WATER

Water table, with date

Water inflow

Partial drilling water loss

Complete drilling water loss

Angles of joint inclination (and other geological features and drill holes) are angles between the feature and a horizontal plane. In core, angles of joints (and other geological structures) are angles between the structure and the plane normal to the axis of the core. In vertical holes these angles are then the true inclination (dip) of the structure.

DEFINITIONS OF ENGINEERING GEOLOGICAL TERMS

This classification system provides a standard terminology for the engineering description of rock.

DEGREE OF WEATHERING [1]

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Rock is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance, and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock, usually as a result of iron bleaching or deposition. The colour and strength of the original substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance, and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (stained)	F_S	Rock substance unaffected by weathering. Weathering is limited to the surface of major discontinuities, for example an iron-stained joint.
Fresh	F	Rock substance unaffected by weathering.

ROCK STRENGTH [2]

Rock strength is defined by the Point Load Strength Index (Is (50)), and refers to the strength of the rock substance in the direction normal to the bedding.

TERM	Is (50)	FIELD GUIDE	APPROX. qu MPa *
Extremely Weak (EW)		Easily remoulded by hand to a material with soil properties.	
	0.03		0.7
Very weak (VW)		May be crumbled in the hand. Sandstone is "sugary" and friable.	
	0.1		2.4
Weak (W)		A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	
	0.3		7
Medium Strong (MS)		A piece of core 150mm long x 50mm dia. may be broken by hand with considerable difficulty. Readily scored with a knife.	
	1		24
Strong (S)		A piece of core 150mm long x 50mm dia. cannot be broken by unaided hands, may be slightly scratched or scored with knife.	
	3		70
Very Strong (VS)		A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	
	10		240
Extremely Strong (ES)		A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with hammer.	

* The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely and should be calibrated on site.

STRATIFICATION SPACING [2]

TERM	SEPARATION OF STRATIFICATION PLANES
Thinly laminated	< 6mm
Laminated	6mm - 20mm
Very thinly bedded	20mm - 60mm
Thinly bedded	60mm - 200mm
Medium bedded	200mm - 600mm
Thickly bedded	600mm - 2m
Very thickly bedded	> 2m

DISCONTINUITY SPACING [3]

TERM	SPACING
Very widely spaced	> 2m
Widely spaced	600mm - 2m
Moderately widely spaced	200mm 600mm
Closely spaced	60mm - 200mm
Very closely spaced	20mm - 60mm
Extremely closely spaced	< 20mm

APERTURE OF DISCONTINUITY SURFACES [4]

The degree to which a discontinuity is open, or to which the faces of the discontinuity have been separated and the space subsequently infilled (such as in a vein, fault or joint).

TERM	APERTURE THICKNESS (Discontinuities, veins, faults, joints)
Wide	> 200mm
Moderately wide	60mm - 200mm
Moderately narrow	20mm - 60mm
Narrow	6mm - 20mm
Very narrow	2mm - 6mm
Extremely narrow	> 0 - 2 mm
Tight	Zero

BLOCK SHAPE AND SIZE [4]

The following descriptive terms define shape:

Blocky	- approximately equidimensional.
Tabular	- one dimension considerably shorter than the other two.
Columnar	- one dimension considerably larger than the other two.

Block sizes are defined by the following descriptive terms:

TERM	BLOCK SIZE	EQUIVALENT DISCONTINUITY SPACINGS IN BLOCKY ROCK
Very large	$> 8m^3$	Extremely wide
Large	$> 0.2m^3$ - $8m^3$	Very wide
Medium	$> 0.008m^3$ - $0.2m^3$	Wide
Small	$> 0.0002m^3$ - $0.008m^3$	Moderately wide
Very small	$\leq 0.0002m^3$	Less than moderately wide

REFERENCES

1. Modifications of:
   (a) McMahon, B.K., Douglas, D.J., & Burgess, P.J., 1975. Engineering classification of sedimentary rocks in the Sydney area. Australian Geomechanics Journal, G5 (1), 51-53.
   (b) Geological Society Engineering Group Working Party, 1977. The description of rock masses for engineering purposes. Quarterly Jour. Engg. Geology, 10 (4), 355-388.

2. McMahon, B.K., Douglas , D.J., & Burgess, P. J., 1975. Engineering classification of sedimentary rocks in the Sydney area. Australian Geomechanics Journal, G5 (1), 51 -53.

3. ISRM Commission on Standardisation of Laboratory and Field Tests, 1978. Suggested methods for the quantitative description of discontinuities in rock masses. J1. Rock Mechanics Min. Sci. and Geomech. Abstra., 15, 319-368.

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Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

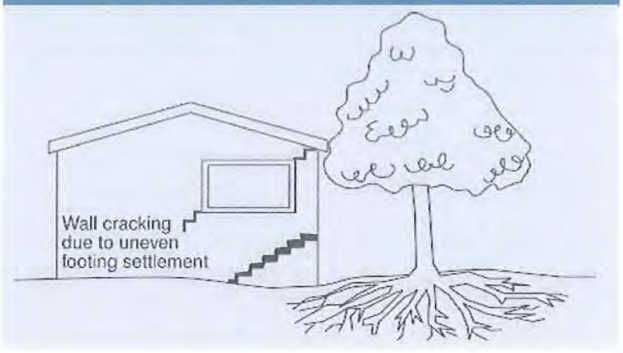
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

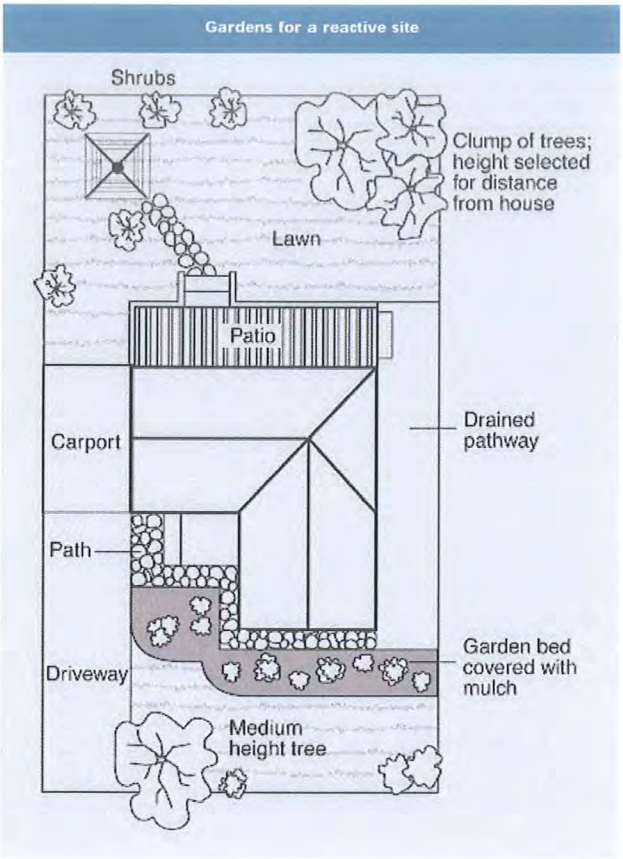
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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APPENDIX B

Borehole Logs

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA1

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 20.1 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST		WATER	METHOD
	20.0		FILL (v)	SAND with clay and trace silt and gravel; brown, orange-brown, yellow-brown, grey-brown, trace light grey; loose; moist; gravel is mostly blue-metal and sandstone.	D	BA1-0.0-0.2 & QC1	Not Encountered	TUBE
				0.30				
0.5	19.5		SC (v)	CLAYEY SAND; yellow-grey-brown, trace orange-brown and light grey; loose; moist.				
1.0	19.0				SPT	2,1,3 N=4		
				- quartz gravel in base of SPT sample.				
				1.45				
1.5	18.5			Hole Terminated at 1.45 m				
2.0	18.0							
2.5	17.5							
3.0	17.0							
3.5	16.5							

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA2

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 21.0 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST		WATER	METHOD
			FILL (v)	TOPSOIL - SILTY SAND, contains fine grass roots; dark brown/dark grey-brown; loose; moist.	D	BA2-0.0-0.2	Not Encountered	TUBE
				0.25				
			FILL (v)	SILTY SAND; dark grey-brown; loose; moist.	D	BA2-0.25-0.55		
0.5	20.5			0.55				
			SP (v)	SAND with clay and trace silt, rare quartz gravel; yellow-grey-brown, grey-brown; loose; moist. - very moist zone 0.8m to 0.95m. Iron-cemented zone 0.95m to 1.0m.				
1.0	20.0			1.00				
			SC (v)	CLAYEY SAND; yellow-brown and orange-brown mottled, trace grey-brown; medium dense; moist.	SPT	2,3,5 N=8		
				1.45				
1.5	19.5			Hole Terminated at 1.45 m				
2.0	19.0							
2.5	18.5							
3.0	18.0							
3.5	17.5							

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA3

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 22.5 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	BITUMEN (0.05m) over roadbase-type gravelly silty sand; grey-brown, grey, blue-grey, light grey; moderately compact; dry to just moist with depth; gravel is mostly blue-metal and angular sandstone fragments.			
				0.35			
			FILL (v)	SILTY SAND with trace gravel; dark grey/dark grey-brown with trace light grey and yellow-grey-brown; loose to medium dense; moist.	D BA3-0.35-0.55		
0.5	22.0			0.55			
			SC (v)	CLAYEY SAND with trace silt; yellow-grey-brown; medium dense; moist.	SPT 8,7,4 N=11		
1.0	21.5			1.00			
			SP (v)	SAND with clay and trace silt; yellow-brown and light grey mottled with trace orange-brown; medium dense; moist.			TUBE
1.5	21.0			1.50	SPT 8/50,-,- N=R	Not Encountered	
			ROCK (v)	SANDSTONE; extremely weathered; behaves as a dense sand with clay; light grey to 1.55m then yellow-brown/orange-yellow-brown to 1.95m, then light grey with trace yellow-brown.			
2.0	20.5			2.20			
			ROCK (v)	SANDSTONE; highly weathered; very weak; light grey with red-brown; contains thin, harder iron-cemented zones.			TC
2.5	20.0						
3.0	19.5			3.20			
				NOTE: Tube refusal at 2.2m depth. TC bit refusal at 3.2m depth. Hole Terminated at 3.20 m			
3.5	19.0						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA4

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 23.7 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	TOPSOIL - SANDY SILT with trace clay and grass roots; dark brown/dark grey-brown; soft; moist.	D BA4-0.0-0.15	Not Encountered	TUBE
				0.15			
			FILL (v)	SANDY SILT (TOPSOIL) mixed with sand and bitumen fragments; dark brown/dark grey-brown with brown and trace light grey; soft/loose; moist. - piece of brick at 0.45m.			
				0.50	SPT 10/50,-,- N=R		
1.0	23.0		SC (v)	SAND with clay / CLAYEY SAND with trace silt; contains thin zones of highly weathered (iron-cemented) sandstone; yellow-brown, yellow-orange-brown, trace light grey; medium dense; moist to very moist.			
				1.40			
			ROCK (v)	SANDSTONE; extremely weathered; extremely weak; light grey with red and trace yellow-brown.			TC
				1.50			
2.0	22.0		ROCK (v)	SANDSTONE; highly weathered; very weak; light grey with red-brown.			
	21.0						
3.0				3.00			
				SEE ENGINEERING GEOLOGY BOREHOLE LOG.			NMLC
	20.0						
4.0			ROCK (v)				
	19.0						
5.0							
	18.0						
				5.90			
6.0				NOTE: Tube refusal at 1.5m depth. Hole Terminated at 5.90 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING
ENGINEERING GEOLOGY BOREHOLE LOG

BOREHOLE No. BA4
Sheet 1 of 1 Sheets

PROJECT HARBORD PUBLIC SCHOOL
LOCATION HARBORD
CO-ORDINATES E N
R.L. COLLAR 23.7m AHD approx.
DATUM
BEARING –
INCLINATION VERTICAL

DRILL GEOPROBE
CORE BARRELL NMLC
CONTRACTOR TERRATEST
DRILLER P.TAPPER
COMMENCED 17.9.2014
COMPLETED 17.9.2014

DRILLING DATA			ROCK SUBSTANCE			ROCK MASS DEFECTS			
DEPTH (R.L.) METRES	Method / Casing, Run / Water	GRAPHIC LOG	DESCRIPTION ROCK TYPE Grainsize, texture, colour, composition, structure, hardness	WEATHERING	ESTIMATED STRENGTH	DEFECT SPACING (mm) 2000 600 200 60 20	VISUAL LOG	DEFECT DESCRIPTION TYPE Inclination, planarity, roughness, coatings or infillings	R.Q.D. / TESTS
1	AUGER - TC BIT		NOT CORED; see soil log.						
2									
3			CORE LOSS; 0.09m						
3.09	DIAMOND CORING RUN 1		SANDSTONE; medium grained; laminated to very thinly bedded; light grey with mid grey laminations and orange-brown and red-brown staining; hard.					3.11 - FRAGMENTS 3.24 - PARTING; 10°; planar; rough. 3.30 - BOXING BREAK. 3.36 - PARTING; 15°; sub-planar; rough; 1-off quartz gravel. 3.47 - JOINT; 20°; planar; rough. 3.54 – 3.68 JOINT; 80° to 90°; irregular; rough. 3.85 - PARTING; 15°; planar; rough. 4.06 - PARTING; 10°; planar; rough. 4.19 - PARTING; 20°; planar; rough. 4.30 - PARTING; 10°; planar; rough.	
4			- coarse grained zone from 4.30 to 4.33m; quartz.	MW	MS			4.34 – 4.90 JOINT; 75° to 85°; sub-planar; rough; with associated boxing breaks. 4.90 - BOXING BREAK	RQD = 62%
5								5.71 – 5.79 JOINTS; 35° + 20°; planar; rough. 5.84 - DRILLING BREAKS	
5.90 6			END AT 5.90m						

Remarks: START CORING AT 3.0m. END OF HOLE AT 5.90m.
Job / Report No. GS58A

Logged by: P.ANDERSON
Date: 18.9.2014
Site Supervisor P.ANDERSON


HARBORD PUBLIC
SCHOOL
BA4
3·00-5·90m
HARBORD PUBLIC
SCHOOL BA4
START 3·00
CORE LOSS
0·09m
5·90
END

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA5

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 26.7 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
	26.5		FILL (v)	BITUMEN (0.04m) over roadbase-type gravel in a silty sand matrix; dark grey-brown, dark grey, brown and light grey; moderately compact; just moist.		Not Encountered	TUBE
				0.25			
			FILL (v)	GRAVEL with sand; gravel is mostly blue-metal, siltstone and sandstone; light grey to mid grey; loose to medium dense; moist.			
0.5				0.50			
	26.0		FILL (v)	SANDY GRAVEL; gravel is mostly quartz gravel; dark grey-brown, dark grey with white/light grey gravel; loose to medium dense; moist.	SPT 1,3,8/100 N=R		
				0.85			
			ROCK (v)	SANDSTONE; extremely weathered; behaves as a dense clayey sand; orange-brown and yellow-brown with light grey.			
1.0				1.00			
	25.5		ROCK (v)	SANDSTONE; highly weathered; very weak; yellow-orange-brown and yellow-brown.			TC
				1.40			
1.5				NOTE: Tube refusal at 1.0m depth. TC bit refusal at 1.4m depth. Hole Terminated at 1.40 m			
	25.0						
2.0							
	24.5						
2.5							
	24.0						
3.0							
	23.5						
3.5							
	23.0						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA6

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 24.2 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
	24.0		FILL (v)	SILTY SAND with gravel; gravel includes pieces of concrete, blue-metal, quartz, sandstone and rare bitumen fragments; dark grey, dark yellow-grey-brown with trace light grey; loose to medium dense; moist.	D BA6-0.0-0.3	Not Encountered	TUBE
				0.35			
0.5			ROCK (v)	SANDSTONE; extremely weathered; extremely weak; light grey and yellow-brown/yellow-orange-brown.			
	23.5			0.70			
1.0			ROCK (v)	SANDSTONE; highly weathered; very weak; light grey/white with yellow, orange-brown and trace red-brown.			TC
	23.0						
1.5							
	22.5						
2.0							
	22.0			2.30			
2.5				NOTE: Tube refusal at 0.7m depth. TC bit refusal at 2.3m depth. Hole Terminated at 2.30 m			
	21.5						
3.0							
	21.0						
3.5							
	20.5						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA7

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 24.3 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	TOPSOIL - SILTY SAND with trace gravel; dark grey-brown/dark brown; loose; moist.	D BA7-0.0-0.2	Not Encountered	TUBE
				0.20			
	24.0		FILL (v)	SAND with silt and trace gravel; gravel is quartz; yellow-brown; loose; moist.			
				0.35			
0.5			ROCK (v)	SANDSTONE; extremely weathered; behaves as a dense clayey sand; light grey with trace yellow.			
	23.5						
1.0				1.00			
				NOTE: Tube refusal at 1.0m depth. Hole Terminated at 1.00 m			
	23.0						
1.5							
	22.5						
2.0							
	22.0						
2.5							
	21.5						
3.0							
	21.0						
3.5							
	20.5						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA8

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 24.5 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	TOPSOIL - SILTY SAND; dark brown/dark grey-brown; loose; moist.	D BA8-0.0-0.2	Not Encountered	TUBE
				0.20			
			FILL (v)	CRUSHED SANDSTONE; light grey with trace red-brown; loose; moist.			
				0.30			
			FILL (v)	SAND with quartz gravel; coarse grained; yellow-brown; loose; very moist to wet.			
0.5	24.0						
				0.60			
			ROCK (v)	SANDSTONE; extremely weathered; behaves as a dense clayey sand; light grey with trace orange-brown and yellow-brown.			
				0.90			
1.0	23.5			NOTE: Tube refusal at 0.9m depth. Hole Terminated at 0.90 m			
1.5	23.0						
2.0	22.5						
2.5	22.0						
3.0	21.5						
3.5	21.0						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BA9

PROJECT: HARBORD PUBLIC SCHOOL
LOCATION: OLIVER STREET, FRESHWATER
CONTRACTOR: TERRATEST
SITE SUPERVISOR: P.ANDERSON

EQUIPMENT: GEOPROBE
PROJECT COORDINATOR: P.SHUN

DATE: 17/09/2014
SURFACE RL: 26.2 m AHD
EASTING:
NORTHING:

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
	26.0		FILL (v)	BITUMEN (0.04m) over roadbase-type gravelly sand; dark grey-brown/dark grey; moderately compact; just moist.			
				0.25			
0.5	25.5		FILL (v)	SILTY SAND with gravel; grey-brown. yellow-grey-brown, light grey, dark grey, red-brown and orange-brown; loose to medium dense; moist.	D BA9-0.3-0.7	Not Encountered	TUBE
				0.80			
			ROCK (v)	SANDSTONE; extremely weathered; extremely weak; light grey with trace orange-brown and red-brown.			
				0.95			
1.0	25.0			NOTE: Tube refusal at 0.95m depth. Hole Terminated at 0.95 m			
1.5	24.5						
2.0	24.0						
2.5	23.5						
3.0	23.0						
3.5	22.5						

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GS58A

SHEET: 1 OF 1

APPENDIX C

Results of Geotechnical Testing

Geotechnical Centre
110B King Street, Manly Vale, NSW 2093
Telephone 02- 9949 0200 Facsimile 02-9948 6185

NSW GOVERNMENT | Public Works

CLIENT:	GEOTECHNICAL & ENVIRONMENTAL	BATCH No:	14028
	SOIL SUMMARY SHEET		
PROJECT:	HARBORD PUBLIC SCHOOL	COMPILED BY:	ZG
LOCATION:	HARBORD	DATE:	26/09/2014

General Information Note: All test methods are as indicated on accompanying test reports.

Sample No.	**5102**					
Bore/Reference	BA1					
Depth (m)	1.00 - 1.45					
Sample Type	SPT					
Soil Colour & Description (v) indicates visual classification	Yellow and Light Grey Clayey Sand with Gravel and Silt					
Classification	SC (v)					

Moisture Content & Density

Field Moisture Content (%)						
Field Wet Density (t/m³)						
Field Dry Density (t/m³)						
Soil Particle Density (t/m³)						

Particle Size Distribution

Cobble Size	(%)	0					
Gravel Size	(%)	9					
Sand Size	(%)	72					
Silt Size	(%)	5					
Clay Size	(%)	14					
Effective Size	(mm)						
Uniformity Coefficient							
Curvature Coefficient							

Plasticity

Liquid Limit	(%)						
Plastic Limit	(%)						
Plasticity Index	(%)						
Linear Shrinkage	(%)						

Dispersion

Dispersal Index						
Emerson Class No.						

Compaction

Compaction Type						
Optimum Moisture Content (%)						
Maximum Dry Density (t/m³)						

California Bearing Ratio

Placement Moisture Content (%)						
Placement Dry Density (t/m³)						
Swell under 4.5kg Surcharge (%)						
C.B.R. at 2.5 mm Penetration (%)						
C.B.R. at 5.0 mm Penetration (%)						

Shrink-Swell Index

Shrink Strain	(%)						
Swell Strain	(%)						
Shrink-Swell Index	(Iss)						

Geotechnical Centre

110B King Street, Manly Vale NSW 2093
Telephone 02 9949 0200 Facsimile 02 9948 6185
NATA Accreditation Number: 13380

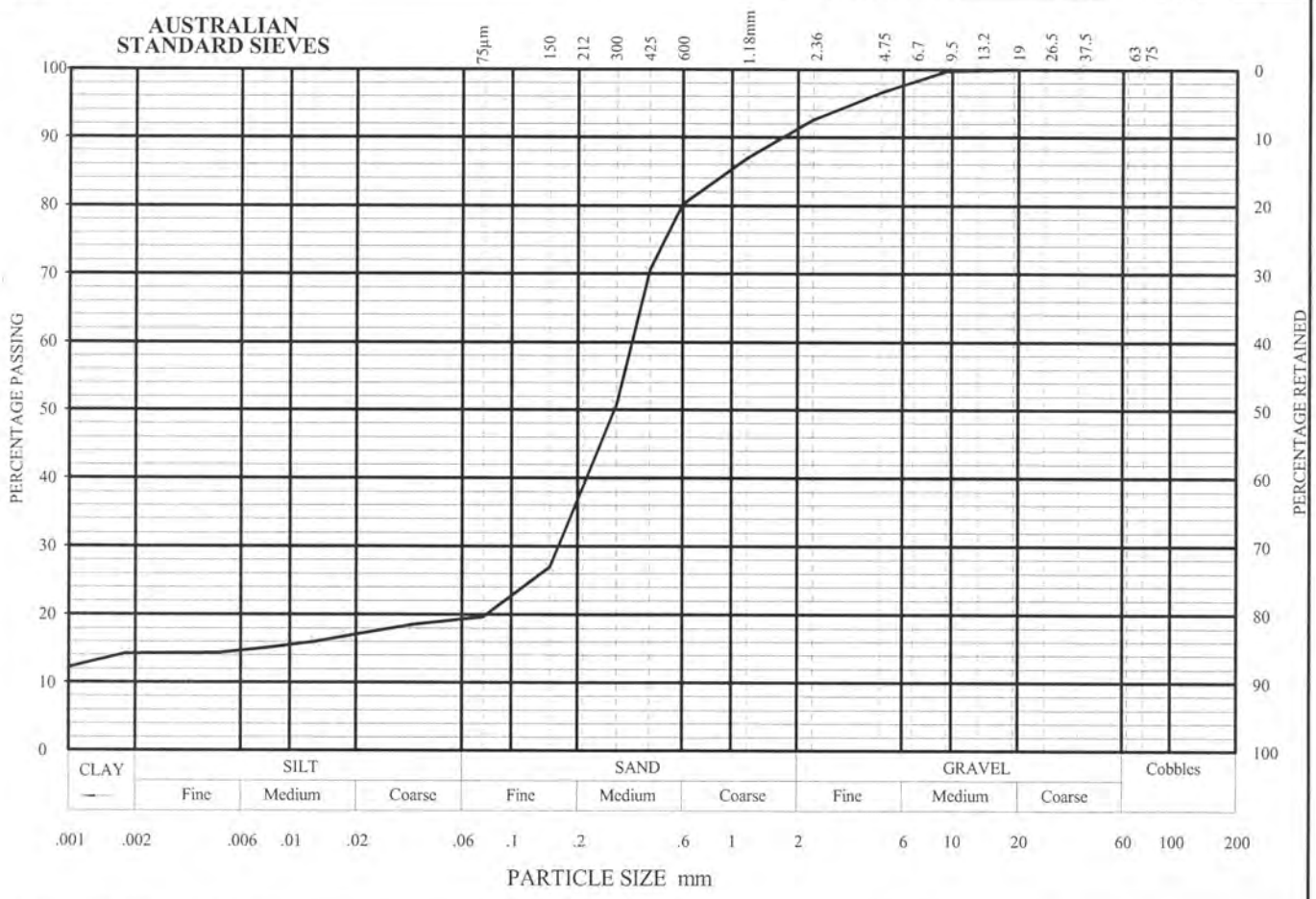
NSW GOVERNMENT | Public Works

CLIENT: GEOTECHNICAL & ENVIRONMENTAL | REPORT No: 14028/5102/R1119

PARTICLE SIZE DISTRIBUTION

PROJECT: HARBORD PUBLIC SCHOOL | SAMPLE No: 5102

LOCATION: HARBORD | HOLE No: BA1 | DEPTH (m): 1.00



SIZE DISTRIBUTION

COBBLES	0 %
GRAVEL	9 %
SAND	72 %
SILT	5 %
CLAY	14 %
EFFECTIVE SIZE D10:	-
UNIFORMITY COEFFICIENT D60/D10(Cu):	-
CURVATURE COEFFICIENT $D30^2$ /(D60 x D10) (Cc):	-

Soil Particle Density: 2.65 t/m³ (estimated for analysis)

Method of dispersion: End-over-end shaking

Hydrometer: ASTM 152H

Dispersion chemical: Sodium hexametaphosphate + Anhydrous sodium carbonate

Notes on Test: Tested as received

Loss in pre-treatment: 0 %

Test Methods:
DPWS GM 9: Determination of the Particle Size Distribution of a Soil

NATA **Accredited for compliance with ISO/IEC 17025.**

Tested By: ZG | Date Tested: 23/09/2014

APPROVED SIGNATORY

Zoran Gusevski 26/09/2014

PARTICLE SIZE DISTRIBUTION R1119 (ISSUE 4, 2005)

APPENDIX D

Results of Topsoil Testing

Soil Chemistry Profile

Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 31937 **Sample N°: 1** **Date Received: 22/9/14** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Harbord Public School**
Client Contact:	**Peter Shun**	Location:	
Client Job N°:		SESL Quote N°:	
Client Order N°:	**GS58A**	Sample Name:	**5106/BA4/ 0.0-0.15m**
Address:	**Level 14, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Description:	**Soil**
		Test Type:	**RSC**

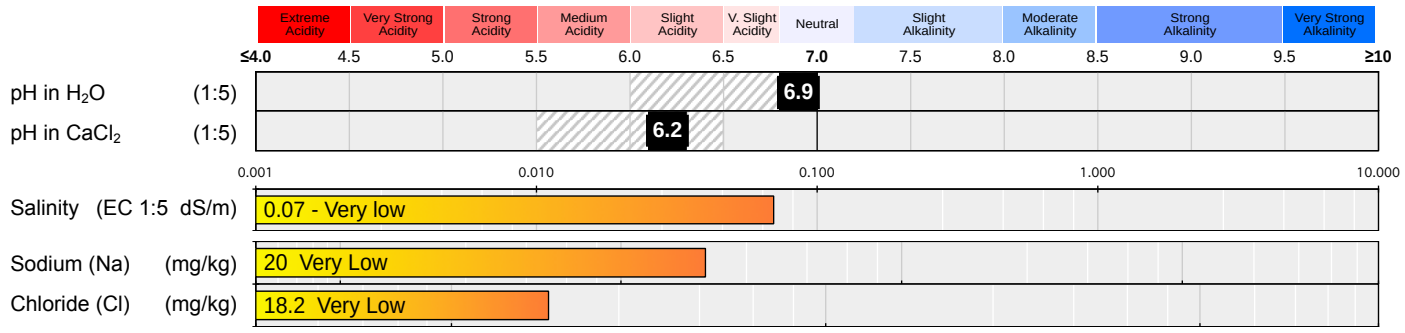
RECOMMENDATIONS

This soil sample collected by the client was analysed for chemical properties relevant to healthy plant growth. It is between slight acidic and neutral pH and has very low saline, sodic and chlorine levels. The cation balance is high calcic therefore has low potential for dispersion and soil structure collapse. The effective cation exchange capacity (eCEC) is moderate, indicating good nutrient retention and holding capacity. Overall all the nutrients are high only Nitrate and Potassium need a boost.

SESL recommends Phosphorus application to maintain current levels. Drainage should be encouraged, to ensure that plants do not become waterlogged. Leaching is recommended to drawdown nutrient levels and to encourage water to move through the profile.

SOIL SAMPLE DEPTH (mm): ○ 100 ◉ 150 ○ 200 **FERTILITY RATING:** ○ Low ◉ Moderate ○ High

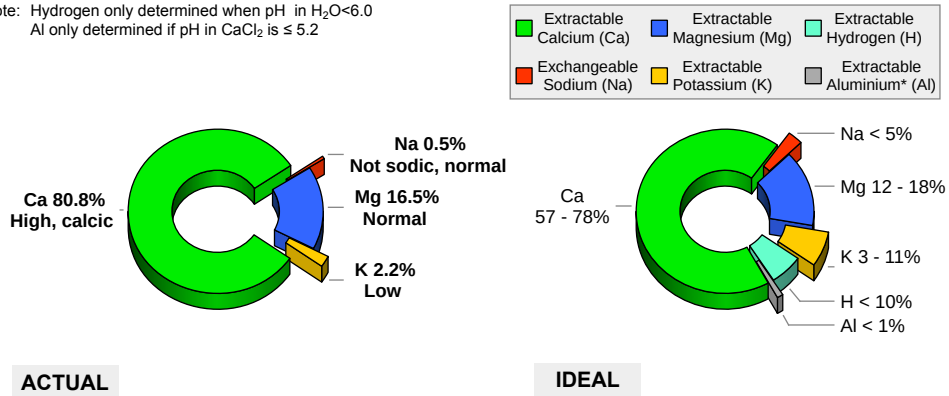
pH and ELECTRICAL CONDUCTIVITY



CATION BALANCE

EXCHANGEABLE CATION PERCENTAGE

Note: Hydrogen only determined when pH in H_2O<6.0
Al only determined if pH in $CaCl_2$ is ≤ 5.2



EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)

CATION RATIOS

Ratio	Result	Target Range
Ca:Mg	**4.9**	4.1 – 6.0
Comment: Balanced		
Mg:K	**7.5**	2.6 – 5.0
Comment: Potassium low		
K/(Ca+Mg)	**0.02**	< 0.07
Comment: Acceptable		
K:Na	**4**	N/A

Sodium Absorption Ratio: 0 Low

Electrochemical Stability Index (ESI):
0.14 Low potential for dispersion and soil structure collapse

SOLUBLE CATIONS (meq/100g)

Na: K: Ca: Mg:

Soil Chemistry Profile

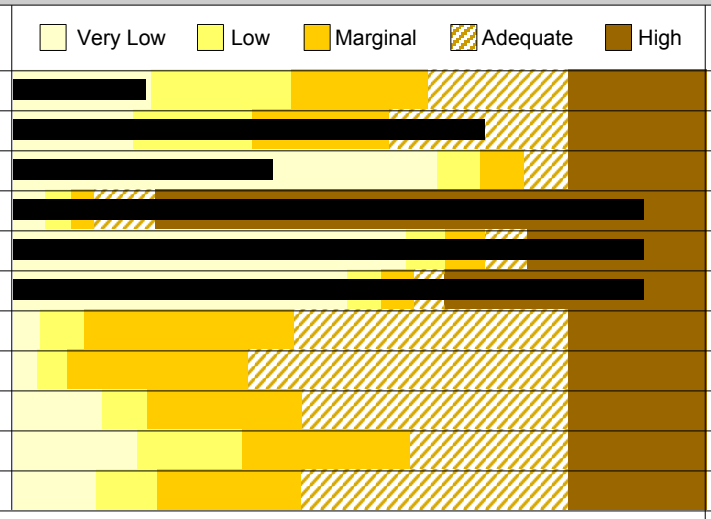
Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 31937 **Sample N°: 1** **Date Received: 22/9/14** **Report Status: ○ Draft ◉ Final**

PLANT AVAILABLE NUTRIENTS

Major Nutrients	Result (mg/kg)	Very Low / Low / Marginal / Adequate / High	Result (g/sqm)	Desirable (g/sqm)	Adjustment (g/sqm)
Nitrate-N (NO_3)	5		1	6	5
Phosphate-P (PO_4)	55.2		11	12.6	1.6
Potassium (K) †	142		28.3	60.6	32.3
Sulphate-S (SO_4)	304		60.6	13.6	Drawdown
Calcium (Ca) †	2655		529.7	431.7	Drawdown
Magnesium (Mg) †	329		65.6	44.9	Drawdown
Iron (Fe)	-		-	110.1	Did not test
Manganese (Mn) †	-		-	8.8	Did not test
Zinc (Zn) †	-		-	1	Did not test
Copper (Cu)	-		-	1.3	Did not test
Boron (B) †	-		-	0.5	Did not test



Explanation of graph ranges:

Very Low
Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.

Low
Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.

Marginal
Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.

Adequate
Supply of this nutrient is adequate for the plant, and and only maintenance application rates are recommended. Potential response to nutrient addition is 5 to 30%.

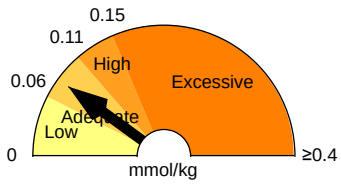
High
The level is excessive and may be detrimental to plant growth (i.e. phytotoxic) and may contribute to pollution of ground and surface waters. Drawdown is recommended. Potential response to nutrient addition is <2%.

NOTES: Adjustment recommendation calculates the elemental application to shift the soil test level to within the **Adequate** band, which maximises growth/yield, and economic efficiency, and minimises impact on the environment.

Drawdown: The objective nutrient management is to utilise residual soil nutrients. There is no agronomic reason to apply fertiliser when soil test levels exceed **Adequate**.

• g/sqm measurements are based on soil bulk density of 1.33 tonne/m^3 and selected soil depth.

Phosphorus Saturation Index



0.08

Adequate. Economic response to P unlikely. P application recommended maintaining current P level.

Exchangeable Acidity

Adams-Evans Buffer pH (BpH):	-
Sum of Base Cations (meq/$100g^{-1}$):	**16.4**
Eff. Cation Exch. Capacity (eCEC):	**16.4**
Base Saturation (%):	**100**
Exchangeable Acidity (meq/$100g^{-1}$):	-
Exchangeable Acidity (%):	-

Lime Application Rate

– to achieve pH 6.0 (g/sqm):	**0**
– to neutralise Al (g/sqm):	-

Gypsum Application Rate

– to achieve 67.5% exch. Ca (g/sqm): **0**

The CGAR is corrected for a soil depth of 150mm and any Lime addition to achieve pH 6.0.

Physical Description

Texture:	-
Colour:	-
Estimated clay content:	**Did not test**
Size:	-
Gravel content:	-
Aggregate strength:	-
Structural unit:	**Did not test**
Potential infiltration rate:	**Did Not Test**
Permeability (mm/hr):	**Did not test**
Calculated EC_{SE} (dS/m):	-

Requires EC and Soil Texture result.

Organic Carbon (OC%)†: **Did not test**

Organic Matter (OM%): -

Additional comments:

Consultant: Kimberley Femia

Authorised Signatory: Ryan Jacka

Date Report Generated 3/10/2014

METHOD REFERENCES:
pH (1:5 H_2O) - Rayment & Higginson (1992) 4A1,
pH (1:5 $CaCl_2$) - Rayment & Higginson (1992) 4B1,
EC (1:5) - Rayment & Higginson (1992) 3A1,
Chloride - Rayment & Higginson (1992) 5A2,
Nitrate - Rayment & Higginson (1992) 7B1
Aluminium - SESL in-house,
PO_4, K, SO_4, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984),
Buffer pH and Hydrogen - Adams-Evans (1972)
Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

A member of the Australasian Soil and Plant Analysis Council
† This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has been demonstrated are highlighted in this report.

APPENDIX E

Results of Soil Corrosion and Scaling Assessment

Corrosion & Scaling Assessment:
Soil Reporting Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 31937 **Sample N°: 2** **Date Received: 22/9/14** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Harbord Public School**
Client Contact:	**Peter Shun**	Location:	
Client Job N°:		SESL Quote N°:	
Client Order N°:	**GS58A**	Sample Name:	**5104/BA3/0.5-0.95m**
Address:	**Level 14, McKell Building** **2-24 Rawson Place** **SYDNEY NSW 2000**	Description: Test Type:	**Soil** **CSCSSNR**

TEST	RESULT	COMMENTS
pH in water (1:5)	8.4	Moderate alkalinity
EC mS/cm (1:5)	0.09	Low salinity
Texture Class	Light Sandy Clay Loam	
Soil Permeability Class		Low
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO_4 / kg	30	Low (non-aggressive)
Chloride (1:5) mgCl / kg	70	Low (non-aggressive)
* Resistivity Ω. m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purposes of this corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows moderate alkalinity, low salinity, low sulphate, low chloride.

According to Australian Standard (AS) 2159-2009, the pH is considered to be non-aggressive towards concrete and non-aggressive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >2400mg/kg SO_4; and (b) low pH, becoming mildly aggressive at pH of <5-6.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <4-5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, according AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
3/10/2014

Consultant: Kimberley Femia

Authorised Signatory: Ryan Jacka

HARBORD PUBLIC SCHOOL NEW CLASSROOM & LIBRARY

STATEMENT OF HERITAGE IMPACT

Heritage Group
NSW Government Architect's Office
Prepared for NSW Department of Education & Communities

October 2014

Report No. 14053

NSW GOVERNMENT | Public Works
Government Architect's Office

HARBORD PUBLIC SCHOOL

NEW CLASSROOM & LIBRARY

STATEMENT OF HERITAGE IMPACT

November 2014

David Mason

Heritage Group, Government Architect's Office, Department of Finance & Services

McKell Building, Level 18 2-24 Rawson Place SYDNEY 2000
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E: David.mason@services.nsw.gov.au
W: www.govarch.services.nsw.gov.au

CONTENTS

1.0 BACKGROUND

1.1 INTRODUCTION

This Heritage Impact Statement has been prepared by the Government Architect's Office, NSW Public Works in connection with the proposed new classroom/library block and landscaping works at Harbord Public School. The HIS is required as part of the Review of Environmental Factors for development without consent under SEPP (Infrastructure) 2007. This report assesses the potential heritage impacts arising from the development and makes recommendations as necessary to mitigate any such impacts.

Harbord Public School is located on the corner of Wyadra Avenue and Oliver Street, Freshwater. The school opened in1912, and was extended and developed at various later periods. Harbord Public School is a heritage item on the DEC s170 Heritage and Conservation Register and a locally listed item in the Waringah LEP. It is not situated in a Heritage Conservation Area.

1.2 METHODOLOGY & LIMITATIONS

The report aims to identify and assess potential heritage impacts arising from the new building and landscaping in the context of the local planning instruments and heritage controls. Research is based on a desk survey of relevant planning policies and historical documentation, site visit and design information supplied by the GAO Project Architect leading the design development. A summary history of the site is provided. There has been limited archival research and no detailed physical assessment of the structures on the site. Some assumptions have been made based on visual observations and documentary research.

1.3 ABBREVIATIONS

DCP	Development Control Plan
HIS	Heritage Impact Statement (also known as Statement of Heritage Impact or SOHI)
LEP	Local Environmental Plan
SEPP	State Environmental Planning Policy (Infrastructure) 2007

1.4 ACKNOWLEDGMENTS

This report has been written by David Mason and reviewed by Bruce Pettman, Government Architect's Office Heritage Group. The author would like to thank Ryan Elwazzi and Cathy Kubany (GAO) for information provided in preparing this report.

2.0 DESCRIPTION

2.1 LOCATION

Harbord Public School is located on the corner of Wyadra Avenue and Oliver Street, Freshwater. The site is on a slight incline and is bounded by low-rise, medium density suburban residential development. It is close to the Corella Street Reserve (park and natural bushland reserve) to the East.

2.2 HISTORY OF SITE DEVELOPMENT

This section is based on a preliminary review of the history, including the references cited at the end of this report, and readily accessible archival photographs. There has been limited archival research and no detailed assessment of the structures on the site. Some assumptions have been made.

According to the NSW Heritage Database, the first Harbord Public School was established in 1911. In fact the first public school was known as Freshwater Public School until 1928.This early school was built using the day labour system at a cost of 700 pounds and opened by Minister for Education Ambrose Carmichael on 14 September 1912, Carmichael admitting his mistake in approving a school that was already “too small” for the community it would serve (Sydney Morning Herald 16 September 191, p.4). The NSW Heritage Database record states:

> “Original weatherboard buildings were replaced by (the) existing brick building which was opened in 1928 by Albert Bruntell, Chief Secretary (of New South Wales)”.

The record’s site description continues:

> “Two storey brick building with extensive use of dichromatic (two-tone) brickwork. Hipped and gabled roof of corrugated iron. Timber multi-paned windows. Lattice vent to gable. Name and date of opening on front facade.”

Photographic evidence shows that the present school building was complete by 1928 (Fig.7). This would have been a substantial feature in a landscape subject to gradual subdivision for low-rise residential housing extending up from the shore and eastwards from Pittwater Road. An aerial photograph of 1943 (Fig.2) shows the location of this 1928 school building (marked ‘A’) at the southwest corner of the site. The photograph shows that the site and surroundings were still sparsely developed at this date and appears to show the eastern boundary of the site did not extend all the way to Corella St. as it does today (compare Fig.3).

One of the original weatherboard structures, identified as ‘B’ in Fig. 4, remained standing until 1998 when it was demolished after a fire (Amos & Proctor 2012). In 1954 the Sydney Morning Herald made reference to Warringah Shire Council’s proposed sanitation improvements at Harbord School, namely:

Figure 1

Aerial photograph showing the school site perimeter (in red) and urban setting

(Source: Sixlite Viewer, Department of Land, -33º 46' 18.48", +151º 17' 6.19" http://maps.six.nsw.gov.au/ Accessed 23 Oct 2014))

"erection of two new closet blocks and a drink and wash shed for infants, extension of two toilet blocks, new drinking and wash troughs and demolition of an existing toilet block" (SMH Wed 9 June 1954 p.9).

Block D, now the Resource Centre, across the court from the 1928 building, was added in the 1960s. It is a modest 1-storey L-shaped block with concrete tile roof and blue-painted timber joinery, and has been subject to little change. Though not of great significance individually, it nonetheless well represents the school's 1960s expansion phase in a manner architecturally consistent, volumetrically and spatially, with the original school site. Block F, a 2-storey building, appears to be of a similar vintage but has been much altered on the north elevation. The Assembly Hall was built in 1963 (Fig.8). It has a polygonal plan and is built of pre cast concrete units with a flat roof supported on Warren type trusses. The building is not mentioned in the list description and appears to be of modest architectural significance. It has also been transformed externally on the N side in the 2000s. The southern edge of the site is dominated by the 2-storey administration/library and classroom block, adjoining the 1928 block. This was built in 2002 in two-tone brick, with rendered brick stairways, north verandah with blue powder coated mesh panels, and corrugated galvanised metal roof. The most recent permanent building is the 2011 home base situated on the eastern edge of the playground. Other buildings are chiefly prefabricated classrooms of various types.

2.3 LANSDCAPE AND SETTING

The NSW Heritage Database listing mentions the particular local heritage significance attributed to the SW corner of the site:

"significance of brick building & pine trees should be recognised by statutory heritage listing. (cont. Norfolk Island Pines in Wyadra Road and Hoop Pine on the corner appear to date from first occupation of the site as a school in 1911)."

The Warringah LEP 2011 mentions the need to recognise these pines as well as the brick school building. Several trees were apparently planted by students in the 1930s though it is unclear which ones (Amos & Proctor 2012). On current evidence the most significant trees appear to be the four along Wyadra Ave. (See arborist's report).

Figure 2

Harbord Public School, aerial photograph 1943. Refer to Table 1

(source – Sixlite Viewer, Department of Land, http://maps.six.nsw.gov.au/viewed 26/07/2013)

Figure 3

Harbord Public School, aerial photograph 2014. Refer to Table 1

(Source: Sixlite Viewer, Department of Land, -33º 46' 18.48", +151º 17' 6.19" http://maps.six.nsw.gov.au/ Accessed 23 Oct 2014))

2.4 ARCHAEOLOGY

The GAO Archaeologist has reported (during an earlier assessment of the site) that the site is not identified for any archaeology. It may be assumed that, had there been any

important pre-existing surface landscape features, structures, paths, rock forms or vegetation, these have not survived.

2.5 ABORIGINAL HERITAGE

The National parks and Wildlife Act 1974 requires that certain processes be followed to evaluate the risk of harm to Aboriginal heritage. The first of these is to search the AHIMS Web Service to confirm the presence of Aboriginal objects in the vicinity. An AHIMS search conducted on 5 July for Lot : 499, DP:DP752038 with a Buffer of 200 meters, has shown no Aboriginal heritage sites or places recorded in or near the above location. This does not rule out the possibility of Aboriginal heritage sites being present. The Department of Environment and Climate Change flow-chart from the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales should be consulted (See References). It is recommended to follow the subsequent stages of the due diligence process: check for landscape features which may indicate the presence of Aboriginal objects; develop strategies to avoid harming Aboriginal objects; and make a desktop evaluation and visual inspection to confirm the presence of Aboriginal objects. Further guidance is beyond the scope of this report and enquiries should be addressed to the DECCW Environment Line on 131555, info@environment.nsw.gov.au.

Table 1

From GAO, *Harbord Public School Home base Block, Statement of Heritage Impact*, 2013

Key to aerial photograph	
BLOCK	DESCRIPTION
A	1928 school building in two-tone brick. Hipped and gabled roof of corrugated iron. Timber multi-paned windows. Lattice vent to gable.
B	Single-storey weatherboard building of ca. 1911 (demolished 1998)
C	Unidentified; possibly sanitation and services (demolished 1950s)
D	'Block A', 1-storey brick classrooms, concrete tile roofs, added mid 1960s, largely intact
E	Pair of sanitation blocks, possibly ca. 1958
F	2-storey brick classrooms, storage and toilet block (1960s)
G	Assembly Hall, 1963
H	School extension 2002
I	BER project buildings 2011
J	Memorial Garden, ca. 1990s-2000s

Figure 4

The memorial garden in the main outdoor play area

Source: GAO

Figure 5

The early 1960s Homebase block

Source: GAO

Figure 6

The 1928 School Building from the north

Source: GAO

Figure 7:

Harbord Public School, 1928

(From 'Manly, Warringah and Pittwater in pictures' CD-ROM Coll. Warringah Library, Accession no. 284756)

Figure 8:

Harbord Public School Hall

(From Amos & Proctor 2012)

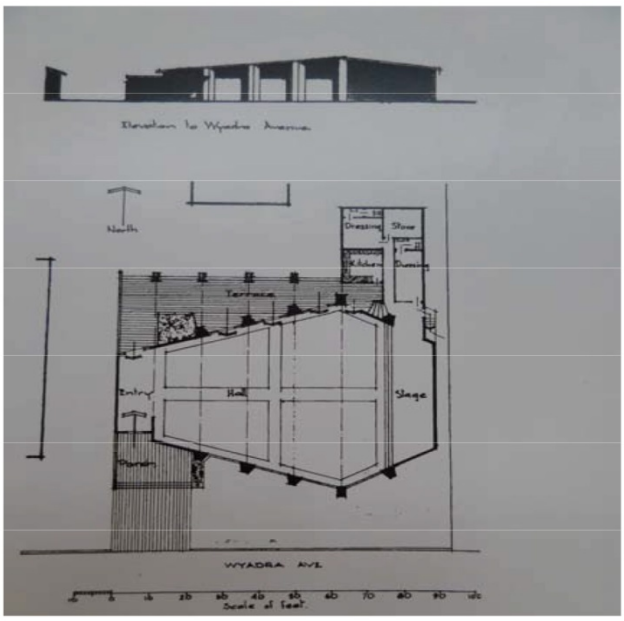


Figure 9:

Harbord Public School, 1980, showing significant trees

(From 'Manly, Warringah and Pittwater in pictures' CD-ROM Coll. Warringah Library, Accession no. 284678)

3.0 HERITAGE SIGNIFICANCE

3.1 STATUTORY LISTINGS

STATE HERITAGE REGISTER (NSW Heritage Act1977)

Harbord Public School is **NOT LISTED** on the State Heritage Register under the *NSW Heritage Act 1977.*

STATE HERITAGE INVENTORY (NSW Heritage Act 1977)

Harbord Public School is **LISTED** in the NSW Department of Education and Communities Heritage and Conservation Register (June 2011) with Inventory No. 4640197

WARRINGAH LOCAL ENVIRONMENT PLAN

Harbord Public School is **LISTED** as a heritage 'General Item" in the Warringah LEP 2011 Schedule 5 Environmental Heritage. The LEP listing (Item 177) pertains to Lots 469–471, 474, 486, 496, 498–500, DP 752038; Lots 1–4, DP 945486; Lots X and Y, DP 407018; Lot 1, DP 391679 (Fig. 10)C BLOCK

3.2 NON-STATUTORY LISTINGS

NATIONAL TRUST OF AUSTRALIA (NSW)
Harbord Public School is NOT CLASSIFIED on the Register of the National Trust of Australia (NSW).

3.3 STATEMENT OF SIGNIFICANCE

The following statement is taken from the NSW Heritage Database

Name of item: Harbord Public School

Type of item: Built

Primary address: cnr Wyadra Road and Oliver Street, Harbord, NSW 2096

Local govt. area: Warringah

Statement of Significance:

> *A representative example of an inter-war school building. Displays high integrity of fabric & use. Historically provides evidence of the early need for educational infrastructure to serve a permanent community. Mature pines are local landmarks.*

3.4 ASPECTS OF SIGNIFICANCE

The following aspects of significance of the site were identified by a heritage specialist during an earlier Heritage Impact Statement prepared by the GAO Heritage Group for a different project in the site (2013). These were identified using standard NSW heritage criteria prepared by the Heritage Branch of the NSW Department of Planning. They are not part of the list entry.

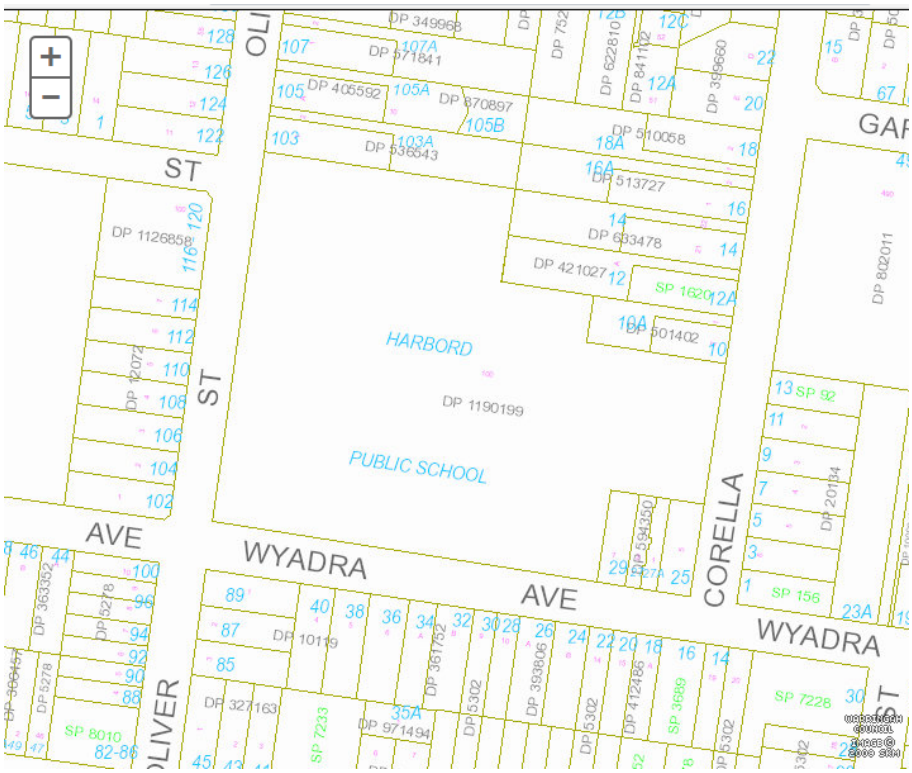


Figure 10

Detail from Warringah LEP 2011 Planning Map.
Harbord School heritage Item 117

Source Warringah LEP 2011

http://www.warringah.nsw.gov.au/planning-and-development/development-plans/warringah-lep-2011

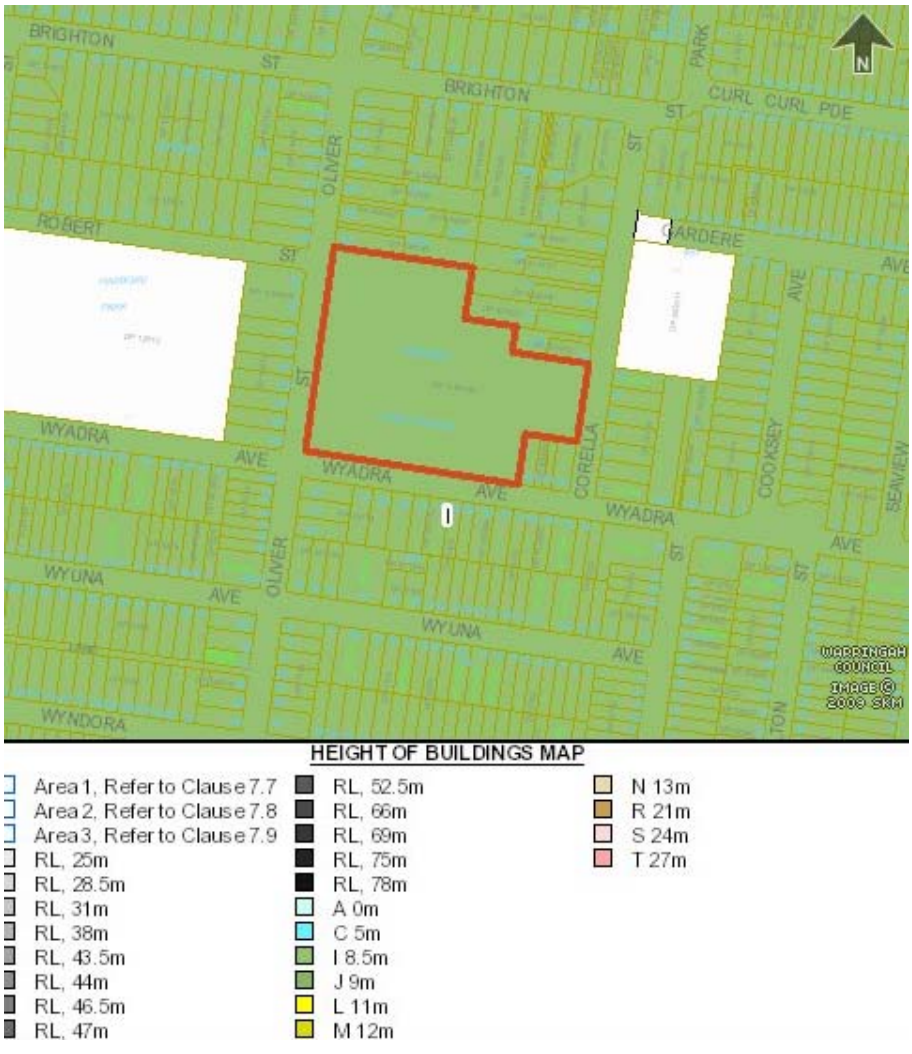


Figure 11

Detail from Warringah LEP 2011
Height of Buildings Map

Source Warringah LEP 2011

http://www.warringah.nsw.gov.au/planning-and-development/development-plans/warringah-lep-2011

CRITERION (A) An item is important in the course, pattern of NSW's cultural or natural history.

The first Freshwater Public School was built in 1912 and Harbord School remains important in the history of the locality. The school has evolved rapidly over the 20th century and as such illustrates the changing demands of educational provision for a permanent and growing residential community. The 1928 school building is of major local significance as the earliest surviving school building on site. Adjacent Norfolk pines and hoop pine at the corner of Wyadra Ave and Oliver St. appear to date from first occupation of the site as a school in 1911 and are significant local landmarks.

CRITERION (B) An item has strong or special association with life or works of a person or group of persons, of importance in NSW cultural or natural history.

The 1928 school building is likely to demonstrate the work of the Government Architect in NSW (Richard McDonald Seymour Wells, 1927-1929), though no documentary evidence has been found. The School has looser association with Ambrose Carmichael's tenure as Minister for Education.

CRITERION (C) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW.

The 1928 school building is well preserved and a representative example of an inter-war school building. It displays high integrity of fabric and use.

CRITERION (D) An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons.

Harbord Public School has strongly emphasised its connection to the community and families of the immediate area, with a centenary booklet and newspaper stories including recollections of former students from the 1920s to the present.

CRITERION (E) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history.

The archaeological research potential of the site is considered to be low. The 1943 aerial photograph suggests there may be some archaeological potential in regard to the western sector, Lots DP 752038, but less in the eastern sector.

CRITERION (F) An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (Rare).

A large part of the original site layout has been lost or obscured by redevelopment at regular periods since 1928. Harbord Public School is not considered to meet the inclusion guidelines for this criterion.

CRITERION (G) An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places, or cultural or natural environments (Representative).

Harbord Public School has been a representative example of a local suburban school: constructed during a time of significant population growth and urban development, and already too small when built, it has continued to evolve and develop to serve the changing demands of the district. The

1928 block is a significant survival from this continued cycle of growth, and evidence of the early need for educational infrastructure to serve a permanent community. A small cluster of 1950's-60's buildings nearby illustrates the next major development phase. Later constructions, chiefly from the 1970s and 1980s, are an ad hoc assembly of functional (and in many cases temporary) classroom buildings and extensions of modest quality and mixed visual character. They are not considered to meet, individually or collectively (in terms of spatial arrangement and architectural character), the inclusion guidelines for this criterion.

4.0 PROPOSAL

4.1 BACKGROUND

The school is expected to outgrow the current building footprint. The school had 1085 enrolments in 2013 and projected growth to 1250 enrolments by 2018, a growth of 13.2%. The school currently has 27 permanent teaching spaces and 18 demountables. To maximise play area and reduce the number of demountable buildings, a new 3 storey building is proposed, reducing the built form footprint. The proposed new building will face Oliver Street and create a courtyard around the heritage building.

It will protect the site from westerlies, create a street front for the school and enhance the main street address at the corner of Oliver and Wyadra Streets. It will also provide disabled access to the lower level freeplay area. The building position will allow improved connectedness of outdoor play areas which recently have been disjointed and poorly supervised due to the clutter of demountables.

Three buildings (excluding demountables) are also to be demolished :

* Block A – one storey Van Der Stein 322m2 (3 homebases, 1 special programs room)

* Block B & C - brick toilet blocks 96m2 (total 8 girls toilets and 4 boys toilets)

The new scheme will result in 44 homebases in permanent accommodation and retain 6 demountables allowing for anticipated increase in numbers.

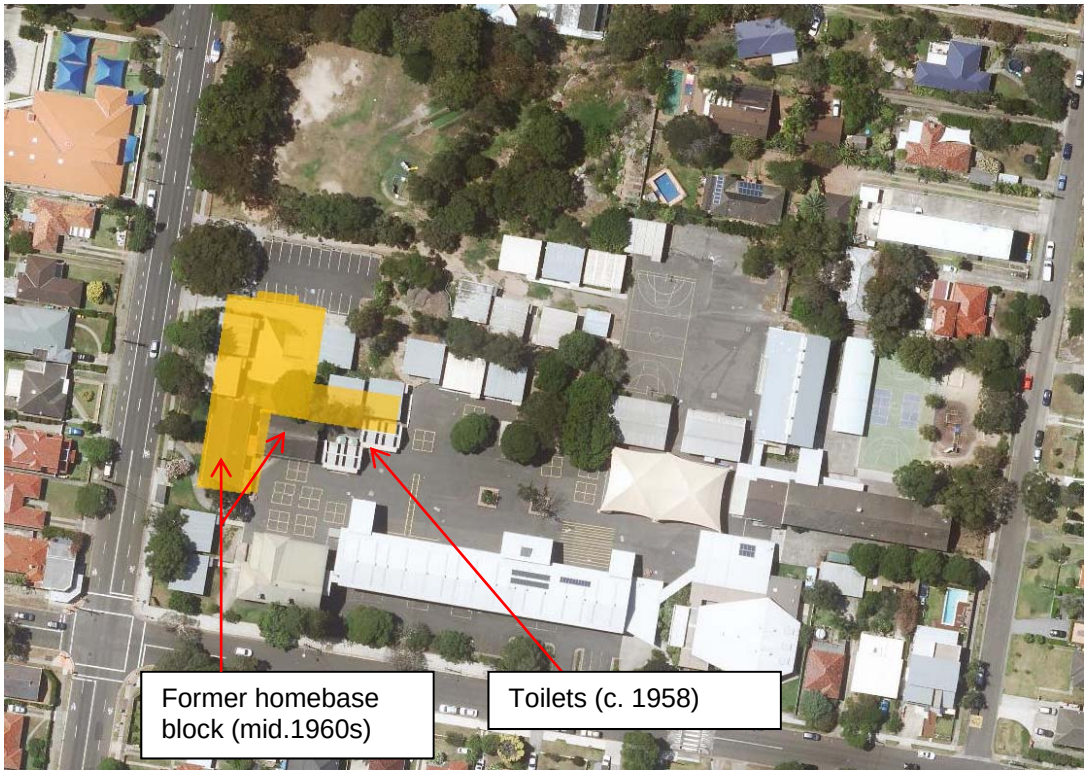


Figure 12

Aerial photo showing approximate site of new building and structures to be demolished

Source:

http://maps.six.nsw.gov.au/

4.1 BUILDING DESIGN

The proposal consists of:

- 3-storey Homebase block incorporating a Library wing to the East and 18 new classrooms
- Re-landscaping in the area between the new block, the memorial garden and the northern edge of the freeplay area

The split-level library is on the first and second floors, while the ground floor has an open cola accessing the landscaped northern sector of the site. The main Homebase section is three-storey, with access via an entry on the ground floor under the cola. An external stairway gives access to the first floor entrance at the Eastern end of the Library. The Homebase section has internal stair towers. Toilets are incorporated under the Library and ain the Homebase section.

The Oliver Street and East (courtyard) front of the Homebase section consist of glazed and CFC-panelled façades with coloured pop-outs in white, dull red and olive green. The pop-outs contain rectangular anodised windows of different dimensions. Vertical slatted sunscreens extend along the facades in the two upper storeys. The recessed ground floor walls are red-brown brick facing. The roof is grey Aramax Freespan sheet over the library wing and metal decking elsewhere. The southern stair tower is partly clad in a translucent screening material.

The Library Wing courtyard front facing the original school building consists of a glass curtain wall with horizontally accented framing elements. The East end of the Library has an external framed decked staircase.

The corner of the new block will be approx. 10m from the corner of the 1928 building and the Library approx. 31m from the N elevation of the 1928 building. The new building will be approx. 12.7m in height plus foundation height, i.e. just above the eaves level of the 1928 building, except in the centre where there is an additional glazed dormer section of approx. 1.5m, just below the ridge level of the1928 building.

4.2 LANDSCAPE DESIGN

The following landscape Statement was provided:

> *The landscape plan for Harbord Public School celebrates the existing site's stormwater drainage, topography and sandstone geology. The design incorporates these site conditions, providing opportunities for engagement and education with natural systems, vegetation and stormwater treatment. Clear site connections provide linking of the internal school spaces to the playing field to the north.*
>
> *The landscape design interventions focus around the proposed new school building and library block. Tree and low ground cover planting define areas providing a range of passive, active and imaginative play opportunities.*

Figure 13 illustrates the concept plan which includes new plantings to provide some screening on the Oliver Street elevation.

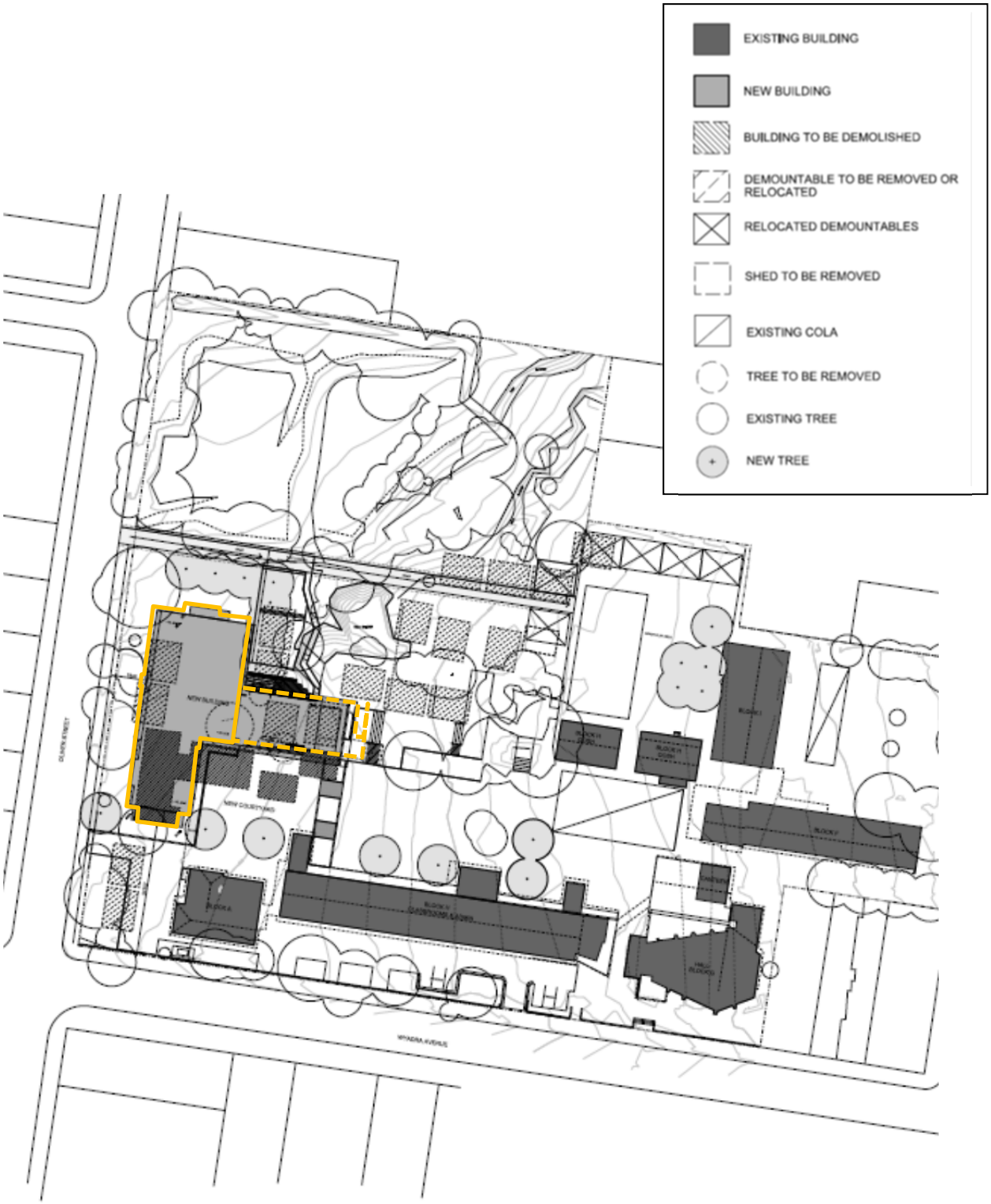
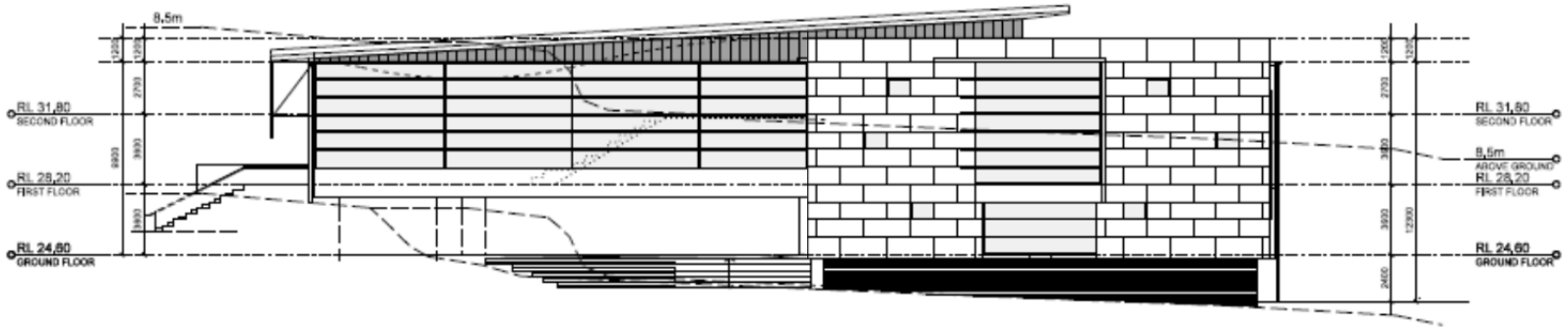
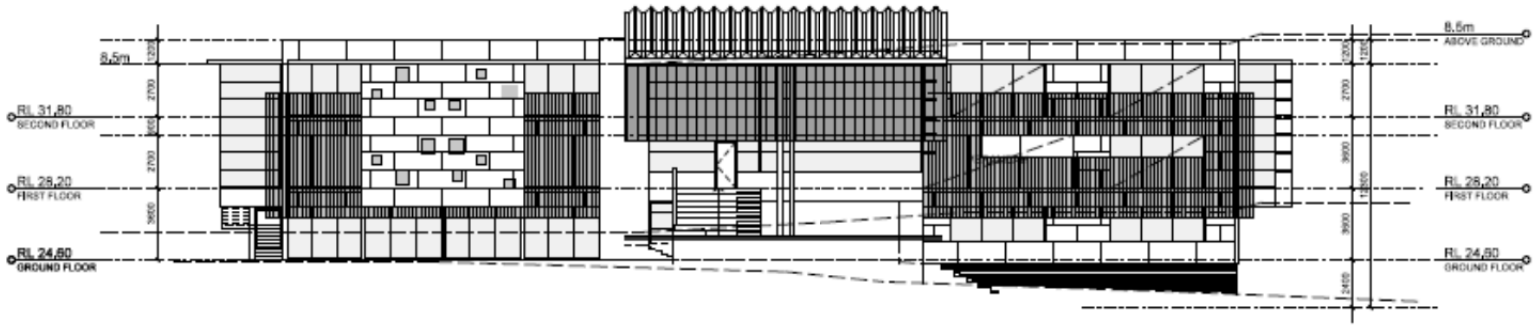


Figure 13. Site Concept Plan, the approximate footprint of the new building is outlined in orange

Source: GAO (06/11/2014)



01 NORTH ELEVATION
SCALE 1:200

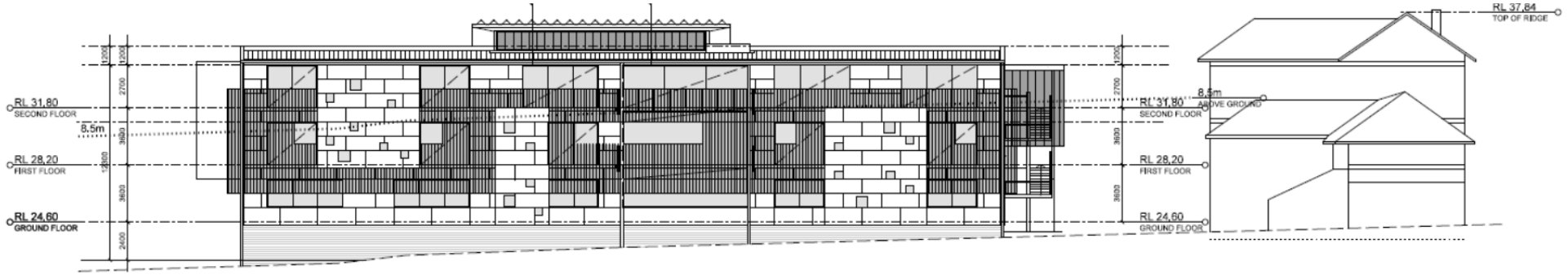


02 EAST ELEVATION
SCALE 1:200

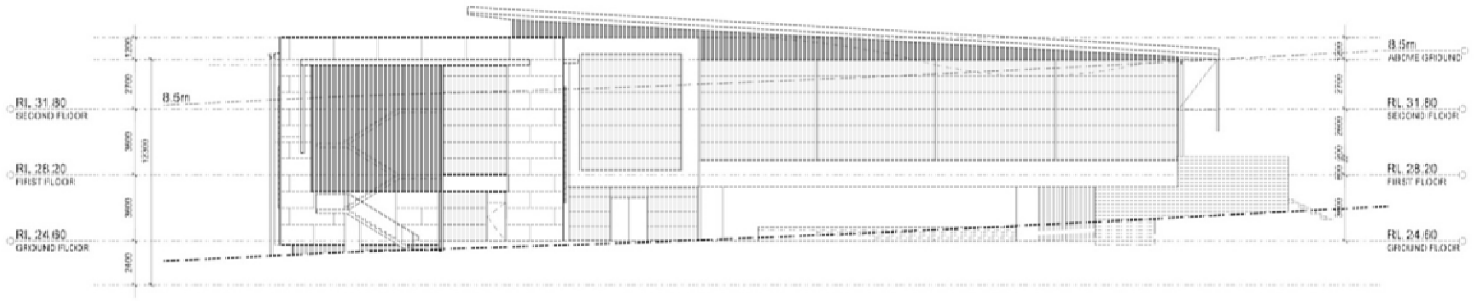
Figure 14

From the top:
North Elevation
East Elevation

Source: GAO (06/11/2014)



04 WEST ELEVATION
SCALE 1:200



03 SOUTH ELEVATION
SCALE 1:200

Figure 15

From the top:
West Elevation
South Elevation

Source: GAO (06/11/2014)

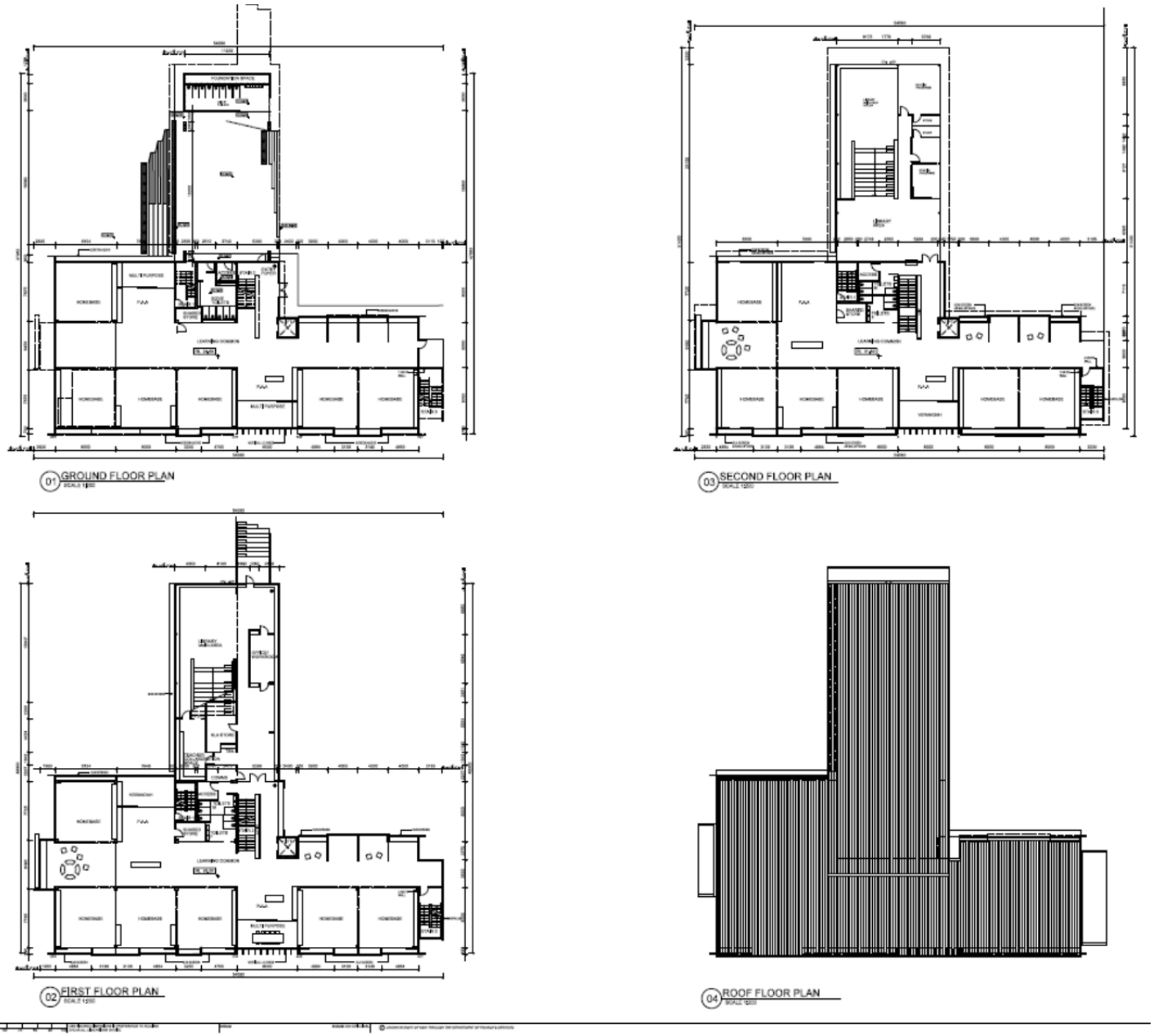


Figure 16

Floor plans and roof plans

Source: GAO (06/11/2014)

5.0 HERITAGE IMPACT ASSESSMENT

5.1 IMPACT ON THE LISTED HERITAGE ITEM

- The new building is located 10.2m north of the corner of the1928 school building. It is separated from the 1928 building by a space just over half the width of the older building, and does not impinge excessively on the curtilage of that building
- The new building follows the same N-S and E-W orientation found in other buildings close by. The orientation of the footprint does not detract significantly from the 1928 building.
- In massing, articulation and spatial arrangement the new building contrasts with the 1928 building, but maintains a compatible rectilinear form and plan. The overall impact of the new building's geometry is not out of proportion with the earlier building.
- The new building is one storey higher than the 1928 building. However, the total height does not exceed the ridge line of the 1928 building.
- The roofline contrasts with that of the1928 building but largely avoids changes of height or deviations in pitch or angle that may detract from the 1928 building.
- Due to the orientation, the new building does not excessively overshadow the 1928 building. There are some impacts associated with obstruction of views and sightlines from the upper floors of the1928 building but these may be mitigated by landscaping.
- In its distributional relationship to the 1928 building, the new building forms one side of an open area facing the 1928 building. The new courtyard has no detrimental heritage impact and some positive impacts in enhancing the distributional relationships between site elements.
- The views from the Library window and the cola also have the potential to enhance the 1928 building by enriching spatial connectivity between the two elements and providing a visual landmark from several vantage points.
- In materials and details the new building incorporates some brick cladding at ground level but otherwise adopts a contrasting modernist approach with cubic forms and projections. These have the potential to provide some strong visual contrasts with the earlier building. The use of soft landscaping will mitigate some of these contrasts. The vertical slatted sunscreens also have some softening effect that reduces overall visual intrusiveness of the CFC-sheet grid-pattern cladding and glazing.

In summary, the new building has some impacts on the neighbouring 1928 building arising from the overall massing and height and potential to impact on views from and to the early building. But these should be offset by enhanced relationship between the components of this part of the site arranged around the courtyard, and by hard and soft landscaping to mitigate sharp contrasts.

5.2 IMPACT ON OTHER STRUCTURES

- Demolition of the 1960s Homebase block and the toilet blocks does not impact on significant structures. These buildings do demonstrate the need for growth and development of the school buildings to accommodate rising student numbers during the 1950s and 1960s. But neither is mentioned as significant in the SHI entry.

In summary the heritage impact on surrounding structures is expected to be minor.

5.3 IMPACT ON SIGNIFICANT LANDSCAPE FEATURES

- The SW corner and southern perimeter close to the 1928 building have significant trees identified in the SHI record. The development (including Wyadra Ave. substation) does not appear to impact on these trees, but this is subject to the scope of the development on the Wyadra Rd side of the site for car parki ng or other services .

In summary, the impact on significant trees of the new homebase/library block is expected to be minor.

5.4 IMPACT ON OTHER VALUES

- The location of the development between the 1928 school building and the freeplay area to the north is not thought to have major impact on archaeological or Aboriginal objects. However, the 1943 aerial photograph (Fig.2) suggests there is some minor archaeological potential (site of early school buildings) in Lots DP 752038. Due diligence and monitoring needs to be observed in these areas.

- Due diligence is required in regard to excavation of land where Aboriginal objects have the potential to be found. Further enquiries should be addressed to the DECCW Environment Line on 131555, info@environment.nsw.gov.au

In summary, the impact on archaeological remains and Aboriginal objects is expected to be low.

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 CONCLUSIONS

This Heritage Impact Assessment concludes that the proposed development has some impact on the locally listed heritage item and significant trees on the corner of Wyadra Avenue and Oliver Street.

Those aspects of the proposal that could potentially impact on the heritage significance of the site include:

- design details that use strongly contrasting materials
- some impacts associated with obstruction of views and sightlines from the upper floors of the1928 building
- potential impacts on significant trees (depending on the final scope of the landscaping works and possible associated parking or access requirements)

Most of these will be offset by hard and soft landscaping, judicious detail design, enhanced relationships between the components of this part of the site arranged around the courtyard, and improved circulation and distribution that may highlight the contribution of the 1928 building to the overall site character.

6.2 RECOMMENDATIONS

This report recommends that the proposal be approved. In addition, this report recommends:

- Due consideration for the impact of any detail design proposals on significant trees on Wyadra Rd, and heritage impacts be assessed in the event of development being proposed to the south of the current H block
- Appropriate landscaping (as illustrated in the concept plan in Fig.13) be implemented to mitigate sharp contrasts in materials and geometry
- Due diligence with regard to excavation of land where Aboriginal objects have the potential to be found: check for landscape features which may indicate the presence of Aboriginal objects; develop strategies to avoid harming Aboriginal objects; and make a desktop evaluation and visual inspection to confirm the presence of Aboriginal objects.

7.0 REFERENCES

Amos, Keith and Proctor Catherine, Celebrating our Centenary: Harbord Public School1912-2012, Harbord Public school, 2012

Department of Environment Climate Change & Water, *Due Diligence Code for the Protection of Aboriginal Objects in New South Wales,* 2010

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Thorp Wendy (1998) Historical Archaeological Resource of Warringah Shire for Warringah Shire Heritage Study, May 1998

Warringah Council Local Environmental Plan 2011 Planning Maps http://eservices2.warringah.nsw.gov.au/ePlanning/Public/xc.plan/PlanningMapsEsri.aspx ((accessed 26 October 2014)

Warringah Council Planning and Development, ePlanning database: http://eservices2warringah.nsw.gov.au/eplanning/Public/XC.Track.Heritage/Searchheritage.aspx?id=2610065 (Assessed 24 Octobert 2014)

APPENDIX A

WARRINGAH LOCAL ENVIRONMENTAL PLAN 2011 (EXTRACT)

WARRINGAH LOCAL ENVIRONMENTAL PLAN 2011 PART 3 (EXTRACT)

Part 3 Exempt and complying development

3.1 Exempt development

Note. Under section 76 of the Act, exempt development may be carried out without the need for development consent under Part 4 of the Act or for assessment under Part 5 of the Act.

The section states that exempt development:

(a) must be of minimal environmental impact, and

(b) cannot be carried out in critical habitat of an endangered species, population or ecological community (identified under the *Threatened Species Conservation Act 1995* or the *Fisheries Management Act 1994*), and

(c) cannot be carried out in a wilderness area (identified under the *Wilderness Act 1987*).

(1) The objective of this clause is to identify development of minimal environmental impact as exempt development.

(2) Development specified in Schedule 2 that meets the standards for the development contained in that Schedule and that complies with the requirements of this Part is exempt development.

(3) To be exempt development, the development:

(a) must meet the relevant deemed-to-satisfy provisions of the *Building Code of Australia* or, if there are no such relevant provisions, must be structurally adequate, and

(b) must not, if it relates to an existing building, cause the building to contravene the *Building Code of Australia*, and

(c) must not be designated development, and

(d) must not be carried out on land that comprises, or on which there is, an item that is listed on the State Heritage Register under the *Heritage Act 1977* or that is subject to an interim heritage order under the *Heritage Act 1977*.

(3A) To be exempt development, the development:

(a) must be carried out at least 1 metre from any registered easement, sewer main or water main, and

(b) must not cause the contravention of any existing condition of a development consent already applying to the land, and

(c) must not alter the drainage of the land, and

(d) must not restrict vehicular or pedestrian access to or from the land.

(4) Development that relates to an existing building that is classified under the *Building Code of Australia* as class 1b or class 2–9 is exempt development only if:

(a) the building has a current fire safety certificate or fire safety statement, or

(b) no fire safety measures are currently implemented, required or proposed for the building.

(5) To be exempt development, the development must:

(a) be installed in accordance with the manufacturer's specifications, if applicable, and

(b) not involve the removal or pruning of a tree or other vegetation that requires a permit or development consent for removal or pruning, unless that removal or pruning is undertaken in accordance with a permit or development consent.

Note. A permit for the removal or pruning of a tree or other vegetation may be granted under this Plan. A development consent for the removal of native vegetation may be granted where relevant under the *Native Vegetation Act 2003*.

(6) A heading to an item in Schedule 2 is part of that Schedule.

3.2 Complying development

Note. Under section 76A of the Act, development consent for the carrying out of complying development may be obtained by the issue of a complying development certificate.

The section states that development cannot be complying development if:

(a) it is on land that is critical habitat of an endangered species, population or ecological community (identified under the *Threatened Species Conservation Act 1995* or the *Fisheries Management Act 1994*), or

(b) it is on land within a wilderness area (identified under the *Wilderness Act 1987*), or

(c) the development is designated development, or

(d) the development is on land that comprises, or on which there is, an item of environmental heritage (that is listed on the State Heritage Register or in Schedule 5 to this Plan or that is subject to an interim heritage order under the *Heritage Act 1977*), or

(e) the development requires concurrence (except a concurrence of the Director-General of the Department of Environment, Climate Change and Water in respect of development that is likely to significantly affect a threatened species, population, or ecological community, or its habitat (identified under the *Threatened Species Conservation Act 1995*)), or

(f) the development is on land identified as an environmentally sensitive area.

(1) The objective of this clause is to identify development as complying development.

(2) Development specified in Part 1 of Schedule 3 that is carried out in compliance with:

(a) the development standards specified in relation to that development, and

(b) the requirements of this Part,

is complying development.

Note. See also clause 5.8 (3) which provides that the conversion of fire alarms is complying development in certain circumstances.

(3) To be complying development, the development must:

(a) be permissible, with development consent, in the zone in which it is carried out, and

(b) meet the relevant deemed-to-satisfy provisions of the *Building Code of Australia*, and

(c) have an approval, if required by the *Local Government Act 1993*, from the Council for an on-site effluent disposal system if the development is undertaken on unsewered land.

(3A) To be complying development, the development must:

(a) be carried out at least 1 metre from any registered easement, sewer main or water main, or, if less than 1 metre, meet the requirements of the relevant public authority relating to development over sewer mains or water mains, and

(b) not be carried out on land used for restricted premises or sex services premises.

(4) A complying development certificate for development specified in Part 1 of Schedule 3 is subject to the conditions (if any) set out or referred to in Part 2 of that Schedule.

(5) A heading to an item in Schedule 3 is part of that Schedule.

3.3 Environmentally sensitive areas excluded

(1) Exempt or complying development must not be carried out on any environmentally sensitive area for exempt or complying development.

(2) For the purposes of this clause:

environmentally sensitive area for exempt or complying development means any of the following:

(a) the coastal waters of the State,

(b) a coastal lake,

(c) land to which *State Environmental Planning Policy No 14—Coastal Wetlands* or *State Environmental Planning Policy No 26—Littoral Rainforests* applies,

(d) land reserved as an aquatic reserve under the *Fisheries Management Act 1994* or as a marine park under the *Marine Parks Act 1997*,

(e) land within a wetland of international significance declared under the Ramsar Convention on Wetlands or within a World heritage area declared under the World Heritage Convention,

(f) land within 100 metres of land to which paragraph (c), (d) or (e) applies,

(g) land identified in this or any other environmental planning instrument as being of high Aboriginal cultural significance or high biodiversity significance,

(h) land reserved under the *National Parks and Wildlife Act 1974* or land acquired under Part 11 of that Act,

(i) land reserved or dedicated under the *Crown Lands Act 1989* for the preservation of flora, fauna, geological formations or for other environmental protection purposes,

(j) land identified as being critical habitat under the *Threatened Species Conservation Act 1995* or Part 7A of the *Fisheries Management Act 1994*.

APPENDIX B

STATE ENVIRONMENTAL PLANNING POLICY (INFRASTRUCTURE) 2007

The State Environmental Planning Policy (Infrastructure) 2007 (SEPP) took effect from 2nd of January 2008 and aims to assist in the effective delivery of public infrastructure by improving certainty and regulatory efficiency. The SEPP provides clear definition of environmental assessment and approval process for public infrastructure and services facilities.

Development without Consent
Clause 29 of the SEPP states that development may be carried out by or on behalf of a public authority without consent on land in a prescribed zone if the development is in connection with an existing educational establishment, including for the purpose of minor alterations and additions such as

- internal fitouts, or
- alterations or additions to address occupational health and safety requirements or to provide access for people with a disability

to an existing educational establishment to be undertaken without development consent.

Need for Consultation
Clause 14 of the SEPP considers the requirements for consultation with Council for development with impacts on local heritage:

Consultation with councils—development with impacts on local heritage

> (1) This clause applies to development carried out by or on behalf of a public authority if the development:
>
> (a) is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area, and
>
> (b) is development that this Policy provides may be carried out without consent.
>
> (2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies unless the authority or the person has:
>
> (a) had an assessment of the impact prepared, and
>
> (b) given written notice of the intention to carry out the development, with a copy of the assessment, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and
>
> (c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

Clause 14 applies to development carried out by or on behalf of a public authority, which does not require consent under this Policy, and which is likely to have an impact that is not minor or inconsequential on a local heritage item or a conservation area.

In this case, under Clause 14 (2), the public authority or its representative must not carry out the work unless an assessment of impact has been prepared; and Council has been advised in writing of the intention to carry out the development and been provided with a copy of the heritage impact assessment; and the authority has taken into consideration any response that is received from Council within 21 days after the notice is given.

APPENDIX C

STATE HERITAGE INVENTORY

Environment & Heritage

Home > Heritage sites > Searches and directories > NSW heritage search

Harbord Public School

Item details

Name of item: Harbord Public School
Type of item: Built
Primary address: cnr Wyadra Road and Oliver Street, Harbord, NSW 2096
Local govt. area: Warringah

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
cnr Wyadra Road and Oliver Street	Harbord	Warringah			Primary Address

Statement of significance:

A representative example of an inter-war school building. Displays high integrity of fabric & use. Historically provides evidence of the early need for educational infrastructure to serve a permanent community. Mature pines are local landmarks.

Note: There are incomplete details for a number of items listed in NSW. The Heritage Branch intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Construction years: 1926-1950

Physical description: Two storey brick building with extensive use of dichromatic (two-tone) brickwork. Hipped & gabled roof of corrugated iron. Timber multi-paned windows. Lattice vent to gable. Name and date of opening on front facade.

History

Historical notes: School was first established in 1911. Original weatherboard buildings replced by existing brick building which was opened in 1928 by Albert Bruntell, Chief Secretary.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
4. Settlement-Building settlements, towns and cities	Accommodation-Activities associated with the provision of accommodation, and particular types of accommodation – does not include architectural styles – use the theme of Creative Endeavour for such activities.	(none)-
6. Educating-Educating	Education-Activities associated with teaching and learning by children and adults, formally and informally.	(none)-
8. Culture-Developing cultural institutions and ways of	Creative endeavour-Activities associated with the production and performance of literary, artistic, architectural and other imaginative, interpretive or inventive works; and/or associated with the production and expression of cultural phenomena; and/or environments that have inspired such creative	(none)-

life	activities.	

Recommended management:

Significance of brick building & pine trees should be recognised by statutory heritage listing. (cont. Norfolk Island Pines in Wyadra Road and Hoop Pine on the corner appear to date from first occupation of the site as a school in 1911).

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan		49234	05 Dec 00		

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Warringah Heritage Study	2001	49234 Major Local Significance	Warringah Council		No

References, internet links & images

Type	Author	Year	Title	Internet Links
Written			Field inspection and written source :- "Harbord, Queenscliff & Curl Curl 1778 - 1978 G.Gordon (1978)	

Note: internet links may be to web pages, documents or images.

(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name: Local Government

Database number: 2610065

Return to previous page

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LIMITED DESTRUCTIVE HAZARDOUS MATERIALS SURVEY REPORT

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

October 2014
J128920

C107477 : PP

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

EXECUTIVE SUMMARY

Purpose

This report presents the findings of a Limited Destructive Hazardous Materials Survey conducted of nominated existing buildings located at Harbord Public School, Oliver Street, Freshwater, NSW 2096. Noel Arnold & Associates Pty Ltd, trading as GreencapNAA, carried out the survey on the 26th September 2014, at the request of Peter Shun, Office of Finance & Services.

Scope

The survey involved a Limited Destructive Hazardous Materials Inspection within the three (3) nominated existing buildings (Blocks A, B and C) within the existing complex of Harbord Public School. The survey involved the visual inspection of representative construction materials including the collection and analysis of suspected asbestos-containing materials, lead-containing paint & lead dust within accessible ceiling spaces.

Hazardous materials assessed included:

- Asbestos-containing material (ACM);
- Synthetic Mineral Fibre (SMF);
- Polychlorinated Biphenyl (PCB)-containing capacitors in fluorescent light and fan fittings;
- Lead-containing paint;
- Lead-containing dust;
- Ozone Depleting Substances (ODSs);
- Flammable & combustible materials; &
- Above & Underground Petroleum Storage Systems (UPSS).

The scope of the works for the survey was confined to accessible materials noted below within the hazardous materials register (refer to **Appendix A**). Where materials could not be safely accessed, hazardous materials likely to be present have been presumed. As the buildings were still operational during the inspection, only limited techniques could be employed.

Findings Summary

The following materials have been identified or presumed at the site:

- Friable Asbestos-Containing Materials;
- Non-friable Asbestos-Containing Materials;
- Lead-containing paint; &
- Lead-containing dust.

Further information on the materials identified and presumed during this survey can be found in **Section 6** and **Appendix A**.

Recommendations

More detailed recommendations can be found in **Section 7**. The below outlines the short and medium term measures which should be taken prior to the planned demolition works at the site. The medium term measures are designed to be implemented if demolition work does not take place within the next 6 months.

Asbestos-Containing Materials (ACM)

Management Recommendations for the identified and presumed ACM are as follows:

- Consider labelling the identified and presumed ACM with industry recognised warning labels until such a time the removal works take place.

Medium Term Recommendations

- GreencapNAA understands that demolition work is planned for these blocks, but if any areas identified as containing asbestos materials are not to be disturbed during the works, it may be possible for them to remain *in-situ* and be managed appropriately. All identified or presumed ACM that will be disturbed by the scheduled works should be removed prior by an appropriately Licensed Asbestos Removal Contractor (LARC);
- Engage an appropriate LARC to undertake removal works for all hazardous materials impacted by the works;
- Engage an independent NSW Asbestos Assessor, if necessary, to conduct air monitoring and clearance inspections during and upon completion of the removal works;
- It is imperative that all works cease, pending further sampling, if materials suspected of containing asbestos or unknown materials are encountered;
- The Office of Finance & Services should ensure that all correct documentation is made available from the ARC prior to commencement of any refurbishment or demolition works;
- All works should be undertaken in accordance with current statutory regulations, standards and Codes of Practice; &
- Where ACMs remain *in-situ* a site Asbestos Register must be updated in order to manage any inherent risk associated.

Synthetic Mineral Fibres (SMFs)

No SMFs were identified at the nominated buildings during the survey.

Polychlorinated Biphenyls (PCBs)

No PCBs were identified at the nominated buildings during the survey.

Lead-Containing Paint

- Engage an appropriately experienced contractor to undertake remedial/removal works of all lead paint systems in poor condition as soon as possible, where practicable, but before any demolition work takes place; &
- All identified lead-based paint systems should be maintained in good condition. Any works on lead-based paint systems likely to create dust, fumes or mist should be undertaken prior to refurbishment/demolition works.

Lead-Containing Dust

- Engage an appropriately experienced contractor to undertake remedial/ removal works within areas found to contain lead-containing dust prior to demolition works; &
- Further investigation should be undertaken in areas not previously accessed, prior to demolition.

Ozone Depleting Substances (ODSs)

No ODSs were identified at the nominated buildings during the survey.

Flammable & Combustible Goods

No flammable and combustible goods were identified at the nominated buildings during the survey.

Petroleum Storage Systems (PSSs)

Underground Petroleum Storage Tanks (UPSSs)

No UPSSs were identified at the nominated buildings during the survey.

Above ground Petroleum Storage Tanks (APSSs)

No APSSs were identified at the nominated buildings during the survey.

Statement of Limitations

This report has been prepared in accordance with the agreement between Office of Finance & Services and GreencapNAA.

Within the limitations of the agreed upon scope of services, this work has been undertaken and performed in a professional manner, in accordance with generally accepted practices, using a degree of skill and care ordinarily exercised by members of its profession and consulting practice. No other warranty, expressed or implied, is made.

This report is solely for the use of Office of Finance & Services and any reliance on this report by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties or for other uses. This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval with comments are provided by GreencapNAA. More detail can be found in our Terms & Conditions. Please contact us to discuss.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

Table of Contents

1. INTRODUCTION

This report presents the findings of a Limited Destructive Hazardous Materials Survey conducted of the Harbord Public School, Oliver Street, Freshwater, NSW 2096. The survey was undertaken to identify potential hazardous materials located within the three (3) nominated existing buildings (Blocks A, B and C) within the existing complex of Harbord Public School, at Harbord, NSW.

Prasanna Pichai of GreencapNAA carried out the survey on Friday 26th of September 2014, at the request of Peter Shun, Office of Finance & Services, to assist in the works planned at the site to redevelop the school.

This is to assist the planned demolition works at the site and in order to comply with the NSW *Work Health and Safety (WHS) Regulation 2011, Code of Practice: How to Manage & Control Asbestos in the Workplace (WorkCover NSW, Dec 2011)* and *Demolition Work Code of Practice (SafeWork Australia, Nov 2013)*.

2. PROJECT SCOPE

The scope of this assessment was to:

- Review any records of audits and remedial works previously undertaken at the site, including plans;
- Undertake limited destructive hazardous materials survey on Blocks A, B and C located at Harbord Public School;
- Compile an up to date Hazardous Materials Register for the buildings, as far as practicable considering the constraints of the investigation; &
- Make recommendations for the short and medium term management and subsequent removal of the hazardous materials, in line with the planned demolition works.

Hazardous materials assessed included:

- Asbestos-Containing Material (ACM);
- Synthetic Mineral Fibre (SMF);
- Polychlorinated Biphenyls (PCBs)-containing capacitors in fluorescent light and fan fittings;
- Lead-Containing Paint;
- Lead-Containing Dust;
- Ozone depleting substances (ODSs);
- Flammable & Combustible Goods; &
- Above & Underground Petroleum Storage Systems (UPSS).

3. PREVIOUS INFORMATION

The following information was provided to GreencapNAA prior to the survey commencing:

Document Type	Issue Date	Reference number	Company undertaken by
Site plan	N/A	P2133G_1	Public Works/Department of Education & Training
Consultants Brief	September 2014	Job No:GS58C	Office of Finances & Services
DEC Asbestos Register	February 2014	2133	Department of Education & Communities
Data Capture Maps	August 2014	P2133F1_1	Public Works/Department of Education & Training
Asbestos Management Plan	June 2014	J126483:2133_ASB_100514_AMP	Noel Arnold & Associates

4. SITE DESCRIPTION

Below is a brief description of the site included within this this report:

Site Details			
Site Address	Harbord Public School, Oliver Street, Freshwater, NSW 2096		
Age	Circa 1960	**No. Buildings**	3
Standard Construction Materials			
Exterior			
Walls	Concrete, Brick & Metal		
Roofs	Metal, Slate Tiles		
Eaves/Awnings	Fibre cement sheeting		
Interior			
Walls	Brick, Plasterboard, Timber & Fibre cement sheeting		
Ceilings	Plasterboard, Fibre Cement Sheeting		
Floors	Concrete, Timber & Metal		
Floor Coverings	Sheet Vinyl, Carpet & Ceramic tiles		

5. METHODOLOGY

The survey involved a visual inspection of accessible and representative construction materials and the collection and analysis of materials suspected of containing hazardous materials.

Asbestos – This component of the assessment was carried out in accordance with the guidelines documented in the Code of Practice*: How to Manage and Control Asbestos in the Workplace (WorkCover NSW, 2011).* During this survey, eight (8) representative samples of suspected ACM were collected and placed in plastic clip-lock sealed bags. These samples were subsequently analysed in GreencapNAA's NATA-accredited laboratory for the presence of asbestos by Polarised Light Microscopy and Dispersion Staining techniques.

Synthetic Mineral Fibres (SMF) - This report broadly identifies SMF materials found or suspected of being present during the survey based on a visual assessment. This was carried out in accordance with the guidelines documented in the *Code of Practice for the Safe Use of Synthetic Mineral Fibres* [NOHSC: 2006 (1990)].

Polychlorinated Biphenyls (PCBs) - Where safe access was gained, detailed information of capacitors in fluorescent light fittings and other electrical equipment were noted for cross-referencing with the Australian

and New Zealand Environmental and Conservation Council (ANZECC) *Identification of PCB-containing capacitors* booklet (1997). Due to the inherent hazard in accessing electrical components, or other reasons such as height restrictions, immovable equipment and furniture, some light fittings may not be safely accessed. In these instances, comment is made on the likelihood of PCB-containing materials based upon age and appearance.

Lead-Containing Paint – Representative painted surfaces were tested unobtrusively for the presence of lead using the LeadCheck paint swab method in several locations. This method can detect lead in paint at concentrations of 0.5% and above, and may indicate lead in some paint films as low as 0.2%. The sampling program was representative of the various types of paints found within the site, concentrating on areas where lead based paints may have been used (e.g. Exterior gloss paints, window and door architraves, skirting boards etc. Three (3) paint chip samples were collected from site during this 2014 survey for percentage analysis. Refer to **Appendix C** for the External Laboratory Analysis Report.

The objective of lead paint identification in this survey is to highlight the presence of lead-based paints within the building, not to specifically identify every source of lead-based paint.

Lead-Containing Dust – The collection and analysis of suspected lead-containing dust samples is conducted in accordance with Australian Standard AS 4874-2000 *Guide to the Investigation of Potentially Contaminated Soil and Deposited Dust as a Source of Lead Available to Humans* and analysed in an external NATA-accredited laboratory, Envirolab Services, by ICP-AES methods. Two (2) suspected lead-containing dust samples were taken at the time of inspection for analysis. Refer to **Appendix C** for the External Laboratory Analysis Report.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health 'Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007' (December 2007), the NSW EPA document 'Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003) and the EnHealth document 'Health-based Soil Investigation Levels' (March 2001).

Ozone Depleting Substance (ODSs) – This aspect of the survey required the broad observation of potentially ODS-containing items, such as refrigerators and air conditioning units.

Flammable & Combustible Goods – This aspect of the survey is based on the requirements of the relevant Australian Standards for Flammable Liquid Storage, stated within the Australian Standard *AS 1940-2004 – The Storage and Handling of Flammable and Combustible Liquids*.

Petroleum Storage Systems (PSS) (Above and below ground) – Observations to the exterior areas of the site entailed identification of any signs of UPSS or APSS being present. We also utilised the Dangerous Goods search documents provided by WorkCover NSW.

Although liquid petroleum gas storage tanks are not covered within the regulation *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008*, Part 1.4, we have included its presence within this survey in line with the *Demolition Work Code of Practice (SafeWork Australia, Nov 2013)*, although no specific recommendations will be made with regards to this.

Areas Not Accessible/Not Inspected

It is noted that given the constraints of practicable access encountered during the risk assessment survey, the following areas were not accessed or inspected:

- Ceiling spaces within demountable buildings due to access restrictions, including occupation of the site;
- Throughout Site: Culverts and floor trenches or tunnels due to occupation of the site;
- Throughout: Under floor coverings in occupied areas where damage may have occurred;
- Within those areas accessible only by dismantling equipment;
- Within voids or internal areas of plant, equipment, air-conditioning ducts etc. due to their potential live status or specialised dismantling requirements ;
- Energised services, gas, electrical, pressurised vessel and chemical lines;
- Areas deemed unsafe or hazardous at time of survey (Roof areas, Ceiling Spaces);

- Within totally inaccessible areas such as voids and cavities created and intimately concealed within the building structure. These voids are only accessible during major demolition works; &
- Height restricted areas.

As the site was occupied and in operation at the time of inspection, no destructive investigation techniques or destructive sampling was undertaken for safety reasons.

Prior to the planned demolition of the buildings on site, it is recommended that all areas noted above are investigated further if they are to be included within the scope of works. This is only practically feasible upon either **vacant possession** of the buildings due to the destructive techniques required to complete the survey.

The presence of any residual asbestos insulation and applications on steel members, concrete surfaces, pipe work, equipment and adjacent areas from prior abatement or refurbishment works cannot be ascertained without extensive removal and damage to existing insulation, fittings and finishes.

Other specific areas not accessed or inspected are described in **Appendix A**.

6. SURVEY FINDINGS

The following materials have been identified or presumed at the site:

Material / Building-Level	Asbestos		SMF	PCBs	Lead Paint	Lead Dust	ODS	Flammable Goods	PSS
	Friable	Non-Friable							
Block A (B00A) – General Learning	✓	✓	-	-	✓	✓	-	-	-
Block B (B00B) – Pupil Toilet Facilities	-	-	-	-	✓	-	-	-	-
Block C (B00C) – Pupil Toilet Facilities	-	-	-	-	✓	-	-	-	-

Further information on the materials identified and presumed during this survey can be found in **Appendix A,** Material Registers.

7. RECOMMENDATIONS

Asbestos containing Materials

Short term recommendations for the identified and presumed ACM are as follows:

- Consider labelling the identified and presumed ACM with industry recognised warning labels, as per the *Work Health & Safety (WHS) Regulations 2011*. This is relevant if the material will remain in situ at the site.

Medium term recommendations for the identified and presumed ACM are as follows:

- GreencapNAA understands that demolition work is planned, but if any areas identified as containing asbestos materials are not to be disturbed during the works, it may be possible for them to remain *in-situ*. All identified or presumed ACM that will be disturbed by the scheduled works should be removed prior by an appropriately Licensed Asbestos Removal Contractor (LARC), Class A LARC for friable works and Class B LARC for non-friable works - as stated in the Code of Practice: *How to Safely Remove Asbestos* (WorkCover NSW, 2011) (Refer to **Appendix A**);
- Engage an independent NSW Asbestos Assessor, if necessary, to conduct air monitoring and clearance inspections during and upon completion of the removal works where necessary. These works should be conducted by a NATA-accredited laboratory in accordance with *the Guidance Note on the Membrane Filter Method for the Estimation of Airborne Asbestos Fibres, 2nd Edition, 2005* [NOHSC: 3003 (2011)];
- All licensed asbestos removal work must be notified to the regulator in writing at least five days before licensed asbestos removal work commences as stated in the Code of Practice: *How to Safely Remove Asbestos* (WorkCover NSW, 2011).
- Disposal receipts should be obtained from the asbestos removal contractor as evidence that the asbestos waste has been taken to an appropriate landfill facility.

- It is imperative that all works cease, pending further sampling, if materials suspected of containing asbestos or unknown materials are encountered;
- The Office of Finance & Services should ensure that all correct documentation is made available, as per the *Work Health & Safety Regulation 2011* and Code of Practice: *How to Safely Remove Asbestos (WorkCover NSW, 2011)*, from the ARC prior to commencement of any refurbishment or demolition works. This includes notification to WorkCover NSW, a Safe Work Method Statement (SWMS and Asbestos Removal Control Plan, as a minimum; &
- All works should be undertaken in accordance with current statutory regulations, standards and Codes of Practice.

Synthetic Mineral Fibre (SMFs)

No SMFs were identified at the nominated buildings during the survey.

Polychlorinated Biphenyls (PCBs)

No PCBs were identified at the nominated buildings during the survey.

Lead-Containing Paint

- Engage an appropriately experienced contractor to undertake remedial/ removal works of all lead paint systems in poor condition as soon as possible.
- All identified lead-based paint systems should be maintained in good condition. Any works on lead-based paint systems likely to create dust, fumes or mist should be undertaken prior to refurbishment/demolition works.

Lead-Containing Dust

- Lead-containing dust has been identified at the time of inspection. Lead-containing dust identified on site, which has a lead content above 300mg/kg should be removed/cleaned in accordance with Australian Standard AS 4361.2-1998 *Guide to Lead Paint Management, Part 2: Residential and Commercial Buildings* prior to any demolition work likely to disturb the material. This includes the use of HEPA-vacuuming, wet wiping and personal protective equipment. Personnel should employ suitable dust suppression techniques and wear appropriate personal protective equipment;
- It is recommended that the removal of the accumulated dust on top of the ceiling within the roof space be undertaken as part of the demolition of the building so that the dust does not become airborne or contaminate soils in the area; &
- Further investigation should be undertaken in areas not previously accessed, prior to demolition.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health 'Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007' (December 2007), the NSW EPA document 'Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003) and the EnHealth document 'Health-based Soil Investigation Levels' (March 2001).

Ozone Depleting Substances (ODSs)

No ODSs were identified at the nominated buildings during the survey.

Flammable & Combustible Goods

No flammable and combustible goods were identified at the nominated buildings during the survey.

Petroleum Storage Systems (PSS)

Underground Petroleum Storage Tanks (UPSSs)

No UPSSs were identified at the nominated buildings during the survey.

Above ground Petroleum Storage Tanks (APSSs)

No APSSs were identified at the nominated buildings during the survey.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX A: HAZARDOUS MATERIALS REGISTERS

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building A - Exterior - Ground Level														
Exterior - North & West Window Frame - Lower Paint System/s - Blue Upper- White Lower Painted Windows	Lead (Paint)	J128920-003-LP-003	Positive, 1.3%	J128920-003-Photo041	10 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Exterior - Throughout A/C Unit - R410A x 4	ODS		Negative											
Exterior - Throughout Awning - Flat Cement Sheeting	Asbestos	Previously Sampled NAA S1	Previously Sampled Positive	J128920-003-Photo037	12 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Eaves - Flat Cement Sheeting	Asbestos	Previously Sampled NAA Similar To: S1	Previously Sampled Positive	J128920-003-Photo036	100 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	similar To S1 Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Expansion Joint - Bituminous Material	Asbestos	J128920-003-007	Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	J128920-003-LP-002	Negative, 0.4%											
Exterior - Throughout Gable Verge Lining - Flat Cement Sheeting - North, south and East facing	Asbestos	J128920-003-005	Positive	J128920-003-Photo034	30 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Window Frames - Putty	Asbestos	J128920-003-006	Negative											
Building A - Interior - Ground Level														
Ceiling Space - North Ceiling - Corrugated Cement Sheet	Asbestos	Not Sampled	Presumed Positive	J128920-003-Photo029	300 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Ceiling Space - North Debris - Dust - Northern Wing	Asbestos	J128920-003-004	Negative											
Ceiling Space - North On Top of Ceiling - Dust - Lead	Lead (Dust)	J128920-003-LD-002	Positive, 570mg/kg	J128920-003-Photo031	500 m²	Poor							All dust, dirt and sediment material with lead levels above the adopted standard (i.e. above 300mg/kg) should be removed under controlled conditions.	

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Ceiling Space - West Ceiling - Corrugated Cement Sheet	Asbestos	Not Sampled Height Restricted	Presumed Positive	J128920-003-Photo020	580 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Ceiling Space - West Debris - Dust - Western Wing	Asbestos	J128920-003-002	Negative											
Ceiling Space - West On Top of Ceiling - Dust - Lead	Lead (Dust)	J128920-003-LD-001	Positive, 550mg/kg	J128920-003-Photo022	500 m²	Poor							All dust, dirt and sediment material with lead levels above the adopted standard (i.e. above 300mg/kg) should be removed under controlled conditions.	
Computer Room - R0018 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo027	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Computer Room - R0018 - Throughout Floor Covering - Sheet Vinyl	Asbestos	J128920-003-003	Negative											
Movement - AR0011 - East Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo026	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Movement - AR0019 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo016	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Movement - R0016 - Throughout Ceiling - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S1	Previously Sampled Positive	J128920-003-Photo001	2 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - Throughout Ceiling - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA s4	Previously Sampled Positive	J128920-003-Photo002	10 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - Throughout Door - Paint System/s - Green Paint	Lead (Paint)	J128920-003-LP-001	Positive, 1.3%	J128920-003-Photo004	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0002 - Throughout Floor Underlay - Screed	Asbestos	J128920-003-001	Negative											
R0002 - Throughout Wall - Paint System/s - Cream Paint	Lead (Paint)	J128920-003-LC-001	Negative											

GREENCAP

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
R0002 - Throughout Wall Lining - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S5	Previously Sampled Positive	J128920-003-Photo003	8 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - West Fridge - R134A	ODS		Presumed Negative											
R0003 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo008	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0004 - North Floor Underlay - Screed	Asbestos	Similar To: J128920-003-001	Presumed Negative											
R0004 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo009	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0005 - North Heater - Insulation - Study Annexe	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo011	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0005 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
R0006 - North Heater - Insulation	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo014	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0006 - North Wall - Paint System/s - Doors x 3	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative										Home base	
R0008 - West Electrical - Switch Board - Compressed Bituminous Electrical Panel	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo017	1 Unit/s	Good	Non Friable	Low		Not Labelled	25-09-2015		Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0008 - West Electrical - Switch Board - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S3	Previously Sampled Positive	J128920-003-Photo018	1 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0008 - West Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
R0010 - North Heater - Insulation	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo033	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0010 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
R0010 - South Heater - Insulation	Asbestos	Not Sampled	Presumed Positive	J128920-003-Photo025	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0020 - East Door - Paint System/s - Home base	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo032	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Storage Room - R0007 - Throughout Floor Underlay - Screed	Asbestos	Similar To: J128920-003-001	Presumed Negative											
Storage Room - R0009 - South Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
Building A - Exterior - Sub-Floor														
Exterior - Throughout Packer - Fibre Cement Sheeting - Presumed Packers and Debris	Asbestos	Not Sampled Locked	Presumed Positive	J128920-003-Photo042	20 m²	Not able to determine	Non Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building B**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**300 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Metal**	**Construction Type:**	**Brick and Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building B - Exterior - Ground Level														
Exterior - South & East Metal Work - Paint System/s	Lead (Paint)	J128920-003-LC-005	Positive	J128920-003-Photo049	2 m²	Poor							Access to flaking/ damaged paint surfaces should be restricted. Engage an appropriately experienced contractor to stabilise or remove this item under controlled conditions.	
Exterior - Throughout Expansion Joint - Bituminous Material	Asbestos	Similar To: J128920-003-007	Presumed Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	Similar To: J128920-003-LP-002	Presumed Negative, 0.4%											
R0001 - Throughout Framework - Paint System/s - Dark Green	Lead (Paint)	J128920-003-LC-003	Negative											
R0002 - East Door - Paint System/s - Dark Green/Grey. 2x doors	Lead (Paint)	J128920-003-LC-004	Negative											
Building B - Interior - Ground Level														
R0001 & R0002 - East & West Cubicle Partitions - Fibre Cement Sheeting - Bright Red	Asbestos	J128920-003-008	Negative											
R0001 & R0002 - Throughout Expansion Joint - Mastic Sealant	Asbestos	Not Sampled No	Presumed Negative											
R0001 & R0002 - Throughout Framework - Paint System/s - Green	Lead (Paint)	J128920-003-LC-002	Negative											

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building C**	**Number of Levels:**	**0**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**300 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Metal (suspected)**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building C - Exterior - Ground Level														
CR0003 - Throughout Framework - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-003	Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	Similar To: J128920-003-LP-002	Presumed Negative, 0.4%											
Exterior - West Metal Work - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-005	Positive	J128920-003-Photo058	2 m²	Poor							Access to flaking/ damaged paint surfaces should be restricted. Engage an appropriately experienced contractor to stabilise or remove this item under controlled conditions.	
Throughout Expansion Joint - Bituminous Material - Expansion Joint To Ground	Asbestos	Similar To: J128920-003-007	Presumed Negative											
Building C - Interior - Ground Level														
R0001 - East & West Cubicle Partitions - Fibre Cement Sheeting - 2 walls	Asbestos	Similar To: J128920-003-008	Presumed Negative											
R0001 - East & West Door - Paint System/s - 4 doors	Lead (Paint)	Similar To: J128920-003-LC-004	Negative											
R0001 - Throughout Framework - Paint System/s - Green	Lead (Paint)	Similar To: J128920-003-LC-002	Negative											
R0001 & R0002 - Throughout Expansion Joint - Mastic Sealant	Asbestos	Not Sampled No	Presumed Negative											
R0002 - East Cubicle Partitions - Fibre Cement Sheeting	Asbestos	Similar To: J128920-003-008	Presumed Negative											
R0002 - East Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-004	Negative											
R0002 - Throughout Framework - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-002	Negative											

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX B: ASBESTOS SAMPLE ANALYSIS REPORTS

Accredited as Noel Arnold & Associates Pty Ltd
Level 2 / 11 Khartoum Road
North Ryde NSW 2113
Australia
P: (02) 9889 1800
F: (02) 9889 1811
www.greencap.com.au

Wednesday, 01/10/2014

Our ref: C107477:J128920-2133

Peter Shun
Office of Finance and Services
Level 14, 2-24 Rawson Place
SYDNEY NSW 2000

Dear Peter,

Re: Asbestos Identification Analysis - Harbord Public School, Oliver Street, Freshwater NSW 2096

This letter presents the results of asbestos fibre identification analysis performed on 8 samples collected by Prasanna Pichai of GreencapNAA on Friday, 26 September 2014. The samples were collected from Harbord Public School, Oliver Street, Freshwater NSW 2096.

All sample analysis was performed using polarised light microscopy, including dispersion staining in our Sydney Laboratory in accordance with GreencapNAA Test Method NALAB 302 Asbestos Identification Analysis and following the guidelines of Australian Standard AS4964-2004.

The samples will be kept for six months and then disposed of, unless otherwise directed.

The results of the asbestos identification analysis are presented in the appended table.

Should you require further information please contact Prasanna Pichai.

Yours sincerely
GreencapNAA

Simon Day : Approved Identifier

Simon Day : Approved Signatory

Wednesday, 01/10/2014

Our ref: C107477:J128920-2133

Site Location:		Harbord Public School, Oliver Street, Freshwater NSW 2096	
	Sample ID	Sample Location/Description/Weight or Size	Analysis Result
1	J128920-2133 01	Building A - Ground Level - R0002 - Throughout - Floor Underlay - Screed Brown compressed/formed powder, organic fibre, quartz screed material and associated clear adhesive material ~ 40 x 40 x 1 mm	No Asbestos Detected
2	J128920-2133 02	Building A - Ground Level - Ceiling Space - West - Debris - Dust Brown-grey non-homogenous dust including, loose organic and vitreous fibres ~ 1.42g	No Asbestos Detected At or Above Reporting Limit NOTE 1 Organic Fibres Synthetic Mineral Fibres
3	J128920-2133 03	Building A - Ground Level - Computer Room - R0018 - Throughout - Floor Covering - Sheet Vinyl Olive green brittle vinyl material, attached brown woven organic fibrous hessian-type matting material and associated amber adhesive material ~ 50 x 40 x 2 mm	No Asbestos Detected Organic Fibres
4	J128920-2133 04	Building A - Ground Level - Ceiling Space - North - Debris - Dust Brown-grey non-homogenous dust including, loose organic and vitreous fibres ~ 2.14g	No Asbestos Detected At or Above Reporting Limit NOTE 1 Organic Fibres Synthetic Mineral Fibres
5	**J128920-2133 05**	**Building A - Ground Level - Exterior - Throughout - Gable Verge Lining - Flat Cement Sheeting Blue, green-painted grey fibre-cement sheet material ~ 21 x 9 x 3 mm**	**Chrysotile (white asbestos)**
6	J128920-2133 06	Building A - Ground Level - Exterior - Throughout - Window Frames - Putty Blue-painted beige hardened mastic material ~ 15 x 15 x 1 mm	No Asbestos Detected
7	J128920-2133 07	Building A - Ground Level - Exterior - Throughout - Expansion Joint - Bituminous Material Black-brown bituminous organic fibre-impregnated flexible mastic material ~ 35 x 30 x 8 mm	No Asbestos Detected Organic Fibres
8	J128920-2133 08	Building B - Ground Level - R0001 - East & West - Cubicle Partitions - Fibre Cement Sheeting Red-painted grey compressed powder, quartz concrete material ~ 25 x 9 x 3 mm	No Asbestos Detected

* Shaded row with bolded text indicates sample contains a positive result for asbestos.

NOTE 1 The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques. The above result can be interpreted that the sample contains no detectable 'respirable' asbestos fibres (AS4964-2004 Clause 9.5).

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX C: LEAD SAMPLE ANALYSIS REPORTS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 116814

Client:
Noel Arnold & Associates Pty Ltd
Level 2, 11 Khartoum Rd
North Ryde
NSW 2113

Attention: Mark Cozanitis

Sample log in details:

Your Reference:	**C107977:J128920**
No. of samples:	3 Paints 2 Dusts
Date samples received / completed instructions received	29/09/2014 / 29/09/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	3/10/14 / 1/10/14
Date of Preliminary Report:	None Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Lead in Paint Our Reference: Your Reference Type of sample	UNITS ---------- ----------	116814-1 J128920-003 -LP-001 Paint	116814-2 J128920-003 -LP-002 Paint	116814-3 J128920-003 -LP-003 Paint
Lead in paint	%w/w	1.3	0.4	1.3

Lead (dust) Our Reference: Your Reference Type of sample	UNITS ---------- ----------	116814-4 J128920-003 -LD-001 Dust	116814-5 J128920-003 -LD-002 Dust
Lead	mg/kg	550	570

Method ID	Methodology Summary
Metals-004	Digestion of Paint chips/scrapings/liquids for Metals determination by ICP-AES/MS and or CV/AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL Lead in Paint	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Lead in paint	%w/w	0.05	Metals-004	<0.05	116814-2	0.4 || 0.50 || RPD: 22	LCS-1	100%
QUALITY CONTROL Lead (dust)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	102%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX D: RISK ASSESSMENT FACTORS

Risk Assessment Factors - Asbestos

To assess the health risk posed by the presence of asbestos-containing material, all relevant factors must be considered. These factors include:

- Evidence of physical damage;
- Evidence of water damage;
- Proximity of air plenums and direct air stream;
- Friability of asbestos material;
- Requirement for access for building operations;
- Requirement for access for maintenance operations;
- Likelihood of disturbance of the asbestos material;
- Accessibility;
- Exposed surface areas; &
- Environmental conditions.

These aspects are in turn judged upon; (i) potential for fibre generation, and, (ii) the potential for exposure. Where these factors have indicated that there is a possibility of exposure to airborne fibres, appropriate recommendations for repair, maintenance or abatement of the asbestos-containing materials are made.

Condition

The condition of the asbestos products identified during the survey is usually reported as either being good or poor.

- *Good* refers to asbestos materials, which have not been damaged or have not deteriorated.
- *Fair* damage refers to the asbestos material having suffered minor cracking or de-surfacing.
- *Poor* describes asbestos materials, which have been damaged, or their condition has deteriorated over time.

Friability

The friability of asbestos products describes the ease of which the material can be crumbled, and hence to release fibres.

- *Friable asbestos* (e.g. limpet beam insulation, pipe lagging) can be easily crumbled and is more hazardous than non-friable asbestos products.
- *Non-friable asbestos,* commonly known as bonded asbestos, is typically comprised of asbestos fibres tightly bound in a stable non-asbestos matrix.

Examples of non-friable asbestos products include asbestos cement materials (sheeting, pipes etc.), asbestos-containing vinyl floor tiles and electrical backing boards.

Accessibility/Disturbance Potential

Asbestos products can be classified as having low, medium or high accessibility/disturbance potential.

- *Low* accessibility describes asbestos products that cannot be easily disturbed, such as materials in building voids, set ceilings etc.
- *Medium* accessibility describes asbestos products that are visible but normal access is impeded, such as materials behind cladding material or is present in a ceiling space or is height restricted.
- *High* accessibility asbestos products can be easily accessed or damaged due to their close proximity to personnel, e.g. asbestos cement walls or down pipes.

Risk Status

The risk factors described above are used to rank the health risk posed by the presence of asbestos-containing materials.

- A *low* risk ranking describes asbestos materials that pose a low health risk to personnel, employees and the general public providing they stay in a stable condition, for example asbestos materials that are in good condition and have low accessibility.
- A *medium* risk ranking applies to materials that pose an increased risk to people in the area.
- Asbestos materials that possess a *high* risk ranking pose a high health risk to personnel or the public in the area of the material. Materials with a high risk ranking will also possess a Priority 1 recommendation to manage the asbestos and reduce the risk.

Priority Rating System for Control Recommendations

The following schedule of risk status priority rating is adopted to assist in the programming of the removal or containment of risks of asbestos materials in the buildings.

Priority 1: Hazard with High Risk Potential (Red)

Status: Area has asbestos materials, which are either damaged or are being exposed to continual disturbance. Due to these conditions there is an increased potential for exposure and/or transfer of the material to other parts with continued unrestricted use of this area.

Recommendation: It is recommended that the area is isolated, air-monitoring be conducted (if relevant) and the asbestos material is promptly removed. After abatement of the asbestos material a re-inspection should be conducted to confirm that the area has been satisfactorily cleared of the material.

Priority 2: Hazard with Medium Risk Potential (Orange)

Status: Area has asbestos materials with a potential for disturbance due to the following conditions:

1. Material has been disturbed or damaged and its current condition, while not posing an immediate hazard, is unstable; or
2. The material is accessible and can, when disturbed, presents a short-term exposure risk; or
3. The material could pose an exposure risk if workers are in close proximity.

Recommendation: Appropriate abatement measures to be taken as soon as is practical (3-6 months). Negligible health risks if materials remain undisturbed under the control of an asbestos materials management plan.

Priority 3: Hazard with Low Risk Potential (Yellow)

Status: Area has asbestos materials where:

1. The condition of any friable asbestos material is stable and has a low potential for disturbance; or
2. The asbestos material is in a non-friable condition, however has been damaged, but does not present an exposure risk unless cut, drilled, sanded or otherwise abraded. The damaged bonded material must be removed or repaired by a licensed contractor.

Recommendation: Negligible health risks if the materials are left undisturbed under the control of an asbestos material management plan. Consider abatement within 12 months of the damaged bonded asbestos materials (e.g. asbestos cement material).

Priority 4: Hazard with Negligible (very low) Risk Potential (Yellow)

Status: The asbestos material is in a non-friable form and in good condition. It is most unlikely that the material can be disturbed under normal circumstances. Even if it were subjected to minor disturbance the material poses a negligible health risk.

Recommendation: These materials should be left and their condition monitored during subsequent reviews.

Risk Assessment Factors for SMF

Risk assessment factors for Synthetic Mineral Fibre is very similar for asbestos products, where evidence of damage, accessibility, likelihood of disturbance etc is used when assessing SMF materials. Similarly SMF condition, accessibility and risk status headings used above for asbestos can be applied to SMF materials.

There are two basic forms of SMF insulation, bonded and un-bonded.

- *Bonded* SMF is where adhesives or cements have been applied to the SMF before delivery and the SMF product has a specific shape.
- *Un-bonded* SMF has no adhesives or cements and the SMF is loose material packed into a package.

Removal of bonded materials is easier and less hazardous than removal of un-bonded SMF material.

Risk Assessment Factors for Polychlorinated Biphenyls

The handling and disposal of PCBs must be performed in accordance with *The New South Wales Protection Of The Environment Operations Act,* 1997.

The following Personal Protective Equipment should be worn when handling items containing Polychlorinated Biphenyls - nitrile gloves, eye protection, and disposable overalls. The PPE should be worn when removing capacitors from light fittings in case Polychlorinated Biphenyls material leaks from the capacitor housing.

Generally, metal-cased capacitors contain PCBs. Plastic–cased capacitors usually do not. However, all leaking capacitors should be treated as if they contain PCBs unless proven otherwise.

Risk Assessment Factors for Lead Paint

Lead paint, as defined by the Australian Standard *AS4361.2 – 1998 Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings,* is that which contains in excess of 1% Lead by weight.

Lead carbonate (white lead) was once the main white pigment in paints for houses and public buildings. Paint with lead pigment was manufactured up until the late 1960's, and in 1969 the National Health and Medical Research Council's Uniform Paint Standard was amended to restrict lead content in domestic paint.

Lead in any form is toxic to humans when ingested or inhaled, with repeated transmission of particles cumulating in lead poisoning. Lead paint is assessed based on two potential routes of exposure. Firstly by the likelihood of inhalation or ingestion by people working in the vicinity of the paint and secondly by the condition of the paint. Paint that is flaking or in poor condition is more likely to be ingested than paint that is in a good, stable condition.

Risk Assessment Factors for Lead-Containing Dust

Lead is ubiquitous in the urban environment, resulting from industrial processes, lead-containing paint and as a by-product from the combustion of leaded petrol and other sources. Lead can accumulate as a constituent of settled dust, particularly in areas not frequently cleaned (such as ceiling spaces, plant rooms, etc) in older buildings.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health '*Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007*' (December 2007), the NSW EPA document '*Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003)* and the EnHealth document '*Health-based Soil Investigation Levels'* (March 2001).

Settled dust in ceilings, etc. is generally more finely divided than soils, and the disturbance or removal of dust with elevated lead content has the potential to exceed exposure standards for inspirable dust and lead.

Prior to undertaking any removal work, the risk for potential exposure must be assessed and consideration to conducting health surveillance and biological monitoring should be given. Since it is difficult to use engineering controls to control airborne dust levels for some dust removal work situations (e.g. enclosed ceiling spaces), there is a greater reliance on personal respiratory protection to provide a safe working environment for the workers carrying out this task. Hence, any workers undertaking such tasks should have

adequate training in correct work procedures, including the selection, use and maintenance of personal protective equipment and good personal hygiene practices.

Risk Assessment Factors for Ozone Depleting Substances (ODSs)

Ozone Depleting Substances (ODSs) are those substances which deplete the earth's ozone layer and have been widely used in a range of commercial and industrial applications. All bulk imports of these substances (except HCFC's and methyl bromide) are banned in to Australia under an international agreement known as the Montreal Protocol.

Hydrochlorofluorocarbons (HCFCs) are refrigerants of low ozone depleting potential that are commonly used in air-conditioning plant, chillers and condensers. HCFCs are subject to Australian Government controls on import and manufacture as part of a phase out quota system in accordance with the Montreal Protocol and the Commonwealth Ozone Protection & Systematic Greenhouse Gas Management Act 1989. Imports of these substances will be fully banned by 2020 with only very limited supplies then available until 2030 to service remaining HCFC-dependant equipment.

Maintenance contractors working with these gases should have procedures in place to safely work, store, handle and dispose of materials correctly.

Risk Assessment Factors for Flammable Materials

The identification of hazards associated with flammable materials looks at how they are stored and handled. Factors considered are the inherent hazards such as fire, explosion and the potential for incidents. Flammable materials include:

- Class 1 – Explosives;
- Class 2 – Gases;
- Class 3 – Flammable Liquids; &
- Class 4 – Flammable Solids;

There are many sub-classes within these classes that further classify dangerous goods according to their properties e.g. Class 2.1 – Flammable Gas, Class 2.2 – Non-Flammable Gas, etc.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX E: PHOTOGRAPHS

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo041
Result: Lead (Paint) - Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-North & West
Feature/Material: Window Frame-Lower Paint System/s

Photo No: J128920-003-Photo037
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Awning-Flat Cement Sheeting

Photo No: J128920-003-Photo036
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Eaves-Flat Cement Sheeting

Photo No: J128920-003-Photo034
Result: Asbestos - Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Gable Verge Lining-Flat Cement Sheeting

Photo No: J128920-003-Photo029
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-North
Feature/Material: Ceiling-Corrugated Cement Sheet

Photo No: J128920-003-Photo031
Result: Lead (Dust) - Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-North
Feature/Material: On Top of Ceiling-Dust - Lead

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo020
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-West
Feature/Material: Ceiling-Corrugated Cement Sheet

Photo No: J128920-003-Photo022
Result: Lead (Dust) - Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-West
Feature/Material: On Top of Ceiling-Dust - Lead

Photo No: J128920-003-Photo027
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Computer Room - R0018-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo026
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - AR0011-East
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo016
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - AR0019-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo001
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - R0016-Throughout
Feature/Material: Ceiling-Fibre Cement Sheeting

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo002
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Ceiling-Fibre Cement Sheeting

Photo No: J128920-003-Photo004
Result: Lead (Paint) - Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo003
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Wall Lining-Fibre Cement Sheeting

Photo No: J128920-003-Photo008
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0003-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo009
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0004-North
Feature/Material: Wall-Paint System/s

Photo No: J128920-003-Photo011
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0005-North
Feature/Material: Heater-Insulation

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo014
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0006-North
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo017
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0008-West
Feature/Material: Electrical - Switch Board-Compressed Bituminous Electrical Panel

Photo No: J128920-003-Photo018
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0008-West
Feature/Material: Electrical - Switch Board-Fibre Cement Sheeting

Photo No: J128920-003-Photo033
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0010-North
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo025
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0010-South
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo032
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0020-East
Feature/Material: Door-Paint System/s

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo042
Result: Asbestos - Presumed Positive
Building/Level: Building A-Sub-Floor
Room/Location: Exterior-Throughout
Feature/Material: Packer-Fibre Cement Sheeting

Photo No: J128920-003-Photo049
Result: Lead (Paint) - Positive
Building/Level: Building B-Ground Level
Room/Location: Exterior-South & East
Feature/Material: Metal Work-Paint System/s

Photo No: J128920-003-Photo058
Result: Lead (Paint) - Positive
Building/Level: Building C-Ground Level
Room/Location: Exterior-West
Feature/Material: Metal Work-Paint System/s

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX F: GENERAL HAZARDOUS MATERIALS INFORMATION

Information on Common Asbestos Materials

Asbestos-containing materials can be classified into the following main categories:-

- Sprayed or trowelled asbestos materials applied to ceilings, walls and other surfaces for fire-rating purposes. This material is commonly referred to as limpet asbestos.
- Asbestos-containing insulation on pipes, boilers, tanks, ducts etc. which is often referred to as asbestos lagging.
- Asbestos cement products, Cementitious or concrete like products.
- Asbestos paper products, millboard in electrical switchboards or underlying lining for linoleum or vinyl floor coverings.
- Asbestos textiles, braided asbestos, rope, tape, gaskets etc. (note that rope and millboard are potentially friable).
- Vinyl tiles, linoleum and vinyl flooring mastic and associated adhesives.
- Asbestos-containing compounds, gaskets and mastic from mechanical fittings, and roofing membranes.
- Electrical switchboards containing compressed asbestos tar electrical boards, asbestos cement sheeting, asbestos rope to spark arresters and asbestos millboard from inside auxiliary switchboxes/fuse boards.
- Roofing sealants, bituminous membranes, tar composites and similar materials were occasionally mixed with asbestos materials.
- Some office furnishings such as wall partitions may contain an asbestos cement internal lining inside plaster or “Stramit” type panelling. Certain types of older vinyl covered desktops and workbenches may contain an underlying asbestos millboard lining.

Sprayed Asbestos Materials

Sprayed asbestos or limpet asbestos is most often found on structural steel members to provide a fire-rating. Limpet asbestos is a friable material. Friable materials are those which can easily be crumbled, pulverised or reduced to powder by hand pressure. Limpet asbestos tends to be the most friable of all asbestos-containing materials and can contain relatively high percentage of asbestos (30% - 90%).

Limpet asbestos can slowly release fibres as the materials age ie. As its friability increases. Direct mechanical damage or excessive machinery vibration can lead to more significant release of airborne asbestos fibres.

Asbestos-Containing Lagging Materials

Insulation such as lagging usually contains a smaller percentage of asbestos (usually 20% - 50%). Protective jackets on the insulation materials (such as metal jacketing or calico on pipe lagging) prevent asbestos fibre release. Physical damage to the protective jacket however, may lead to the release of respirable fibres. The binding material in the insulation can deteriorate with age rendering it more friable.

Asbestos Cement Sheeting Materials

Asbestos cement products and asbestos gaskets generally do not present a significant health risk unless they are cut, sanded or otherwise disturbed so as to release asbestos dust. Fibre release due to occasional damage is negligible and thus not a significant health risk. Care must be taken therefore in the removal of asbestos cement products to avoid the release of airborne fibres. Unless analysis of fibro-cement products indicates otherwise, these materials should be considered as containing asbestos.

External asbestos cement claddings become weathered after many years by the gradual loss of cement from the exposed surface. This leaves loosely bound layers enriched with asbestos fibres. In other words, the material becomes more friable through the weathering process.

Asbestos-Containing Vinyl Products

Vinyl tiles and linoleum flooring manufactured before 1984 may contain asbestos in various quantities in a well-bound cohesive matrix. Asbestos-containing vinyl floor and wall coverings generally do not present a significant health risk unless they are sanded or otherwise mechanically abraded so as to release asbestos

dust. Fibre release due to occasional damage is negligible and thus not a significant health risk. Care must be taken therefore, in the removal of asbestos-containing vinyl tiles to avoid the release of airborne fibres. Unless analysis of vinyl tiles and linoleum flooring indicates otherwise, these materials should be considered as containing asbestos. Older bituminous adhesives may also contain asbestos and must be removed as an asbestos process in circumstance where the floor is to be renewed and re-levelled by floor sanding or grinding.

Asbestos Containing Gaskets

Gaskets and sealing compounds in equipment, duct work and re-heat air conditioning boxes may contain asbestos. These should be replaced with non-asbestos equivalents during routine maintenance. In addition, asbestos-containing mastic and seals in air handling duct work joints. These usually do not pose a hazard as the asbestos fibres are firmly held within the plastic resinous compound and should be replaced as part of routine maintenance or removed during the demolition of the plant equipment.

Asbestos Insulation to Re-Heat Boxes

Insulation to internal lining of ductwork sections and electrical re-heat air conditioning boxes generally contain asbestos millboard. These should be replaced with non-asbestos equivalents during routine maintenance.

Asbestos-Containing Mastics and Sealants

Many mastic and sealant products contain Chrysotile asbestos within the pliable, resinous matrix. The nature of the substrate is such that it does not readily dry out in situ, and therefore the fibres are well bound and pose a low risk.

Management of Asbestos Hazards

The health effects associated with asbestos exposure are due to the inhalation of airborne respirable asbestos fibres. In general, the asbestos fibres cannot be released to become airborne in significant quantities unless the asbestos-containing material is severely disrupted such as in the case of cutting asbestos cement products with power saws etc.

A range of control measures are available for the abatement of asbestos hazards. The selection of the appropriate control measure is based on the assessment risk for each specific location. These measures include:

- **Leave and maintain** in existing condition.
- **Repair and maintain** in good condition.
- **Enclose** asbestos or synthetic mineral fibre material by providing a barrier such as a box enclosure or steel cladding.
- **Remove** by approved methods under controlled conditions.
- **Labelling** of asbestos materials that are to remain in situ should be undertaken where practical to ensure that the asbestos materials are not damaged inadvertently by maintenance contractors etc.

Synthetic Mineral Fibre (SMF)

General

In the late 1980's the International Agency for Research on Cancer (IARC) evaluated certain SMF materials as being possibly carcinogenic to humans. The similarity in application and appearance to asbestos has resulted in some community concern regarding the health effects associated with exposure to SMF.

Current medical research indicates that the slightly increased risk of lung cancer for workers employed in the early days of rockwool and slagwool manufacture, and workers in the glasswool sector is not anticipated under present day working conditions. However, acute health effects such as eye, skin and upper respiratory tract irritation may occur with certain SMF products.

Caution is required when handling SMF products in order to minimise disturbance of the materials and subsequent airborne SMF fibre levels. Where SMF materials are to be installed or removed, then suitable controls and appropriate personal protection are to be provided.

It is recommended that the following Code of Practice be closely adhered to for appropriate procedures when handling such materials:

- *WorkSafe Australia Synthetic Mineral Fibre, National Standard & National Code of Practice, May 1990.*

Polychlorinated Biphenyls (PCBs)

General

PCBs are usually identified as a colourless to darker coloured oily liquid. PCBs are considered probable carcinogens. They can be absorbed through the skin, inhaled as a vapour or ingested, therefore contact with them should be prevented. They are often found in old transformers and metallised capacitors of fluorescent light fittings. These synthetic compounds are chemically stable, have good insulating properties and do not degrade appreciably over time or with exposure to high temperatures. It is these properties that made PCBs useful in electrical devices.

Lead-Containing Paint

General

Lead paint, as defined by the Australian Standard *AS4361.2 – 1998 Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings,* is that which contains in excess of 1% Lead by weight.

Lead carbonate (white lead) was once the main white pigment in paints for houses and public buildings. Paint with lead pigment was manufactured up until the late 1960's, and in 1969 the National Health and Medical Research Council's Uniform Paint Standard was amended to restrict lead content in domestic paint.

Many older Australian homes and buildings still contain lead paint, even though it may be covered with layers of more recent paint. Lead paint was used mainly on exterior surfaces, and to a lesser degree on interior doors plus door and window architraves, especially in undercoats and primers, where concentrations of up to 20% lead content were used. Interior walls weren't commonly painted with paint containing white lead pigment, though some colours did contain red, orange and yellow lead pigments.

All paints manufactured for Australian dwellings from the 1970's onwards have been required to contain less than 1% lead, though higher lead-content industrial paints may have been applied since then to housing and commercial buildings.

Lead in any form is toxic to humans when ingested or inhaled, with repeated transmission of particles cumulating in lead poisoning. Lead paint removal poses two potential avenues of transmission. Firstly by inhalation or ingestion by workers and public in the vicinity of the works, and secondly by the deposition of particles on nearby footpaths, streets or soil where they may be re-suspended, tracked into houses or buildings where it can be inhaled or ingested.

Lead-Containing Dust

General

Lead Dust as a hazardous substance based on the reproductive and cumulative effects. Lead is ubiquitous in the urban environment, resulting from industrial processes, leaded paint manufactured before 1976 and as a by-product from the combustion of leaded petrol. Therefore a high dust accumulation is likely to be found in older homes near major roads.

Occupational monitoring results indicate that the removal of ceiling dust has the potential to exceed exposure standards for inspirable dust and lead. Therefore, in accordance with the Occupational Health and Safety Act (Hazardous Substances), the risk must be assessed before any work is carried out in removing the dust accumulated in the ceiling space. Furthermore, health surveillance and biological monitoring is warranted and should be carried out.

Since it is difficult to use engineering controls for lead dust removal work situations, to control airborne dust levels, there is a great reliance on personal respirator protection, to provide a safe working environment for the workers carrying out this type of job. It can be concluded that workers require training in the correct work procedures, including the selection, use and maintenance of personal protective equipment. A friable asbestos removal contractor is the most appropriately trained person to undertake lead dust removal activities.

Ozone Depleting Substances (ODSs)

Ozone Depleting Substances (ODSs) are those substances which deplete the earth's ozone layer and have been widely used in a range of commercial and industrial applications. All bulk imports of these substances (except HCFC's and methyl bromide) are banned in to Australia under an international agreement known as the Montreal Protocol.

Hydrochlorofluorocarbons (HCFCs) are refrigerants of low ozone depleting potential that are commonly used in air-conditioning plant, chillers and condensers. HCFCs are subject to Australian Government controls on import and manufacture as part of a phase out quota system in accordance with the Montreal Protocol and the Commonwealth Ozone Protection & Systematic Greenhouse Gas Management Act 1989. Imports of these substances will be fully banned by 2020 with only very limited supplies then available until 2030 to service remaining HCFC-dependant equipment.

Maintenance contractors working with these gases should have procedures in place to safely work, store, handle and dispose of materials correctly.

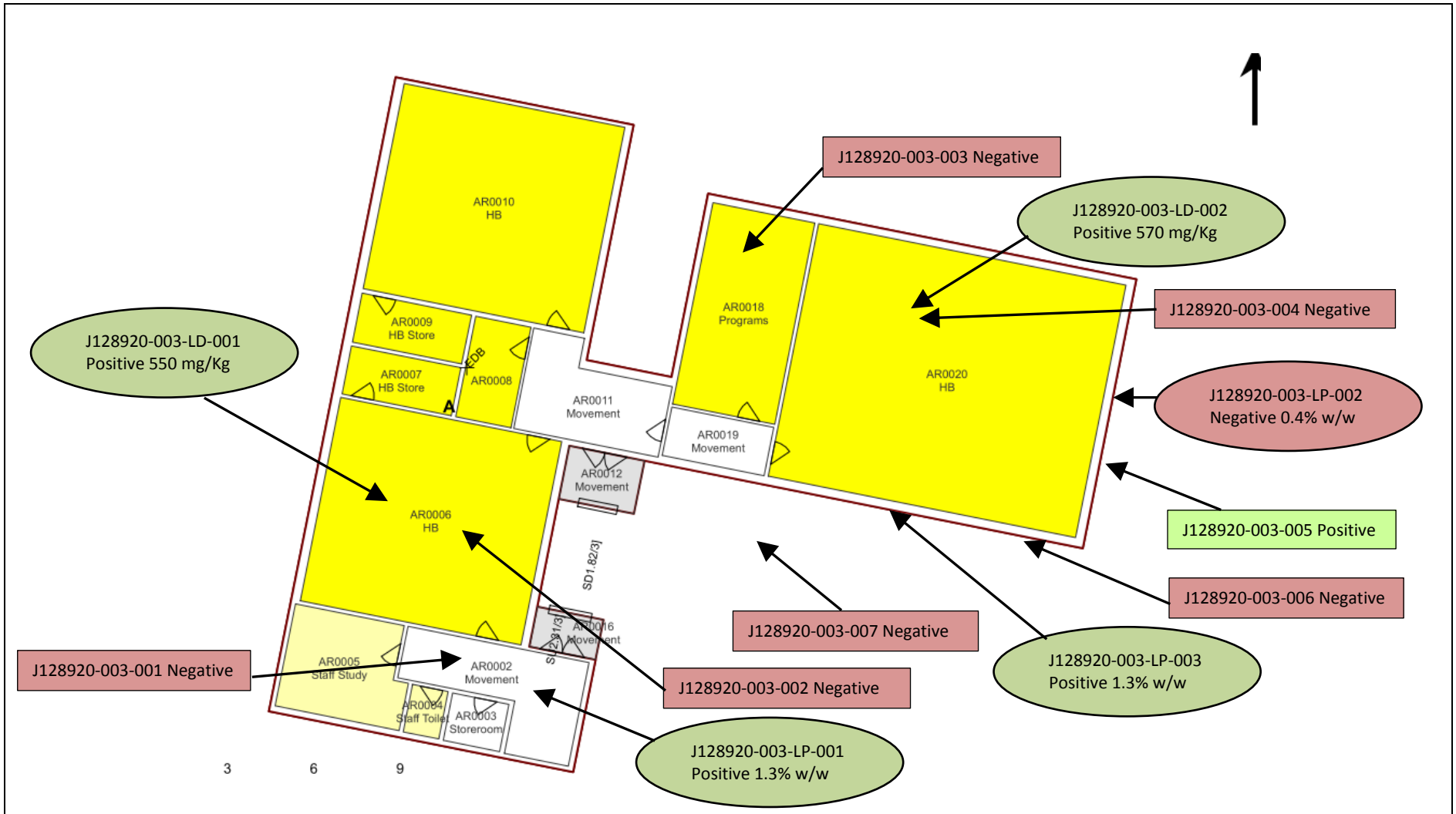
Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

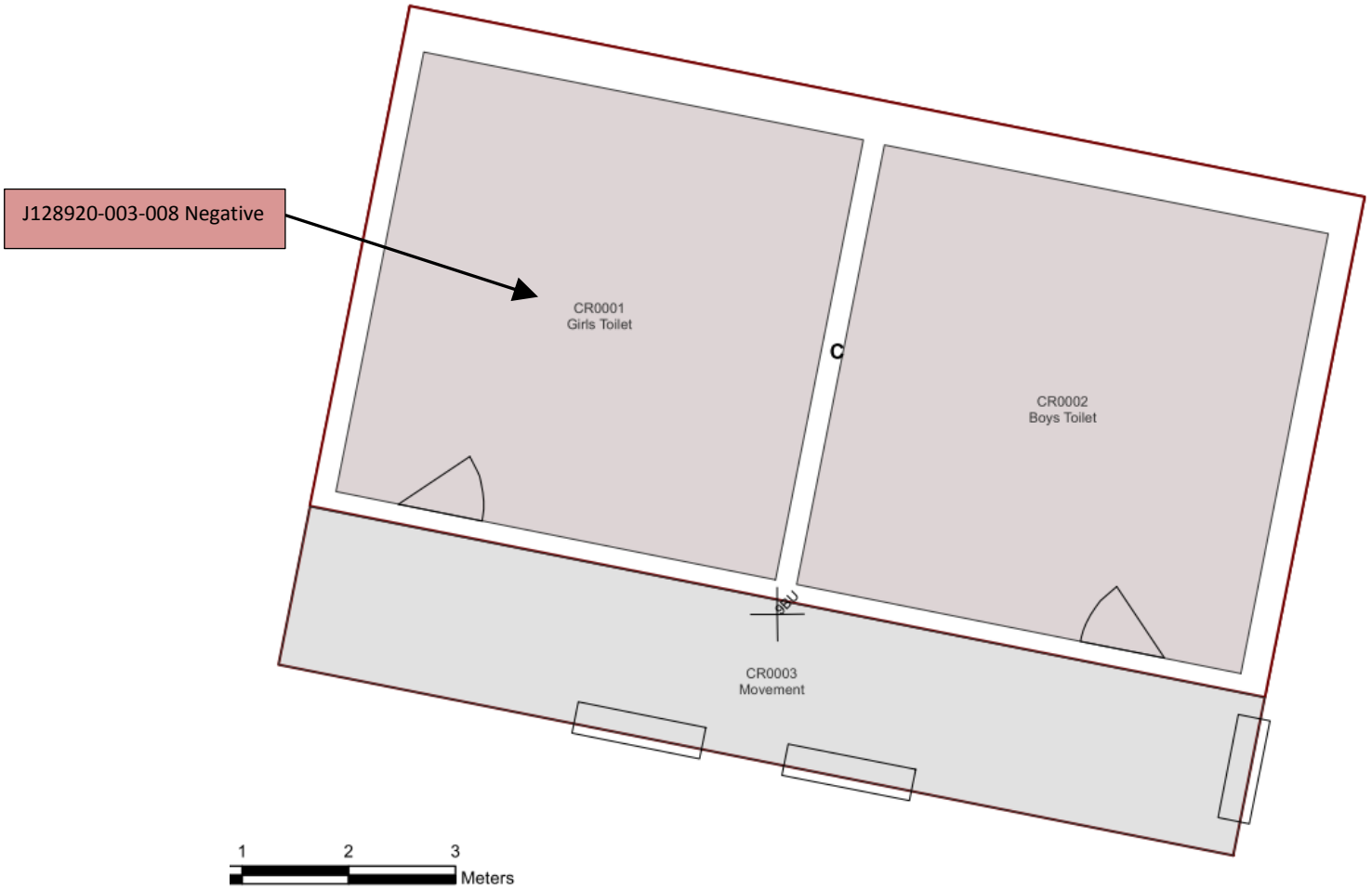
APPENDIX G: SITE PLANS SAMPLING LOCATIONS

Date : September 2014	Site: Harbord Public School	Client Number : C107477	Job Number : J128920



Date: September 2014	**Building:** Building A	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample

Date: September 2014	**Building:** Building B	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample



Date: September 2014	**Building:** Building C	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample

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LIMITED DESTRUCTIVE HAZARDOUS MATERIALS SURVEY REPORT

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

October 2014
J128920

C107477 : PP

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

EXECUTIVE SUMMARY

Purpose

This report presents the findings of a Limited Destructive Hazardous Materials Survey conducted of nominated existing buildings located at Harbord Public School, Oliver Street, Freshwater, NSW 2096. Noel Arnold & Associates Pty Ltd, trading as GreencapNAA, carried out the survey on the 26th September 2014, at the request of Peter Shun, Office of Finance & Services.

Scope

The survey involved a Limited Destructive Hazardous Materials Inspection within the three (3) nominated existing buildings (Blocks A, B and C) within the existing complex of Harbord Public School. The survey involved the visual inspection of representative construction materials including the collection and analysis of suspected asbestos-containing materials, lead-containing paint & lead dust within accessible ceiling spaces.

Hazardous materials assessed included:

- Asbestos-containing material (ACM);
- Synthetic Mineral Fibre (SMF);
- Polychlorinated Biphenyl (PCB)-containing capacitors in fluorescent light and fan fittings;
- Lead-containing paint;
- Lead-containing dust;
- Ozone Depleting Substances (ODSs);
- Flammable & combustible materials; &
- Above & Underground Petroleum Storage Systems (UPSS).

The scope of the works for the survey was confined to accessible materials noted below within the hazardous materials register (refer to **Appendix A**). Where materials could not be safely accessed, hazardous materials likely to be present have been presumed. As the buildings were still operational during the inspection, only limited techniques could be employed.

Findings Summary

The following materials have been identified or presumed at the site:

- Friable Asbestos-Containing Materials;
- Non-friable Asbestos-Containing Materials;
- Lead-containing paint; &
- Lead-containing dust.

Further information on the materials identified and presumed during this survey can be found in **Section 6** and **Appendix A**.

Recommendations

More detailed recommendations can be found in **Section 7**. The below outlines the short and medium term measures which should be taken prior to the planned demolition works at the site. The medium term measures are designed to be implemented if demolition work does not take place within the next 6 months.

Asbestos-Containing Materials (ACM)

Management Recommendations for the identified and presumed ACM are as follows:

- Consider labelling the identified and presumed ACM with industry recognised warning labels until such a time the removal works take place.

Medium Term Recommendations

- GreencapNAA understands that demolition work is planned for these blocks, but if any areas identified as containing asbestos materials are not to be disturbed during the works, it may be possible for them to remain *in-situ* and be managed appropriately. All identified or presumed ACM that will be disturbed by the scheduled works should be removed prior by an appropriately Licensed Asbestos Removal Contractor (LARC);
- Engage an appropriate LARC to undertake removal works for all hazardous materials impacted by the works;
- Engage an independent NSW Asbestos Assessor, if necessary, to conduct air monitoring and clearance inspections during and upon completion of the removal works;
- It is imperative that all works cease, pending further sampling, if materials suspected of containing asbestos or unknown materials are encountered;
- The Office of Finance & Services should ensure that all correct documentation is made available from the ARC prior to commencement of any refurbishment or demolition works;
- All works should be undertaken in accordance with current statutory regulations, standards and Codes of Practice; &
- Where ACMs remain *in-situ* a site Asbestos Register must be updated in order to manage any inherent risk associated.

Synthetic Mineral Fibres (SMFs)

No SMFs were identified at the nominated buildings during the survey.

Polychlorinated Biphenyls (PCBs)

No PCBs were identified at the nominated buildings during the survey.

Lead-Containing Paint

- Engage an appropriately experienced contractor to undertake remedial/removal works of all lead paint systems in poor condition as soon as possible, where practicable, but before any demolition work takes place; &
- All identified lead-based paint systems should be maintained in good condition. Any works on lead-based paint systems likely to create dust, fumes or mist should be undertaken prior to refurbishment/demolition works.

Lead-Containing Dust

- Engage an appropriately experienced contractor to undertake remedial/ removal works within areas found to contain lead-containing dust prior to demolition works; &
- Further investigation should be undertaken in areas not previously accessed, prior to demolition.

Ozone Depleting Substances (ODSs)

No ODSs were identified at the nominated buildings during the survey.

Flammable & Combustible Goods

No flammable and combustible goods were identified at the nominated buildings during the survey.

Petroleum Storage Systems (PSSs)

Underground Petroleum Storage Tanks (UPSSs)

No UPSSs were identified at the nominated buildings during the survey.

Above ground Petroleum Storage Tanks (APSSs)

No APSSs were identified at the nominated buildings during the survey.

Statement of Limitations

This report has been prepared in accordance with the agreement between Office of Finance & Services and GreencapNAA.

Within the limitations of the agreed upon scope of services, this work has been undertaken and performed in a professional manner, in accordance with generally accepted practices, using a degree of skill and care ordinarily exercised by members of its profession and consulting practice. No other warranty, expressed or implied, is made.

This report is solely for the use of Office of Finance & Services and any reliance on this report by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties or for other uses. This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval with comments are provided by GreencapNAA. More detail can be found in our Terms & Conditions. Please contact us to discuss.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

Table of Contents

1. INTRODUCTION

This report presents the findings of a Limited Destructive Hazardous Materials Survey conducted of the Harbord Public School, Oliver Street, Freshwater, NSW 2096. The survey was undertaken to identify potential hazardous materials located within the three (3) nominated existing buildings (Blocks A, B and C) within the existing complex of Harbord Public School, at Harbord, NSW.

Prasanna Pichai of GreencapNAA carried out the survey on Friday 26th of September 2014, at the request of Peter Shun, Office of Finance & Services, to assist in the works planned at the site to redevelop the school.

This is to assist the planned demolition works at the site and in order to comply with the NSW *Work Health and Safety (WHS) Regulation 2011, Code of Practice: How to Manage & Control Asbestos in the Workplace (WorkCover NSW, Dec 2011)* and *Demolition Work Code of Practice (SafeWork Australia, Nov 2013)*.

2. PROJECT SCOPE

The scope of this assessment was to:

- Review any records of audits and remedial works previously undertaken at the site, including plans;
- Undertake limited destructive hazardous materials survey on Blocks A, B and C located at Harbord Public School;
- Compile an up to date Hazardous Materials Register for the buildings, as far as practicable considering the constraints of the investigation; &
- Make recommendations for the short and medium term management and subsequent removal of the hazardous materials, in line with the planned demolition works.

Hazardous materials assessed included:

- Asbestos-Containing Material (ACM);
- Synthetic Mineral Fibre (SMF);
- Polychlorinated Biphenyls (PCBs)-containing capacitors in fluorescent light and fan fittings;
- Lead-Containing Paint;
- Lead-Containing Dust;
- Ozone depleting substances (ODSs);
- Flammable & Combustible Goods; &
- Above & Underground Petroleum Storage Systems (UPSS).

3. PREVIOUS INFORMATION

The following information was provided to GreencapNAA prior to the survey commencing:

Document Type	Issue Date	Reference number	Company undertaken by
Site plan	N/A	P2133G_1	Public Works/Department of Education & Training
Consultants Brief	September 2014	Job No:GS58C	Office of Finances & Services
DEC Asbestos Register	February 2014	2133	Department of Education & Communities
Data Capture Maps	August 2014	P2133F1_1	Public Works/Department of Education & Training
Asbestos Management Plan	June 2014	J126483:2133_ASB_100514_AMP	Noel Arnold & Associates

4. SITE DESCRIPTION

Below is a brief description of the site included within this this report:

Site Details			
Site Address	Harbord Public School, Oliver Street, Freshwater, NSW 2096		
Age	Circa 1960	**No. Buildings**	3
Standard Construction Materials			
Exterior			
Walls	Concrete, Brick & Metal		
Roofs	Metal, Slate Tiles		
Eaves/Awnings	Fibre cement sheeting		
Interior			
Walls	Brick, Plasterboard, Timber & Fibre cement sheeting		
Ceilings	Plasterboard, Fibre Cement Sheeting		
Floors	Concrete, Timber & Metal		
Floor Coverings	Sheet Vinyl, Carpet & Ceramic tiles		

5. METHODOLOGY

The survey involved a visual inspection of accessible and representative construction materials and the collection and analysis of materials suspected of containing hazardous materials.

Asbestos – This component of the assessment was carried out in accordance with the guidelines documented in the Code of Practice*: How to Manage and Control Asbestos in the Workplace (WorkCover NSW, 2011).* During this survey, eight (8) representative samples of suspected ACM were collected and placed in plastic clip-lock sealed bags. These samples were subsequently analysed in GreencapNAA's NATA-accredited laboratory for the presence of asbestos by Polarised Light Microscopy and Dispersion Staining techniques.

Synthetic Mineral Fibres (SMF) - This report broadly identifies SMF materials found or suspected of being present during the survey based on a visual assessment. This was carried out in accordance with the guidelines documented in the *Code of Practice for the Safe Use of Synthetic Mineral Fibres* [NOHSC: 2006 (1990)].

Polychlorinated Biphenyls (PCBs) - Where safe access was gained, detailed information of capacitors in fluorescent light fittings and other electrical equipment were noted for cross-referencing with the Australian

and New Zealand Environmental and Conservation Council (ANZECC) *Identification of PCB-containing capacitors* booklet (1997). Due to the inherent hazard in accessing electrical components, or other reasons such as height restrictions, immovable equipment and furniture, some light fittings may not be safely accessed. In these instances, comment is made on the likelihood of PCB-containing materials based upon age and appearance.

Lead-Containing Paint – Representative painted surfaces were tested unobtrusively for the presence of lead using the LeadCheck paint swab method in several locations. This method can detect lead in paint at concentrations of 0.5% and above, and may indicate lead in some paint films as low as 0.2%. The sampling program was representative of the various types of paints found within the site, concentrating on areas where lead based paints may have been used (e.g. Exterior gloss paints, window and door architraves, skirting boards etc. Three (3) paint chip samples were collected from site during this 2014 survey for percentage analysis. Refer to **Appendix C** for the External Laboratory Analysis Report.

The objective of lead paint identification in this survey is to highlight the presence of lead-based paints within the building, not to specifically identify every source of lead-based paint.

Lead-Containing Dust – The collection and analysis of suspected lead-containing dust samples is conducted in accordance with Australian Standard AS 4874-2000 *Guide to the Investigation of Potentially Contaminated Soil and Deposited Dust as a Source of Lead Available to Humans* and analysed in an external NATA-accredited laboratory, Envirolab Services, by ICP-AES methods. Two (2) suspected lead-containing dust samples were taken at the time of inspection for analysis. Refer to **Appendix C** for the External Laboratory Analysis Report.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health 'Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007' (December 2007), the NSW EPA document 'Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003) and the EnHealth document 'Health-based Soil Investigation Levels' (March 2001).

Ozone Depleting Substance (ODSs) – This aspect of the survey required the broad observation of potentially ODS-containing items, such as refrigerators and air conditioning units.

Flammable & Combustible Goods – This aspect of the survey is based on the requirements of the relevant Australian Standards for Flammable Liquid Storage, stated within the Australian Standard *AS 1940-2004 – The Storage and Handling of Flammable and Combustible Liquids*.

Petroleum Storage Systems (PSS) (Above and below ground) – Observations to the exterior areas of the site entailed identification of any signs of UPSS or APSS being present. We also utilised the Dangerous Goods search documents provided by WorkCover NSW.

Although liquid petroleum gas storage tanks are not covered within the regulation *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008*, Part 1.4, we have included its presence within this survey in line with the *Demolition Work Code of Practice (SafeWork Australia, Nov 2013)*, although no specific recommendations will be made with regards to this.

Areas Not Accessible/Not Inspected

It is noted that given the constraints of practicable access encountered during the risk assessment survey, the following areas were not accessed or inspected:

- Ceiling spaces within demountable buildings due to access restrictions, including occupation of the site;
- Throughout Site: Culverts and floor trenches or tunnels due to occupation of the site;
- Throughout: Under floor coverings in occupied areas where damage may have occurred;
- Within those areas accessible only by dismantling equipment;
- Within voids or internal areas of plant, equipment, air-conditioning ducts etc. due to their potential live status or specialised dismantling requirements ;
- Energised services, gas, electrical, pressurised vessel and chemical lines;
- Areas deemed unsafe or hazardous at time of survey (Roof areas, Ceiling Spaces);

- Within totally inaccessible areas such as voids and cavities created and intimately concealed within the building structure. These voids are only accessible during major demolition works; &
- Height restricted areas.

As the site was occupied and in operation at the time of inspection, no destructive investigation techniques or destructive sampling was undertaken for safety reasons.

Prior to the planned demolition of the buildings on site, it is recommended that all areas noted above are investigated further if they are to be included within the scope of works. This is only practically feasible upon either **vacant possession** of the buildings due to the destructive techniques required to complete the survey.

The presence of any residual asbestos insulation and applications on steel members, concrete surfaces, pipe work, equipment and adjacent areas from prior abatement or refurbishment works cannot be ascertained without extensive removal and damage to existing insulation, fittings and finishes.

Other specific areas not accessed or inspected are described in **Appendix A**.

6. SURVEY FINDINGS

The following materials have been identified or presumed at the site:

Material / Building-Level	Asbestos		SMF	PCBs	Lead Paint	Lead Dust	ODS	Flammable Goods	PSS
	Friable	Non-Friable							
Block A (B00A) – General Learning	✓	✓	-	-	✓	✓	-	-	-
Block B (B00B) – Pupil Toilet Facilities	-	-	-	-	✓	-	-	-	-
Block C (B00C) – Pupil Toilet Facilities	-	-	-	-	✓	-	-	-	-

Further information on the materials identified and presumed during this survey can be found in **Appendix A,** Material Registers.

7. RECOMMENDATIONS

Asbestos containing Materials

Short term recommendations for the identified and presumed ACM are as follows:

- Consider labelling the identified and presumed ACM with industry recognised warning labels, as per the *Work Health & Safety (WHS) Regulations 2011*. This is relevant if the material will remain in situ at the site.

Medium term recommendations for the identified and presumed ACM are as follows:

- GreencapNAA understands that demolition work is planned, but if any areas identified as containing asbestos materials are not to be disturbed during the works, it may be possible for them to remain *in-situ*. All identified or presumed ACM that will be disturbed by the scheduled works should be removed prior by an appropriately Licensed Asbestos Removal Contractor (LARC), Class A LARC for friable works and Class B LARC for non-friable works - as stated in the Code of Practice: *How to Safely Remove Asbestos* (WorkCover NSW, 2011) (Refer to **Appendix A**);
- Engage an independent NSW Asbestos Assessor, if necessary, to conduct air monitoring and clearance inspections during and upon completion of the removal works where necessary. These works should be conducted by a NATA-accredited laboratory in accordance with *the Guidance Note on the Membrane Filter Method for the Estimation of Airborne Asbestos Fibres, 2nd Edition, 2005* [NOHSC: 3003 (2011)];
- All licensed asbestos removal work must be notified to the regulator in writing at least five days before licensed asbestos removal work commences as stated in the Code of Practice: *How to Safely Remove Asbestos* (WorkCover NSW, 2011).
- Disposal receipts should be obtained from the asbestos removal contractor as evidence that the asbestos waste has been taken to an appropriate landfill facility.

- It is imperative that all works cease, pending further sampling, if materials suspected of containing asbestos or unknown materials are encountered;
- The Office of Finance & Services should ensure that all correct documentation is made available, as per the *Work Health & Safety Regulation 2011* and Code of Practice: *How to Safely Remove Asbestos (WorkCover NSW, 2011)*, from the ARC prior to commencement of any refurbishment or demolition works. This includes notification to WorkCover NSW, a Safe Work Method Statement (SWMS and Asbestos Removal Control Plan, as a minimum; &
- All works should be undertaken in accordance with current statutory regulations, standards and Codes of Practice.

Synthetic Mineral Fibre (SMFs)

No SMFs were identified at the nominated buildings during the survey.

Polychlorinated Biphenyls (PCBs)

No PCBs were identified at the nominated buildings during the survey.

Lead-Containing Paint

- Engage an appropriately experienced contractor to undertake remedial/ removal works of all lead paint systems in poor condition as soon as possible.
- All identified lead-based paint systems should be maintained in good condition. Any works on lead-based paint systems likely to create dust, fumes or mist should be undertaken prior to refurbishment/demolition works.

Lead-Containing Dust

- Lead-containing dust has been identified at the time of inspection. Lead-containing dust identified on site, which has a lead content above 300mg/kg should be removed/cleaned in accordance with Australian Standard AS 4361.2-1998 *Guide to Lead Paint Management, Part 2: Residential and Commercial Buildings* prior to any demolition work likely to disturb the material. This includes the use of HEPA-vacuuming, wet wiping and personal protective equipment. Personnel should employ suitable dust suppression techniques and wear appropriate personal protective equipment;
- It is recommended that the removal of the accumulated dust on top of the ceiling within the roof space be undertaken as part of the demolition of the building so that the dust does not become airborne or contaminate soils in the area; &
- Further investigation should be undertaken in areas not previously accessed, prior to demolition.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health 'Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007' (December 2007), the NSW EPA document 'Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003) and the EnHealth document 'Health-based Soil Investigation Levels' (March 2001).

Ozone Depleting Substances (ODSs)

No ODSs were identified at the nominated buildings during the survey.

Flammable & Combustible Goods

No flammable and combustible goods were identified at the nominated buildings during the survey.

Petroleum Storage Systems (PSS)

Underground Petroleum Storage Tanks (UPSSs)

No UPSSs were identified at the nominated buildings during the survey.

Above ground Petroleum Storage Tanks (APSSs)

No APSSs were identified at the nominated buildings during the survey.

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX A: HAZARDOUS MATERIALS REGISTERS

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building A - Exterior - Ground Level														
Exterior - North & West Window Frame - Lower Paint System/s - Blue Upper- White Lower Painted Windows	Lead (Paint)	J128920-003-LP-003	Positive, 1.3%	J128920-003-Photo041	10 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Exterior - Throughout A/C Unit - R410A x 4	ODS		Negative											
Exterior - Throughout Awning - Flat Cement Sheeting	Asbestos	Previously Sampled NAA S1	Previously Sampled Positive	J128920-003-Photo037	12 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Eaves - Flat Cement Sheeting	Asbestos	Previously Sampled NAA Similar To: S1	Previously Sampled Positive	J128920-003-Photo036	100 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	similar To S1 Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Expansion Joint - Bituminous Material	Asbestos	J128920-003-007	Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	J128920-003-LP-002	Negative, 0.4%											
Exterior - Throughout Gable Verge Lining - Flat Cement Sheeting - North, south and East facing	Asbestos	J128920-003-005	Positive	J128920-003-Photo034	30 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Exterior - Throughout Window Frames - Putty	Asbestos	J128920-003-006	Negative											
Building A - Interior - Ground Level														
Ceiling Space - North Ceiling - Corrugated Cement Sheet	Asbestos	Not Sampled	Presumed Positive	J128920-003-Photo029	300 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Ceiling Space - North Debris - Dust - Northern Wing	Asbestos	J128920-003-004	Negative											
Ceiling Space - North On Top of Ceiling - Dust - Lead	Lead (Dust)	J128920-003-LD-002	Positive, 570mg/kg	J128920-003-Photo031	500 m²	Poor							All dust, dirt and sediment material with lead levels above the adopted standard (i.e. above 300mg/kg) should be removed under controlled conditions.	

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Ceiling Space - West Ceiling - Corrugated Cement Sheet	Asbestos	Not Sampled Height Restricted	Presumed Positive	J128920-003-Photo020	580 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
Ceiling Space - West Debris - Dust - Western Wing	Asbestos	J128920-003-002	Negative											
Ceiling Space - West On Top of Ceiling - Dust - Lead	Lead (Dust)	J128920-003-LD-001	Positive, 550mg/kg	J128920-003-Photo022	500 m²	Poor							All dust, dirt and sediment material with lead levels above the adopted standard (i.e. above 300mg/kg) should be removed under controlled conditions.	
Computer Room - R0018 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo027	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Computer Room - R0018 - Throughout Floor Covering - Sheet Vinyl	Asbestos	J128920-003-003	Negative											
Movement - AR0011 - East Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo026	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Movement - AR0019 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo016	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Movement - R0016 - Throughout Ceiling - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S1	Previously Sampled Positive	J128920-003-Photo001	2 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - Throughout Ceiling - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA s4	Previously Sampled Positive	J128920-003-Photo002	10 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - Throughout Door - Paint System/s - Green Paint	Lead (Paint)	J128920-003-LP-001	Positive, 1.3%	J128920-003-Photo004	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0002 - Throughout Floor Underlay - Screed	Asbestos	J128920-003-001	Negative											
R0002 - Throughout Wall - Paint System/s - Cream Paint	Lead (Paint)	J128920-003-LC-001	Negative											

GREENCAP

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
R0002 - Throughout Wall Lining - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S5	Previously Sampled Positive	J128920-003-Photo003	8 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0002 - West Fridge - R134A	ODS		Presumed Negative											
R0003 - North Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo008	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0004 - North Floor Underlay - Screed	Asbestos	Similar To: J128920-003-001	Presumed Negative											
R0004 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo009	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
R0005 - North Heater - Insulation - Study Annexe	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo011	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0005 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
R0006 - North Heater - Insulation	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo014	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0006 - North Wall - Paint System/s - Doors x 3	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative										Home base	
R0008 - West Electrical - Switch Board - Compressed Bituminous Electrical Panel	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo017	1 Unit/s	Good	Non Friable	Low		Not Labelled	25-09-2015		Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0008 - West Electrical - Switch Board - Fibre Cement Sheeting	Asbestos	Previously Sampled NAA S3	Previously Sampled Positive	J128920-003-Photo018	1 m²	Good	Non Friable	Low	Low	Not Labelled	25-09-2015	P4	Maintain in current condition, label and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0008 - West Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building A**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**800 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Fibre Cement**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
R0010 - North Heater - Insulation	Asbestos	Not Sampled Live Electrical Hazard	Presumed Positive	J128920-003-Photo033	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0010 - North Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
R0010 - South Heater - Insulation	Asbestos	Not Sampled	Presumed Positive	J128920-003-Photo025	1 Unit/s	Good	Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	
R0020 - East Door - Paint System/s - Home base	Lead (Paint)	Similar To: J128920-003-LP-001	Presumed Positive, 1.3%	J128920-003-Photo032	2 m²	Good							Maintain in good condition and incorporate into a HMMP. Remove under controlled conditions prior to demolition or refurbishment.	
Storage Room - R0007 - Throughout Floor Underlay - Screed	Asbestos	Similar To: J128920-003-001	Presumed Negative											
Storage Room - R0009 - South Wall - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-001	Presumed Negative											
Building A - Exterior - Sub-Floor														
Exterior - Throughout Packer - Fibre Cement Sheeting - Presumed Packers and Debris	Asbestos	Not Sampled Locked	Presumed Positive	J128920-003-Photo042	20 m²	Not able to determine	Non Friable	Low	Low	Not Labelled	25-09-2015	P3	Confirm status, label, maintain in current condition and incorporate into an HMMP. Remove by licensed asbestos contractor prior to demolition or refurbishment.	

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building B**	**Number of Levels:**	**1**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**300 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Metal**	**Construction Type:**	**Brick and Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building B - Exterior - Ground Level														
Exterior - South & East Metal Work - Paint System/s	Lead (Paint)	J128920-003-LC-005	Positive	J128920-003-Photo049	2 m²	Poor							Access to flaking/ damaged paint surfaces should be restricted. Engage an appropriately experienced contractor to stabilise or remove this item under controlled conditions.	
Exterior - Throughout Expansion Joint - Bituminous Material	Asbestos	Similar To: J128920-003-007	Presumed Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	Similar To: J128920-003-LP-002	Presumed Negative, 0.4%											
R0001 - Throughout Framework - Paint System/s - Dark Green	Lead (Paint)	J128920-003-LC-003	Negative											
R0002 - East Door - Paint System/s - Dark Green/Grey. 2x doors	Lead (Paint)	J128920-003-LC-004	Negative											
Building B - Interior - Ground Level														
R0001 & R0002 - East & West Cubicle Partitions - Fibre Cement Sheeting - Bright Red	Asbestos	J128920-003-008	Negative											
R0001 & R0002 - Throughout Expansion Joint - Mastic Sealant	Asbestos	Not Sampled No	Presumed Negative											
R0001 & R0002 - Throughout Framework - Paint System/s - Green	Lead (Paint)	J128920-003-LC-002	Negative											

Hazardous Materials Register

Harbord Public School

Site Details		Building Details				Audit Details	
Full Address:	**Oliver Street Freshwater NSW 2096**	**Building Name:**	**Building C**	**Number of Levels:**	**0**	**Survey Date:**	**25-09-2014**
Property ID:	**003**	**Est. Building Size:**	**300 m²**	**Est. Building Age:**	**1950**	**Inspected By:**	**Prasanna Pichai**
Client Name:	**Office of Finance and Services**	**Roof Type:**	**Metal (suspected)**	**Construction Type:**	**Brick & Concrete**	**Company:**	**Noel Arnold & Associates**

Location - Item Description	Hazard Type	Sample No	Item Status	Photo No.	Est. Extent	Condition	Friability	Dist. Potential	Risk Rating	Current Label	ReInspect Date	Control Priority	Control Recommendation	Record of Works Undertaken
Building C - Exterior - Ground Level														
CR0003 - Throughout Framework - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-003	Negative											
Exterior - Throughout Gable - Paint System/s - Fluoro Green	Lead (Paint)	Similar To: J128920-003-LP-002	Presumed Negative, 0.4%											
Exterior - West Metal Work - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-005	Positive	J128920-003-Photo058	2 m²	Poor							Access to flaking/ damaged paint surfaces should be restricted. Engage an appropriately experienced contractor to stabilise or remove this item under controlled conditions.	
Throughout Expansion Joint - Bituminous Material - Expansion Joint To Ground	Asbestos	Similar To: J128920-003-007	Presumed Negative											
Building C - Interior - Ground Level														
R0001 - East & West Cubicle Partitions - Fibre Cement Sheeting - 2 walls	Asbestos	Similar To: J128920-003-008	Presumed Negative											
R0001 - East & West Door - Paint System/s - 4 doors	Lead (Paint)	Similar To: J128920-003-LC-004	Negative											
R0001 - Throughout Framework - Paint System/s - Green	Lead (Paint)	Similar To: J128920-003-LC-002	Negative											
R0001 & R0002 - Throughout Expansion Joint - Mastic Sealant	Asbestos	Not Sampled No	Presumed Negative											
R0002 - East Cubicle Partitions - Fibre Cement Sheeting	Asbestos	Similar To: J128920-003-008	Presumed Negative											
R0002 - East Door - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-004	Negative											
R0002 - Throughout Framework - Paint System/s	Lead (Paint)	Similar To: J128920-003-LC-002	Negative											

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX B: ASBESTOS SAMPLE ANALYSIS REPORTS

Accredited as Noel Arnold & Associates Pty Ltd
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www.greencap.com.au

Wednesday, 01/10/2014

Our ref: C107477:J128920-2133

Peter Shun
Office of Finance and Services
Level 14, 2-24 Rawson Place
SYDNEY NSW 2000

Dear Peter,

Re: Asbestos Identification Analysis - Harbord Public School, Oliver Street, Freshwater NSW 2096

This letter presents the results of asbestos fibre identification analysis performed on 8 samples collected by Prasanna Pichai of GreencapNAA on Friday, 26 September 2014. The samples were collected from Harbord Public School, Oliver Street, Freshwater NSW 2096.

All sample analysis was performed using polarised light microscopy, including dispersion staining in our Sydney Laboratory in accordance with GreencapNAA Test Method NALAB 302 Asbestos Identification Analysis and following the guidelines of Australian Standard AS4964-2004.

The samples will be kept for six months and then disposed of, unless otherwise directed.

The results of the asbestos identification analysis are presented in the appended table.

Should you require further information please contact Prasanna Pichai.

Yours sincerely
GreencapNAA

Simon Day : Approved Identifier

Simon Day : Approved Signatory

Wednesday, 01/10/2014

Our ref: C107477:J128920-2133

Site Location:		Harbord Public School, Oliver Street, Freshwater NSW 2096	
	Sample ID	Sample Location/Description/Weight or Size	Analysis Result
1	J128920-2133 01	Building A - Ground Level - R0002 - Throughout - Floor Underlay - Screed Brown compressed/formed powder, organic fibre, quartz screed material and associated clear adhesive material ~ 40 x 40 x 1 mm	No Asbestos Detected
2	J128920-2133 02	Building A - Ground Level - Ceiling Space - West - Debris - Dust Brown-grey non-homogenous dust including, loose organic and vitreous fibres ~ 1.42g	No Asbestos Detected At or Above Reporting Limit NOTE 1 Organic Fibres Synthetic Mineral Fibres
3	J128920-2133 03	Building A - Ground Level - Computer Room - R0018 - Throughout - Floor Covering - Sheet Vinyl Olive green brittle vinyl material, attached brown woven organic fibrous hessian-type matting material and associated amber adhesive material ~ 50 x 40 x 2 mm	No Asbestos Detected Organic Fibres
4	J128920-2133 04	Building A - Ground Level - Ceiling Space - North - Debris - Dust Brown-grey non-homogenous dust including, loose organic and vitreous fibres ~ 2.14g	No Asbestos Detected At or Above Reporting Limit NOTE 1 Organic Fibres Synthetic Mineral Fibres
5	**J128920-2133 05**	**Building A - Ground Level - Exterior - Throughout - Gable Verge Lining - Flat Cement Sheeting Blue, green-painted grey fibre-cement sheet material ~ 21 x 9 x 3 mm**	**Chrysotile (white asbestos)**
6	J128920-2133 06	Building A - Ground Level - Exterior - Throughout - Window Frames - Putty Blue-painted beige hardened mastic material ~ 15 x 15 x 1 mm	No Asbestos Detected
7	J128920-2133 07	Building A - Ground Level - Exterior - Throughout - Expansion Joint - Bituminous Material Black-brown bituminous organic fibre-impregnated flexible mastic material ~ 35 x 30 x 8 mm	No Asbestos Detected Organic Fibres
8	J128920-2133 08	Building B - Ground Level - R0001 - East & West - Cubicle Partitions - Fibre Cement Sheeting Red-painted grey compressed powder, quartz concrete material ~ 25 x 9 x 3 mm	No Asbestos Detected

* Shaded row with bolded text indicates sample contains a positive result for asbestos.

NOTE 1 The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques. The above result can be interpreted that the sample contains no detectable 'respirable' asbestos fibres (AS4964-2004 Clause 9.5).

Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX C: LEAD SAMPLE ANALYSIS REPORTS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 116814

Client:
Noel Arnold & Associates Pty Ltd
Level 2, 11 Khartoum Rd
North Ryde
NSW 2113

Attention: Mark Cozanitis

Sample log in details:

Your Reference:	**C107977:J128920**
No. of samples:	3 Paints 2 Dusts
Date samples received / completed instructions received	29/09/2014 / 29/09/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	3/10/14 / 1/10/14
Date of Preliminary Report:	None Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Lead in Paint Our Reference: Your Reference Type of sample	UNITS ---------- ----------	116814-1 J128920-003 -LP-001 Paint	116814-2 J128920-003 -LP-002 Paint	116814-3 J128920-003 -LP-003 Paint
Lead in paint	%w/w	1.3	0.4	1.3

Lead (dust) Our Reference: Your Reference Type of sample	UNITS ---------- ----------	116814-4 J128920-003 -LD-001 Dust	116814-5 J128920-003 -LD-002 Dust
Lead	mg/kg	550	570

Method ID	Methodology Summary
Metals-004	Digestion of Paint chips/scrapings/liquids for Metals determination by ICP-AES/MS and or CV/AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL Lead in Paint	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Lead in paint	%w/w	0.05	Metals-004	<0.05	116814-2	0.4 || 0.50 || RPD: 22	LCS-1	100%
QUALITY CONTROL Lead (dust)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	102%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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APPENDIX D: RISK ASSESSMENT FACTORS

Risk Assessment Factors - Asbestos

To assess the health risk posed by the presence of asbestos-containing material, all relevant factors must be considered. These factors include:

- Evidence of physical damage;
- Evidence of water damage;
- Proximity of air plenums and direct air stream;
- Friability of asbestos material;
- Requirement for access for building operations;
- Requirement for access for maintenance operations;
- Likelihood of disturbance of the asbestos material;
- Accessibility;
- Exposed surface areas; &
- Environmental conditions.

These aspects are in turn judged upon; (i) potential for fibre generation, and, (ii) the potential for exposure. Where these factors have indicated that there is a possibility of exposure to airborne fibres, appropriate recommendations for repair, maintenance or abatement of the asbestos-containing materials are made.

Condition

The condition of the asbestos products identified during the survey is usually reported as either being good or poor.

- *Good* refers to asbestos materials, which have not been damaged or have not deteriorated.
- *Fair* damage refers to the asbestos material having suffered minor cracking or de-surfacing.
- *Poor* describes asbestos materials, which have been damaged, or their condition has deteriorated over time.

Friability

The friability of asbestos products describes the ease of which the material can be crumbled, and hence to release fibres.

- *Friable asbestos* (e.g. limpet beam insulation, pipe lagging) can be easily crumbled and is more hazardous than non-friable asbestos products.
- *Non-friable asbestos,* commonly known as bonded asbestos, is typically comprised of asbestos fibres tightly bound in a stable non-asbestos matrix.

Examples of non-friable asbestos products include asbestos cement materials (sheeting, pipes etc.), asbestos-containing vinyl floor tiles and electrical backing boards.

Accessibility/Disturbance Potential

Asbestos products can be classified as having low, medium or high accessibility/disturbance potential.

- *Low* accessibility describes asbestos products that cannot be easily disturbed, such as materials in building voids, set ceilings etc.
- *Medium* accessibility describes asbestos products that are visible but normal access is impeded, such as materials behind cladding material or is present in a ceiling space or is height restricted.
- *High* accessibility asbestos products can be easily accessed or damaged due to their close proximity to personnel, e.g. asbestos cement walls or down pipes.

Risk Status

The risk factors described above are used to rank the health risk posed by the presence of asbestos-containing materials.

- A *low* risk ranking describes asbestos materials that pose a low health risk to personnel, employees and the general public providing they stay in a stable condition, for example asbestos materials that are in good condition and have low accessibility.
- A *medium* risk ranking applies to materials that pose an increased risk to people in the area.
- Asbestos materials that possess a *high* risk ranking pose a high health risk to personnel or the public in the area of the material. Materials with a high risk ranking will also possess a Priority 1 recommendation to manage the asbestos and reduce the risk.

Priority Rating System for Control Recommendations

The following schedule of risk status priority rating is adopted to assist in the programming of the removal or containment of risks of asbestos materials in the buildings.

Priority 1: Hazard with High Risk Potential (Red)

Status: Area has asbestos materials, which are either damaged or are being exposed to continual disturbance. Due to these conditions there is an increased potential for exposure and/or transfer of the material to other parts with continued unrestricted use of this area.

Recommendation: It is recommended that the area is isolated, air-monitoring be conducted (if relevant) and the asbestos material is promptly removed. After abatement of the asbestos material a re-inspection should be conducted to confirm that the area has been satisfactorily cleared of the material.

Priority 2: Hazard with Medium Risk Potential (Orange)

Status: Area has asbestos materials with a potential for disturbance due to the following conditions:

1. Material has been disturbed or damaged and its current condition, while not posing an immediate hazard, is unstable; or
2. The material is accessible and can, when disturbed, presents a short-term exposure risk; or
3. The material could pose an exposure risk if workers are in close proximity.

Recommendation: Appropriate abatement measures to be taken as soon as is practical (3-6 months). Negligible health risks if materials remain undisturbed under the control of an asbestos materials management plan.

Priority 3: Hazard with Low Risk Potential (Yellow)

Status: Area has asbestos materials where:

1. The condition of any friable asbestos material is stable and has a low potential for disturbance; or
2. The asbestos material is in a non-friable condition, however has been damaged, but does not present an exposure risk unless cut, drilled, sanded or otherwise abraded. The damaged bonded material must be removed or repaired by a licensed contractor.

Recommendation: Negligible health risks if the materials are left undisturbed under the control of an asbestos material management plan. Consider abatement within 12 months of the damaged bonded asbestos materials (e.g. asbestos cement material).

Priority 4: Hazard with Negligible (very low) Risk Potential (Yellow)

Status: The asbestos material is in a non-friable form and in good condition. It is most unlikely that the material can be disturbed under normal circumstances. Even if it were subjected to minor disturbance the material poses a negligible health risk.

Recommendation: These materials should be left and their condition monitored during subsequent reviews.

Risk Assessment Factors for SMF

Risk assessment factors for Synthetic Mineral Fibre is very similar for asbestos products, where evidence of damage, accessibility, likelihood of disturbance etc is used when assessing SMF materials. Similarly SMF condition, accessibility and risk status headings used above for asbestos can be applied to SMF materials.

There are two basic forms of SMF insulation, bonded and un-bonded.

- *Bonded* SMF is where adhesives or cements have been applied to the SMF before delivery and the SMF product has a specific shape.
- *Un-bonded* SMF has no adhesives or cements and the SMF is loose material packed into a package.

Removal of bonded materials is easier and less hazardous than removal of un-bonded SMF material.

Risk Assessment Factors for Polychlorinated Biphenyls

The handling and disposal of PCBs must be performed in accordance with *The New South Wales Protection Of The Environment Operations Act,* 1997.

The following Personal Protective Equipment should be worn when handling items containing Polychlorinated Biphenyls - nitrile gloves, eye protection, and disposable overalls. The PPE should be worn when removing capacitors from light fittings in case Polychlorinated Biphenyls material leaks from the capacitor housing.

Generally, metal-cased capacitors contain PCBs. Plastic–cased capacitors usually do not. However, all leaking capacitors should be treated as if they contain PCBs unless proven otherwise.

Risk Assessment Factors for Lead Paint

Lead paint, as defined by the Australian Standard *AS4361.2 – 1998 Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings,* is that which contains in excess of 1% Lead by weight.

Lead carbonate (white lead) was once the main white pigment in paints for houses and public buildings. Paint with lead pigment was manufactured up until the late 1960's, and in 1969 the National Health and Medical Research Council's Uniform Paint Standard was amended to restrict lead content in domestic paint.

Lead in any form is toxic to humans when ingested or inhaled, with repeated transmission of particles cumulating in lead poisoning. Lead paint is assessed based on two potential routes of exposure. Firstly by the likelihood of inhalation or ingestion by people working in the vicinity of the paint and secondly by the condition of the paint. Paint that is flaking or in poor condition is more likely to be ingested than paint that is in a good, stable condition.

Risk Assessment Factors for Lead-Containing Dust

Lead is ubiquitous in the urban environment, resulting from industrial processes, lead-containing paint and as a by-product from the combustion of leaded petrol and other sources. Lead can accumulate as a constituent of settled dust, particularly in areas not frequently cleaned (such as ceiling spaces, plant rooms, etc) in older buildings.

There is currently no specific criteria for "lead in dust" in Australia, however a criteria for lead in soil in residential settings of 300mg/kg is established. The use of this criteria for lead in dust is supported by a number of government agencies and papers, including the WA Department of Health '*Report on Lead Dust Monitoring in residences undertaken in Esperance Between 1 July and 8 August 2007*' (December 2007), the NSW EPA document '*Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices: A Guide for Councils' (February 2003)* and the EnHealth document '*Health-based Soil Investigation Levels'* (March 2001).

Settled dust in ceilings, etc. is generally more finely divided than soils, and the disturbance or removal of dust with elevated lead content has the potential to exceed exposure standards for inspirable dust and lead.

Prior to undertaking any removal work, the risk for potential exposure must be assessed and consideration to conducting health surveillance and biological monitoring should be given. Since it is difficult to use engineering controls to control airborne dust levels for some dust removal work situations (e.g. enclosed ceiling spaces), there is a greater reliance on personal respiratory protection to provide a safe working environment for the workers carrying out this task. Hence, any workers undertaking such tasks should have

adequate training in correct work procedures, including the selection, use and maintenance of personal protective equipment and good personal hygiene practices.

Risk Assessment Factors for Ozone Depleting Substances (ODSs)

Ozone Depleting Substances (ODSs) are those substances which deplete the earth's ozone layer and have been widely used in a range of commercial and industrial applications. All bulk imports of these substances (except HCFC's and methyl bromide) are banned in to Australia under an international agreement known as the Montreal Protocol.

Hydrochlorofluorocarbons (HCFCs) are refrigerants of low ozone depleting potential that are commonly used in air-conditioning plant, chillers and condensers. HCFCs are subject to Australian Government controls on import and manufacture as part of a phase out quota system in accordance with the Montreal Protocol and the Commonwealth Ozone Protection & Systematic Greenhouse Gas Management Act 1989. Imports of these substances will be fully banned by 2020 with only very limited supplies then available until 2030 to service remaining HCFC-dependant equipment.

Maintenance contractors working with these gases should have procedures in place to safely work, store, handle and dispose of materials correctly.

Risk Assessment Factors for Flammable Materials

The identification of hazards associated with flammable materials looks at how they are stored and handled. Factors considered are the inherent hazards such as fire, explosion and the potential for incidents. Flammable materials include:

- Class 1 – Explosives;
- Class 2 – Gases;
- Class 3 – Flammable Liquids; &
- Class 4 – Flammable Solids;

There are many sub-classes within these classes that further classify dangerous goods according to their properties e.g. Class 2.1 – Flammable Gas, Class 2.2 – Non-Flammable Gas, etc.

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Harbord Public School, Oliver Street, Freshwater, NSW 2096

APPENDIX E: PHOTOGRAPHS

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo041
Result: Lead (Paint) - Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-North & West
Feature/Material: Window Frame-Lower Paint System/s

Photo No: J128920-003-Photo037
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Awning-Flat Cement Sheeting

Photo No: J128920-003-Photo036
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Eaves-Flat Cement Sheeting

Photo No: J128920-003-Photo034
Result: Asbestos - Positive
Building/Level: Building A-Ground Level
Room/Location: Exterior-Throughout
Feature/Material: Gable Verge Lining-Flat Cement Sheeting

Photo No: J128920-003-Photo029
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-North
Feature/Material: Ceiling-Corrugated Cement Sheet

Photo No: J128920-003-Photo031
Result: Lead (Dust) - Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-North
Feature/Material: On Top of Ceiling-Dust - Lead

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo020
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-West
Feature/Material: Ceiling-Corrugated Cement Sheet

Photo No: J128920-003-Photo022
Result: Lead (Dust) - Positive
Building/Level: Building A-Ground Level
Room/Location: Ceiling Space-West
Feature/Material: On Top of Ceiling-Dust - Lead

Photo No: J128920-003-Photo027
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Computer Room - R0018-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo026
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - AR0011-East
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo016
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - AR0019-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo001
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: Movement - R0016-Throughout
Feature/Material: Ceiling-Fibre Cement Sheeting

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo002
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Ceiling-Fibre Cement Sheeting

Photo No: J128920-003-Photo004
Result: Lead (Paint) - Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo003
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0002-Throughout
Feature/Material: Wall Lining-Fibre Cement Sheeting

Photo No: J128920-003-Photo008
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0003-North
Feature/Material: Door-Paint System/s

Photo No: J128920-003-Photo009
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0004-North
Feature/Material: Wall-Paint System/s

Photo No: J128920-003-Photo011
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0005-North
Feature/Material: Heater-Insulation

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo014
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0006-North
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo017
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0008-West
Feature/Material: Electrical - Switch Board-Compressed Bituminous Electrical Panel

Photo No: J128920-003-Photo018
Result: Asbestos - Previously Sampled Positive
Building/Level: Building A-Ground Level
Room/Location: R0008-West
Feature/Material: Electrical - Switch Board-Fibre Cement Sheeting

Photo No: J128920-003-Photo033
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0010-North
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo025
Result: Asbestos - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0010-South
Feature/Material: Heater-Insulation

Photo No: J128920-003-Photo032
Result: Lead (Paint) - Presumed Positive
Building/Level: Building A-Ground Level
Room/Location: R0020-East
Feature/Material: Door-Paint System/s

Photographs

Harbord Public School 25-09-2014

Photo No: J128920-003-Photo042
Result: Asbestos - Presumed Positive
Building/Level: Building A-Sub-Floor
Room/Location: Exterior-Throughout
Feature/Material: Packer-Fibre Cement Sheeting

Photo No: J128920-003-Photo049
Result: Lead (Paint) - Positive
Building/Level: Building B-Ground Level
Room/Location: Exterior-South & East
Feature/Material: Metal Work-Paint System/s

Photo No: J128920-003-Photo058
Result: Lead (Paint) - Positive
Building/Level: Building C-Ground Level
Room/Location: Exterior-West
Feature/Material: Metal Work-Paint System/s

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APPENDIX F: GENERAL HAZARDOUS MATERIALS INFORMATION

Information on Common Asbestos Materials

Asbestos-containing materials can be classified into the following main categories:-

- Sprayed or trowelled asbestos materials applied to ceilings, walls and other surfaces for fire-rating purposes. This material is commonly referred to as limpet asbestos.
- Asbestos-containing insulation on pipes, boilers, tanks, ducts etc. which is often referred to as asbestos lagging.
- Asbestos cement products, Cementitious or concrete like products.
- Asbestos paper products, millboard in electrical switchboards or underlying lining for linoleum or vinyl floor coverings.
- Asbestos textiles, braided asbestos, rope, tape, gaskets etc. (note that rope and millboard are potentially friable).
- Vinyl tiles, linoleum and vinyl flooring mastic and associated adhesives.
- Asbestos-containing compounds, gaskets and mastic from mechanical fittings, and roofing membranes.
- Electrical switchboards containing compressed asbestos tar electrical boards, asbestos cement sheeting, asbestos rope to spark arresters and asbestos millboard from inside auxiliary switchboxes/fuse boards.
- Roofing sealants, bituminous membranes, tar composites and similar materials were occasionally mixed with asbestos materials.
- Some office furnishings such as wall partitions may contain an asbestos cement internal lining inside plaster or “Stramit” type panelling. Certain types of older vinyl covered desktops and workbenches may contain an underlying asbestos millboard lining.

Sprayed Asbestos Materials

Sprayed asbestos or limpet asbestos is most often found on structural steel members to provide a fire-rating. Limpet asbestos is a friable material. Friable materials are those which can easily be crumbled, pulverised or reduced to powder by hand pressure. Limpet asbestos tends to be the most friable of all asbestos-containing materials and can contain relatively high percentage of asbestos (30% - 90%).

Limpet asbestos can slowly release fibres as the materials age ie. As its friability increases. Direct mechanical damage or excessive machinery vibration can lead to more significant release of airborne asbestos fibres.

Asbestos-Containing Lagging Materials

Insulation such as lagging usually contains a smaller percentage of asbestos (usually 20% - 50%). Protective jackets on the insulation materials (such as metal jacketing or calico on pipe lagging) prevent asbestos fibre release. Physical damage to the protective jacket however, may lead to the release of respirable fibres. The binding material in the insulation can deteriorate with age rendering it more friable.

Asbestos Cement Sheeting Materials

Asbestos cement products and asbestos gaskets generally do not present a significant health risk unless they are cut, sanded or otherwise disturbed so as to release asbestos dust. Fibre release due to occasional damage is negligible and thus not a significant health risk. Care must be taken therefore in the removal of asbestos cement products to avoid the release of airborne fibres. Unless analysis of fibro-cement products indicates otherwise, these materials should be considered as containing asbestos.

External asbestos cement claddings become weathered after many years by the gradual loss of cement from the exposed surface. This leaves loosely bound layers enriched with asbestos fibres. In other words, the material becomes more friable through the weathering process.

Asbestos-Containing Vinyl Products

Vinyl tiles and linoleum flooring manufactured before 1984 may contain asbestos in various quantities in a well-bound cohesive matrix. Asbestos-containing vinyl floor and wall coverings generally do not present a significant health risk unless they are sanded or otherwise mechanically abraded so as to release asbestos

dust. Fibre release due to occasional damage is negligible and thus not a significant health risk. Care must be taken therefore, in the removal of asbestos-containing vinyl tiles to avoid the release of airborne fibres. Unless analysis of vinyl tiles and linoleum flooring indicates otherwise, these materials should be considered as containing asbestos. Older bituminous adhesives may also contain asbestos and must be removed as an asbestos process in circumstance where the floor is to be renewed and re-levelled by floor sanding or grinding.

Asbestos Containing Gaskets

Gaskets and sealing compounds in equipment, duct work and re-heat air conditioning boxes may contain asbestos. These should be replaced with non-asbestos equivalents during routine maintenance. In addition, asbestos-containing mastic and seals in air handling duct work joints. These usually do not pose a hazard as the asbestos fibres are firmly held within the plastic resinous compound and should be replaced as part of routine maintenance or removed during the demolition of the plant equipment.

Asbestos Insulation to Re-Heat Boxes

Insulation to internal lining of ductwork sections and electrical re-heat air conditioning boxes generally contain asbestos millboard. These should be replaced with non-asbestos equivalents during routine maintenance.

Asbestos-Containing Mastics and Sealants

Many mastic and sealant products contain Chrysotile asbestos within the pliable, resinous matrix. The nature of the substrate is such that it does not readily dry out in situ, and therefore the fibres are well bound and pose a low risk.

Management of Asbestos Hazards

The health effects associated with asbestos exposure are due to the inhalation of airborne respirable asbestos fibres. In general, the asbestos fibres cannot be released to become airborne in significant quantities unless the asbestos-containing material is severely disrupted such as in the case of cutting asbestos cement products with power saws etc.

A range of control measures are available for the abatement of asbestos hazards. The selection of the appropriate control measure is based on the assessment risk for each specific location. These measures include:

- **Leave and maintain** in existing condition.
- **Repair and maintain** in good condition.
- **Enclose** asbestos or synthetic mineral fibre material by providing a barrier such as a box enclosure or steel cladding.
- **Remove** by approved methods under controlled conditions.
- **Labelling** of asbestos materials that are to remain in situ should be undertaken where practical to ensure that the asbestos materials are not damaged inadvertently by maintenance contractors etc.

Synthetic Mineral Fibre (SMF)

General

In the late 1980's the International Agency for Research on Cancer (IARC) evaluated certain SMF materials as being possibly carcinogenic to humans. The similarity in application and appearance to asbestos has resulted in some community concern regarding the health effects associated with exposure to SMF.

Current medical research indicates that the slightly increased risk of lung cancer for workers employed in the early days of rockwool and slagwool manufacture, and workers in the glasswool sector is not anticipated under present day working conditions. However, acute health effects such as eye, skin and upper respiratory tract irritation may occur with certain SMF products.

Caution is required when handling SMF products in order to minimise disturbance of the materials and subsequent airborne SMF fibre levels. Where SMF materials are to be installed or removed, then suitable controls and appropriate personal protection are to be provided.

It is recommended that the following Code of Practice be closely adhered to for appropriate procedures when handling such materials:

- *WorkSafe Australia Synthetic Mineral Fibre, National Standard & National Code of Practice, May 1990.*

Polychlorinated Biphenyls (PCBs)

General

PCBs are usually identified as a colourless to darker coloured oily liquid. PCBs are considered probable carcinogens. They can be absorbed through the skin, inhaled as a vapour or ingested, therefore contact with them should be prevented. They are often found in old transformers and metallised capacitors of fluorescent light fittings. These synthetic compounds are chemically stable, have good insulating properties and do not degrade appreciably over time or with exposure to high temperatures. It is these properties that made PCBs useful in electrical devices.

Lead-Containing Paint

General

Lead paint, as defined by the Australian Standard *AS4361.2 – 1998 Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings,* is that which contains in excess of 1% Lead by weight.

Lead carbonate (white lead) was once the main white pigment in paints for houses and public buildings. Paint with lead pigment was manufactured up until the late 1960's, and in 1969 the National Health and Medical Research Council's Uniform Paint Standard was amended to restrict lead content in domestic paint.

Many older Australian homes and buildings still contain lead paint, even though it may be covered with layers of more recent paint. Lead paint was used mainly on exterior surfaces, and to a lesser degree on interior doors plus door and window architraves, especially in undercoats and primers, where concentrations of up to 20% lead content were used. Interior walls weren't commonly painted with paint containing white lead pigment, though some colours did contain red, orange and yellow lead pigments.

All paints manufactured for Australian dwellings from the 1970's onwards have been required to contain less than 1% lead, though higher lead-content industrial paints may have been applied since then to housing and commercial buildings.

Lead in any form is toxic to humans when ingested or inhaled, with repeated transmission of particles cumulating in lead poisoning. Lead paint removal poses two potential avenues of transmission. Firstly by inhalation or ingestion by workers and public in the vicinity of the works, and secondly by the deposition of particles on nearby footpaths, streets or soil where they may be re-suspended, tracked into houses or buildings where it can be inhaled or ingested.

Lead-Containing Dust

General

Lead Dust as a hazardous substance based on the reproductive and cumulative effects. Lead is ubiquitous in the urban environment, resulting from industrial processes, leaded paint manufactured before 1976 and as a by-product from the combustion of leaded petrol. Therefore a high dust accumulation is likely to be found in older homes near major roads.

Occupational monitoring results indicate that the removal of ceiling dust has the potential to exceed exposure standards for inspirable dust and lead. Therefore, in accordance with the Occupational Health and Safety Act (Hazardous Substances), the risk must be assessed before any work is carried out in removing the dust accumulated in the ceiling space. Furthermore, health surveillance and biological monitoring is warranted and should be carried out.

Since it is difficult to use engineering controls for lead dust removal work situations, to control airborne dust levels, there is a great reliance on personal respirator protection, to provide a safe working environment for the workers carrying out this type of job. It can be concluded that workers require training in the correct work procedures, including the selection, use and maintenance of personal protective equipment. A friable asbestos removal contractor is the most appropriately trained person to undertake lead dust removal activities.

Ozone Depleting Substances (ODSs)

Ozone Depleting Substances (ODSs) are those substances which deplete the earth's ozone layer and have been widely used in a range of commercial and industrial applications. All bulk imports of these substances (except HCFC's and methyl bromide) are banned in to Australia under an international agreement known as the Montreal Protocol.

Hydrochlorofluorocarbons (HCFCs) are refrigerants of low ozone depleting potential that are commonly used in air-conditioning plant, chillers and condensers. HCFCs are subject to Australian Government controls on import and manufacture as part of a phase out quota system in accordance with the Montreal Protocol and the Commonwealth Ozone Protection & Systematic Greenhouse Gas Management Act 1989. Imports of these substances will be fully banned by 2020 with only very limited supplies then available until 2030 to service remaining HCFC-dependant equipment.

Maintenance contractors working with these gases should have procedures in place to safely work, store, handle and dispose of materials correctly.

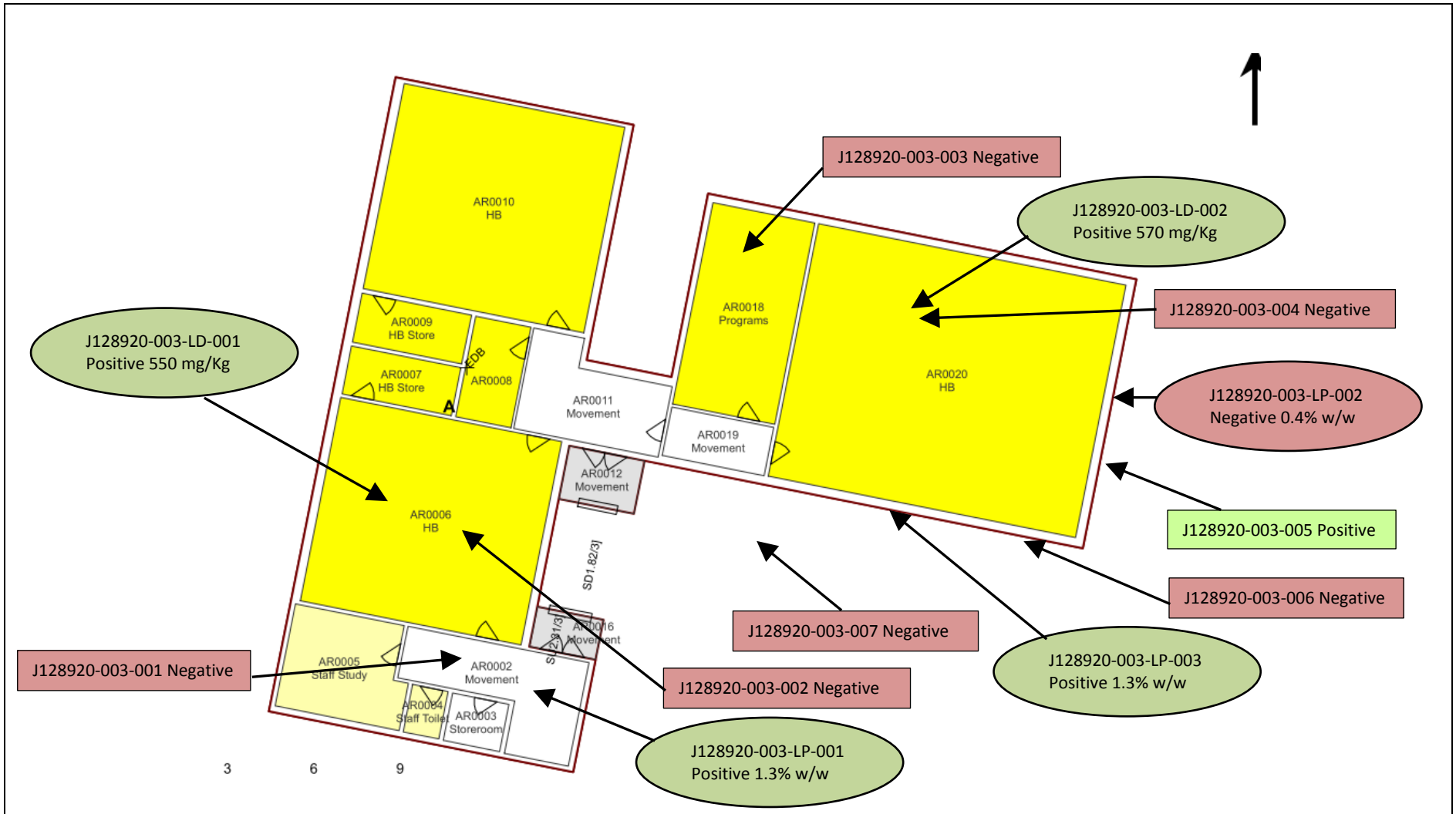
Limited Destructive Hazardous Materials Survey Report

Office of Finance & Services

Harbord Public School, Oliver Street, Freshwater, NSW 2096

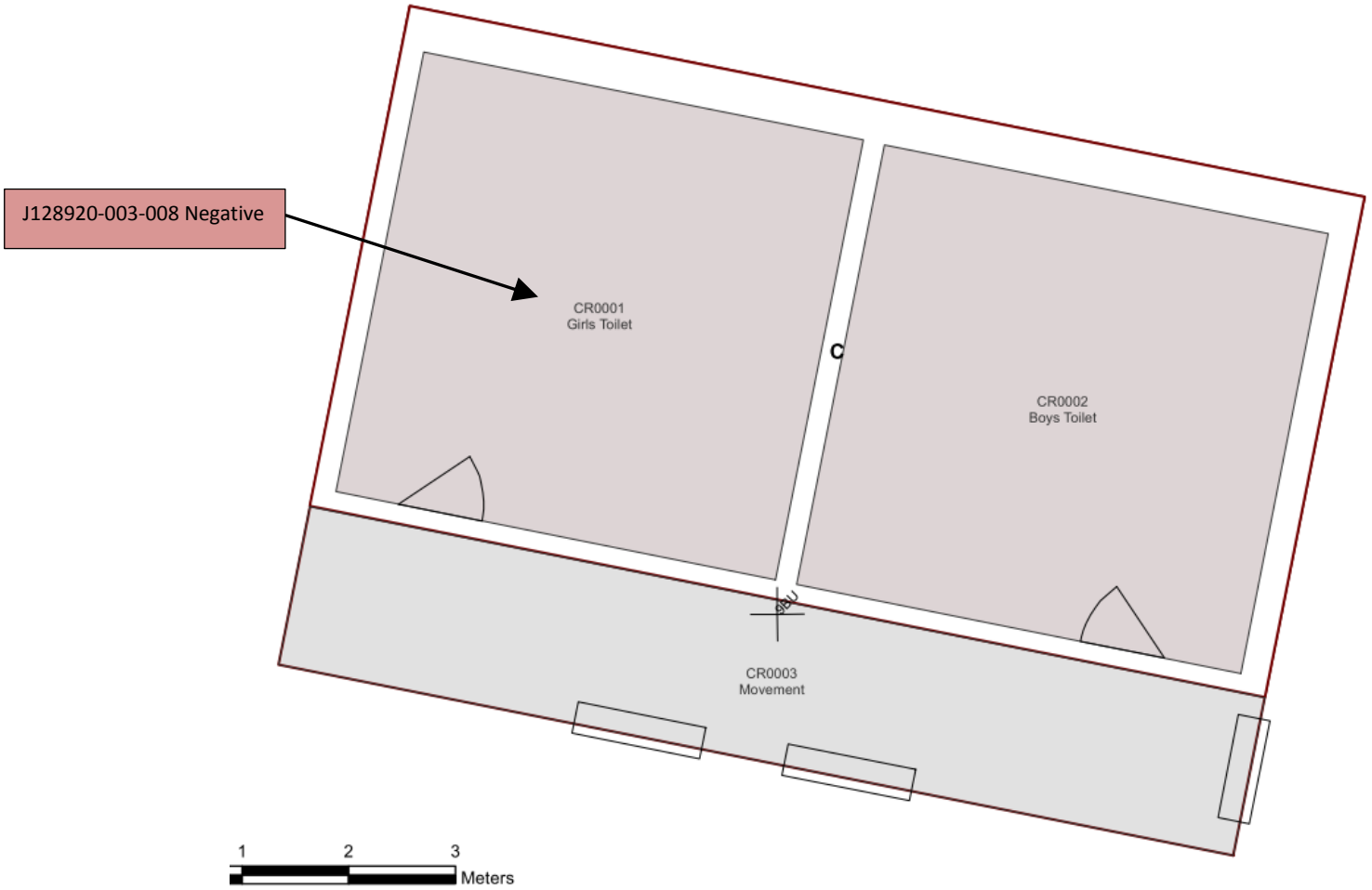
APPENDIX G: SITE PLANS SAMPLING LOCATIONS

Date : September 2014	Site: Harbord Public School	Client Number : C107477	Job Number : J128920



Date: September 2014	**Building:** Building A	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample

Date: September 2014	**Building:** Building B	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample



Date: September 2014	**Building:** Building C	**Client Number:** C107477	**Job Number:** J128920
Positive Asbestos Sample	Negative Asbestos Sample	Positive Lead Paint/Dust Sample	Negative Lead Paint/Dust Sample