Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Remediation Action Plan

Proposed Mixed Use Development
42 Honeysuckle Drive, Newcastle

Prepared for
Doma Holdings (Honeysuckle) Pty Ltd

Project 91181.00
April 2018

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	91181.00	Document No.	R.004.Rev0
Document title	Remediation Action Plan Proposed Mixed Use Development		
Site address	42 Honeysuckle Drive, Newcastle		
Report prepared for	Doma Holdings (Honeysuckle) Pty Ltd		
File name	91181.00.R.004.Rev0		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Draft A	Matthew Blackert	Chris Bozinovski	19 December 2017
Revision 0	Matthew Blackert	Chris Bozinovski	13 April 2018

Distribution of copies

Status	Electronic	Paper	Issued to
Draft A	1	0	Chris Farrington, Doma Holdings (Honeysuckle) Pty Ltd
Revision 0	1	0	Chris Farrington, Doma Holdings (Honeysuckle) Pty Ltd

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		13 April 2018
Reviewer		13 April 2018

bsi. ISO 9001 Quality Management

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
15 Callistemon Close
Warabrook NSW 2304
PO Box 324
Hunter Region Mail Centre NSW 2310
Phone (02) 4960 9600
Fax (02) 4960 9601

Table of Contents

Remediation Action Plan
Proposed Mixed Use Development
42 Honeysuckle Drive, Newcastle

1. Introduction

This Remediation Action Plan (RAP) outlines the methods and procedures that will be used to remediate the site for the proposed nine storey mixed use development at 42 Honeysuckle Drive, Newcastle. The work was commissioned in a service order dated 16 August 2017 by Chris Farrington of Doma Holdings (Honeysuckle) Pty Ltd and was undertaken with reference to Douglas Partners Pty Ltd (DP) proposal NCL170375 dated 15 August 2017.

The RAP has been developed based on available standards and guidelines prepared by the relevant authorities, and the results of the previous Contamination and Acid Sulfate Soil Assessment (ASS) (Ref 1) conducted by DP for the proposed development in October 2017.

The previous investigation conducted by DP (Ref 1), which included a review of previous investigations on the site by DP and others, identified the following contamination issues:

The presence of PAH, TRH (long-chained) and heavy metal (namely copper, nickel and zinc) concentrations within soils above the NEPM 2013 human health and ecological criteria for residential and commercial landuses;

The presence of bonded asbestos containing materials (ACM) at the ground surface and potentially within fill materials (likely source of identified ACM).

This RAP has been prepared to describe the remediation strategy via on-site management of PAH, TRH (long-chained), heavy metal and asbestos impacted filling beneath proposed concrete pavements and buildings.

The RAP includes an unexpected finds protocol and contingency measures to manage redevelopment works during the course of remediation.

The results of previous soil analysis conducted by DP and others with comparison to NEPM 2013 criteria are provided in Tables 9, 10 and 31, Appendix A.

This RAP details the aims, methods and procedures by which the remediation and site validation will be achieved. It will enable the site to be declared suitable for the proposed mixed use residential development.

2. Methods and Objectives of the RAP

It is proposed that the remediation method will involve the on-site management of soils impacted by PAHs, TRH (long-chained), heavy metals and contingency for possible ACM by capping with concrete building slabs and pavements or capping with clean imported filling (virgin excavated natural material (VENM) or excavated natural material (ENM)) or validated on-site soils within landscape areas (where required).

The objective of the RAP is to ensure that the site is remediated in an acceptable manner, with minimal environmental impact, to a condition suitable for the proposed mixed use development. The objectives of this RAP are therefore to provide a strategy for site remediation which:

- Minimises impacts from the site on the environment and on public health and safety during site remediation;
- Maximises the protection of workers involved with site remediation;
- Renders the site safe for the proposed landuse and substantially reduces potential exposure pathways to contaminants;
- Minimises impacts on the local environment during and following site remediation.

The RAP also provides an outline working plan for the excavation, stockpiling, management and disposal of excess spoil and sediment controls and a contingency plan.

3. Review of Site Information

3.1 Site Description

The site is identified as Lot 22 DP1072217, 42 Honeysuckle Drive, Newcastle, New South Wales and is shown in Drawing 1, in Appendix B.

The site is a trapezoidal shaped allotment situated at the western end of the Honeysuckle precinct and has a plan area of 3728 m^2. Current site levels range from about RL2.1 (AHD) to RL3.8. The site is bounded by the following land:

- Part Lot 23 (floodway) and Cottage Creek to the north-west;
- Honeysuckle Drive to the north-east;
- Hunter Water Corporation building to the south-east;
- Great Northern Railway Corridor (railway tracks have been recently demolished and removed) to the south-west.

At the time of field work in October 2017 the site was vacant, predominantly grassed and contained mounded fill.

The site is shown in Figure 1 below.

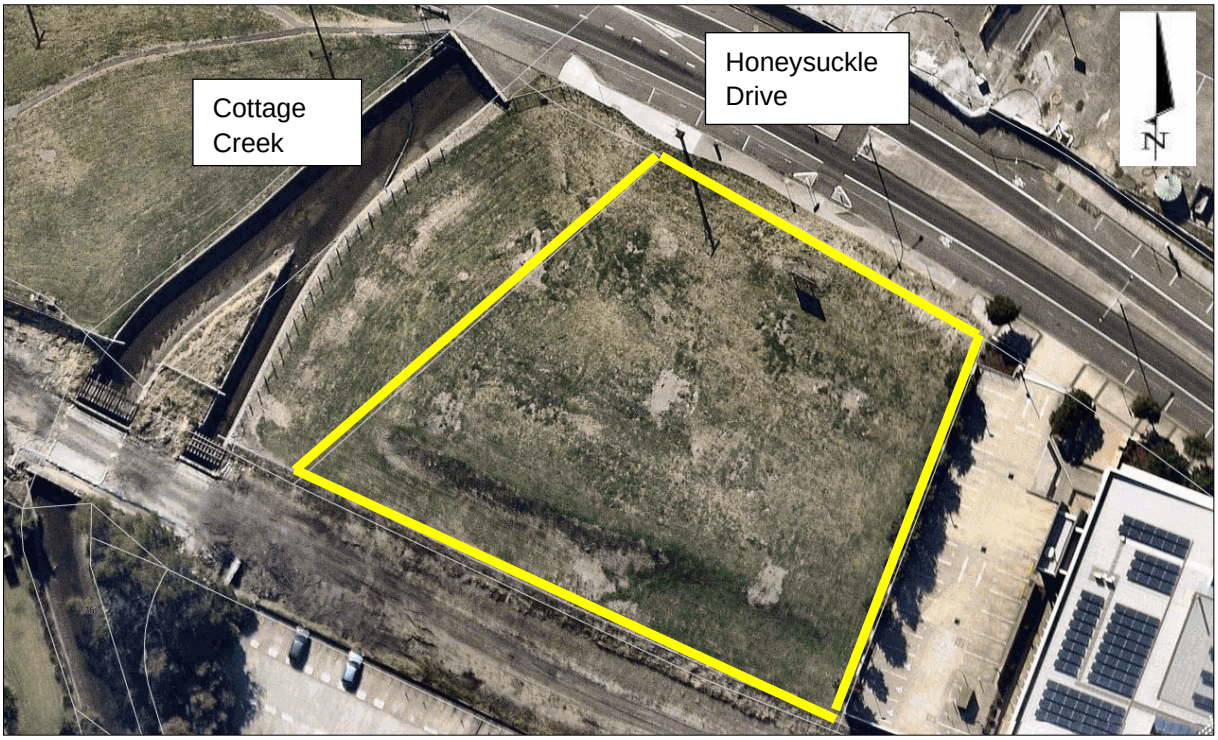


Figure 1: Aerial View of Site (Nearmap imaged dated 23 July 2017)

The site is currently zoned B3 Commercial Core under the current Newcastle 2012 LEP.

3.2 Site Condition

The following site conditions are based on site inspections conducted by DP in September 2017 (Ref 1).

The site was vacant, predominantly grassed and contained mounded fill in September 2017. The mounded fill covers the majority of the site footprint, which has raised site levels 1.5 m to 2 m above the street level. The fill mound extends into the adjacent allotment to the west (Lot 23) and batters down to Cottage Creek;

Several localised surface disturbances (likely to be former test pit locations) were evident across the site. Where present, building materials (i.e. concrete, timber and bricks), slag and asphalt were observed at the surface. A fibro sheet fragment (later confirmed as ACM – refer to Section 4) was observed at the disturbed surface of a former test pit within the south west corner of the site (refer to Figure 3).

Figure 1: Looking west from north east portion site. Likely former test pit location in foreground (disturbed surface).

Figure 2: Looking north from southern portion of site. Fill batter in centre, former railway line south of fence.

Figure 3: Looking east at the southern portion of site. Fibro fragment in foreground amongst disturbed ground from likely former test pit.

Figure 4: Looking south west at disturbed ground from likely former test pit.

Figure 5: Looking east at northern portion site and fill batter.

Approximate photo locations and orientations are shown on Drawing 1, Appendix B.

Further details on site conditions are presented in Ref 1.

3.3 Proposed Future Development

It is understood that the proposed development will comprise the following:

- A nine storey mixed use building, with parking, serviced apartments and retail development on the ground floor, four storeys of parking and hotel rooms above the ground floor and an additional four storeys of residential apartments above the hotel;
- The ground floor level is proposed at approximately RL2.5 to RL3.0 (approximately 0.5 m to 1.5 m below existing site levels) which is marginally above existing street levels (i.e. no basement proposed). The far southern part of the site will require filling by up to 0.5 m to reach base slab level;
- Localised deeper excavations will be required for the five lift pits / services;

Refer to Ground Floor, Civil Works, Bulk Earthworks and Concept Cut / Fill Plans provided in Appendix B for relevant information on the proposed development.

The landscape design report is also provided in Appendix B. Some deep tree plantings are proposed around the perimeter of the proposed development. As noted on the landscape drawings, the "Landscape design will be updated with due consideration to the requirements for 'Site Capping' in accordance with the approved 'Remediation Action Plan' for the site".

Further details are shown on the ground floor plan, Appendix B.

Based on the above, the development is generally considered to be characterised as high density with minimal access to soil with reference to NEPM (2013) (Ref 2).

3.4 Site History

The brief site history review undertaken as part of Reference 1 indicates the site has been associated with a number of potentially contaminating landuses including industrial railway yards and has been subject to extensive filling including importation of excess potentially contaminated fill materials from other Honeysuckle development sites.

A number of potential on-site sources of site contamination were identified due to former and current site activities.

Details of site history are provided in Reference 1.

3.5 Geology and Hydrogeology

The 1:100,000 scale Newcastle Coalfield Regional Geology map (Sheet 9321, NSW Department of Mineral Resources, 1995) indicates that the site is underlain by Quaternary aged Alluvium comprising sand, silt, clay and gravel sediments deposited under water during a period of higher sea level. These alluvial deposits are underlain by rock of the Permian aged Newcastle Coal Measures, including sandstone, siltstone, tuff, conglomerate and coal.

The following general subsurface profile was encountered in the previous investigation (Ref 1):

FILLING: Encountered in all bores/CPTs from the surface to 2.0 m / 4.0 m depth and generally comprised silty sands and sands with variable inclusions, including sandstone cobbles/boulders, gravels, ash, coal, shells and bricks.

SANDS: Sands were encountered in all bores and CPTs beneath filling to depths of termination (bores) to 15.35 m (CPTs) and comprised upper loose to dense sands overlying 'Upper' loose to medium dense sand and 'Central' medium dense to dense sand.

UPPER CLAYS: An upper layer of soft to firm clay / clayey sand and loose silty sand ('weak alluvial') was encountered in the majority of bores and all CPTs from 2.3 m to 4.5 m depth. The layer ranged in thickness from 0.3 m to 1.1 m where encountered.

LOWER CLAYS: Stiff or better clays ('lower clays') were encountered in all CPTs from 12.9 m to 15.3 m depth to termination at depths of 16 m to 30 m.

The 1:25,000 scale Acid Sulphate Soil Risk Map for Newcastle (Sheet 9232-S2, NSW Department of Land and Water Conservation, 1995) indicates that there is a high probability of acid sulphate soils occurring between 1 m and 3 m below natural ground level at this site. Assessment of ASS conditions by DP (Ref 1) indicated the natural sands/clayey sands and silty sand fill below approximately RL0.2 are potential acid sulfate soils (PASS), which will require management if disturbed during development in accordance with the acid sulfate soil management plan (ASSMP – Ref 3).

The groundwater table has been recorded at levels in the range RL0.1 to RL0.7 during 2009, 2010 and 2017 investigations. It should be noted that groundwater levels are affected by climatic conditions, soil permeability and tidal fluctuations and will therefore vary with time.

The regional groundwater flow regime is believed to be to the north/north-east of the site, towards the Hunter River / Cottage Creek, which is approximately 75 m north-west/10 m west of the site respectively, and is considered to be the nearest sensitive receptor.

An on-line records search of registered groundwater wells with the NSW Department of Primary Industries (DPI) Office of Water (NOW) indicated that there were six registered wells located within 500 m of the site. All six wells were located to the west to south of the site and are considered up-gradient or across gradient from the site. There were no registered wells between the site and the Hunter River.

Reference to site survey plan for the site indicates that surface levels are in the order of RL2.1 to RL3.8.

4. Results of Previous Investigations

The results of previous investigations (Ref 1) indicated the following:

- The site has been associated with a number of potentially contaminating landuses including industrial railway yards and has been subject to extensive filling including importation of excess potentially contaminated fill materials from other Honeysuckle development sites;
- Previous investigations by others has confirmed the presence of elevated contaminants at the site (namely PAHs and TRH) above the commercial/industrial landuse criteria current at the time of investigation;
- Due to the elevated contamination the site has been subject to remediation in 2003/2004 to remove the bulk of soil contamination (Note: RCA considered localised ‘hot spots’ would still be present on site);
- A site audit of the site in 2004 by Graeme Nyland of Environ Pty Ltd (Ref 11), including remediation and validation of the site by RCA in 2004, concluded that the site was suitable for commercial/industrial landuse, subject to capping with suitable materials that may include clean soils or a building slab, notation of contaminated soil on the Section 149 planning certificate, maintenance of site capping, and that groundwater is not abstracted for use. The auditor also recommended any landscape areas should be validated or capped with imported VENM/ENM and a suitable marker layer;

- Review of the previous contamination assessment analytical results conducted as part of the current investigation indicated that soils remain on site (i.e. post remediation) above the current NEPM 2013 landuse and ecological investigation/screening criteria for residential and commercial landuses (namely PAHs, TRH (long-chained) and some heavy metals (copper, nickel, zinc));
- The site has remained undeveloped since 2004 and was used as a temporary construction yard in 2005;
- Additional contamination testing for the 2017 investigation has confirmed the presence of similar contaminants within soils and similar exceedances of the adopted NEPM 2013 SAC (i.e. PAHs, TRH (long-chained) and some heavy metals (i.e. the results are commensurate with previous testing at the site);
- Leachability testing in distilled water indicate that soils with elevated PAHs and TRH generally have a low propensity to leach;
- Leachability testing for waste classification (i.e. TCLP) also indicated soils with elevated PAHs and lead from the 2017 investigation had a low propensity to leach. Based on the total and leachable concentrations and the available general immobilisation approvals for ash, the soils tested are generally classified as 'General Solid Waste' with the exception of localised hotspots (i.e. 203/2.5 m). It is noted that bonded asbestos (i.e. fibro) was identified at the surface of the site (likely to be brought to the surface through test pitting by others). While not detected in the soil samples tested, materials containing asbestos are classified as 'special waste' (Asbestos waste) in addition to the chemical waste classification.

Based on the previous investigation DP concluded that the site is considered to be suitable for the proposed mixed use development, provided the following is undertaken:

- All materials exceeding landuse criteria are suitably remediated or managed on-site; and
- Appropriate remediation and Work Health and Safety (WHS) procedures are undertaken during development to address bonded asbestos fragments and asbestos impacted fill materials (where present) with reference to NEPM 2013 guidelines.

5. Conceptual Site Model

A Conceptual Site Model (CSM) was prepared for the site with reference to the National Environment Protection (Assessment of Site Contamination) Measure 1999 (Amendment Measure 2013) Schedule B2 (Ref 2). The CSM identifies potential contaminant sources and contaminants of concern, contaminant release mechanisms, exposure pathways and potential receptors. The CSM has been updated to reflect the identified sources of contamination based on the results of the previous investigation, and is presented in Table 1 below.

The proposed remediation strategy (refer to Section 7) is to manage PAH, TRH (long-chained) and heavy metal impacted soils beneath a suitable capping layer to prevent accessibility. As a contingency, possible asbestos impacts (if encountered) would also be managed effectively beneath the capping layer. The capping layer would comprise a concrete slab (i.e. proposed building floor slabs/concrete pavements or a suitable imported clean (i.e. VENM/ENM) soil or validated on-site soil capping layer in landscape areas. This remediation approach would address the potential exposure pathways described below in Table 1.

Table 1: Conceptual Site Model

Known and Potential Primary Sources	Primary Release Mechanism	Secondary Release Mechanism	Potential Impacted Media	Contaminants of Concern	Exposure Pathway	Potential Receptors	
						Current	Future
Filling present within the site (including land reclamation, imported fill from other Honeysuckle developments etc.)	Placement of filling on-site	Long-term leaching of contaminants via runoff, rain water infiltration / percolation and potential disturbance during development	Soil, groundwater, surface water	TRH, BTEX, PAH, Metals, Pesticides, PCB, asbestos	Dermal contact, inhalation (dust/vapours), ingestion	Public (open site), maintenance workers, consultants, trespassers, surface water bodies, groundwater, neighbouring properties in the case of groundwater migration	Public (i.e. shoppers, hotel guests etc.), residences, site workers, maintenance workers, construction workers, consultants, trespassers, surface water bodies, groundwater neighbouring properties in the case of groundwater migration
Former rail and port activities	Spills and leaks from plant and equipment, storage and use of chemicals / machinery, imported filling etc.	Long-term leaching of contaminants via runoff, rain water infiltration / percolation and potential disturbance during development	Soil, groundwater, surface water	TRH, BTEX, PAH, Metals, Pesticides, asbestos	Dermal contact, inhalation (dust/vapours), ingestion		
Demolished buildings (where present)	On-site surface impact / burial of demolition materials	Long-term leaching of contaminants via runoff, rain water infiltration / percolation and potential disturbance during development	Soil, groundwater, surface water	Asbestos, PCBs, Metals, foreign matter	Dermal contact, inhalation (dust), ingestion		
Former road pavements remnants (tarry residues)	Construction materials used for road construction	Long-term leaching of contaminants via runoff, rain water infiltration / percolation and potential disturbance during development	Soil, groundwater, surface water	TRH, BTEX, PAH, Metals	Dermal contact, inhalation (dust/vapours), ingestion		

6. Assessment of Remediation Options

A number of remediation options were reviewed with reference to the principles and criteria defined in relevant documents, including, the following:

- NEPC, "National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013", 11 April 2013 (Ref 2);
- NSW EPA, Contaminated Land Management, "Guidelines for the NSW Site Auditor Scheme (3rd Edition)', October 2017 (Ref 4).

NEPM 2013 guidelines state that the preferred hierarchy of options for site clean-up and/or management are as follows:

- On-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site; or

If the above are not practicable:

- Consolidation and isolation of the soil on site by containment with a properly designed barrier; and
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material;

or

- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

Based on the distribution and depth of contaminated soils, subsurface conditions, the type of contamination (i.e. PAH, TRH (long-chained) and heavy metal impacted soils and potentially asbestos impacted filling), the following remediation options were considered as follows:

1. No Action;
2. Off-site disposal of contaminated soils to a licensed landfill;
3. On-site treatment and re-use of the contaminated soils on site;
4. On-site management (i.e. containment) of the contaminated soils;
5. A combination of Options 2 to 4.

1. No Action

The "No Action" option involves no remediation response to the contamination identified or likely to be present on the subject site. This option was considered not appropriate as it does not provide any means to appropriately address, remediate, alleviate, and/or manage the long and short-term human health and environmental risk of the contamination already identified on-site.

2. Off-site Disposal of Contamination Soils

Off-site disposal of contaminated soil could be considered. However, the associated landfill disposal costs for removal of all contaminated soils are likely to be economically prohibitive.

It is noted that excavation and off-site disposal of excess fill materials will be required to achieve design FFL, however, due to the depth and sporadic distribution of contamination across the site, the bulk excavation proposed will not remove all of the contaminated soil/fill identified on site.

3. On-site Treatment and Re-use of Contaminated Material

While treatment of PAH, heavy metal and possible asbestos impacted soils are possible, the distribution of the contamination is likely to be sporadic and difficult to assess given the potential history of impact (i.e. importation of filling (source unknown), former remediation which has resulted in disturbance of fill layers). The costs associated with additional investigation and remediation for these contaminants is also considered to be significant compared to on-site management given remediation options would require a number of treatment options to treat the various contaminants.

4. On-Site Management of Contaminated Soils

On-site management of contaminated soils involves placement/retention of the contaminated soils within the site area such that the proposed development is constructed over the contaminated soils, minimising the potential for access to the contaminated soils. The management of contaminated soils at the site requires the preparation and implementation of a long-term Site Management Plan (SMP) at the site which outlines the procedures used to render the site suitable for the proposed development. The SMP also provides the procedures for managing contaminated soils should access to the soils be required following construction. On-site management of contaminated materials also requires that a notice be placed on the Section 149 Planning Certificate. On-site management is generally considered for non-volatile contaminants which have a low propensity to leach.

On-site management of PAH, TRH (long-chained), heavy metal and possible asbestos impacted soils is considered to be the most appropriate remediation strategy for the proposed development given the distribution (i.e. localised and sporadic within fill materials) and characteristics (i.e. low propensity to leach) of the impact on site. The site will be effectively capped by the proposed development in any case.

It is noted that on-site management is not considered suitable for volatile hydrocarbon impact. However, volatile impacts were generally not encountered within the site.

Based on the above, the adopted remediation approach for the development is as follows:

- Off-site disposal of PAH, TRH (long-chained), heavy metal and possible asbestos impacted soils from the upper fill profile required as part of earthworks construction (i.e. excess soils);
- On-site management (capping) of remaining PAH, TRH (long-chained), heavy metal and possible asbestos impacted soils.

It is noted that on-site treatment and re-use of materials on-site could be considered as a contingency measure in the event that volatile contamination is identified during construction.

On-site management of PAH, TRH (long-chained), heavy metal and possible asbestos contaminated soil (i.e. Option 4) would generally comprise the following:

- Excavation to invert depth of proposed capping layer;
- Placement of excavated contaminated materials in proposed fill areas (i.e. where beneath invert depth for proposed capping layer) where applicable;
- Disposal of excess contaminated soils to an appropriately licensed landfill;
- Capping of contaminated soils with concrete (i.e. building slabs, concrete pavements) or clean soils within landscape areas.

It is noted that construction of the proposed building and pavements will largely provide the above capping, with only localised capping within landscape areas.

On-site management of contaminated soils is considered to be a feasible remediation option to protect human health and the environment, and minimise constraints on the future use of the site for the mixed use development. Similar remediation has been successfully conducted for commensurate contaminated land in the vicinity of the subject site.

The Waste Hierarchy adopted by the NSW EPA is, in order of preference, Avoidance, Resource Recovery and Disposal. A 'Cap and Contain' approach would be consistent with a resource recovery initiative.

It is noted that the adopted remediation approach (i.e. on-site management) will restrict the re-use of groundwater (i.e. no abstraction of groundwater for beneficial use will be permitted). This is consistent with the previous site audit report for the subject site and is commensurate with similar on-site management conducted on nearby sites.

7. Remediation Goals and Acceptance Criteria

7.1 Remediation Goals

The main objective of this remediation approach will be to place contaminated PAH, TRH (long-chained), heavy metal and possible asbestos contaminated soil beneath a suitable capping layer to prevent exposure and accessibility.

The capping layer is to comprise:

- A concrete slab/pavement (i.e. proposed concrete building slabs / pavements) – minimum 100 mm thickness; or
- A minimum of 0.5 m of imported material (i.e. landscape areas) which should be classified as VENM or ENM, or a commercially available and certified product (suitable for on-site use) which should be accompanied by a certificate from the supplier (where imported). Validated on-site materials could also be utilised as capping subject to detailed testing (if conducted).

Conformance with the above capping will require monitoring during construction, plus ongoing monitoring / inspections and maintenance during the life of the development.

Any excess materials requiring off-site disposal should be classified with reference to NSW EPA waste classification guidelines (Ref 5), and disposed to a facility which is licensed to receive such materials. It is noted that previous investigation (Ref 1) has indicated the majority of fill materials tested are classified as 'General Solid Waste' based on total and leachable (TCLP) concentrations in conjunction with the use of NSW EPA general immobilisation approvals, with the exception of localised hot spots which were found to be 'Hazardous Waste'. It is noted asbestos impacted soils would be classified as 'Special Waste'.

While analysed natural soil samples were classified as 'General Solid Waste' based on contaminant concentrations, the presence of acid sulphate soil on-site will also affect the classification of natural soils / localised fill and should be considered in regards to re-use/disposal (i.e. neutralisation of ASS will be required prior to off-site disposal to landfill).

To further reduce the potential impact on the environment and human health, the following additional measures are recommended in the construction of the capping layer:

- Placement of a geo-fabric layer on top of the contaminated fill materials to act as a warning/marker layer and to provide separation from overlying materials. Note: Plastic sheeting could be used as an alternative marker layer beneath concrete slabs;
- Preparation of a long term Site Management Plan (SMP). The SMP will outline the precautionary management procedures to be adopted if the permanent capping layer is breached in future. The SMP will also promote awareness of the contamination management and the requirement of avoiding disturbance to the capping where possible.

This process of remediation will substantially reduce the potential for human contact with materials that are contaminated so that the development site can be made suitable for the proposed mixed use development.

7.2 Remediation Acceptance Criteria

Achievement of the objective of capping and containment of the PAH, TRH (long-chained), heavy metal and possible asbestos contaminated soil (if present) will be demonstrated by the successful installation of a constructed capping layer. In the case of contained soils the remediation acceptance criteria (RAC) will not, therefore, take the form of a set of concentrations for various contaminants. Rather, the RAC will be deemed to have been attained when the concrete slab/pavements and soil capping has been successfully installed.

In addition to the above, imported fill used to reinstate site excavations, raise site levels (if required) and for use in the pavement or landscape areas should be classified as VENM or ENM (refer to Ref 6) and should be accompanied by a certificate from the supplier, otherwise detailed assessment (including analysis of representative samples) will be required prior to use on-site.

Where remediation/validation of parts of the site are considered (i.e. as an alternative to capping within landscape areas), the RAC for soils remaining on-site with respect to the proposed landuse and identified contaminants are provided in Table 2 below. On the basis of the findings of the previous investigation, the contaminants of concern are largely PAH, TRH, heavy metal and asbestos.

It is considered that the validation analysis should focus on the identified contaminants of concern. In order to provide for contingency situations, however, RAC are also established for other contaminants (i.e. BTEX, PCB etc.). This should, however, only be used as and when required (i.e. if signs of such contaminants are observed, suspected or found) and where contamination is not suitable for on-site management.

The adopted criteria are as follows:

- NEPM 2013 (Ref 2) - Health Investigation Levels (HIL) and Health Screening Levels (HSL) for high density residential landuse with minimal access to soils (HIL B/HSL B);
- NEPM 2013 (Ref 2) - Management Limits for Residential, Parkland and Public Open Space Landuse – Coarse Soil Texture for TRH impact;
- NEPM 2013 (Ref 2) – Ecological Investigation Levels (EIL) and Ecological Screening Levels (ESL) for urban residential and public open space;
- CRC Care 2011 (Ref 7) – Petroleum based HSL for direct contact for high density residential landuse with minimal access to soils (HSL B).

For the purposes of providing a single RAC for each analyte the lowest of the above criteria (i.e. most conservative) has been adopted as the RAC as shown in Table 2 below.

Table 2 – Site RAC for Soil (mg/kg)

Contaminant	NEPM HIL B[b] / HSL B[c]	NEPM EIL / ESL[g] Residential / Open Space	CRC Care Direct Contact - HSL B[a]	NEPM Management Limits – Residential / Open Space Landuse / Coarse Soil[d]	Adopted RAC (mg/kg)
Asbestos [e]	0.001% for FA and AF; 0.04% w/w for ACM over the impacted volume; and No visible asbestos for surface soils.	NC	NC	NC	Nil (imported fill and excavation validation) OR 0.001% for FA and AF, 0.04% w/w for ACM & No visible asbestos for surface soils for existing filling
Arsenic	500	100	NC	NC	100
Cadmium	150	NC	NC	NC	150
Chromium	500	190 (Cr III)	NC	NC	190 (Cr VI)
Copper	30,000	80	NC	NC	80
Lead	1200	1100	NC	NC	1100
Mercury	120	NC	NC	NC	120
Nickel	1200	20	NC	NC	20
Zinc	60,000	250	NC	NC	250
TRH (C_6-C_{10})-BTEX (F1)	45	180	5600	700	45
TRH (>C_{10}-C_{16})-Naphthalene (F2)	110	120	4200	1000	110
TRH (>C_{16}-C_{34})	NC	300	5800	2500	300
TRH (>C_{34}-C_{40})	NC	2800	8100	10,000	2800
Benzene	0.5	50	140	NC	0.5
Toluene	160	85	21,000	NC	85
Ethylbenzene	55	70	5900	NC	55

Table 2 – Site RAC for Soil (mg/kg) (continued)

Contaminant	NEPM HIL B[b] / HSL B[c]	NEPM EIL / ESL[g] Residential / Open Space	CRC Care Direct Contact - HSL B[a]	NEPM Management Limits – Residential Landuse / Coarse Soil[d]	Adopted RAC (mg/kg)
Xylene	40	105	17,000	NC	40
Total PAH	400	NC	NC	NC	400
Benzo(a)pyrene	NC	0.7	NC	NC	NC
Benzo(a)pyrene TEQ	4	NC	NC	NC	4
Naphthalene	3	170	2200	NC	3
PCBs	1	NC	NC	NC	1

Notes for Table 2:

a CRC Care (2011) – Petroleum based HSL for direct contact – Table B4 (Ref 7)

b NEPC (2013) Health-based investigation levels (HIL) – Table 1A(1) (Ref 2)

c NEPC (2013) Health-based screening levels for vapour intrusion (Sand 0 to <1 m) – Table 1A(3) (Ref 2)

d NEPC (2013) Management Limits for TPH – Table 1 B(7) (Ref 2)

e WA DOH (2009) – Trigger levels for residential landuse with minimal access to soils (Ref 8)

f Adoption of a lower RAC should be considered when the material will be below the water table or potentially in contact with surface water due to the leachable characteristics of Naphthalene.

g EIL/ESL apply to the top 2 m of the soil profile. Some EILs are based on conservative soil parameters, which may be increased subject to the results of additional analysis of pH, CEC.

NC No Criteria

NEPC (2013) provides the following definitions for forms of asbestos:

- Bonded **asbestos containing material (ACM)** comprises asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin (e.g. asbestos fencing and vinyl tiles). This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would imply a high degree of damage and hence potential for fibre release.
- **Fibrous asbestos (FA)** comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically unbonded or was previously bonded and is now significantly degraded (crumbling).
- **Asbestos fines (AF)** include free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. Bonded ACM fragments to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage which increases the potential for fibre release.

From a risk to human health perspective, FA and AF are considered to be equivalent to 'friable' asbestos.

7.3 Long Term Management

A long term Site Management Plan (SMP) is required for on-site management of contamination. The SMP would be prepared at the completion of remediation works. The SMP will promote awareness of the contamination management and the requirements to avoid disturbance (where possible), and provide an outline and maintenance requirements.

While no active long term management is envisaged, the SMP will recommend routine inspections of the capping layer to monitor for erosion, cracking, settlement or movements of the capping slab/pavements and landscape areas. Maintenance would be required if the site inspection indicates that the capping layer is not operating effectively.

The SMP should be noted on the Section 149 planning certificate to ensure future landholders or future developments on the site are aware of the management requirements for the site.

8. Responsibilities

In order to achieve the goals of the remediation/earthworks programme, the following roles and responsibilities have been identified for the contractor and consultants:

Contractor

The contractor is responsible for on-site operations including:

- Handling of fill materials (contaminated or otherwise) including excavations, stockpiles, segregation, placement, compaction, and disposal of unsuitable or excess materials;
- Disposal of contaminated soil or excess fill to a licensed landfill (after classification) if required;
- Safety of all personnel on site;
- Measures to minimise environmental effects;
- Preparation of a site specific Construction Environmental Management Plan (CEMP) and WHS plan. The CEMP should reference this RAP and will require review and comment by DP to confirm consistency with the objectives of the RAP prior to commencement of remediation;
- Ensure required licenses and approvals from regulatory authorities are obtained prior to remediation works commencing. It is noted that an appropriately licenced contractor will be required to conduct earthworks within the site due to the potential presence of ACM in filling.

Occupational Hygienist (OH)

- Advice on management of asbestos contamination (if required);
- Set-up and maintenance, analysis and reporting of air monitoring for air borne asbestos fibres during construction works resulting in the disturbance of fill materials (i.e. any excavations, stockpiling, placement or transport of fill materials), where required. It is noted that minor ACM fragments were observed within filling at the site, however, there is a risk that further ACM is present. It is noted that asbestos air monitoring is only likely to be required if an increased occurrence of ACM is observed, subject to advice from the OH.

General Site Validation (Suitably Qualified Environmental Consultant)

- Advice on excavation and segregation of contaminated soils and treatment of ASS (where required);
- Validation of excavations and ASS treatment (where required);
- Inspection of remediation and validation works;
- Waste Classification of soil/fill requiring off-site disposal;
- Sampling and classification of imported fill materials (where required);
- Provision of a remediation and validation report;
- Correspondence/liaison with the regulatory authority throughout the remediation works;
- Provision of a long term SMP.

Client

- Overall project management;
- Engaging suitably qualified remediation contractor, and Environmental Consultant to conduct the remediation works;
- Ensure necessary approvals and notifications have been obtained prior to remedial works commencing;
- Liaison with the regulator , environmental consultant, remediation contractor during remediation process;
- Submission of validation reports to regulator.

Prior to the commencement of remedial works, a site meeting between the client, contractor and environmental consultant is recommended to confirm responsibilities and procedures in accordance with the agreed management plan.

9. Regulatory Approvals and Licences

State Environmental Planning Policy No. 55 - Remediation of Land (Ref 9, SEPP 55) aims to provide a state-wide planning approach to the remediation of contaminated land. Under clause 7(1) of SEPP 55 the approval authority is required to consider whether the land is contaminated, and:

a) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out; and

b) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

This RAP presents the proposed management and remediation options to address contamination on site. Implementation of the RAP will render the site suitable for the proposed development.

In accordance with Clause 9 of SEPP 55 the definition of Category 1 remediation works which require development consent are as follows:

a) designated development; or

b) carried out or to be carried out on land declared to be a critical habitat; or

c) possibly have a significant effect on a critical habitat or a threatened species, population or ecological community; or

d) development for which another State environmental planning policy or a regional environmental plan requires development consent; or

e) carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:

   i) coastal protection;

   ii) conservation or heritage conservation;

   iii) habitat area, habitat protection area, habitat or wildlife corridor;

   iv) environment protection;

   v) escarpment, escarpment protection or escarpment preservation;

   vi) floodway;

   vii) littoral rainforest;

   viii) nature reserve;

   ix) scenic area or scenic protection;

   x) wetland; or

f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands commissioner).

It is understood that site remediation works are considered to be Category 1 under SEPP55 due to the site being within a coastal protection zone and being within flood prone land. The remediation category, however, should be confirmed with Newcastle City Council (NCC).

It is noted that the proposed mixed use development, which is integral to the remediation of the site (i.e. building slabs/pavements and imported clean soils within landscape areas to form cap for the proposed on-site containment remediation) will require development consent from NCC.

Based on review of Appendix D of the Guidelines for the NSW Site Auditor Scheme (Ref 4), the following consent, notification or licence requirements are anticipated:

- Any conditions outlined in the DA;
- Notifications of the consent authority;
- EPA licences or permits for the transportation and disposal of wastes under the POEO Act;

- WorkCover NSW asbestos removal work licence under the WHS Regulation 2011 and appropriate notification prior to commencement;
- As site development may involve groundwater extraction, a groundwater interference permit through the NOW may need to be obtained prior to construction commencing as per the requirements of the NSW Aquifer Interference Policy September 2012.

It is recommended that the proposed development is staged and conditional, upon the following:

- Submission of a validation report for the site;
- Submission of a long term SMP for the site (on-site capping);
- Notification is placed on the Section 149 planning certificate detailing the site has been remediated and is subject to a long term SMP (where applicable).

10. Remediation Strategy

10.1 Sequence of Remediation

The remediation strategy and requirements should be incorporated with the proposed development.

The following general methodology and sequence of activities is suggested:

1. Client/Contractor to obtain all necessary approvals and notifications to allow commencement of the works, including council approvals;
2. Inception meeting between the client, contractor and environmental consultant to confirm responsibilities and procedures for remediation and construction;
3. Contractor to set up environmental controls and secure the site;
4. Bulk excavation of excess fill materials for off-site disposal. Due to the variable nature of site filling and potential for localised hot spots and ACM impacts, the following is recommended prior to excavation:
    - Further investigation via test pits for waste classification purposes within areas of proposed excavations;
    - Confirmation of waste classification and possible presence of 'hot-spots' or ACM impacts;
    - Confirmation of disposal / re-use options with reference to NSW EPA waste classification guidelines or relevant resource recovery exemptions (where appropriate);
    - Appropriate removal / disposal of excess materials based on the classification in accordance with statutory and regulatory requirements;
    - Filling and hot-spots (where present) should be carefully segregated to minimise the risk of cross-contamination with 'cleaner' materials;
    - Pile spoil should be segregated and managed with due consideration to the waste classification of the spoil (i.e. upper filling with possible hot-spots and ACM impacts, underlying ASS with requirements for treatment prior to disposal);

- Where possible, soils should be maintained on-site beneath site capping to minimise disposal costs.

5. If feasible, excavate / strip contaminated fill materials from landscape areas and temporarily stockpile within the proposed concrete pavement footprint for placement within pavement areas (subject to geotechnical suitability). Validate the stripped fill surface to confirm the appropriate removal of impacted filling. It is recommended that the excavation/stripping is extended within the proposed concrete building footprint to avoid slumping of excavation sides (i.e. to avoid re-contamination of soils within the landscape area footprint);
6. Continue excavation of landscape areas (where applicable) to design invert levels (i.e. to accommodate design imported soil profile) and stockpile separately to allow classification and assessment of re-use/disposal options;
7. Backfill landscape areas as required with imported VENM/ENM materials or validated soils from on-site which are suitable for landscaping;
8. Trim / excavate the surface (as required) and/or place excavated impacted fill materials (including impacted stockpiled materials from landscape areas) within the pavement areas in order to achieve the final design surface level and maximise use of excess site soils (i.e. impacted soils) beneath concrete slabs/pavements. Due regard should be made to the geotechnical properties of the soils for placement within load bearing/pavement areas;
9. Co-ordinate excavations for service trenches and footings (or other underground installations) so that excess spoil (potentially impacted soils) can be utilised beneath capping if suitable. Impacted soils should not be re-used as backfill within service trenches below the water table. It is recommended that where practical the impacted fill materials are initially stripped and the natural surface validated so that underlying fill or natural materials proposed to be excavated can be re-used on-site within landscape areas or within trench backfill (if required). It is noted that treatment of ASS soils will be required, where disturbed, with reference to the ASSMP (Ref 3);
10. Prior to capping, the site surface should be surveyed by a registered surveyor to confirm that appropriate levels have been achieved (i.e. to allow design finished levels for pavements and a minimum 0.5 m capping in landscape areas). Construction of pavements and landscape areas should only commence once appropriate levels have been achieved;
11. Following survey confirmation of site levels, place a geofabric marker/separation layer (Bidim A34 or similar) over the impacted fill materials across the site. The geofabric should extend at least 0.5 m beyond the impacted filling along the sides of service trenches and validated landscape areas. Plastic sheeting could be utilised immediately beneath concrete floor slabs or concrete pavements in lieu of the geofabric. A validation inspection should be conducted by a suitably qualified environmental consultant to confirm that the geo-fabric marker layer covers the required footprint;
12. Import and construct the sealed pavement;
13. Repeat previous systematic survey to ensure that all areas are covered by the appropriate cap;
14. All imported fill materials utilised during construction should be confirmed for use by a suitably qualified environmental consultant prior to use;
15. Excess filling excavated from within the site that cannot be accommodated beneath capping will require appropriate off-site disposal by a licenced contractor (refer to Section 10.2);

16. At the completion of capping, a validation inspection should be conducted by a suitably qualified environmental consultant to confirm that appropriate capping has been achieved in accordance with the RAP;
17. Upon the completion of capping, a suitably qualified environmental consultant should prepare a Remediation and Validation report. A long term SMP should then be prepared at the completion of construction for council review and approval, in order for council to update the S149 certificate for the site. An important part of the ongoing management of the site will be the inspection and maintenance of the capping (i.e. pavement/soil capping in landscape areas (if required)).

Due regard should be given to the geotechnical requirements for site development so that site works are compatible with remediation requirements.

It is noted that the above procedure is not prescriptive and the contractor should confirm the construction process that will achieve the objectives of remediation in a practical and economical manner, with due regard to WHS. This procedure should be presented in the CEMP for the work.

Capping of impacted materials within landscape areas could also be considered as an alternative to complete removal and validation. If capping within landscape areas is required for construction, steps 5 to 7 above would be replaced as follows:

1. Prepare landscape areas (garden beds) to accept nominal 500 mm of soil (VENM/ENM) as part of the management of landscape areas (i.e. outside the proposed concrete pavement areas);
2. Prior to capping, the site surface should be surveyed by a registered surveyor to confirm that appropriate levels have been achieved (i.e. to allow design finished levels for landscape areas to be achieved);
3. Following survey confirmation of site levels, place a geofabric marker/separation layer (Bidim A34 or similar) over the placed materials across the site;
4. Import and place approved fill material (VENM/ENM) over the landscaped areas to achieve a minimal 500 mm cap after construction;
5. Repeat previous systematic survey to ensure that all areas are covered by the appropriate cap.

A minimum capping of 500 mm is suggested for landscape areas with general ground cover (i.e. shallow root system). Increase capping thickness should be utilised where deep rooted vegetation is proposed (i.e. trees). Advice should be sought from the landscape designers regarding the required thickness of capping to support the root zone for vegetation within landscape areas. Landscape plans and specifications should be updated to reflect the remediation requirements.

Further assessment prior to construction is recommended to confirm the most economical and feasible remediation procedure in landscape areas (i.e. full removal and validation within landscape areas or on-site management (i.e. capping)). The landscape design drawings (Appendix B), should be updated to reflect the remediation method adopted (i.e. capping strategy).

10.1.1 Contingency Plan

If contaminated soil quantities are such that they cannot be accommodated beneath the concrete paved areas or 500mm thick VENM/ENM capping layer (landscape areas), the excess materials will require stockpiling, classification (if required), treatment (if required) and off-site disposal to a licensed landfill (refer to Section 10.2).

If indications of gross soil contamination are observed on-site during remediation works (i.e. staining / odours etc.), the materials should be appropriately investigated by a suitably qualified environmental consultant and either managed on site (if appropriate) or disposed off-site to a licenced landfill following classification.

The CEMP should provide further details regarding contingency procedures, including incident management and unexpected finds protocol.

10.2 Disposal of Contaminated Materials

Any excess contaminated materials which cannot be accommodated beneath capping must be disposed of to an appropriately licensed landfill or re-used on another site under a general or specific resource recovery exemption (where possible).

Previous investigations (Ref 1) indicated the following:

- The majority of fill materials tested are classified as ‘General Solid Waste’ based on total and leachable (TCLP) concentrations in conjunction with the use of NSW EPA general immobilisation approvals, with the exception of localised hot spots which were found to be ‘Hazardous Waste’. It is noted asbestos impacted soils would be classified as ’Special Waste’;
- The presence of acid sulphate soil on-site will also affect the classification of natural soils and should be considered in regards to re-use/disposal (i.e. neutralisation of ASS will be required prior to off-site disposal to landfill);
- Options for re-use of site materials under a general resource recover exemption are limited due to the presence of elevated contaminant concentrations, ASS in natural soils and potential presence of asbestos within filling. Further investigation to confirm waste classification and to assess the extent of asbestos impact within fill materials in conjunction with an application for a specific exemption through the NSW EPA will be required if re-use of fill materials on another site is to be considered. Ideally this should be conducted prior to construction.

Excess materials should be assessed for beneficial off-site re-use or recycling where possible in order to minimise disposal costs.

Any materials which require off-site disposal must be classified in accordance with the *NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (November 2014 – Ref 5).* The criteria for disposal in accordance with Reference 5 are presented in Tables 3 and 4 below. In addition, asbestos contaminated soil/fill/sediment will require disposal to a licensed landfill as ‘special waste’ in accordance with Reference 5.

Table 3 – Landfill Disposal Criteria – Total Concentrations

CONTAMINANT THRESHOLD VALUES FOR CLASSIFYING WASTE BY CHEMICAL ASSESSMENT WITHOUT DOING THE LEACHING TEST (1)		
Contaminant	Maximum Values of Total Concentration for Classification without TCLP	
	General Solid Waste CT1 (mg/kg)	Restricted Solid Waste CT2 (mg/kg)
Benzene	10	40
Toluene	288	1152
Ethyl Benzene	600	2400
Xylenes (total)	1000	4000
C_6-C_9 petroleum hydrocarbons	650	2600
C_{10}-C_{36} petroleum hydrocarbons	10000	40000
Lead	100	400
Arsenic	100	400
Cadmium	20	80
Chromium (total)	100	400
Mercury	4	16
Nickel	40	160
Polycyclic Aromatic Hydrocarbons (total)	200	800
Benzo(a)pyrene	0.8	3.2

Notes to Table 3:
Adopted from Table 1 – Ref 5

Table 4 – Landfill Disposal Criteria – Leachable and Total Concentrations

LEACHABLE CONCENTRATION (TCLP) AND TOTAL CONCENTRATION (SCC) FOR CLASSIFYING WASTE BY CHEMICAL ASSESSMENT (1)				
Contaminant	Maximum Values for Leachable Concentration and Total Concentration when used together			
	General Solid Waste		Restricted Solid Waste	
	Leachable Concentration TCLP1 (mg/L)	Total Concentration SCC1 (mg/kg)	Leachable Concentration TCLP2 (mg/L)	Total Concentration SCC2 (mg/kg)
Benzene	0.5	18	2	72
Toluene	14.4	518	57.6	2073
Ethyl Benzene	30	1080	120	4320
Xylenes (total)	50	1800	200	7200
C_6-C_9 petroleum hydrocarbons(2)	N/A(2)	650	N/A(2)	2600
C_{10}-C_{36} petroleum hydrocarbons(2)	N/A(2)	10000	N/A(2)	40000
Lead	5	1500	20	6000
Arsenic	5	500	20	2000
Cadmium	1	100	4	400
Chromium (total)	5	1900	20	7600
Mercury	0.2	50	0.8	200
Nickel	2	1050	8	4200
Polycyclic Aromatic Hydrocarbons (total)	N/A	200	N/A	800
Benzo(a)pyrene	0.04	10	0.16	23

Notes to Table 4:

(1) Adopted from Table 2 – Ref 5

(2) Petroleum hydrocarbons are assessed only by total concentration (SCC1 or SCC2)

N/A – Not applicable

Classification of materials for off-site disposal will include inspection, sampling and analysis at generally not less than one per 25 m^3. The frequency of testing required for classification should be confirmed by a suitably qualified environmental consultant, and will depend on the volume and consistency of the material.

Groundwater disposal (if required) should be conducted by a licensed contractor in accordance with statutory and regulatory requirements. Groundwater requiring off-site disposal is classed as Liquid Waste in accordance with NSW EPA guidelines (Ref 5).

Truck dispatch shall be logged and recorded by the contractor for each load leaving the site (refer to Section 10.4). A record of the truck dispatch will be provided to DP by the contractor. The waste tracking procedure should be confirmed by the OH due to the potential presence of bonded asbestos.

10.3 Stockpiling of Contaminated Materials

Where required, contaminated material shall be temporarily stockpiled at a suitable location(s) within the site.

All stockpiles of contaminated material shall be appropriately fenced and demarcated to clearly delineate their boundaries. Stockpiles shall be lightly conditioned by water sprinkler and covered by geotextile or similar cover to prevent dust blow. Geotextile silt fences or hay bales should be erected around each stockpile to prevent losses by surface erosion where required or sediment run-off. The location and quantity of stockpiled contaminated soils should be recorded by the contactor.

If temporary stockpiling is required following capping, stockpiles should be placed over plastic or concrete slabs to minimise cross-contamination with underlying soils. The footprint of such stockpiles should also be validated via inspection and testing (where required) for potential contaminants following removal as discussed in Section 11.3.

10.4 Loading and Transport of Contaminated Materials

Transport of contaminated material off the site shall be via a clearly demarcated haul route and this route exclusively shall be used for entry and egress of vehicles used to haul identified contaminated materials within and away from the site.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licences / permits, consents and approvals from NSW EPA and/or other Authorities to transport and dispose the waste materials according to the classification guidelines.

Details of all contaminated materials removed from the site shall be documented by the contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate). Such information should be provided to DP for reporting purposes. A site log/tracking sheets shall be maintained by the remediation contractor for stockpiles (numbered locations), to enable the tracking of disposed loads against on-site origin and location of the materials and corresponding (validation) sample numbers.

Measures shall be implemented to minimise the potential for contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Such measures could include the deployment of a vehicle washing / cleaning facility, which should be placed at a location before the egress point of the site. The facility shall be able to handle all vehicles and plant operating on site (if required). Residue from the cleaning facility will be deemed contaminated unless shown by validation to be below RAC criteria.

The proposed waste transport route should be notified to the local Council and truck dispatch shall be logged and recorded by the contractor for each load leaving the site. The waste tracking procedure should be confirmed by the environmental consultant.

10.5 Imported Fill

Imported fill used to reinstate site excavations or raise site levels (where required), or utilised for the proposed development (i.e. landscape areas, pavement materials etc.) should be classified as VENM or ENM, or comply with an appropriate / relevant resource recovery order / exemption (RRO / RRE) and should be accompanied by a certificate from the supplier, otherwise detailed assessment (including analysis of representative samples) will be required prior to use on-site. Imported soils should also meet the adopted RAC. Soil proposed for importation should be confirmed to be VENM / ENM or comply with a relevant RRO / RRE prior to delivery to the site.

10.6 Geotechnical Considerations

The site stripping, excavation and the placement and compaction of fill materials should be carried out with due consideration of geotechnical requirements for development. Deleterious inclusions such as organics, timber, metal, concrete (>200 mm) should be segregated from filling that may be used as engineered fill (i.e. for support of buildings or pavements).

Fill materials that will support structural loads, pavement, services or form structural backfill, should be placed and compacted to a suitable geotechnical specification that takes account of the intended purpose of the fill.

The geotechnical specification for earthworks should be prepared as part of the final design.

10.7 Acid Sulfate Soil Management

Based on the results of previous investigations, natural sands/clayey sands and silty sand fill below approximately RL0.2 are PASS. Disturbance of these materials (i.e. excavation or dewatering) will need to be conducted in accordance with the site specific Acid Sulphate Soil Management Plan (ASSMP) for the proposed development (Ref 3).

The ASSMP includes details on soil neutralisation, groundwater monitoring and treatment, validation and reporting requirements.

It is noted that disturbance of PASS during remediation works is likely to be minor or localised, with the exception of possibly piling (subject to methodology adapted).

10.8 Unexpected Finds Protocol

The results of previous assessments at the site indicate the presence of PAH, TRH (long-chained), heavy metal and possible asbestos contamination within filling at the site, and identified the potential for 'hotspot' to remain post original remediation works. Due to the historical use of the site, history of demolition and the presence of uncontrolled filling at the site, there is potential for additional contamination within site soils. Contingency procedures are required should additional potentially contaminated soils be identified during site development.

The following general procedures are suggested for the assessment and management of potentially impacted filling/soils during remediation/earthworks. Based on the results of previous assessment, soils/filling may be potentially impacted by petroleum hydrocarbons, heavy metals, PAH, asbestos:

- Excavation, handling loading and transport of contaminated materials should be undertaken by a licensed contractor in accordance with the appropriate regulatory approvals and legislative requirements;
- The progress of site excavations during construction should be inspected by the contractor during earthworks, and periodically by the contaminated lands consultant (i.e. DP). Potential soil contamination may include stained soils, odorous soils, soils containing fibro fragments, soils containing building rubble (i.e. bricks, tiles, concrete, timber etc.) and slag/ash products;
- If potentially contaminated soils are encountered (i.e. visual or olfactory indication of contamination), excavation of filling should cease, and the extent of the affected filling should be assessed by DP;
- The affected soils may need to be segregated based on visual/olfactory observations, and stockpiled for further assessment, alternatively, the soils may be suitable to remain on-site beneath the cap;
- If the assessment of impacted materials indicates that the materials are not suitable to remain on-site, the materials should be classified for disposal to an appropriately licensed landfill with reference to the NSW EPA waste classification guidelines (Ref 5);
- The affected area should be stripped and validated by DP;
- Excavation in the affected area cannot recommence until the validation testing indicates the absence of gross impact and no visual or olfactory indicators of contamination);
- Licensed contractor to load classified materials directly into appropriate trucks for transport and disposal to a licensed facility (Note: waste classification is required prior to off-site disposal).

It is noted that additional investigations for waste classification and assessment of asbestos impacts to be conducted prior to construction will minimise the potential for unexpected finds during construction

11. Sample Collection and Analysis

11.1 Sample Collection and Handling

11.1.1 Soil

Soil sampling will be directly from the exposed surface of excavation, or, in the case of stockpiles, from various depths between the surface and the base. Sampling data shall be recorded to comply with routine Chain of Custody (COC) requirements.

The general sampling, handling, transport and tracking procedures comprises:

- The use of stainless steel sampling equipment;
- The use of disposable gloves for each sampling event;
- Washing of all sampling equipment in contact with the sample, in a 3% solution of phosphate free detergent (Decon 90) then rinsing with distilled water prior to each sample being collected;
- Transfer of the sample immediately into new glass jars;
- Collection of 10% replicate samples for QA/QC purposes;
- Collection of replicate soil samples in zip-lock plastic bags for PID screening;
- Labelling of the sample containers with individual and unique identification including Project Number and Sample Number;
- Placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and
- Use of chain of custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

11.1.2 Seepage / Groundwater

The general sampling, handling, transport and tracking procedures for the collection and analysis of a seepage/groundwater sample from water within the excavation comprises:

- Collection of seepage/groundwater ‘grab’ sample using a long-handled ‘swing-sampler’ fitted with new laboratory prepared containers for analysis;
- The use of disposable gloves for each sampling event;
- Collection of 10% replicate samples for QA/QC purposes;
- Collection of replicate water samples in a laboratory prepared jar for field screening of the groundwater with a PID;
- Labelling of the sample containers with individual and unique identification including Project Number and Sample Number;
- Placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and

- Use of COC documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

11.2 Sample Holding Times

The maximum sample holding times are as follows:

Soil

- Metals – 6 months (if required);
- TRH/BTEX – 14 days;
- PAH – 14 days, and 40 days following extraction (if required);
- OCP/OPP – 14 days, and 40 days following extraction (if required);
- Asbestos – Not applicable.

Groundwater

- Metals – 6 months (if required);
- TRH/BTEX – 14 days;
- PAH – 14 days, and 40 days following extraction (if required).

All samples must be collected in appropriate containers and stored at 4°C or below.

11.3 Validation Sample Analysis

Analysis for the validation of stripped/excavated contaminated soils within landscape areas or base of bulk excavations (if required) should comprise the following:

- Total Recoverable hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);

Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn);

Asbestos (WA Department of Health – 500 mL).

The analytical programme will be reviewed following excavation, segregation and sampling to confirm analytes for testing. Leachability (TCLP) analysis may be required for stockpile samples if total contaminant levels are found to exceed ‘General Solid Waste’ Criteria.

11.4 Waste Classification Sample Analysis

Analysis for waste classification should comprise the following target contaminants, based on previous work at the site:

- Total Recoverable hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn);
- Asbestos (WA Department of Health – 500 mL).

Additional analytes (i.e. foreign materials, pH, EC, etc.) may be required if assessment against a general RRO is proposed.

The analytical programme will be reviewed following inspection and sampling to confirm analytes for testing. Leachability (TCLP) analysis may be required if total contaminant levels are found to exceed 'General Solid Waste' criteria.

11.5 Imported Fill

Any materials which are imported onto the site (e.g. to backfill excavations/service trenches, utilised as bedding materials for pavements etc.) should be classified as VENM or ENM or comply with a relevant RRE / RRE, or a commercially available and certified product (suitable for on-site use), and should be accompanied by a certificate from the supplier. Imported soils should also meet the adopted RAC. Otherwise detailed assessment (including analysis of representative samples) will be required prior to use on site. An appropriate report must be made available to the environmental consultant prior to the importation of the material.

12. Quality Assurance Plan

12.1 Field Quality Assurance

Sampling accuracy and precision should be maintained through the analysis of 10% field duplicate/replicate samples.

Appropriate sampling procedures should be undertaken to minimise potential for cross contamination, for example:

- Standard operating procedures are followed;
- Site safety plans are developed prior to commencement of works;
- Duplicate or replicate field samples are collected and analysed;
- Equipment rinsate samples are analysed as part of the QA/QC programme;

- Samples are stored under secure, temperature controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory.

12.2 Laboratory Quality Assurance and Quality Control

DP's preferred laboratory routinely undertakes in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks;
- Statistical analysis of QC data.

12.3 Data Quality Indicators

Based on the analysis of quality control samples i.e. duplicates/replicates and in-house laboratory QA/QC procedures, the following data quality indicators have been assigned for the validation testing:

- Conformance with specified holding times;
- Accuracy of spiked samples within the laboratory's acceptable range (typically 70% to 130% for inorganic contaminants and greater for some organic contaminants);
- Field and laboratory duplicates and replicates samples will have a precision average of +/- 50% relative per cent difference (RPD). Elevated RPDs may be present due to heterogeneity of materials;
- Rinsate samples will show that the sampling equipment is free of introduced contaminants (i.e. the analytes within the normal range for deionised water);
- Field duplicates/replicates will be collected at a frequency of 10% of all samples, and rinsate samples of field equipment will be collected at one per day of sampling.

An assessment of the overall data quality will be presented in the final validation report.

12.4 Validation Reporting

A validation report will be prepared by the environmental consultant with reference to the NSW EPA Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites (Ref 10) and other appropriate guidance documentation. An important part of site validation (for on-site capping) will be the inspection to confirm that appropriate capping has been achieved in accordance with the RAP.

The report shall be submitted to the client for submission to Council at the completion of the remediation works program. The validation report shall confirm that the site has been remediated to a suitable standard for the proposed mixed use development.

The validation report should include details of the total volume of contaminated materials removed from site (if any), indicate the final disposal destination of the materials removed from site (if any), the final location and depth of materials retained on site, present details of the capping procedure and final capping depths, present detailed analytical results, and provide comment on the suitability of the site for the proposed mixed use development remediation.

Upon the completion of remediation and validation works and construction, a SMP will be drafted for long-term management of capped materials on-site (i.e. measures to reduce the likelihood of future disturbance, and procedures for handling/disposal in the event that identified contaminated materials are disturbed).

The SMP will promote awareness of the contamination management and the requirement of avoiding disturbance to the capping. The SMP will require review and approval by the regulator who will also organise for the placement of an appropriate notification on the S149 certificate for the site.

13. Environmental Management Plan (During Construction)

13.1 Introduction

The contractor should undertake the work with due regard to the minimisation of environmental effects and to meet all statutory and regulatory requirements.

The contractor shall have in place a CEMP so that work on the site complies with, but not limited to, the requirements of the following legislation:

- Protection of the Environment Operations Act;
- Contaminated Land Management Act;
- Dangerous Goods Act;
- Construction Safety Act;
- Work Health and Safety Act (SafeWork NSW);
- Council Development Approval Conditions.

The contractor shall also be responsible that the site works comply with the following conditions:

- Wastes generated at the site are disposed in an appropriate manner;
- Fugitive dust leaving the confines of the site is minimised;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas;
- Noise and vibration levels at the site boundaries comply with the legislative requirements.

Asbestos materials have been associated with various human respiratory diseases. The risk of contracting these diseases from contact with asbestos depends entirely on the fibres becoming airborne. It is important during disturbance of potential asbestos impacted soils that the potential for generating airborne asbestos fibres should be minimised. Moreover, levels of airborne asbestos fibres immediately outside the works area should be maintained to within the acceptable background level (i.e. <0.01 fibre/mL). As asbestos material identified on the site was generally in the form of fragments there is a low risk of asbestos fibres becoming airborne. Appropriate air monitoring should be conducted by the OH during remediation in the event that ACM are encountered during development.

In order to achieve a minimisation of environmental effects, the following measures are recommended, and should be adopted by the appointed contractor.

The contractor's CEMP is to include:

- Contingency plans to respond to site incidents;
- SMP for the operation phase of remedial works;
- A remedial schedule and hours of operation (which will be subject to development consent conditions);
- Details of relevant contacts;
- Requirements outlined in NCC Technical Manual: Contaminated Land Management (June 2012);
- Procedure(s) for dealing with deleterious materials that may affect containment of materials and/or use as fill (as per Section 10.8);
- Incident management/emergency response procedures;
- Any community consultation requirements.

At commencement of remediation works, interim measures should be adopted to manage possible human-health and environmental impacts in the event that ACM is observed at the surface (i.e. prior to full scale construction). Such measures could include use of spray / sprinklers to prevent dust blow or temporary covers. Requirements for interim control measures should be confirmed with the OH.

In order to achieve a minimisation of environmental effects, the following measures are recommended, and should be adopted by the appointed contractor as part of the contractors Environmental Management Plan.

13.2 Traffic Management

All vehicular traffic shall use only routes approved by Council, to and from the selected landfill where off-site disposal is undertaken. All loads shall be tarpaulin covered and lightly wetted to minimise the potential for materials or dust are dropped or deposited outside or within the site. The proposed landfill should be consulted for any additional requirements.

Each vehicle that has trafficked potentially impacted site soils within the site shall be inspected for cleanliness before being logged out as clean (wheels and chassis), or hosed down into a wheel wash or wash down bay until designated as clean when exiting the site (if required).

Wheel wash silt residues should be collected periodically and either returned to the excavation area or included in the remediation stockpile. Such material will be treated as contaminated unless analysis proves otherwise.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent or approvals to dispose the waste materials according to the waste classification.

Waste tracking should be conducted by the licensed contractor in accordance with regulatory requirements. Details of all materials removed from the site shall be documented by a contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate) provided to the environmental consultant responsible for site validation. A site log shall be maintained by the contractor to track disposed loads against on-site origin and location of the materials.

Truck dispatch shall be logged and recorded by the contractor for each load leaving the site. A record of the truck dispatch should be provided to the environmental consultant responsible for site validation by the contractor.

Similarly tracking and documentation of all on-site movements of material should be maintained by the contractor.

13.3 Excavations

Records of all excavations and stockpile locations should be maintained. A site diary should also be maintained by the contractor to record daily progress, abnormal occurrences, incidents, and truck movements.

Contaminated material should be stockpiled at suitable locations within the site. All temporary stockpiles of contaminated material shall be secured and demarcated to clearly delineate their boundaries.

All excavations shall be made with due regard to the stability of adjacent footings and structures. It will be the contractor's responsibility to provide adequate battering, shoring and/or underpinning to protect adjacent structures (if required).

No person shall be permitted to enter an unsupported excavation where it is more than 1.5 m deep or where it is considered to be unstable, irrespective of depth.

Records of all imported filling and placement should also be maintained by the contractor.

13.4 Stormwater Management and Control

Appropriate measures shall be taken to minimise the potential for potentially contaminated water or sediments to leave the site. Such measures could include:

Appropriate construction of stockpiles (if required), with regular checks for integrity and repairs if / when required;

- Construction of diversion bunds to divert stormwater from contaminated areas and contaminated soil stockpiles;
- Provision of sediment traps including geotextiles or hay bales;
- Construction of sediment control basins (if required);
- Staging of works to minimise the area of disturbance at any one time.

Discharge of any waters should meet the consent conditions from the appropriate authority. This should be verified by sampling and analyses undertaken by the contractor.

For example, if excavations fill with water during validation works (i.e. due to rainfall), the water will require analysis to determine appropriate options for discharge (i.e. disposal to stormwater, sewer or collection by a licensed contractor).

13.5 Control of Dust and Odour

Control of dust and odour during the course of the remediation works shall be maintained by the contractor and may include, but not necessarily be limited to, the following:

- The use of a water cart, as and when appropriate, to eliminate wind-blown dust;
- Use of sprays/sprinklers to prevent dust blow from stockpiles;
- Covering of stockpiles with plastic sheeting or geotextile membranes;
- Restriction of stockpile heights to 2 m above surrounding site level;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues. Undertake immediate remediation measures to rectify any cases of excessive dust or odour;
- Provision of temporary capping over site soils such as the contractor staging area.

13.6 Noise Control

Noise and vibration will be restricted to reasonable levels. All plant and machinery used on site should not breach statutory noise levels. Working hours will be restricted to those specified by Council.

14. Work Health and Safety

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. The practices outlined should generally comply with the WHS policies specified by the relevant Authorities.

All personnel on site should be required to wear the following protection as a minimum:

- Steel-capped boots;
- Safety glasses or safety goggles with side shields meeting AS1337 requirements (as necessary);
- Hard hat meeting AS1801 requirements;
- Hearing protection meeting AS1270 requirements when working around machinery or plant equipment if noise levels exceed exposure standards.

In the event that personnel are required to work in areas of potential contact with ACM, the following protection will be required in accordance with the Worksafe NSW: Asbestos – Code of Practice and Guidelines Notes:

- Disposable coveralls to prevent contact with asbestos materials if large volumes of asbestos material are present;
- Breathing apparatus fitted with a Class P2 filter;
- Steel-capped boots (laceless unless boot covers are worn);
- nitrile work gloves meeting AS 2161 requirements or heavy duty gauntlet gloves;
- Safety glasses or safety goggles with side shields meeting AS 1337 requirements (as necessary);
- Hard hat meeting AS 1801 requirements;
- Hearing protection meeting AS 1270 requirements when working around machinery or plant equipment if noise levels exceed exposure standards.

Excavation, handling, stockpiling, transport etc. of materials containing asbestos should be undertaken by a licenced contractor in accordance with the SafeWork NSW: Asbestos – Code of Practice and Guidelines Notes, and the relevant statutory requirements such as Part 7 of the Protection of the Environment Operations (Waste) Regulation 2014. Based on the results of the previous investigations, the presence of asbestos materials may possibly comprise bonded ACM (i.e. fibro fragments).

The contractor shall prepare a project-specific environmental management and WHS plans to supplement measures presented in this RAP.

15. References

1. Douglas Partners Pty Ltd, ‘Report on Contamination and Acid Sulfate Soil Assessment, Proposed Mixed Use Development, 42 Honeysuckle Drive, Newcastle’, Project 91181.00, Report 91181.00.R.002.Rev0, October 2017.

2. National Environment Protection Council (2013), 'National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013', 11 April 2013.
3. Douglas Partners Pty Ltd, 'Acid Sulfate Soil Management Plan, Proposed Mixed Use Development, 42 Honeysuckle Drive, Newcastle', Project 91181.00, Report 91181.00.R.003.Rev0, November 2017.
4. NSW EPA, Contaminated Land Management, "Guidelines for the NSW Site Auditor Scheme (3rd Edition)', October 2017.
5. NSW EPA, "Waste Classification Guidelines, Part 1: Classifying Waste", November 2014.
6. NSW EPA, 'Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 - The excavated Natural Material Order 2014'.
7. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report no.10 (2011), 'Health screening levels for petroleum hydrocarbons in soil and groundwater' September 2011.
8. Western Australia Department of Health (2009), 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia', May 2009.
9. NSW EPA, "Managing Land Contamination, Planning Guidelines, SEPP55 – Remediation of Land", 1988.
10. NSW EPA Contaminated Sites (2011), "Guidelines for Consultants Reporting on Contaminated Sites", August 2011.
11. ENVIRON Australia Pty Ltd (2004), 'Summary Site Audit Report, Lot 22 and Part Lot 23, Lee 5 South, prepared for Hunter Development Corporation', Ref No 31-0069B, Audit GN 74-2, June 2004.
12. Douglas Partners Pty Ltd, 'Report on Resource Recovery Exemption Feasibility Assessment, Proposed Re-Use of Surplus Materials, Lot 22, Honeysuckle Drive, Newcastle', Project 39829.05, September 2014.

16. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 42 Honeysuckle Drive, Newcastle with reference to DP's proposal dated 15 August 2017 and acceptance received from Mr Chris Farrington of Doma Holdings (Honeysuckle) Pty Ltd dated16 August 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Doma Holdings (Honeysuckle) Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has been detected by observation and confirmed by laboratory analysis within filling at the surface of the site (likely to be associated with deeper fill materials brought to the surface through previous test pitting by others). Building demolition materials, such as concrete and brick were also identified in filling and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report
Table 9: Results of Chemical Analysis of Soil and Fibro Samples – from the Current Investigation (91181.00.R.002.Rev0)
Table 10: Results of Leachability Testing of Soil Samples (91181.00.R.002.Rev0)
Table B1: Summary of Previous Chemical Testing against NEPM 2013 Criteria (91181.00.R.002.Rev0)

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

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

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Table 9: Results of Chemical Analysis of Soil and Fibro Samples – from the Current Investigation

Analyte	Units	PQL	NSW EPA 2014 - General Solid Waste CT1 (No TCLP)	NSW EPA 2014 - Restricted Solid Waste CT2 (No TCLP)	NEPM 2013 Table 1A(1) HILs Res B Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 EILs Res/Open Space Aged	NEPM 2013 EILs Comm/Ind Aged	NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	Field ID	201	201	201	201	202	202	202	202	202	203	203	203	D202	203	204	D204	204	204	204	204	S205	SF205 (fibro)
								0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m							Sample Depth	0.2	1	2.3	4	0.5	1.5	3	3.8	5.5	0.2	1	2.5	2.5	3	0.2	0.2	1	3	3.5	4		
																										Sample Date	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017	7/09/2017
Inorganics																																							
CEC	meq/100g	1																									-	-	8.9	3.6	-	-	15	13	-	-	-	12	-	-	7.9	-	-	-	-	-	-
pH 1:5 soil:water1:5 soil:water	pH Units																										-	-	7.2	7.5	-	-	7.6	7.3	7.1	-	-	-	7.3	-	-	7.5	7.8	-	7.8	-	-
Metals																																							
Arsenic	mg/kg	4	100	400	500	300	3000													100	160						14	10	<4	9	13	<4	<4	4	-	9	<4	<4	6	<4	12	8	<4	5	-	<4	-	-
Beryllium	mg/kg	1	20	80	90	90	500																				<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	-
Boron	mg/kg	3			40000	20000	300000																				<3	4	<3	3	7	<3	<3	4	-	<3	<3	3	4	<3	4	<3	<3	<3	-	<3	-	-
Cadmium	mg/kg	0.4	20	80	150	90	900																				<0.4	0.9	<0.4	<0.4	1	<0.4	<0.4	<0.4	-	0.4	<0.4	<0.4	<0.4	<0.4	1	0.7	<0.4	<0.4	-	<0.4	-	-
Chromium (III+VI)	mg/kg	1	100	400	500	300	3600													190	320						13	13	2	8	10	1	3	12	-	6	1	13	6	5	14	8	4	6	-	2	-	-
Copper	mg/kg	1			30000	17000	240000													80	110						59	280	7	4	220	<1	6	31	-	75	2	41	25	8	110	74	12	11	-	<1	-	-
Iron	mg/kg	1																									9700	52,000	2300	6200	21,000	940	1900	8400	-	7500	1100	6900	5900	3200	16,000	7700	3900	4100	-	1300	-	-
Lead	mg/kg	1	100	400	1200	600	1500													1100	1800						72	200	14	6	300	1	9	25	-	120	2	52	16	10	170	130	13	9	-	2	-	-
Manganese	mg/kg	1			14000	19000	60000																				560	470	23	20	360	6	20	91	-	290	8	45	46	38	360	240	56	26	-	6	-	-
Mercury	mg/kg	0.1	4	16	120	80	730																				<0.1	0.3	<0.1	<0.1	0.2	<0.1	<0.1	0.3	-	0.2	<0.1	0.7	<0.1	<0.1	0.1	0.1	<0.1	<0.1	-	<0.1	-	-
Molybdenum	mg/kg	1	100	400																							<1	<1	<1	17	1	<1	<1	2	-	1	<1	<1	2	1	1	<1	4	1	-	2	-	-
Nickel	mg/kg	1	40	160	1200	1200	6000													20	30						10	10	2	7	11	<1	1	11	-	6	<1	12	6	4	11	6	3	4	-	1	-	-
Selenium	mg/kg	2	20	80	1400	700	10000																				<2	<2	<2	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	<2	-	-
Zinc	mg/kg	1			60000	30000	400000													250	350						150	280	13	10	360	3	12	41	-	190	4	73	25	16	310	220	28	18	-	4	-	-
TPH																																								
C10-C16	mg/kg	50																						1000	1000		<50	<50	<50	<50	<50	<50	<50	<50	-	<50	<50	330	420	<50	65	<50	<50	<50	-	<50	-	-
C16-C34	mg/kg	100																				300	1700	2500	3500		<100	310	<100	<100	200	<100	<100	<100	-	180	<100	4300	5100	270	1800	140	120	<100	-	<100	-	-
C34-C40	mg/kg	100																				2800	3300	10000	10000		<100	<100	<100	<100	<100	<100	<100	<100	-	<100	<100	750	820	<100	260	<100	<100	<100	-	<100	-	-
F2-NAPHTHALENE	mg/kg	50						110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL			120	170				<50	<50	<50	<50	<50	<50	<50	<50	-	<50	<50	330	420	<50	65	<50	<50	<50	-	<50	-	-
C6 - C9	mg/kg	25	650	2600																							<25	<25	<25	<25	<25	<25	<25	<25	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	<25	-	-
C10 - C14	mg/kg	50																									<50	<50	<50	<50	<50	<50	<50	<50	-	<50	<50	86	100	<50	<50	<50	<50	<50	-	<50	-	-
C15 - C28	mg/kg	100																									<100	210	<100	<100	120	<100	<100	<100	-	120	<100	3400	4100	190	1400	<100	<100	<100	-	<100	-	-
C29 -C36	mg/kg	100																									<100	120	<100	<100	100	<100	<100	<100	-	<100	<100	1500	1700	100	540	<100	<100	<100	-	<100	-	-
+C10 - C36 (Sum of total)	mg/kg		10000	40000																							<250	355	<250	<250	245	<250	<250	<250	-	195	<250	4986	5900	315	1965	<250	<250	<250	-	<250	-	-
C10 - C40 (Sum of total)	mg/kg	50																									<50	310	<50	<50	200	<50	<50	<50	-	180	<50	5400	6400	270	2100	140	120	<50	-	<50	-	-
C6-C10 less BTEX (F1)	mg/kg	25						45	70	110	200	NL	NL	NL	NL	260	370	630	NL			180	215				<25	<25	<25	<25	<25	<25	<25	<25	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	<25	-	-
C6-C10	mg/kg	25																						700	700		<25	<25	<25	<25	<25	<25	<25	<25	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	<25	-	-
BTEX																																								
Benzene	mg/kg	0.2	10	40				0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3			50	75				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	-
Ethylbenzene	mg/kg	1	600	2400				55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL			70	165				<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	-
Toluene	mg/kg	0.5	288	1152				160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL			85	135				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-
Xylene (m & p)	mg/kg	2																									<2	<2	<2	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	<2	-	-
Xylene (o)	mg/kg	1																									<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	-
Xylene Total	mg/kg	1	1000	4000				40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL			105	180				<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	-
PAH/Phenols																																								
Total Positive PAHs	mg/kg	0.05	200	800	400	300	4000																				38	130	8.8	<0.05	45	<0.05	17	3.9	-	74	<0.05	990	1400	83	990	60	63	11	-	0.4	-	-
Acenaphthene	mg/kg	0.1																									0.3	0.5	0.2	<0.1	0.2	<0.1	<0.1	<0.1	-	0.6	<0.1	26	40	0.6	7.9	0.6	0.8	<0.1	-	<0.1	-	-
Acenaphthylene	mg/kg	0.1																									<0.1	0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1	-	0.2	<0.1	8.7	14	0.4	0.8	0.1	0.1	<0.1	-	<0.1	-	-
Anthracene	mg/kg	0.1																									0.8	3.7	0.4	<0.1	0.8	<0.1	0.3	0.1	-	1.6	<0.1	65	99	3.6	35	1.7	2	0.2	-	<0.1	-	-
Benz(a)anthracene	mg/kg	0.1																									2.5	6.8	0.5	<0.1	3.4	<0.1	1.7	0.4	-	5.1	<0.1	82	110	7.8	68	4.2	3.7	1	-	<0.1	-	-
Benzo(a) pyrene	mg/kg	0.05	0.8	3.2																		0.7	1.4				3	8.1	0.57	<0.05	3.8	<0.05	1.5	0.3	-	6	<0.05	67	85	6.8	53	4.9	4	1.2	-	0.06	-	-
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5			4	3	40																				4.2	12	0.8	<0.5	5.3	<0.5	2.1	<0.5	-	8.6	<0.5	98	120	9.7	77	6.9	5.7	1.7	-	<0.5	-	-
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5			4	3	40																				4.2	12	0.8	<0.5	5.3	<0.5	2.1	<0.5	-	8.6	<0.5	98	120	9.7	77	6.9	5.7	1.7	-	<0.5	-	-
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5			4	3	40																				4.2	12	0.8	<0.5	5.3	<0.5	2.1	<0.5	-	8.6	<0.5	98	120	9.7	77	6.9	5.7	1.7	-	<0.5	-	-
Benzo(b,j+k)fluoranthene	mg/kg	0.2																									4.8	13	0.9	<0.2	6.3	<0.2	2.3	0.5	-	9.9	<0.2	110	140	11	84	7.9	6.4	2	-	<0.2	-	-
Benzo(g,h,i)perylene	mg/kg	0.1																									1.9	5.7	0.3	<0.1	2.1	<0.1	0.6	0.2	-	3.6	<0.1	22	28	2.6	33	2.9	2.3	0.5	-	<0.1	-	-
Chrysene	mg/kg	0.1																									2.4	7.2	0.5	<0.1	3.2	<0.1	1.5	0.4	-	5.5	<0.1	74	95	7	50	4.1	3.6	1	-	<0.1	-	-
Dibenz(a,h)anthracene	mg/kg	0.1																									0.2	0.8	<0.1	<0.1	0.3	<0.1	0.1	<0.1	-	0.6	<0.1	8.3	6.8	0.6	5	0.5	0.3	0.1	-	<0.1	-	-
Fluoranthene	mg/kg	0.1																									7.7	37	1.7	<0.1	9.3	<0.1	3.7	0.8	-	15	<0.1	220	300	17	220	12	12	1.8	-	0.2	-	-
Fluorene	mg/kg	0.1																									0.3	0.7	0.2	<0.1	0.2	<0.1	<0.1	<0.1	-	0.5	<0.1	5.6	9	0.6	9.8	0.5	1.3	<0.1	-	<0.1	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																									2	5.8	0.3	<0.1	2.3	<0.1	0.7	0.2	-	3.8	<0.1	27	35	3	34	3	2.4	0.6	-	<0.1	-	-
Naphthalene	mg/kg	0.1						3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	170	370						<1 - 0.1	<1 - 0.1	<1 - 0.2	<0.1	<1 - 0.2	<0.1	<1 - 0.1	<0.1	-	<1 - 0.2	<0.1	<1 - 3.7	<1 - 4.7	<1 - 0.4	<1 - 3.1	<1 - 0.2	<1 - 0.8	<0.1	-	<0.1	-	-
Phenanthrene	mg/kg	0.1																									5	14	1.7	<0.1	4.2	<0.1	0.6	0.3	-	7.6	<0.1	100	180	6.1	210	6.5	12	0.3	-	<0.1	-	-
Pyrene	mg/kg	0.1																									6.9	31	1.4	<0.1	8.4	<0.1	3.7	0.8	-	14	<0.1	170	240	15	180	11	11	1.9	-	0.2	-	-
Polychlorinated biphenyls																																								
PCBs (Sum of total)	mg/kg	0.1	49.9999	49.9999	1	1	7																				<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1016	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1221	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1232	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1242	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1248	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1254	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Arochlor 1260	mg/kg	0.1																									<0.1	<0.2	<0.1	-	<0.2	<0.1	<0.1	-	-	<0.2	-	<1	<1	-	-	-	-	-	-	-	-	-
Organochlorine pesticides																																								
Endosulfan	mg/kg		60	240	400	340	2000																				<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	-	-	<0.3	-	<0.3	<0.3	-	-	-	-	-	-	-	-	-
4,4-DDE	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
a-BHC	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Aldrin	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Aldrin + Dieldrin	mg/kg				10	10	45																				<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	-	<0.2	-	<0.2	<0.2	-	-	-	-	-	-	-	-	-
b-BHC	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Chlordane (cis)	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Chlordane (trans)	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
d-BHC	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
DDD	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
DDT	mg/kg	0.1																		180	640						<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
DDT+DDE+DDD	mg/kg	0.1			600	400	3600																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Dieldrin	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Endosulfan I	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Endosulfan II	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Endosulfan sulphate	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Endrin	mg/kg	0.1			20	20	100																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Endrin aldehyde	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Heptachlor	mg/kg	0.1			10	10	50																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.1			15	10	80																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Methoxychlor	mg/kg	0.1			500	400	2500																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Organophosphorous Pesticides																																								
Azinophos methyl	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Bromophos-ethyl	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Chlorpyrifos	mg/kg	0.1	4	16	340	250	2000																				<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Chlorpyrifos-methyl	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Diazinon	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Dichlorvos	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Dimethoate	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Ethion	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Fenitrothion	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Malathion	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Parathion	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Ronnel	mg/kg	0.1																									<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-
Pesticides																																								
Moderately Harmful Pesticides (total)	mg/kg		250	1000																							<0.6	<0.6	<0.6	-	<0.6	<0.6	<0.6	-	-	<0.6	-	<0.6	<0.6	-	-	-	-	-	-	-	-	-
Pesticides (total, NSW Waste 2014)	mg/kg																										<0.6	<0.6	<0.6	-	<0.6	<0.6	<0.6	-	-	<0.6	-	<0.6	<0.6	-	-	-	-	-	-	-	-	-
Scheduled chemicals (NSW Waste 2014)	mg/kg		49.999	49.999																							<1.3	<1.3	<1.3	-	<1.3	<1.3	<1.3	-	-	<1.3	-	<1.3	<1.3	-	-	-	-	-	-	-	-	-
Asbestos																																								
Asbestos Identification	g/kg	0.1			D	D	D																				-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	D

Notes to Table:
D - Detected
ND - Not Detected
D202 - Replicate of Sample Bore 203/2.5 m
D204 - Replicate of Sample Bore 204/0.2 m

Table 10: Results of Leachabililty Testing of Soil Samples

Sample	Depth (m)	Metals			PAHs																			TRH					
		Lead (Pb)			Total PAH			Benzo(a)pyrene			Naphthalene			Anthracene			Fluoranthene			Phenanthrene			C10 - C14		C15 - C28		C29 - C36	
		Total	TCLP	ASLP	Total	TCLP	ASLP	Total	TCLP	ASLP	Total	TCLP	ASLP	Total	TCLP	ASLP	Total	TCLP	ASLP	Total	TCLP	ASLP	Total	ASLP	Total	ASLP	Total	ASLP
		(mg/kg)	(mg/L)	(µg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(mg/L)	(mg/L)	(mg/kg)	(µg/L)	(mg/kg)	(µg/L)	(mg/kg)	(µg/L)
201	0.2	72	-	-	38	0.012	NIL (+)VE	*3*	<0.001	<0.0005	<1 - 0.1	<0.001	<0.0002	0.8	<0.001	<0.0001	7.7	<0.001	<0.0001	5	0.012	<0.0001	<50	-	<100	-	<100	-
201	1	200	2.4	-	130	NIL (+)VE	NIL (+)VE	*8.1*	<0.001	<0.0005	<1 - 0.1	<0.001	<0.0002	3.7	<0.001	<0.0001	37	<0.001	<0.0001	14	<0.001	<0.0001	<50	-	210	-	120	-
202	0.5	300	0.2	-	45	NIL (+)VE	NIL (+)VE	3.8	<0.001	<0.0005	<1 - 0.2	<0.001	<0.0002	0.8	<0.001	<0.0001	9.3	<0.001	<0.0001	4.2	<0.001	<0.0001	<50	-	120	-	100	-
203	0.2	120	0.1	-	74	NIL (+)VE	NIL (+)VE	6	<0.001	<0.0005	<1 - 0.2	<0.001	<0.0002	1.6	<0.001	<0.0001	15	<0.001	<0.0001	7.6	<0.001	<0.0001	<50	-	120	-	<100	-
D202	2.5	16	-	-	**1400**	-	-	85	<0.001	-	<1 - 4.7	<0.001	-	99	<0.001	-	300	-	<0.0001	180	-	<0.0001	100	<0.05	4100	0.35	1700	<0.1
204	0.2	170	0.08	-	**990**	NIL (+)VE	NIL (+)VE	53	<0.001	<0.0005	**<1 - 3.1**	<0.001	<0.0002	35	<0.001	<0.0001	220	<0.001	<0.0001	210	<0.001	<0.0001	<50	-	1400	-	540	-
204	1	13	-	-	63	NIL (+)VE	NIL (+)VE	4	<0.001	<0.0005	<1 - 0.8	<0.001	<0.0002	2	<0.001	<0.0001	12	<0.001	<0.0001	12	<0.001	<0.0001	<50	-	<100	-	<100	-
Laboratory PQL		1	0.1	-	0.05	0.001	0.001	0.05	0.001	0.0005	0.1	0.001	0.0002	0.1	0.001	0.0001	0.1	0.001	0.0001	0.1	0.001	0.0001	50	0.05	100	0.05	100	0.1
NEPM 2013 - HIL Res B		1200			400			-			-			-			-			-			-		-		-	
NEPM 2013 - EIL Res/Open Space Aged		1100			-			-			170			-			-			-			-		-		-	
NEPM 2013 - ESL Urban Res Coarse Soil		-			-			0.7			-			-			-			-			-		-		-	
NSW EPA 2014 - Waste Classification Guidelines	**General Solid**	1500 (1)	5	NC	200	NC	NC	10 (1)	0.04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	10,000 Total (NC for ASLP)					
	Restricted	6000 (1)	20	NC	800	NC	NC	23 (1)	0.16	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	40,000 Total (NC for ASLP)					
ANZECC (2000) - Trigger Values for Slightly to Moderately Disturbed Systems	**Fresh**	NC	NC	3.4	NC	NC	NC	NC	NC	0.0001 (L)	NC	NC	0.016 (L)	NC	NC	0.00001 (L)	NC	NC	0.001 (L)	NC	NC	0.0006 (L)	NC	NC	NC	NC	NC	NC
	Marine	NC	NC	4.4	NC	NC	NC	NC	NC	0.0001 (L)	NC	NC	0.05 (L)	NC	NC	0.00001 (L)	NC	NC	0.001 (L)	NC	NC	0.0006 (L)	NC	NC	NC	NC	NC	NC

Notes to Table:
Total concentrations in mg/kg on a dry weight basis
TCLP concentrations in mg/L
ASLP concentrations in mg/L and µg/L (as shown)
(1) - Waste Classification Criteria for Total Concentrations when used with TCLP Results
PQL - practical quantitation limit
NC - No Criteria
- Not Tested
TCLP - standard NSW EPA acid leaching test
ASLP - Leaching test using distilled water as extracting fluid
(L) - 95% Low Reliability Trigger Values (99% protection level applied where recommended (ie benzo(a)pyrene))
Underlined results exceed NEPM 2013 EIL Res/Open Space Aged
Bold Results exceed NEPM 2013 HIL for Res B landuse
Green Font results exceed NEPM 2013 ESL Urban Res Coarse Soil
Shaded Results Exceed Criteria Shaded

Table B1 - Summary of Previous Soil Analysis (soils remaining on site)

Analyte	Units	PQL	NSW EPA 2014 - General Solid Waste CT1 (No TCLP)	NSW EPA 2014 - Restricted Solid Waste CT2 (No TCLP)	NEPM 2013 EILs Res/Open Space Aged	NEPM 2013 EILs Comm/Ind Aged	NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil	NEPM 2013 Table 1A(1) HILs Res B Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
												0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m		
Chemical Characteristics																									
pH																									
Metals																									
Arsenic	mg/kg	4	100	400	100	160		3	500	300	3000														
Beryllium	mg/kg	1	20	80					90	90	500														
Boron	mg/kg	3							40000	20000	300000														
Cadmium	mg/kg	0.4	20	80					150	90	900														
Chromium (III+VI)	mg/kg	1	100	400	190	320			500	300	3600														
Copper	mg/kg	1			80	110			30000	17000	240000														
Iron	mg/kg	1																							
Lead	mg/kg	1	100	400	1100	1800			1200	600	1500														
Manganese	mg/kg	1							14000	19000	60000														
Mercury	mg/kg	0.1	4	16					120	80	730														
Molybdenum	mg/kg	1	100	400																					
Nickel	mg/kg	1	40	160	20	30			1200	1200	6000														
Selenium	mg/kg	2	20	80					1400	700	10000														
Zinc	mg/kg	1			250	350			60000	30000	400000														
TPH																									
C10-C16	mg/kg	50																						1000	1000
C16-C34	mg/kg	100					300	1700																2500	3500
C34-C40	mg/kg	100					2800	3300																10000	10000
F2-NAPHTHALENE	mg/kg	50					120	170				110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL		
C6 - C9	mg/kg	25	650	2600																					
C10 - C14	mg/kg	50																							
C15 - C28	mg/kg	100																							
C29-C36	mg/kg	100																							
>C10 - C36 (Sum of total)	mg/kg		10000	40000																					
C10 - C40 (Sum of total)	mg/kg	50																							
C6-C10 less BTEX (F1)	mg/kg	25					180	215				45	70	110	200	NL	NL	NL	NL	260	370	630	NL		
C6-C10	mg/kg	25																						700	700
BTEX																									
Benzene	mg/kg	0.2	10	40			50	75				0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3		
Ethylbenzene	mg/kg	1	600	2400			70	165				55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL		
Toluene	mg/kg	0.5	288	1152			85	135				160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL		
Xylene (m & p)	mg/kg	2																							
Xylene (o)	mg/kg	1																							
Xylene Total	mg/kg	1	1000	4000			105	180				40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL		
PAH/Phenols																									
Total Positive PAHs	mg/kg	0.05	200	800					400	300	4000														
Acenaphthene	mg/kg	0.1																							
Acenaphthylene	mg/kg	0.1																							
Anthracene	mg/kg	0.1																							
Benz(a)anthracene	mg/kg	0.1																							
Benzo(a) pyrene	mg/kg	0.5	0.8	3.2			0.7	1.4																	
Benzo[b+j]fluoranthene	mg/kg	0.2																							
Benzo(g,h,i)perylene	mg/kg	0.1																							
Carcinogenic PAHs (as BaP TEQ)	mg/kg								4	3	40														
Chrysene	mg/kg	0.1																							
Dibenz(a,h)anthracene	mg/kg	0.1																							
Fluoranthene	mg/kg	0.1																							
Fluorene	mg/kg	0.1																							
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																							
Naphthalene	mg/kg	0.1			170	370						3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL		
Phenanthrene	mg/kg	0.1																							
Pyrene	mg/kg	0.1																							
Polychlorinated biphenyls																									
PCBs (Sum of total)	mg/kg	0.1	49.9999	49.9999					1	1	7														
Arochlor 1016	mg/kg	0.1																							
Arochlor 1221	mg/kg	0.1																							
Arochlor 1232	mg/kg	0.1																							
Arochlor 1242	mg/kg	0.1																							
Arochlor 1248	mg/kg	0.1																							
Arochlor 1254	mg/kg	0.1																							
Arochlor 1260	mg/kg	0.1																							
Organochlorine pesticides																									
Endosulfan	mg/kg		60	240					400	340	2000														
4,4-DDE	mg/kg	0.1																							
a-BHC	mg/kg	0.1																							
Aldrin	mg/kg	0.1																							
Aldrin + Dieldrin	mg/kg								10	10	45														
b-BHC	mg/kg	0.1																							
Chlordane (cis)	mg/kg	0.1																							
Chlordane (trans)	mg/kg	0.1																							
d-BHC	mg/kg	0.1																							
DDD	mg/kg	0.1																							
DDT	mg/kg	0.1			180	640																			
DDT+DDE+DDD	mg/kg	0.1							600	400	3600														
Dieldrin	mg/kg	0.1																							
Endosulfan I	mg/kg	0.1																							
Endosulfan II	mg/kg	0.1																							
Endosulfan sulphate	mg/kg	0.1																							
Endrin	mg/kg	0.1							20	20	100														
Endrin aldehyde	mg/kg	0.1																							
g-BHC (Lindane)	mg/kg	0.1																							
Heptachlor	mg/kg	0.1							10	10	50														
Heptachlor epoxide	mg/kg	0.1																							
Hexachlorobenzene	mg/kg	0.1							15	10	80														
Methoxychlor	mg/kg	0.1							500	400	2500														
Organophosphorous Pesticides																									
Azinophos methyl	mg/kg	0.1																							
Bromophos-ethyl	mg/kg	0.1																							
Chlorpyrifos	mg/kg	0.1	4	16					340	250	2000														
Chlorpyrifos-methyl	mg/kg	0.1																							
Diazinon	mg/kg	0.1																							
Dichlorvos	mg/kg	0.1																							
Dimethoate	mg/kg	0.1																							
Ethion	mg/kg	0.1																							
Fenitrothion	mg/kg	0.1																							
Malathion	mg/kg	0.1																							
Parathion	mg/kg	0.1																							
Ronnel	mg/kg	0.1																							
Pesticides																									
Moderately Harmful Pesticides (total)	mg/kg		250	1000																					
Pesticides (total, NSW Waste 2014)	mg/kg																								
Scheduled chemicals (NSW Waste 2014)	mg/kg		49.999	49.999																					
Asbestos Identification	g/kh	0.1							D	D	D														

Analyte	PKK ESA 2002			RCA CI 2004	RCA IRAP 2004										RCA VR 2004			DP WC 2008																		
Sample ID	LSBH05	LSBH06	LSTP16	RCA4-2	RCA1-1	RCA1-2	RCA4-2	RCA10-1	Q1	RCA13-1	RCA14-1	RCA15-1	V30	95% UCL	V30	V31	95% UCL	DP1	DP1	DP2	DP2	DP3	DP3	DP4	DP5	DP5	BD4 (DP5)	DP6	DP7	DP7	BD5 (DP7)	DP8	DP8	DP9	BD6 (DP9)	DP9
Depth (m)	0.1	1	0.1	1.5-1.6	0.2-0.3	0.6-0.7	1.5-1.6	0.8-0.9	0.8-0.9	0.5-0.6	0.6-0.7	0.4-0.5	Fill		Fill	Fill		0-0.1	0.4-0.5	0-0.1	0.8-1.0	0.4-0.5	1.8-1.9	0.8-1.0	0.3-0.5	1.3-1.5	BD4	0.3-0.5	0.3-0.5	1.3-1.5	BD5	0-0.1	0.8-1.0	0.3-0.5	BD6	1.7-1.8
Layer	1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
Chemical Characteristics																																				
pH			-																																	
Metals																																				
Arsenic	13	16	8		2	9	15	8	7	5	2	3	33	12.4				7	12	5	11	13	21	14	13	14	10	5	12	14	12	9	14	11	11	15
Beryllium																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	2	<0.5	1		<0.1	0.4	0.5	1.4	1.4	0.1	<0.1	0.8	2.8	1.3				0.5	1	0.6	1.6	1.3	2	1.3	1.4	2.6	1.7	0.6	1.3	1.7	1.4	0.95	1.7	1.2	1.5	1.5
Chromium (III+VI)	6	12	4		2	5	6	4	4	2	1	2	40	14.9				7	12	5.2	9.4	10	12	25	91	8.6	12	4.2	7.7	10	14	9.4	10	9.3	9.5	12
Copper	85	330	43		9	390	86	54	43	6	56	3	230	155				51	110	42	180	380	220	360	100	130	120	36	140	180	160	95	92	260	69	82
Iron																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	215	342	201		15	380	280	210	190	19	11	7	600	262.9				130	230	67	250	330	350	360	200	360	300	83	410	410	310	120	250	140	180	500
Manganese	200	636	148															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.2	0.2	0.1		<0.05	0.21	0.1	0.07	0.07	<0.05	<0.05	<0.05	0.21	0.16				0.07	0.08	<0.05	0.16	0.23	0.2	0.21	0.13	0.33	0.12	0.09	0.2	0.22	0.24	0.14	0.15	0.17	0.12	0.13
Molybdenum																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	6	10	4		<1	5	8	4	3	1	<1	1	120	44.7				3.9	10	3.4	8.7	9.4	12	21	15	8.3	8.9	3.3	7.8	9.6	9.7	9.3	10	7.4	8.4	11
Selenium																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	454	453	337		36	550	220	380	350	51	20	54	710	375.4				150	290	180	390	460	490	820	330	490	390	160	360	550	430	230	400	290	380	410
TPH																																				
C10-C16																																				
C16-C34																																				
C34-C40																																				
F2-NAPHTHALENE		346	111	<150	75	75	475	75	75	75	75	75			260	<150	207	110	108	180	190	96	70	109	70	114	70	70	77	190	120	470	170	420	330	103
C6 - C9		<2	<2	<10	5	5	5	5	5	5	5	5			<10	<10	9.2	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14		<50	<50	<50	25	25	25	25	25	25	25	25			<50	<50	16.2	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C15 - C28		346	111	<100	50	50	450	50	50	50	50	50			210	<100	190.7	90	88	160	170	76	<50	89	<50	94	<50	<50	57	170	100	450	150	400	310	83
C29-C36		238	<100	240	50	50	240	50	50	50	50	50			230	<100	123.7	<50	56	190	81	<50	<50	75	<50	51	<50	<50	<50	120	<50	200	110	230	140	<50
>C10 - C36 (Sum of total)		609	186	240	125	125	715	125	125	125	125	125																								
C10 - C40 (Sum of total)																																				
C6-C10 less BTEX (F1)		49.2	49.2	<60	27	27	30	30	30	30	30	30			<60	<60	25.4	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
C6-C10		<52	<52	<60	30	30	30	30	30	30	30	30			<60	<60	25.4	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
BTEX																																				
Benzene		<0.2	<0.2		<0.5	<0.5												<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene		<0.2	<0.2		<0.5	<0.5												<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene		<0.2	<0.2		<0.5	<0.5												<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene (m & p)																																				
Xylene (o)																																				
Xylene Total		<0.2	<0.2		<1.5	<1.5												<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
PAH/Phenols																																				
Total Positive PAHs		148.8	33.3	322	4	29.3	322.25	9.3	7.8	4	4	45.15			262	18.1	129.5	40.3	38.6	35.8	81.5	20.3	19.2	19.1	30.1	36.1	32.3	5.01	29	58.9	41.9	124.6	53.8	219.7	279.3	53
Acenaphthene		1.5	0.25															0.6	0.2	0.2	1	<0.1	0.2	<0.1	0.1	0.2	0.1	<0.1	0.2	0.7	0.2	1.2	0.5	2.4	1.8	0.2
Acenaphthylene		1.1	0.25															0.3	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.3	0.3	<0.1	0.2	0.3	0.5	1.5	0.4	0.6	0.9	0.5
Anthracene		5.1	0.8															1.1	0.8	0.8	4.5	0.8	0.5	0.5	0.7	0.9	0.6	0.1	0.7	2	0.9	3.6	1.4	6.3	7	1.1
Benz(a)anthracene		10.9	2.6															2.8	2.9	2.2	5.3	1.6	1.4	1.4	2.2	2.6	2.5	0.4	2.1	4	3.5	9.2	4.1	13	15	4.5
Benzo(a) pyrene		10.2	2.5	22	125	1.2	22	0.7	0.5	0.25	0.25	3.5			17	1.7	6.45	2.6	3.2	2.8	5.4	1.2	1.4	1.6	2.5	2.8	2.9	0.41	2.4	3.9	3.8	7.1	4.2	13	15	4.4
Benzo[b+j]fluoranthene		11.5	2.7															4.4	5.2	4.5	8.6	2.1	2.3	2.6	4	4.7	4.3	0.6	3.8	6.2	5.5	12	6.9	19	21	6.6
Benzo(g,h,i)perylene		7.6	2															1.8	2.5	2.7	4	0.6	1.1	1.2	2	2.3	2.1	0.3	1.9	2.8	2.5	4.1	3.2	8.4	9.3	2.7
Carcinogenic PAHs (as BaP TEQ)		14.822	3.473	22	125	1.2	22	0.7	0.5	0.25	0.25	3.5			17	1.7	6.45	3.812	4.682	4.129	8.019	1.839	2.083	2.315	3.71	4.147	4.212	0.546	3.488	5.715	5.485	10.814	6.219	18.874	21.593	6.442
Chrysene		9.2	2.3															2.4	2.7	2.2	4.9	1.3	1.2	1.3	2	2.4	2.1	0.3	1.9	3.7	3	8.3	3.7	10	13	3.5
Dibenz(a,h)anthracene		1.6	0.25															0.3	0.4	0.4	0.8	0.2	0.2	0.2	0.4	0.4	0.4	<0.1	0.3	0.5	0.5	1.1	0.6	1.7	1.9	0.6
Fluoranthene		28.8	6.9															8.3	7.5	6.8	16	4.2	4	3.8	6.1	7.3	6.4	1.1	5.7	12	8	35	11	52	70	11
Fluorene		1.3	0.25															0.6	0.2	0.3	1.2	0.3	0.1	0.1	0.2	0.2	0.1	<0.1	0.2	0.8	0.2	0.5	0.5	2.2	2.3	0.3
Indeno(1,2,3-c,d)pyrene		6.9	1.7															1.5	2.2	2.1	3.4	0.5	0.9	0.9	1.5	1.7	1.9	0.3	1.6	2.3	2.3	3.7	2.5	7.9	8.7	2.7
Naphthalene	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25						0.2	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.3	<0.1	0.2	0.4	0.3
Phenanthrene		20.2	2.9															6.1	3.3	3.7	11	3.6	2.1	1.7	2.6	3.5	2.5	0.4	2.5	8.6	3.2	17	5.5	35	52	4.8
Pyrene		28.7	6.7															7.3	7.2	6.7	15	3.6	3.7	3.6	5.6	6.8	6.1	1.1	5.5	11	7.7	20	9.3	48	61	10
Polychlorinated biphenyls																																				
PCBs (Sum of total)																																				
Arochlor 1016																																				
Arochlor 1221																																				
Arochlor 1232																																				
Arochlor 1242																																				
Arochlor 1248																																				
Arochlor 1254																																				
Arochlor 1260																																				
Organochlorine pesticides																																				
Endosulfan					<0.05	<0.05																														
4,4-DDE																																				
a-BHC																																				
Aldrin																																				
Aldrin + Dieldrin					<0.05	<0.05																														
b-BHC																																				
Chlordane (cis)																																				
Chlordane (trans)																																				
d-BHC																																				
DDD																																				
DDT					<0.2	<0.2																														
DDT+DDE+DDD																																				
Dieldrin																																				
Endosulfan I																																				
Endosulfan II																																				
Endosulfan sulphate																																				
Endrin																																				
Endrin aldehyde																																				
g-BHC (Lindane)																																				
Heptachlor																																				
Heptachlor epoxide																																				
Hexachlorobenzene																																				
Methoxychlor					<0.2	<0.2																														
Organophosphorous Pesticides																																				
Azinophos methyl																																				
Bromophos-ethyl																																				
Chlorpyrifos																																				
Chlorpyrifos-methyl																																				
Diazinon																																				
Dichlorvos																																				
Dimethoate																																				
Ethion																																				
Fenitrothion																																				
Malathion																																				
Parathion																																				
Ronnel																																				
Pesticides																																				
Moderately Harmful Pesticides (total)																																				
Pesticides (total, NSW Waste 2014)																																				
Scheduled chemicals (NSW Waste 2014)																																				
Asbestos Identification																																				

Notes to Table:

Env Stds Description

NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs.

NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs

When calculating "F2-NAPTHALENE", PQL values were used as a total values if the total concentration of C10-C14 and/or C15-C28 and/or napthalene were below PQL. If there was no value for napthalene or the value was <PQL, it was omitted from the calculation. Both of these approaches overestimate the true "F2 NAPTHALENE" and thus are considered conservative.

When Calculating C6-C10, C6-C9 was added to C10-C14. PQL values were used as a total values if the total concentration of C6-C9 and/or C10-C14 were below PQL. The result is therefore likely to overestimate results and are considered to be conservative.

When calculating Carcinogenic PAHs (as BaP TEQ), individual PAH species results from reports preceeding the DP 2008 Waste Classification report were used (where available) to calulate B(a)P TEQ. Where individual species concentrations werent available B(a)P concentrations have been reported. As all individual species were not available the BaP TEQ values reported could be underestimated.

KEY (for consultant reports)

DP WC 2008	Douglas Partners - Waste Classification, 2008
RCA CI 2004	RCA - Contamination Investigation, 2004
RCA IRAP 2004	RCA - Implementation of Remedial Action Plan, 2004
RCA VR 2004	RCA - Validation Results, 2004
PKK ESA 2002	PPK - Environmental Site Assessment, 2002

Table B1 - Summary of Previous Soil Analysis (soils remaining on site)

Analyte	Units	PQL	NSW EPA 2014 - General Solid Waste CT1 (No TCLP)	NSW EPA 2014 - Restricted Solid Waste CT2 (No TCLP)	NEPM 2013 ESLs Res/Open Space Aged	NEPM 2013 ESLs Comm/Ind Aged	NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil	NEPM 2013 Table 1A(1) HILs Res B Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
Sample ID																										
Depth (m)																										
Layer												0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m		
Chemical Characteristics																										
pH																										
Metals																										
Arsenic	mg/kg	4	**100**	400	100	160		3	500	300	3000															
Beryllium	mg/kg	1	**20**	80					90	90	500															
Boron	mg/kg	3							40000	20000	300000															
Cadmium	mg/kg	0.4	**20**	80					150	90	900															
Chromium (III+VI)	mg/kg	1	**100**	400	190	320			500	300	3600															
Copper	mg/kg	1			80	110			30000	17000	240000															
Iron	mg/kg	1																								
Lead	mg/kg	1	**100**	400	1100	1800			1200	600	1500															
Manganese	mg/kg	1							14000	19000	60000															
Mercury	mg/kg	0.1	**4**	16					120	80	730															
Molybdenum	mg/kg	1	**100**	400																						
Nickel	mg/kg	1	**40**	160	20	30			1200	1200	6000															
Selenium	mg/kg	2	**20**	80					1400	700	10000															
Zinc	mg/kg	1			250	350			60000	30000	400000															
TPH																										
C10-C16	mg/kg	50																						1000	1000	
C16-C34	mg/kg	100					300	1700																2500	3500	
C34-C40	mg/kg	100					2800	3300																10000	10000	
F2-NAPHTHALENE	mg/kg	50					120	170				110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL			
C6 - C9	mg/kg	25	**650**	2600																						
C10 - C14	mg/kg	50																								
C15 - C28	mg/kg	100																								
C29-C36	mg/kg	100																								
=C10 - C36 (Sum of total)	mg/kg		**10000**	40000																						
C10 - C40 (Sum of total)	mg/kg	50																								
C6-C10 less BTEX (F1)	mg/kg	25					180	215				45	70	110	200	NL	NL	NL	NL	260	370	630	NL			
C6-C10	mg/kg	25																						700	700	
BTEX																										
Benzene	mg/kg	0.2	**10**	40			50	75				0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3			
Ethylbenzene	mg/kg	1	**600**	2400			70	165				55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL			
Toluene	mg/kg	0.5	**288**	1152			85	135				160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL			
Xylene (m & p)	mg/kg	2																								
Xylene (o)	mg/kg	1																								
Xylene Total	mg/kg	1	**1000**	4000			105	180				40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL			
PAH/Phenols																										
Total Positive PAHs	mg/kg	0.05	**200**	800					400	300	4000															
Acenaphthene	mg/kg	0.1																								
Acenaphthylene	mg/kg	0.1																								
Anthracene	mg/kg	0.1																								
Benz(a)anthracene	mg/kg	0.1																								
Benzo(a) pyrene	mg/kg	0.5	**0.8**	3.2			0.7	1.4																		
Benzo(b+j)fluoranthene	mg/kg	0.2																								
Benzo(g,h,i)perylene	mg/kg	0.1																								
Carcinogenic PAHs (as BaP TEQ)									4	3	40															
Chrysene	mg/kg	0.1																								
Dibenz(a,h)anthracene	mg/kg	0.1																								
Fluoranthene	mg/kg	0.1																								
Fluorene	mg/kg	0.1																								
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																								
Naphthalene	mg/kg	0.1			170	370						3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL			
Phenanthrene	mg/kg	0.1																								
Pyrene	mg/kg	0.1																								
Polychlorinated biphenyls																										
PCBs (Sum of total)	mg/kg	0.1	**49.9999**	49.9999					1	1	7															
Arochlor 1016	mg/kg	0.1																								
Arochlor 1221	mg/kg	0.1																								
Arochlor 1232	mg/kg	0.1																								
Arochlor 1242	mg/kg	0.1																								
Arochlor 1248	mg/kg	0.1																								
Arochlor 1254	mg/kg	0.1																								
Arochlor 1260	mg/kg	0.1																								
Organochlorine pesticides																										
Endosulfan	mg/kg		**60**	240					400	340	2000															
4,4-DDE	mg/kg	0.1																								
a-BHC	mg/kg	0.1																								
Aldrin	mg/kg	0.1																								
Aldrin + Dieldrin	mg/kg								10	10	45															
b-BHC	mg/kg	0.1																								
Chlordane (cis)	mg/kg	0.1																								
Chlordane (trans)	mg/kg	0.1																								
d-BHC	mg/kg	0.1																								
DDD	mg/kg	0.1																								
DDT	mg/kg	0.1			180	640																				
DDT+DDE+DDD	mg/kg	0.1							600	400	3600															
Dieldrin	mg/kg	0.1																								
Endosulfan I	mg/kg	0.1																								
Endosulfan II	mg/kg	0.1																								
Endosulfan sulphate	mg/kg	0.1																								
Endrin	mg/kg	0.1							20	20	100															
Endrin aldehyde	mg/kg	0.1																								
g-BHC (Lindane)	mg/kg	0.1																								
Heptachlor	mg/kg	0.1							10	10	50															
Heptachlor epoxide	mg/kg	0.1																								
Hexachlorobenzene	mg/kg	0.1							15	10	80															
Methoxychlor	mg/kg	0.1							500	400	2500															
Organophosphorous Pesticides																										
Azinophos methyl	mg/kg	0.1																								
Bromophos-ethyl	mg/kg	0.1																								
Chlorpyrifos	mg/kg	0.1	**4**	16					340	250	2000															
Chlorpyrifos-methyl	mg/kg	0.1																								
Diazinon	mg/kg	0.1																								
Dichlorvos	mg/kg	0.1																								
Dimethoate	mg/kg	0.1																								
Ethion	mg/kg	0.1																								
Fenitrothion	mg/kg	0.1																								
Malathion	mg/kg	0.1																								
Parathion	mg/kg	0.1																								
Ronnel	mg/kg	0.1																								
Pesticides																										
Moderately Harmful Pesticides (total)	mg/kg		**250**	1000																						
Pesticides (total, NSW Waste 2014)	mg/kg																									
Scheduled chemicals (NSW Waste 2014)	mg/kg		**49.999**	49.999																						
Asbestos Identification	g/kh	0.1							D	D	D															

Analyte	DP WC 2008						DP WC 2008	DP4	PKK ESA 2002	DP WC 2008		PKK ESA 2002					RCA CI 2004	RCA IRAP 2004				V1	V2	V3	VQ1	V4	V5	V6	V7	V8	V9	V10	VQ1-1	V11	V12	V13	V14	V15
Sample ID	DP10	DP10	DP11	DP12	DP13	DP13	DP2	DP4	LSBH08	DP6	DP9	LSBH05	LSBH06	LSBH08	LSTP16	LSTP16	RCA4-3	RCA1-4	RCA4-2	RCA10-5	Q5																		
Depth (m)	0.3-0.5	1.3-1.5	0.3-0.5	0-0.1	0-0.1	0.8-1.0	1.8-1.9	1.7-1.9	1	1.3-1.5	1.3-1.5	2.5	4	1	0.5	0.5	2.7-2.8	2.0-2.1	2.7-2.8	1.9-2.0	1.9-2.0																		
Layer	L1	L1	L1	L1	L1	L1	L3	L3	L4	L4	L4	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5
Chemical Characteristics																																						
pH																																						
Metals																																						
Arsenic	10	13	9	4	7	7	30	12	10	8	6				4	4		3	1	2	2	2							2		4			2		2			5
Beryllium	-	-	-	-	-	-																																
Boron	-	-	-	-	-	-																																
Cadmium	1.2	1.7	0.91	<0.3	0.4	0.4	9.6	3.3	1	1.8	0.6	1	<0.5	1	<0.5	<0.5		<0.1	<0.1	<0.1	<0.1	<0.1							<0.1		<0.1			<0.1		<0.1			0.4
Chromium (III+VI)	6.2	8	11	3.6	5.7	5.2	22	9.3	9	4.5	5.6	7	<5	9	3	3		<1	<1	1	1	1							1		1			<1		1			2
Copper	55	97	48	18	35	30	230	92		24	52	40	2	69	11	11		2	2	2	2	10							10		11			2		2			23
Iron	-	-	-	-	-	-																																
Lead	**170**	**330**	95	37	53	57	**710**	**290**	**151**	72	**110**	**147**	3	**151**	22	22		2	6	<2	<2	6							11		14			<2		<2			63
Manganese	-	-	-	-	-	-			399			161	11	399	273	273																						
Mercury	0.22	0.21	0.09	<0.05	0.08	0.07	0.29	0.15	0.1	0.05	0.14	0.1	<0.1	0.1	<0.1	<0.1		<0.05	<0.05	<0.05	<0.05	<0.05							<0.05		<0.05			<0.05		<0.05			<0.05
Molybdenum	-	-	-	-	-	-																																
Nickel	5.6	9.2	18	2.9	5.4	4.2	37	14	7	12	7.9	4	<1	7	3	3		<1	<1	<1	<1	1							1		1			<1		<1			3
Selenium	-	-	-	-	-	-																																
Zinc	280	490	220	94	110	99	1500	810	258	500	150	286	5	258	29	29		<5	10	5	8	16							31		25			6		<5			180
TPH																																						
C10-C16																																						
C16-C34																																						
C34-C40																																						
F2-NAPHTHALENE	77	130	117	70	98	339	40	40		89	70						150	75	150	75	75	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
C6 - C9	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20						<10	5	<10	5	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C14	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20						<50	25	<50	25	25	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28	57	110	97	<50	78	320	<50	250		69	<50						<100	50	<100	50	50	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36	<50	51	52	<50	<50	95	<50	290		<50	<50						<100	50	<100	50	50	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
=C10 - C36 (Sum of total)																		125		125	125																		
C10 - C40 (Sum of total)																																						
C6-C10 less BTEX (F1)	37	37	37	37	37	37	37	37		37	37						<60	27	<60	30	30	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60
C6-C10	<40	<40	<40	<40	<40	<40	<40	<40		<40	<40						<60	30	<60	30	30	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60
BTEX																																						
Benzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5							<0.5																				
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5							<0.5																				
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5							<0.5																				
Xylene (m & p)																																						
Xylene (o)																																						
Xylene Total	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5							<1.5																				
PAH/Phenols																																						
Total Positive PAHs	33.3	63.2	60.1	21.3	44.6	**215.2**	12.11	10.76		26.5	7.82						4.8	4	1.3	4	4.5	3.2	7.4	1.6	5.9	0.5	9.8	1	<0.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	66.4	<0.5	5.4
Acenaphthene	0.2	0.9	0.2	<0.1	0.2	4.4	0.1	<0.1		0.1	<0.1																											
Acenaphthylene	0.2	0.3	0.5	0.3	0.6	0.6	0.1	<0.1		0.1	0.1																											
Anthracene	0.7	2.2	1.1	0.3	0.9	10	0.3	0.2		0.6	0.1																											
Benz(a)anthracene	2.4	4.3	4.7	1.9	3.8	13	0.8	0.8		1.9	0.7																											
Benzo(a) pyrene	**2.9**	**4.5**	**5.1**	**2.2**	**4**	**12**	**0.91**	0.76		**2**	0.72						<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.8	<0.5	0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**4.8**	<0.5	0.5
Benzo(b+j)fluoranthene	4.2	6.5	7.5	3.3	6	17	1.5	1.4		3.3	1.1																											
Benzo(g,h,i)perylene	2.1	2.9	3.6	1.4	2.2	6.2	0.7	0.5		1.5	0.4																											
Carcinogenic PAHs (as BaP TEQ)	4.192	6.526	7.323	3.179	5.865	17.299	1.315	1.143		2.982	1.05						<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.8	<0.5	0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	0.5
Chrysene	2.1	3.7	3.7	1.5	3.3	9.7	0.8	0.8		1.7	0.6																											
Dibenz(a,h)anthracene	0.4	0.6	0.6	0.3	0.6	1.5	0.1	0.1		0.3	0.1																											
Fluoranthene	6.6	13	13	4.2	9.3	49	2.4	2.3		5.7	1.6																											
Fluorene	0.2	0.7	0.3	<0.1	0.2	3.8	0.1	<0.1		<0.1	<0.1																											
Indeno(1,2,3-c,d)pyrene	1.9	2.8	3.3	1.3	2.3	6.4	0.6	0.5		1.3	0.4																											
Naphthalene	<0.1	0.1	0.1	<0.1	0.1	0.6	<0.1	<0.1		<0.1	<0.1							0.25		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Phenanthrene	3.1	8.7	4.4	0.7	2.7	39	1.4	1.3		2.7	0.5																											
Pyrene	6.3	12	12	3.9	8.4	42	2.3	2.1		5.3	1.5																											
Polychlorinated biphenyls																																						
PCBs (Sum of total)																																						
Arochlor 1016																																						
Arochlor 1221																																						
Arochlor 1232																																						
Arochlor 1242																																						
Arochlor 1248																																						
Arochlor 1254																																						
Arochlor 1260																																						
Organochlorine pesticides																																						
Endosulfan																		0.025																				
4,4-DDE																																						
a-BHC																																						
Aldrin																																						
Aldrin + Dieldrin																		0.05																				
b-BHC																																						
Chlordane (cis)																																						
Chlordane (trans)																																						
d-BHC																																						
DDD																																						
DDT																		0.1																				
DDT+DDE+DDD																																						
Dieldrin																																						
Endosulfan I																																						
Endosulfan II																																						
Endosulfan sulphate																																						
Endrin																																						
Endrin aldehyde																																						
g-BHC (Lindane)																																						
Heptachlor																																						
Heptachlor epoxide																																						
Hexachlorobenzene																																						
Methoxychlor																		0.1																				
Organophosphorous Pesticides																																						
Azinophos methyl																																						
Bromophos-ethyl																																						
Chlorpyrifos																																						
Chlorpyrifos-methyl																																						
Diazinon																																						
Dichlorvos																																						
Dimethoate																																						
Ethion																																						
Fenitrothion																																						
Malathion																																						
Parathion																																						
Ronnel																																						
Pesticides																																						
Moderately Harmful Pesticides (total)																																						
Pesticides (total, NSW Waste 2014)																																						
Scheduled chemicals (NSW Waste 2014)																																						
Asbestos Identification																																						

Notes to Table:

Env Stds Description

NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs.

NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs

When calculating "F2-NAPTHALENE", PQL values were used as a total values if the total concentration of C10-C14 and/or C15-C28 and/or napthalene were below PQL. If there was no value for napthalene or the value was <PQL, it was omitted from the calculation. Both of these approaches overestimate the true "F2 NAPTHALENE" and thu conservative.

When Calculating C6-C10, C6-C9 was added to C10-C14. PQL values were used as a total values if the total concentration of C6-C9 and/or C10-C14 were below PQL. The result is therefore likely to overestimate results and are considered to be conservative.

When calculating Carcinogenic PAHs (as BaP TEQ), individual PAH species results from reports preceeding the DP 2008 Waste Classification report were used (where available) to calulate B(a)P TEQ. Where individual species concentrations werent available B(a)P concentrations have been reported. As all individual species were not availabl reported could be underestimated.

KEY (for consultant reports)

DP WC 2008	Douglas Partners - Waste Classification, 2008
RCA CI 2004	RCA - Contamination Investigation, 2004
RCA IRAP 2004	RCA - Implementation of Remedial Action Plan, 2004
RCA VR 2004	RCA - Validation Results, 2004
PKK ESA 2002	PPK - Environmental Site Assessment, 2002

Table B1 - Summary of Previous Soil Analysis (soils remaining on site)

Analyte	Units	PQL	NSW EPA 2014 - General Solid Waste CT1 (No TCLP)	NSW EPA 2014 - Restricted Solid Waste CT2 (No TCLP)	NEPM 2013 EILs Res/Open Space Aged	NEPM 2013 EILs Comm/Ind Aged	NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil	NEPM 2013 Table 1A(1) HILs Res B Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
												0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m		
Chemical Characteristics																									
pH																									
Metals																									
Arsenic	mg/kg	4	**100**	400	100	160		3	500	300	3000														
Beryllium	mg/kg	1	**20**	80					90	90	500														
Boron	mg/kg	3							40000	20000	300000														
Cadmium	mg/kg	0.4	**20**	80					150	90	900														
Chromium (III+VI)	mg/kg	1	**100**	400	190	320			500	300	3600														
Copper	mg/kg	1			80	110			30000	17000	240000														
Iron	mg/kg	1																							
Lead	mg/kg	1	**100**	400	1100	1800			1200	600	1500														
Manganese	mg/kg	1							14000	19000	60000														
Mercury	mg/kg	0.1	**4**	16					120	80	730														
Molybdenum	mg/kg	1	**100**	400																					
Nickel	mg/kg	1	**40**	160	20	30			1200	1200	6000														
Selenium	mg/kg	2	**20**	80					1400	700	10000														
Zinc	mg/kg	1			250	350			60000	30000	400000														
TPH																									
C10-C16	mg/kg	50																						1000	1000
C16-C34	mg/kg	100					300	1700																2500	3500
C34-C40	mg/kg	100					2800	3300																10000	10000
F2-NAPHTHALENE	mg/kg	50					120	170				110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL		
C6 - C9	mg/kg	25	**650**	2600																					
C10 - C14	mg/kg	50																							
C15 - C28	mg/kg	100																							
C29-C36	mg/kg	100																							
+C10 - C36 (Sum of total)	mg/kg		**10000**	40000																					
C10 - C40 (Sum of total)	mg/kg	50																							
C6-C10 less BTEX (F1)	mg/kg	25					180	215				45	70	110	200	NL	NL	NL	NL	260	370	630	NL		
C6-C10	mg/kg	25																						700	700
BTEX																									
Benzene	mg/kg	0.2	**10**	40			50	75				0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3		
Ethylbenzene	mg/kg	1	**600**	2400			70	165				55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL		
Toluene	mg/kg	0.5	**288**	1152			85	135				160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL		
Xylene (m & p)	mg/kg	2																							
Xylene (o)	mg/kg	1																							
Xylene Total	mg/kg	1	**1000**	4000			105	180				40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL		
PAH/Phenols																									
Total Positive PAHs	mg/kg	0.05	**200**	800					400	300	4000														
Acenaphthene	mg/kg	0.1																							
Acenaphthylene	mg/kg	0.1																							
Anthracene	mg/kg	0.1																							
Benz(a)anthracene	mg/kg	0.1																							
Benzo(a) pyrene	mg/kg	0.5	**0.8**	3.2			0.7	1.4																	
Benzo[b+j]fluoranthene	mg/kg	0.2																							
Benzo(g,h,i)perylene	mg/kg	0.1																							
Carcinogenic PAHs (as BaP TEQ)	mg/kg								4	3	40														
Chrysene	mg/kg	0.1																							
Dibenz(a,h)anthracene	mg/kg	0.1																							
Fluoranthene	mg/kg	0.1																							
Fluorene	mg/kg	0.1																							
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																							
Naphthalene	mg/kg	0.1			170	370						3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL		
Phenanthrene	mg/kg	0.1																							
Pyrene	mg/kg	0.1																							
Polychlorinated biphenyls																									
PCBs (Sum of total)	mg/kg	0.1	**49.9999**	49.9999					1	1	7														
Arochlor 1016	mg/kg	0.1																							
Arochlor 1221	mg/kg	0.1																							
Arochlor 1232	mg/kg	0.1																							
Arochlor 1242	mg/kg	0.1																							
Arochlor 1248	mg/kg	0.1																							
Arochlor 1254	mg/kg	0.1																							
Arochlor 1260	mg/kg	0.1																							
Organochlorine pesticides																									
Endosulfan	mg/kg		**60**	240					400	340	2000														
4,4-DDE	mg/kg	0.1																							
a-BHC	mg/kg	0.1																							
Aldrin	mg/kg	0.1																							
Aldrin + Dieldrin	mg/kg								10	10	45														
b-BHC	mg/kg	0.1																							
Chlordane (cis)	mg/kg	0.1																							
Chlordane (trans)	mg/kg	0.1																							
d-BHC	mg/kg	0.1																							
DDD	mg/kg	0.1																							
DDT	mg/kg	0.1			180	640																			
DDT+DDE+DDD	mg/kg	0.1							600	400	3600														
Dieldrin	mg/kg	0.1																							
Endosulfan I	mg/kg	0.1																							
Endosulfan II	mg/kg	0.1																							
Endosulfan sulphate	mg/kg	0.1																							
Endrin	mg/kg	0.1							20	20	100														
Endrin aldehyde	mg/kg	0.1																							
g-BHC (Lindane)	mg/kg	0.1																							
Heptachlor	mg/kg	0.1							10	10	50														
Heptachlor epoxide	mg/kg	0.1																							
Hexachlorobenzene	mg/kg	0.1							15	10	80														
Methoxychlor	mg/kg	0.1							500	400	2500														
Organophosphorous Pesticides																									
Azinophos methyl	mg/kg	0.1																							
Bromophos-ethyl	mg/kg	0.1																							
Chlorpyrifos	mg/kg	0.1	**4**	16					340	250	2000														
Chlorpyrifos-methyl	mg/kg	0.1																							
Diazinon	mg/kg	0.1																							
Dichlorvos	mg/kg	0.1																							
Dimethoate	mg/kg	0.1																							
Ethion	mg/kg	0.1																							
Fenitrothion	mg/kg	0.1																							
Malathion	mg/kg	0.1																							
Parathion	mg/kg	0.1																							
Ronnel	mg/kg	0.1																							
Pesticides																									
Moderately Harmful Pesticides (total)	mg/kg		**250**	1000																					
Pesticides (total, NSW Waste 2014)	mg/kg																								
Scheduled chemicals (NSW Waste 2014)	mg/kg		**49.999**	49.999																					
Asbestos Identification	g/kh	0.1							D	D	D														

	RCA VR 2004													
Sample ID	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29
Depth (m)														
Layer	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5
Arsenic									3				11	
Cadmium									<0.1				0.3	
Chromium (III+VI)									2				8	
Copper									6				100	
Lead									5				**160**	
Mercury									<0.05				<0.05	
Nickel									2				7	
Zinc									11				200	
F2-NAPHTHALENE	150	149	150	150	150	150	150	150	150	150	150	150	150	150
C6 - C9	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C14	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28	<100	140	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36	<100	160	<100	<100	<100	<100	100	<100	<100	<100	<100	<100	<100	<100
C6-C10 less BTEX (F1)	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60
C6-C10	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60
Total Positive PAHs	1.5	193.2	7.4	5.3	<0.5	3	77.9	7.6	18.2	<0.5	2.7	<0.5	11.5	6.9
Benzo(a) pyrene	<0.5	**14**	0.6	0.5	<0.5	0.5	**6.6**	0.7	**1.5**	<0.5	0.6	<0.5	**0.9**	0.5
Carcinogenic PAHs (as BaP TEQ)	<0.5	14	0.6	0.5	<0.5	0.5	6.6	0.7	1.5	<0.5	0.6	<0.5	0.9	0.5
Naphthalene	0.25	1.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

	RCA VR 2004													DP WC 2008						DP WC 2008
Sample ID	V32	V33	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	95% UCL	DP1	DP4	DP6	DP8	DP11	DP12	DP10
Depth (m)														1.4-1.5	2.0-2.2	1.8-2.0	1.8-2.0	1.3-1.5	0.8-1.0	1.9-2.0
Layer	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L5	L6
Arsenic								2					4.33	<3	5	7	4	<3	<3	6
Cadmium								<0.1					0.28	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1
Chromium (III+VI)								2					2.2	1	2.4	1.9	1.4	1.4	1.3	5.2
Copper								10					62.3	2.1	19	2.7	3.4	2.6	1.2	40
Lead								11					**310.4**	3	22	3	5	3	1	**110**
Mercury								<0.05					NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06
Nickel								1					2.87	0.7	1.6	1.5	1.3	1	0.8	4.4
Zinc								35					64.5	5.6	44	8.3	6.7	7.3	3.8	180
F2-NAPHTHALENE	150	150	150	150	150	150	150	150	150	150	150	150	79	70	70	70	70	70	70	70
C6 - C9	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	5.9	<20	<20	<20	<20	<20	<20	<20
C10 - C14	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	24.4	<20	<20	<20	<20	<20	<20	<20
C15 - C28	<100	<100	<100	<100	<100	<100	<100	<100	110	<100	<100	<100	54.4	<50	<50	<50	<50	<50	53	<50
C29-C36	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	54.5	<50	<50	<50	<50	<50	<50	<50
C6-C10 less BTEX (F1)	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	30.3	37	37	37	37	37	37	37
C6-C10	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	<60	30.3	<40	<40	<40	<40	<40	<40	<40
Benzene														<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene														<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene														<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene Total														<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.6
Total Positive PAHs	52.2	<0.5	2.4	37.7	<0.5	<0.5	14.4	11.5	54.1	7.3	<0.5	<0.5	54.4	1.14	1.02	<0.1	0.39	6.83	30.7	19.6
Acenaphthene														<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Acenaphthylene														<0.1	<0.1	<0.1	<0.1	0.1	0.5	0.1
Anthracene														<0.1	<0.1	<0.1	<0.1	0.1	0.4	0.5
Benz(a)anthracene														0.1	0.1	<0.1	<0.1	0.7	3.2	1.5
Benzo(a) pyrene	**4.1**	<0.5	0.5	**2.3**	<0.5	<0.5	**1.3**	0.8	**5.1**	0.6	<0.5	<0.5	**3.05**	0.14	0.12	<0.5	0.09	0.63	**2.8**	**1.7**
Benzo[b+j]fluoranthene														0.2	<0.2	<0.2	<0.2	1	4.4	2.5
Benzo(g,h,i)perylene														<0.1	<0.1	<0.1	<0.1	0.3	1.4	1.2
Carcinogenic PAHs (as BaP TEQ)	4.1	<0.5	0.5	2.3	<0.5	<0.5	1.3	0.8	5.1	0.6	<0.5	<0.5	3.05	0.17	0.13	<0.5	0.09	0.84	4.15	2.434
Chrysene														<0.1	0.1	<0.1	<0.1	0.5	2.4	1.2
Dibenz(a,h)anthracene														<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.2
Fluoranthene														0.3	0.3	<0.1	0.2	1.5	6.8	3.9
Fluorene														<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Indeno(1,2,3-c,d)pyrene														<0.1	<0.1	<0.1	<0.1	0.3	1.5	1.1
Naphthalene	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene														0.1	0.1	<0.1	<0.1	0.4	0.9	1.9
Pyrene														0.3	0.3	<0.1	0.1	1.3	6	3.6

Notes to Table:

Env Stds Description

NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs.

NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil:Management limits are applied after consideration of relevant ESLs and HSLs

When calculating "F2-NAPTHALENE", PQL values were used as a total values if the total concentration of C10-C14 and/or C15-C28 and/or napthalene were below PQL. If there was no value for napthalene or the value was <PQL, it was omitted from the calculation. Both of these approaches overestimate the true "F2 NAPTHALENE" and thu conservative.

When Calculating C6-C10, C6-C9 was added to C10-C14. PQL values were used as a total values if the total concentration of C6-C9 and/or C10-C14 were below PQL. The result is therefore likely to overestimate results and are considered to be conservative.

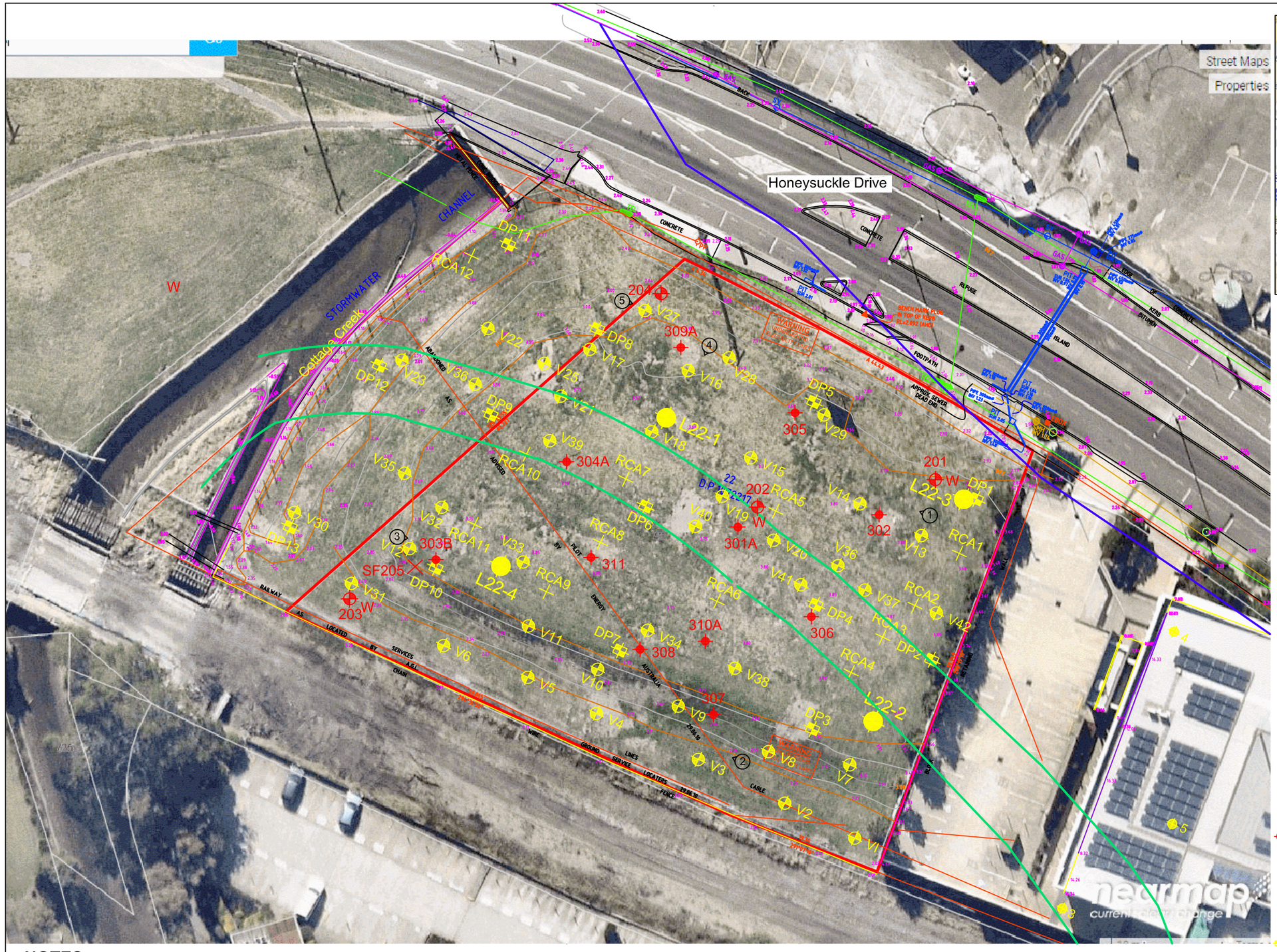
When calculating Carcinogenic PAHs (as BaP TEQ), individual PAH species results from reports preceeding the DP 2008 Waste Classification report were used (where available) to calulate B(a)P TEQ. Where individual species concentrations werent available B(a)P concentrations have been reported. As all individual species were not availabl reported could be underestimated.

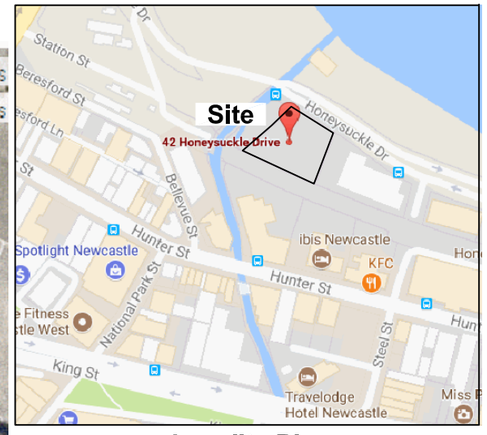
KEY (for consultant reports)

DP WC 2008	Douglas Partners - Waste Classification, 2008
RCA CI 2004	RCA - Contamination Investigation, 2004
RCA IRAP 2004	RCA - Implementation of Remedial Action Plan, 2004
RCA VR 2004	RCA - Validation Results, 2004
PKK ESA 2002	PPK - Environmental Site Assessment, 2002

Appendix B

Drawing 1 – Test Location Plan
Drawings supplied by client:
AD.03.101 Rev1 – Ground Floor Plan
C06DA Rev A – Concept Civil Works Plan (Ground Level)
C04DA Rev B – Concept Bulk Earthworks Plans
C05DA Rev V – Concept Cut / Fill Plan
Landscape Drawings – DA Design Report (Rev C)





Locality Plan

NOTES

1. Drawing adapted from plan by de Witt Consulting, Ref 7768 dated 27.07.17, Nearmap Image dated 27.7.17 and plan by BatesSmart, Ref Ground Floor Plan s12109 dated 27.09.2017.
2. Current test locations are approximate only and were located using tape measurement from existing site features and hand held GPS.

0 5 10 15 20 30 40 50m

1:500 @ A3

LEGEND

- Borehole Location (current investigation)
- W Well Installed
- Cone Penetration Test Location (current investigation)
- Surface Soil and Fibro Sample Location (current investigation)
- Previous Test Locations
- Inferred Old Channel from Historical Photos
- Site Boundary
- (10) Approximate Photo Location and Orientation

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: The Doma Group		TITLE: **Test Location Plan** **Proposed Mixed Use Development** **42 Honeysuckle Drive, Newcastle**
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: As shown	DATE: 12.04.2018	

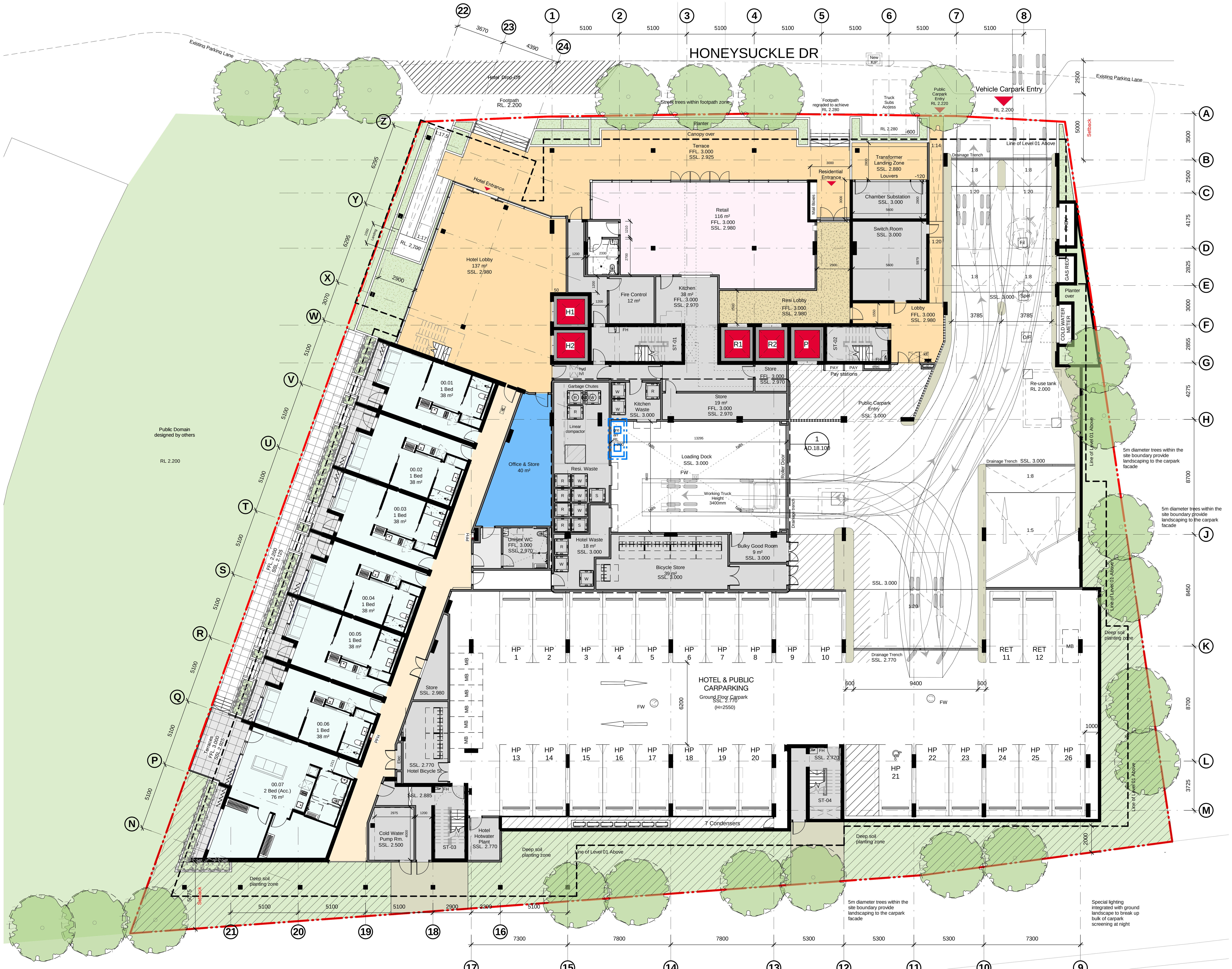
N

PROJECT No:	91181.00
DRAWING No:	1
REVISION:	D.002.Rev0

Check all dimensions and site conditions prior to commencement of any work, the purchase or ordering of any materials, fittings, plant, services or equipment and the preparation of shop drawings and or the fabrication of any components.

Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the architect for clarification.

All drawings may not be reproduced or distributed without prior permission from the architect.



HONEYSUCKLE DR
Existing Parking Lane
Vehicle Carpark Entry
RL 2.200
Street trees within footpath zone
Terrace FFL. 3.000 SSL. 2.925
Hotel Entrance
Hotel Lobby 137 m² SSL. 2.980
Retail 116 m² FFL. 3.000 SSL. 2.980
Residential Entrance
Transformer Landing Zone SSL. 2.880 Louvers
Chamber Substation SSL. 3.000
Switch Room SSL. 3.000
Resi Lobby FFL. 3.000 SSL. 2.980
Lobby FFL. 3.000 SSL. 2.980
Kitchen 38 m² FFL. 3.000 SSL. 2.970
Fire Control 12 m²
Public Domain designed by others
RL 2.200
00.01 1 Bed 38 m²
00.02 1 Bed 38 m²
00.03 1 Bed 38 m²
00.04 1 Bed 38 m²
00.05 1 Bed 38 m²
00.06 1 Bed 38 m²
00.07 2 Bed (Acc.) 76 m²
Office & Store 40 m²
Garbage Chutes
Linear compactor
Resi. Waste
Kitchen Waste SSL. 3.000
Store 19 m² FFL. 3.000 SSL. 2.970
Loading Dock SSL. 3.000
Working Truck Height 3400mm
Public Carpark Entry SSL. 3.000
Pay stations
Re-use tank RL 2.000
Hotel Waste 18 m² SSL. 3.000
Bicycle Store 39 m² SSL. 3.000
Bulky Good Room 9 m² SSL. 3.000
Unisex WC FFL. 3.000 SSL. 2.970
HOTEL & PUBLIC CARPARKING
Ground Floor Carpark SSL. 2.770 (H=2550)
Store SSL. 2.980
SSL. 2.770 Hotel Bicycle St.
Cold Water Pump Rm. SSL. 2.500
Hotel Hotwater Plant SSL. 2.770
7 Condensers
Deep soil planting zone
5m diameter trees within the site boundary provide landscaping to the carpark facade
Special lighting integrated with ground landscape to break up bulk of carpark screening at night
Line of Level 01 Above

1 Plan
Ground Floor 1 : 150

Overall Parking Schedule

Comments	Subtotal
Accessible Hotel and Public	11
Accessible Residential	6
Hotel and Public	117
Residential	87
Retail	2
Visitor	11
Total Amount	234

Ground Floor - Carspaces

Comments	Subtotal
Accessible Hotel and Public	1
Hotel and Public	23
Retail	2
Total Amount	26

Ground Floor - Motorbikes

Motorbikes	Subtotal
	6
Total Amount	6

Ground Floor - Bicycles

Bicycles	Subtotal
	47
Total Amount	47

Revision	Date	Description	Initial	Checked
2	13/04/18	ISSUE FOR DA COMMENTS	DOMA	BS
1	12/03/18	ISSUE FOR COORDINATION	DOMA	BS

42 Honeysuckle Drive
42 Honeysuckle Drive, Newcastle

General Arrangement Plan
Ground Floor Plan

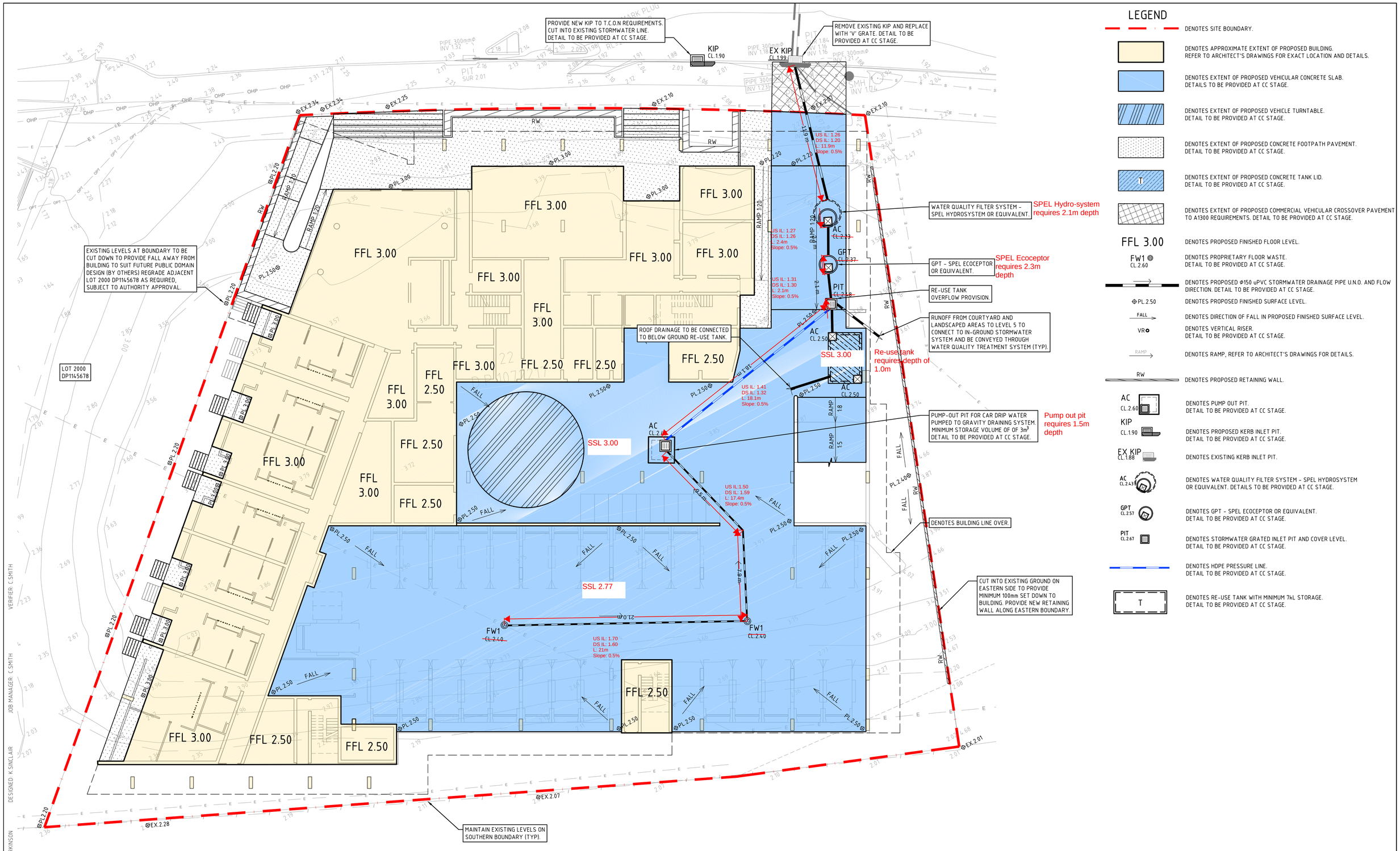
Status	DD		
Scale	1 : 150	@ A1	
Drawn	Author	Checked	Checker
Project No.	s12109		
Plot Date	12/04/2018 12:28:38 PM		
Plot File	42HONEYSUCKLEDRIVE_ARCH		
Drawing no.	AD.03.101	Revision	2

Melbourne 1 Nicholson Street
Melbourne VIC 3000 Australia
T 03 8664 6200 F 03 8664 6300
email mel@batessmart.com.au
http://www.batessmart.com.au

Sydney 43 Brisbane Street
Surry Hills NSW 2010 Australia
T 02 8354 5100 F 02 8354 5199
email syd@batessmart.com.au
http://www.batessmart.com.au

Bates Smart Pty Ltd ABN 70 004 999 400

BATESSMART™



VERIFIER C.SMITH
JOB MANAGER C.SMITH
DESIGNED K.SINCLAIR
DRAWN J.PARKINSON

FOR APPROVAL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JP	KS		29.09.17
A	ISSUED FOR DA APPROVAL	JP	KS	CS	05.10.17

CLIENT
DOMAGROUP
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
BATESSMART
THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:150 0 1.5 3 4.5 6.0 7.5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
PROPOSED DEVELOPMENT
42 Honeysuckle Drive,
Newcastle. NSW.

DRAWING TITLE
CONCEPT CIVIL WORKS PLAN - GROUND LEVEL

JOB NUMBER **NL171278**
DRAWING NUMBER **C06DA**
REVISION **A**
DRAWING SHEET SIZE = A1

LEGEND

- DENOTES SITE BOUNDARY.
- BL 2.35 — DENOTES BULK EARTHWORKS LEVEL.
- DENOTES MINOR CONTOUR.
- DENOTES MAJOR CONTOUR.
- DENOTES APPROXIMATE EXTENT OF PROPOSED BUILDING. REFER TO ARCHITECT'S DRAWINGS FOR EXACT LOCATION AND DETAILS.
- RW — DENOTES PROPOSED RETAINING WALL.
- BEL 2.30 — DENOTES PROPOSED BULK EARTHWORKS PAD LEVEL.

PROVIDE TEMPORARY 1V:1H BATTER AT LOCATION OF RETAINING WALLS (TYP).

LIFT OVER-RUN TO LIFT MANUFACTURERS SPECIFICATION (TYP). ASSUMED 1.5m OVERRUN AND 1V:1H BATTERS.

BEL 2.80

BEL 2.57

VERIFIER: C.SMITH
JOB MANAGER: C.SMITH
DESIGNED: K.SINCLAIR
DRAWN: J.PARKINSON

FOR APPROVAL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DA APPROVAL	JP	KS	CS	05.10.17
B	RE-ISSUED FOR DA APPROVAL	JP	CP	CS	11.04.18

CLIENT: DOMAGROUP

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: BATESSMART

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

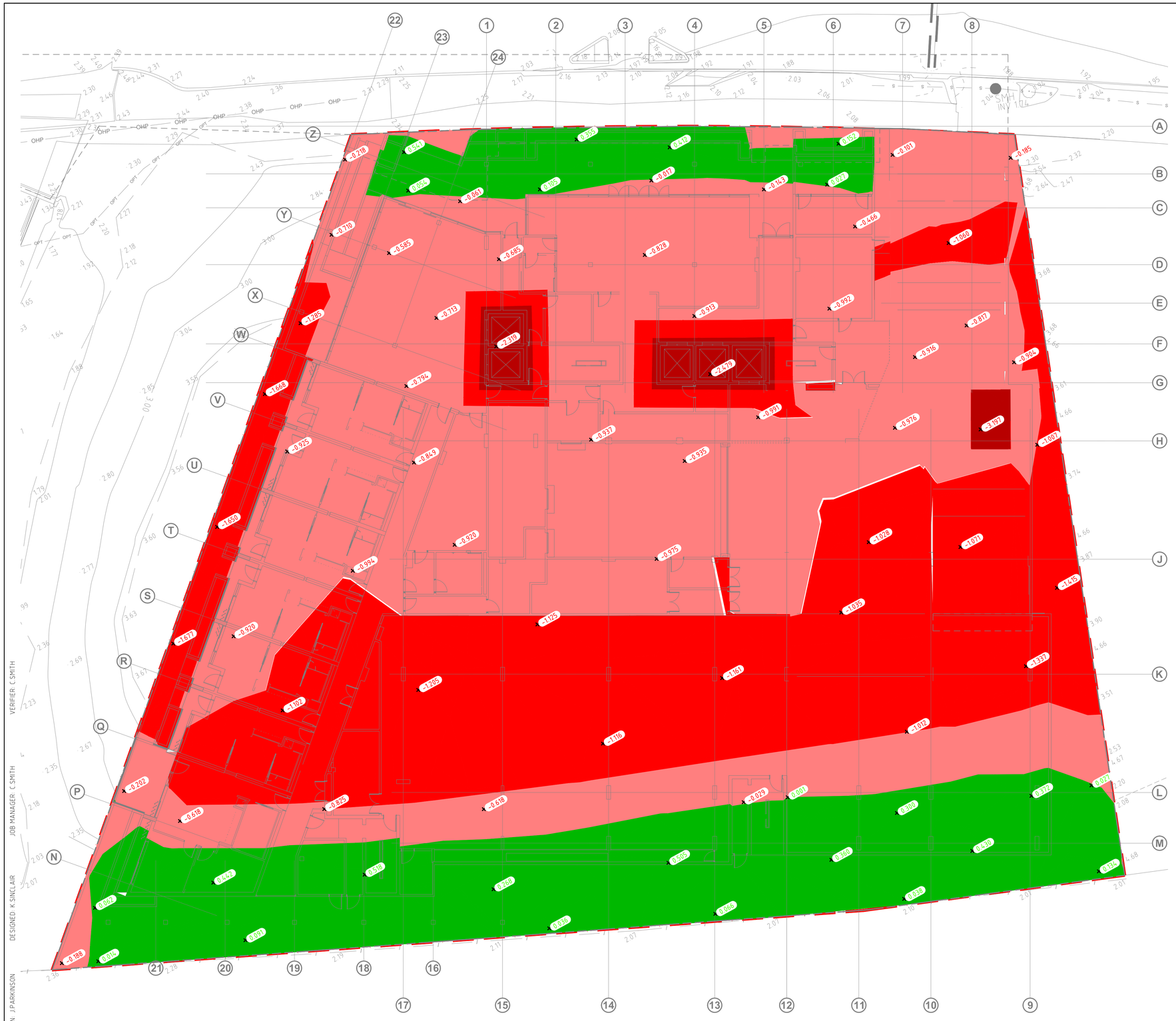
PLANS 1:150 0 1.5 3 4.5 6.0 7.5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: **PROPOSED DEVELOPMENT 42 Honeysuckle Drive, Newcastle. NSW.**

DRAWING TITLE: **CONCEPT BULK EARTHWORKS PLAN**

JOB NUMBER: **NL171278**
DRAWING NUMBER: **C04DA**
REVISION: **B**
DRAWING SHEET SIZE = A1



LEGEND

DENOTES SITE BOUNDARY.

× -0.882 DENOTES CUT SPOT HEIGHT.

× 0.882 DENOTES FILL SPOT HEIGHT.

Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-3.245	-2.000
2		-1.999	-1.000
3		-0.999	0.000
4		0.000	0.700

BULK EARTHWORKS NOTES

1. BULK EARTHWORKS LEVELS SHOWN ARE BASED ON THE PAVEMENT THICKNESSES NOMINATED ON THE CIVIL DESIGN PLANS AND THE FOLLOWING FLOOR SLAB ALLOWANCES:
   - BUILDING: 200mm
   - CARPARK: 150mm
   - FOOTPATH: 100mm

2. THE APPROXIMATE SITE EARTHWORKS VOLUMES BASED ON THE NOTED PAVEMENT THICKNESSES ARE OUTLINED BELOW:
   - CUT: 2854m³
   - FILL: 196m³
   - NET: 2658m³ (CUT)

NOTE:
THE ABOVE VOLUMES ARE BASED ON SUPPLIED SURVEY DATA AND AS SUCH ARE APPROXIMATE ONLY, THE CONTRACTOR SHALL SATISFY THEMSELVES AS TO THEIR ACCURACY.

THE ABOVE VOLUMES DO NOT INCLUDE A STRIPPING ALLOWANCE.

VERIFIER: C.SMITH
JOB MANAGER: C.SMITH
DESIGNED: K.SINCLAIR
DRAWN: J.PARKINSON

FOR APPROVAL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DA APPROVAL	JP	KS	CS	05.10.17
B	RE-ISSUED FOR DA APPROVAL	JP	CP	CS	11.04.18

CLIENT
DOMAGROUP
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
BATESSMART
THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:150 0 1.5 3 4.5 6.0 7.5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
PROPOSED DEVELOPMENT
42 Honeysuckle Drive,
Newcastle. NSW.

DRAWING TITLE
CONCEPT CUT/FILL PLAN

JOB NUMBER **NL171278**
DRAWING NUMBER **C05DA**
REVISION **B**
DRAWING SHEET SIZE = A1

6.0
Landscape Context
Planning and Opportunities

NOTE:

THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

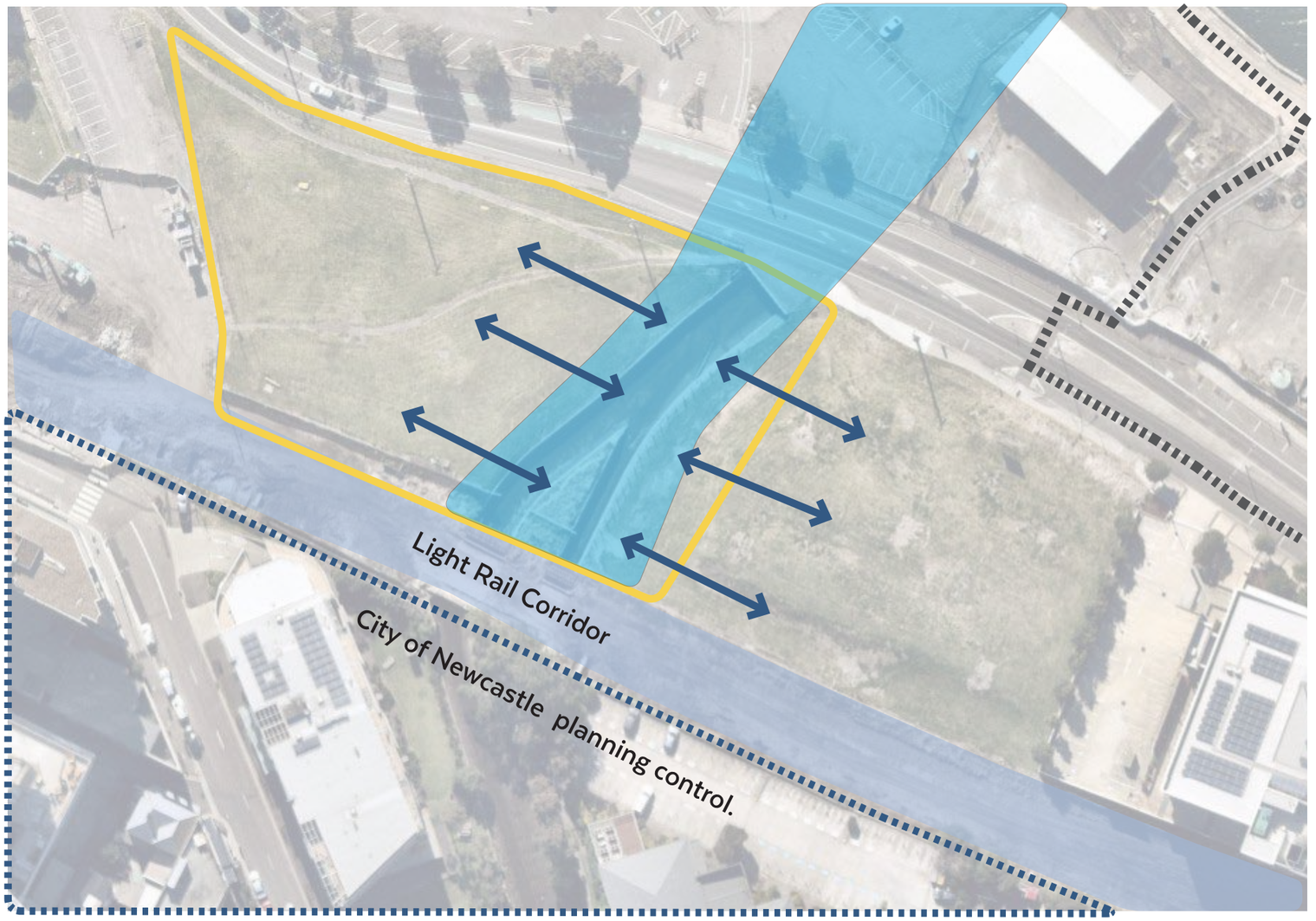
Honeysuckle Public Domain Strategy 2001

The Cottage Creek Precinct

- Rejuvenation of the canal into a hybrid, ecological, stormwater system.
- Public interaction and connection with cottage creek.
- Public domain activation with outdoor eateries and pocket parks.

Public Domain Opportunities and Currently

- Visual and physical connections to Cottage Creek.
- Streetscape improvement and quality.
- Interface with light rail corridor.



6.1
Landscape Identity
Ground Floor and Public Domain

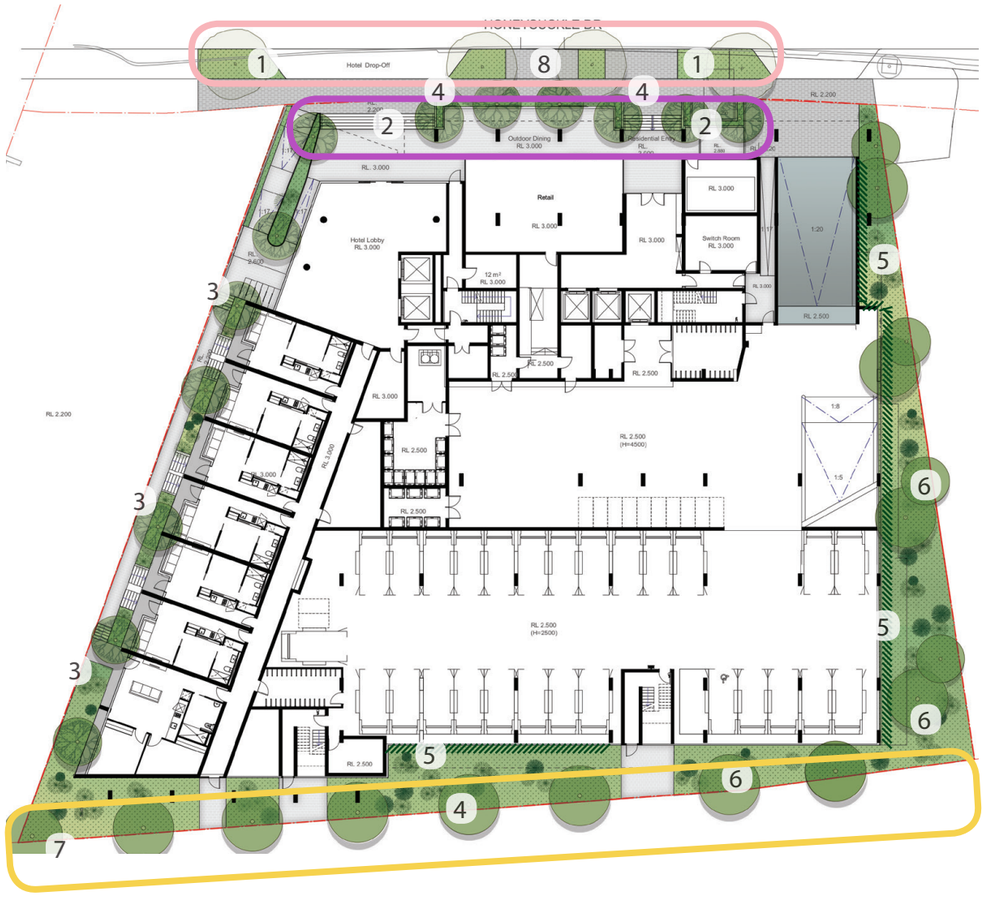
NOTE:

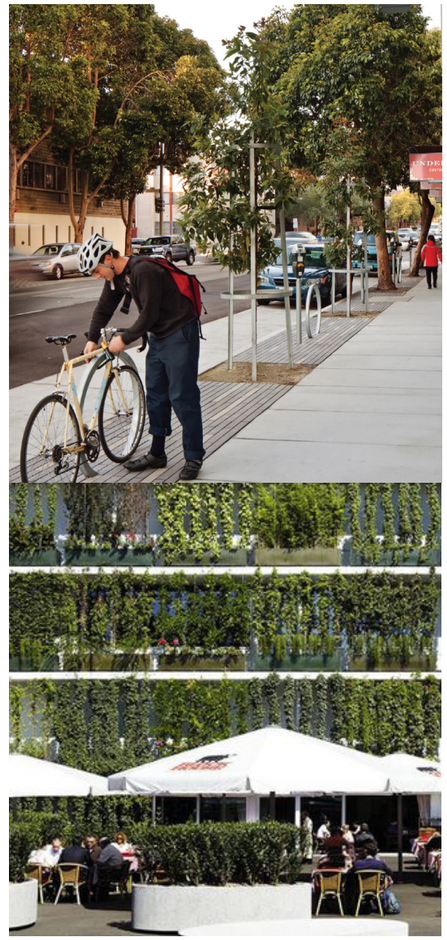
THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

Design Principles

No specific street tree or streetscape design guidelines are apparent., However there are existing streetscape treatments to take cues from. The existing concrete and paver banding will be continued for the footpaths.
The existing streetscape is harsh with little to now significant street tree planting.
Trees can be accommodated within the parking lanes, the footpaths are very narrow.
Space needs to be found for pedestrians, car parking, vehicle entries, trees and the cycleway

1. Tree planting in parking lanes to provide streetside shade within generous planted blisters.
2. Second line borrowed streetscape on the terrace including trees, greenery and shade.
3. Western planter beds to create buffer to ground floor hotel terraces.
4. Tree planting to building perimeter to frame connections to surrounding public space.
5. Green facade on eastern and southern floor.
6. Trees used for greenery but to not conceal building.
7. Meaningful potential for an engagement with the light rail.
8. Bike parking on street near crossing point to attract retail opportunity.





6.2
Landscape Identity
Concept Level 5 Courtyard

NOTE:

THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

Design Principles

- Build upon the architectural concept to create a strong sense of place and building identity.
- Respond to existing site conditions with landscape gestures that creates an attractive residential environment and a strong connection between proposed building and public domain.
- Propose robust high quality materials and finishes that are consistent with the architectural benchmarks.
- Ensure that the proposed landscape elements allows for clear permeability and circulation.
- Consider ongoing maintenance requirements of the landscape components.
- Create a communal spaces that are attractive, comfortable, and provides and uplifting everyday experience.
- Use drought and exposure tolerant planting that uses a mixture of hardy exotic and native species suitable for rooftop planting.
- Temporary nature of water in Australia
- Directing Water for a Purpose
- Access defining spaces with a function
- Water body as gathering space

6.3
Landscape Identity
Concept Level 5 Courtyard and Private Terraces

NOTE:

THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

Landscapes for different people and purpose

A diverse group of landscape spaces ranging from private terraces to large BBQ and communal spaces catering for two or more large groups.
Tree planting for privacy.

1. Garden feel to small scale spaces, including all private terraces.
2. Spaces defined with paved areas and low walls and screening.
3. A generosity of trees and planting.
4. Larger spaces for 8 or more people that provides built shade, BBQ, outlook and views.

Connection as landscape

The connections are varied in detailing and hierarchy. They have the following attributes:
Main connections run north south along grid axis

5. Minor connections east west and to help define spaces. Connections are disjointed for interest

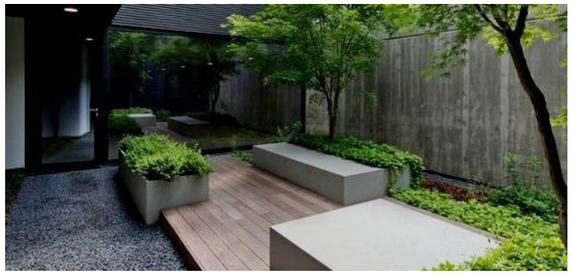
Water as foci + thresholds

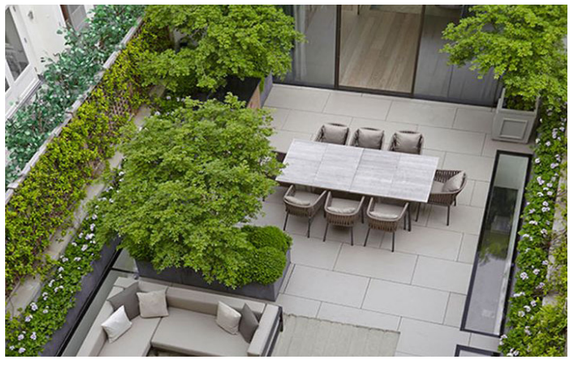
A series of water channels and basins will connect the landscape and provide intrigue. It is for aesthetic appeal as well as above ground irrigation. Other attributes include:

6. Contrast of stillness and movement. The water that is ephemeral at times
7. Main channel to run north south along grid axis

Trees to frame and shade

Opportunities for tree planting exists in both the courtyard and private spaces. A variation of native and exotic will provide contrasts in texture, foliage and filtered light.
Tree planting in the main courtyard will vary in size and form to create different characters.





6.3
Landscape Identity
Concept Level 5 Courtyard and Private Terraces

NOTE:

THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

6.4
Landscape Planting

NOTE:

THE LANDSCAPE DESIGN WILL BE UPDATED WITH DUE CONSIDERATION TO THE REQUIREMENTS FOR “SITE CAPPING” IN ACCORDANCE WITH THE APPROVED “REMEDIATION ACTION PLAN” FOR THE SITE.

Public Domain

- Medium sized exposure tolerant street trees to provide shade and greenery.
- Suggested species include locally native Syzigium leuhmanniana, S. australe or Glochidion ferdinandii
- Additional massed planting may be possible where space permits to contribute greenery on the street.

Glochidion ferdinandii

Acmena Allyns magic

Anigozanthis Bush Ranger

Lomandra Little Con

Babingtonia compacta

Green Facades and Tensioned Frames

- A number of different native vine species will be utilised depending on exposure and shade conditions.
- Tensioned systems will be proprietary,high quality 316 stainless steel cables and fittings,

Aphenopetalum resinosum

Eustrephis latifolius

Cissus antarctica

Cissus hyperglauca

Pandorea pandorana

Planting for Level 5 Courtyards and Terraces

- Tree species will be a mixture of small to medium trees that are selected for adaptability to the varied conditions.
- Tree species will be smaller in private terraces to enable views and to be of an appropriate scale.
- Low planting and shrubs will provide privacy and screening, design interest and will predominantly use local native species in clever ways to create a bold planting scheme.

Hibiscus tilaceous

Corymbia ficifolia cultivars

Banksia integrifolia Roller Coaster

Darwinia citriodora

Leucophyta brownii

6.5
Green Facade
Typical Construction Methodology