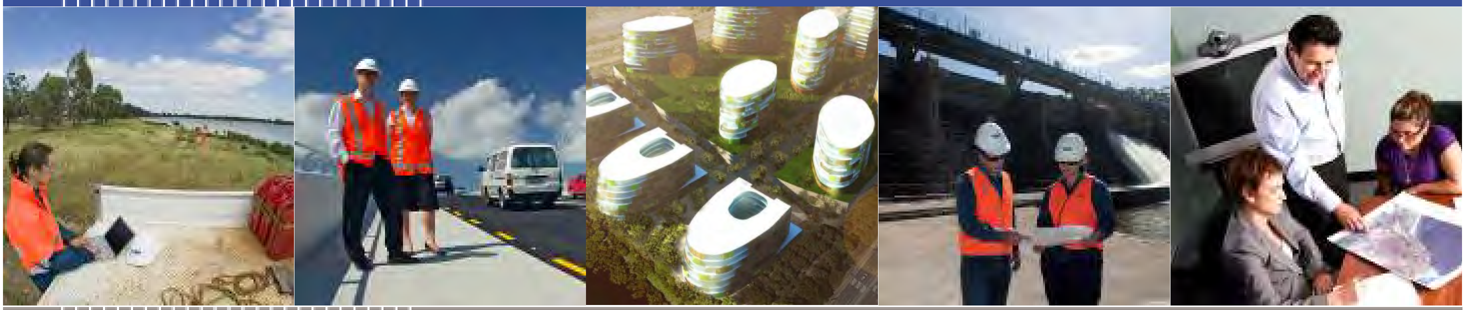

Final Report - Revision C

Remediation Action Plan

181 James Ruse Drive, Camellia, NSW

5 SEPTEMBER 2013

Prepared for

Statewide Planning Pty Ltd

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URS Proj # 43218346

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Abbreviations

Abbreviation	Description
°C	Degrees Celsius
µg/L	Micrograms per litre
ACM	Asbestos-Containing Materials
AF	Asbestos Fibres
AHD	Australian Height Datum
AMG	Australian Map Grid
ANZECC	Australian and New Zealand Environment and Conservation Council
ASLP	Australian Standard Leaching Procedure
ASS	Acid Sulfate Soils
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethyl-benzene, Xylenes
COC	Chain of Custody
COPC	Constituents of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQI	Data Quality Indicator(s)
DQO	Data Quality Objective(s)
EC	Electrical Conductivity
Eh	Redox Potential
EIL	Ecologically-based Investigation Level
ENM	Excavated Natural Material
EMP	Environmental Management Plan
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
FA	Fibrous Asbestos
FB	Field Blank (quality control sample)
GAC	Granular Activated Carbon
GAI	General Approval for Immobilisation (issued by EPA)
GIL	Groundwater Investigation Level(s)
GSW	General Solid Waste
GSW (Special Waste)	Asbestos Waste
Ha	Hectares
HIL	Health-based Investigation Level
HSE	Health, Safety and Environment
HSL	Health Screening Level(s)

Abbreviations

Abbreviation	Description
HW	Hazardous Waste
IL	Investigation Level(s)
JH	James Hardie
LCS	Laboratory Control Sample
LNAPL	Light Non-Aqueous Phase Liquid(s)
LOR	Limit of Reporting
m	metre
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
MS	Matrix Spike or Mass Spectrometry or Mass Spectra
mS	milliSiemen
MSD	Matrix Spike Duplicate
mV	milli-Volts
MW	Monitoring Well
N/A	Not Applicable
NAPL	Non-Aqueous Phase Liquid(s)
NATA	National Association of Testing Laboratories
NEPM	National Environment Protection Measure
OCPs	Organochlorine Pesticides
OPPs	Organophosphorous Pesticides
PSH	Phase-Separated Hydrocarbons (same as LNAPL)
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photo-Ionisation Detector
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
QRA	Qualitative Risk Assessment
RAP	Remediation Action Plan
RB	Rinsate Blank (quality control sample)
RPD	Relative Percentage Difference
RSW	Restricted Solid Waste
SAS	Site Audit Statement
SB	Soil Bore
SCC	Specific Contaminant Concentration (or Total Concentration)
SIA	Specific Immobilisation Approval

Abbreviations

Abbreviation	Description
SSI	Supplementary Site Investigation
SWL	Standing Water Level
TB	Trip Blank
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Level
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHS	Work Health and Safety
WWC	Woodward-Clyde

Executive Summary

Statewide Planning Pty Ltd (Statewide) commissioned URS Australia Pty Ltd (URS) to prepare this Remediation Action Plan (RAP) for remediation works to be conducted at 181 James Ruse Drive, Camellia, NSW (the site). The site has a total area of 6.095 hectares (Ha) (60,950 m^2) and can be defined as the western portion of the former James Hardie Pty Ltd (JH) manufacturing property, to the west of the Clyde to Carlingford Railway.

Past industrial site uses, which include the manufacture of asbestos-containing materials by JH, the Camellia Chemical factory close to James Ruse Drive, a drum cleaning operation in the northeast corner and a former boiler stationed close to the southeast corner, have resulted in asbestos filling across most of the site, localised, metal and hydrocarbon-impacted shallow soils, with limited occurrences of buried materials containing high concentrations of polycyclic aromatic hydrocarbons.

Localised phase-separated hydrocarbons (PSH) have also been detected in perched groundwater at the northeast corner of the site, with elevated arsenic also identified in groundwater sampled close to the western site boundary.

Statewide propose to redevelop the site for mixed land use comprising of commercial and residential apartments with basement car parking, subject to planning approval. The overall goal of remediation is to make the site suitable for the proposed land use, such that adverse health risks to future site users and the environment are mitigated and controlled in the long term.

The site is subject to a statutory site audit by a NSW EPA accredited Site Auditor under the Contaminated Land Management Act 1997 (CLM Act) and after successful completion of site remediation it is envisaged that the Site Auditor will issue a Site Audit Statement (SAS) concluding on the suitability of the land for its proposed use.

The objective of the RAP is to document the contamination status of the site, document the preferred remedial approach (or combined approaches), establish validation criteria and approach, document the legislative framework the remediation will be subject to, and document a site management plan for long term management of residual contamination.

The site is predominantly covered by a concrete and asphalt hardstand capping layer and is currently regulated by the NSW EPA under a Public Positive Covenant. This is enforced given the public health issues associated with asbestos materials that have been used to fill and level the site. The cap is to be maintained under the covenant to prevent the release of airborne asbestos materials into the environment.

Surrounding the site is the Parramatta River (north), mixed commercial/industrial (south), a rail corridor (east), and James Ruse Drive (west).

The contaminated materials and estimated quantities requiring remediation are as follows:

Material Type	Estimated Quantity (m^3)	Total Estimated Quantity (m^3)
Fill Intended for On-site Encapsulation in Containment Cell(s):		
Asbestos waste fill	67,507	
Clinker Material	683	68,190
Impacted Natural Soil to be Biologically Treated and Reused On-site:		
Hydrocarbon impacted soil	10,020	10,020

Other materials that may require remediation include localised lead and arsenic impacted soils, of which the lead impacts will require additional investigation to delineate the extent.

The preferred remedial approaches are:

- internment of fill that consists of asbestos, ash fill and clinker material within three, purpose-built, concrete containment cells that will be integrated with the proposed site redevelopment infrastructure; and
- bioremediation of hydrocarbon-impacted soils utilising biopiling or landfarming technologies, after which the soils are to be beneficially reused onsite, or buried within the containment cells.

If space is available in the containment cells, then other fill materials may also be contained.The total estimated volume of fill materials onsite is 89,000 m^3.

Impacted groundwater including impacts by PSH, dissolved phase hydrocarbons and metals, is proposed to be ameliorated through the remediation of the soil contamination sources in localised areas, with the installation of monitoring wells at strategic locations, to monitor the quality of groundwater migrating across the site boundaries. Any water accumulated in excavation pits, including impacted groundwater, will be subject to onsite treatment through a wastewater treatment system prior to reuse onsite (as dust suppression) or offsite discharge.

To refine the proposed approaches and reduce uncertainty associated with aspects of the remedial design, a program of preparatory investigative works is required. The objectives of these works are to:

- Assess the migration potential and extent of PSH and dissolved phase impacts in groundwater at the north eastern site area;
- Assess the TPH-leaching capacity of clinker material;
- Assess the extent of lead-impacted soils at the northern boundary;
- Validate in-situ materials at designated containment cell locations; and
- Implement trials to verify the proposed bioremediation approach can meet the remedial objectives.

At the time of preparing this RAP an Environmental Impact Statement (EIS) was being prepared to address conditions set under the planning approval process, including air quality, community, waste, traffic, and soil and water management.

Containment of the contaminated materials will be managed under a site specific Site Management Plan (SMP) such that contained materials can be monitored in the long term.

1

Introduction

1.1 Background

Statewide Planning Pty Ltd (Statewide) commissioned URS Australia Pty Ltd (URS) to prepare this Remediation Action Plan (RAP) for remediation works to be conducted at 181 James Ruse Drive, Camellia, NSW (the site). The site has a total area of 6.095 hectares (Ha) (60,950 m^2) covering the western portion of the former James Hardie Pty Ltd (JH) manufacturing property and is situated to the west of the Clyde to Carlingford Railway. The site is identified as No. 181 James Ruse Drive, Camellia and its location is shown on **Figure 1**.

The site has historically been used for industrial purposes, which include the manufacture of asbestos-containing materials by JH since occupying the site in the late 1950's. Waste materials were used to fill and level the site, the majority of which consisted of asbestos waste, and is approximately 4.0 m thick in some areas. The surface of the site is currently capped with concrete and bitumen hardstand.

Past industrial site uses also include a drum cleaning operation in the northeast corner and a former boiler stationed close to the southeast corner, which have resulted in localised, heavy metal and hydrocarbon-impacted shallow soils, with limited occurrences of buried clinker material containing high concentrations of polycyclic aromatic hydrocarbons. Localised phase-separated hydrocarbons have also been detected in perched groundwater at the northeast corner of the site, in the area of the former drum cleaning facility.

The site is controlled under a Public Positive Covenant by the NSW EPA given the public health issues associated with asbestos materials. The cap is to be maintained under the covenant to prevent the release of airborne asbestos materials into the environment.

Statewide propose to redevelop the site for mixed land use comprising of commercial and residential apartments with basement car parking, subject to planning approval. The overall goal of remediation is to make the site suitable for the proposed land use, such that adverse health risk to future site occupants and users, and the environment is mitigated and controlled in the long term.

The site is subject to a statutory site audit by a NSW EPA accredited Site Auditor under the Contaminated Land Management Act 1997 (CLM Act). After successful completion of site remediation the Site Auditor will issue a Site Audit Statement (SAS) concluding on the suitability of the land for its proposed use.

This RAP documents:

- the known site contamination,
- the proposed remedial works to address existing site contamination, that predominantly includes asbestos waste fill materials and hydrocarbon impacted soils;
- the method of validating the remediation work;
- the legislative requirements for approvals, site management during remediation, long term management and environmental monitoring obligations.

1.2 Objectives

Statewide wish to remediate the site such that the overall goal to make the site suitable for the proposed commercial and residential land use, can be met. As part of the overall goal the following objectives will be addressed:

- Gaining regulatory approval to undertake the remediation and redevelopment works;

- Commencing the community consultation process;
- Documenting procedures and management controls for the site remediation;
- Mitigating health risk to future site users;
- Mitigating health risk to adjoining land users; and
- Mitigating risk to sensitive environmental receptors.

1.3 Scope of Work

Statewide engaged URS to perform the following scope of work:

- Review of the previous environmental investigations and the previous RAP (as listed in **Section 2.3**);
- Liaising with all relevant stakeholders involved in the site redevelopment planning phase including the appointed Site Auditor, and various specialist consultants; and
- Preparation of an RAP in accordance with the Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 1997) including the following:
  - Documenting the contamination conditions at the site;
  - Estimating the extent and quantity of materials requiring remediation;
  - Presenting additional investigations works necessary to enable site monitoring to occur and to refine potential remedial strategies for Regulatory approval;
  - Documenting the preferred remedial approach (or combined approaches) for effective management of the contaminated materials;
  - Establishing validation criteria for soils and groundwater; and
  - Establishing a validation approach and sampling methodology, to assess that remediation has been completed in accordance with the remediation objectives.

1.4 Regulatory Framework

The RAP is prepared in accordance with the following regulatory framework:

- Environmental Planning and Assessment Act 1979 (EP&A Act);
- Contaminated Land Management Act 1997 (CLM Act);
- Protection of the Environment Operations Act 1997 (POEO Act);
- Protection of the Environment Operations (Waste) Regulations 2005 (POEO – Waste Regulations);
- State Environmental Planning Policy No.55 – Remediation of Land 1998 (SEPP55);
- State Environmental Planning Policy No.71 – Coastal Protection (SEPP71); and
- Work Health and Safety Act 2011 (WHS Act).

2

Site Overview

2.1 Site Identification

The site can be described as the western portion of the former James Hardie and Company Pty Ltd property, and is displayed on **Figure 2**. Identifying features of the site are presented in **Table 2-1**.

Defined site and lot boundaries are presented in a survey plan of the site for the purposes of this RAP in **Appendix J**.

Table 2-1 Site Identification

Item	Description
Site Owner	Summer Hill Business Estate Pty Ltd
Site Address	181 James Ruse Drive, Camellia, NSW, 2142
Local Government Authority	Parramatta City Council
Current Zoning	B5 – Business development (Parramatta City Council, LEP, 2011); and Environmental Protection Zone (NSW EPA).
Current Land Use	Vacant
Proposed Land Use	Mixed land use of Residential (apartments), and Commercial (retail).
Geographical Coordinates	317092 Easting, 6256527 Northing (Map Grid Australia [MGA] Zone 56)
Site Elevation	Between 2.5 and 6 mAHD
Site Area	6.095 Ha (refer to **Appendix J**), excludes: - Sydney Water easement (247 m^2) - the 'Handle' portion (6,889 m^2)

The Site is approximately rectangular in shape with the eastern and western boundaries of the site respectively defined by the *Clyde to Carlingford* Rail Corridor and James Ruse Drive, respectively.

The northern boundary is lined by the mangrove-covered, south bank of the Parramatta River, which is currently accessible from the rest of the site. The southern boundary is marked by the northern wall of an adjacent industrial facility, which is constructed along the southern extent of an east-west aligned access road. The southwest part of the east-west access road forms a Sydney Water sewer easement. Correspondence between Statewide and Sydney Water indicates that the easement must not be disturbed and is therefore precluded from any remedial works. More information on surrounding land uses is provided in **Section 2.2**.

It should be noted that the site area previously included a narrow driveway extending southwards from the southeast corner of the site to The Grand Avenue. This portion of the site is referred to as 'the Handle' and has been excluded from the site area for the purposes of future site redevelopment works. However, no subdivision of the site has been approved by Council to confirm that this is the case to exclude 'the Handle', as shown on the survey plan in Appendix J as the yellow highlighted parcels of land.

The site area also excludes a narrow, almost rectangular nature strip with approximate dimensions 20m by 100m, located adjacent to the north western corner of the site, immediately east of James Ruse Drive.

A list of the Lot and DP numbers for the individual land parcels making up the site were sourced from the survey plan presented in **Appendix J** and provided in **Table 2-2**.

Table 2-2 Lot and Deposited Plan Identification

Block No.	Description	Title Reference	Block No.	Description	Title reference
1	Lot 1 DP 724228	1/724228	19	Lot 3 DP 6856	3/6856
2	Lot 4 DP 128720	4/128720	20	Lot 2 DP 6856	2/6856
3	Lot 3 DP 128720	2/128720	21	Lot 1 DP 128720	1/128720
4	Lot 2 DP 128720	1/128720	22	Lot 1 DP 927064	1/927064
5	Lot 17 DP 6856	17/6856	23	Lot 1 DP 2737	1/2737
6	Lot 16 DP 6856	16/6856	24	Lot 2 DP 2737	2/2737
7	Lot 15 DP 6856	15/6856	25	Lot 3 DP 2737	3/2737
8	Lot 14 DP 6856	14/6856	26	Lot 4 DP 2737	4/2737
9	Lot 13 DP 6856	13/6856	27	Lot 5 DP 2737	5/2737
10	Lot 12 DP 6856	12/6856	28	Lot 6 DP 2737	6/2737
11	Lot 11 DP 6856	11/6856	29	Lot 7A DP 418035	7A/418035
12	Lot 10 DP 6856	10/6856	30	Lot 9A DP 418035	9A/418035
13	Lot 9 DP 6856	9/6856	31	Lot 10 DP 610228	10/610228
14	Lot 8 DP 6856	8/6856	32	Lot 2 DP 512655	2/512655
15	Lot 7 DP 6856	7/6856	33	Lot 1 DP 499552	1/499552
16	Lot 6 DP 6856	6/6856	34	Lot 25 DP 6856	25/6856
17	Lot 5 DP 6856	5/6856	35	Lot 2 DP 549496	2/549496
18	Lot 4 DP 6856	4/6856	36	Part Lot 1 DP 668318	1/668318

Note: * The site, which is the subject of this RAP, excludes the yellow highlighted parcels on the survey plan in **Appendix J**.

2.2 Surrounding Land Use

The following surrounding land uses are noted from a review of Parramatta Council's LEP 2011 (Land Zoning Map Sheet LZN_010) and from field visits completed by URS between October and December 2012.

- **North**: Immediately to the north is the south bank of the Parramatta River, zoned W2 'Recreational Waterways' and is characterised by mangrove vegetation and visible debris, including asbestos-containing material fragments. The University of Western Sydney Parramatta campus, zoned 'SP2 Educational Establishment' is located north of the river.
- **East**: Immediately to the east is the *Clyde to Carlingford* Rail Corridor, zoned 'SP2 Infrastructure' and Camellia suburban railway station, then vacant land zoned 'RE1 Public Recreation' to the east bordering the river and further to the east an industrial estate, zoned 'IN3 Heavy Industrial', which

was historically the eastern portion of the James Hardie manufacturing facility. Access to the rail corridor is prevented by a perimeter fence ‘A’ Class Hoarding.

- **South**: Mixed light industrial, retail and warehouse buildings border the site, including a Sydney Water building (possibly a pumping station), zoned as ‘B5 Business Development’ and further south, beyond to Grand Avenue are the grounds of the Rosehill Racecourse, zoned ‘R2 Private Recreation’.
- **West**: James Ruse Drive, zoned SP2 Infrastructure and then warehouses and factories, zoned ‘IN1 General Industrial’

2.3 Previous Environmental Investigations

The following reports were previously prepared for the site and provide relevant information with respect to site history, contamination sources and site characterisation. Only the reports annotated with a (*) were reviewed in preparation of this RAP.

- *Phase 1 Environmental Audit Report on the James Hardie Property, Camellia (Woodward-Clyde (WWC), 1994);
- *Phase 2 Audit Site Investigations, James Hardie – Camellia (WWC, 1995a);
- Remediation Report, James Hardie Camellia (WWC, 1995b);
- Adjacent Sites Consideration Report (WWC, 1995c);
- Contamination Management Plan, Former James Hardie Site, Grand Avenue Camellia (Australian Water Technologies (AWT), 1999);
- Voluntary Remediation and Contamination Management Plan, Former James Hardie Site, Grand Avenue, Camellia (AWT, 2000);
- Soil Sampling and Groundwater Monitoring, Former James Hardie Site, Camellia (AWT, 2001);
- Resampling of Groundwater Monitoring Wells, Former James Hardie Site, Camellia (Sydney Water, 2002);
- Resampling of Groundwater Monitoring Wells, Former James Hardie Site, Camellia (Sydney Water, 2003);
- *Sampling and Analytical Quality Plan, Soil and Groundwater Investigation, Sydney Water, Camellia Site, NSW (URS, 2005);
- *Phase 2 Environmental Site Assessment, Sydney Water Camellia, Western Site, 1 Grand Avenue (URS, 2006);
- Site Audit Report – Western Site, 1 Grand Avenue, Camellia (Environ Australia, 2006);
- Remedial Action Plan, 1 Grand Avenue, Camellia, NSW, Western Site (Environmental Investigations, 2007);
- Preliminary Geotechnical Investigation Report, 1 Grand Avenue, Camellia, NSW, Western Site (Environmental Investigations, 2009a);
- *Groundwater Assessment – Additional Investigation, 1 Grand Avenue, Camellia, NSW, Western Site (Environmental Investigations, 2009b);
- *Remedial Action Plan, Camellia West (Molino Stewart, 2011); and
- *Supplementary Site Investigation, Camellia West (URS, 2013).

2.4 Site History

Information regarding the records of previous ownership and land use at the site was sourced from the reports listed in **Section 2.3**. A summary is provided below:

1816 until 1897: The site was reported to be owned by John McArthur (WWC, 1994) and used for mixed residential and rural use.

1897 until 1960s: The land west of the Clyde-Carlingford Railway Line was divided into numerous plots, which were predominantly owned by a number of private individuals for various uses until the 1960s. Individual property owners were occupied with professions such as farmers, labourer, driver and bank officers (WWC, 1994).

1920s and 1940s: WWC (1994) reported that Walter Pezet, a chemical manufacturer, “was associated with all the lots” during the 1920s, 1930s and 1940s.

1950s and 1960s: Private ownership of lots within the site area was acquired by a number of companies, including:

- Malvern Manufacturing Company Pty Limited (1956 - 1961);
- Steward Brothers (Sunlight Cooperage) Pty Limited (1953 - 1962: Drum reconditioning, Lot 1 DP 499552, Lot 25 DP 6856 and Lot 2 DP549496);
- Rheem Australia Pty Limited (1962 -1963: Drum reconditioning, on Stewart Brothers site);
- Melae Dave Pty Limited (1962);
- Essen Engineering Pty Ltd (1961 – 1963);
- Raasey Pty Ltd; (1963)
- Camellia Chemical Company Pty Ltd (1960 – 1962: Chemical storage, Lot 16, 17 and 18 DP 6856);
- Pearce Provident Pty Ltd (1962); and
- Nelson Daw Pty Limited (1963).

1957 until 1958: Lot 201 DP 1706 was acquired by James Hardie and developed as the Decorated Boards factory, after extensive fill was introduced to the south east area of the site in the form of coal ash and asbestos, believed to be around 2 m thick, in 1958 (WWC, 1994). The Decorated Boards factory involved “zinc silicate based paint production” and curing in gas fired drying tunnels.

1959 until mid-1960: Fill was introduced to the northern portion of the site, bounding the Parramatta River and alongside the Clyde-Carlingford Railway line, with reported depth 1 m, increasing toward the river.

1962 until 1966: The remaining lots on the western side of the railway line were acquired by James Hardie and used for an asbestos store and trading store.

1971: The roads established on the site, were acquired from the RTA by James Hardie and shallow fill comprised of asbestos and coal ash was used on the roads.

1970s until 1982: Coal stockpile and ash bins were located in the south eastern portion of the site, north of the decorated Boards factory.

1983:	All asbestos manufacture ceased and James Hardie site decommissioned.
1995 until 2001:	Site buildings all demolished.
2001 - 2002:	Sydney Water took ownership of land and undertook remedial activities.
2002 - Present	Summer Hill Business Estate acquired the site in 2007.

2.5 Proposed Redevelopment Works

Statewide intend to redevelop the site for “mixed retail” and “high-rise residential” use. The redevelopment is subject to approval by the Department of Planning, under which specific conditions must be met (Director General Requirements - DGRs).

The proposed site layout for the new buildings is presented on **Figure 8**. Features of the new development include:

- 1,800 residential units;
- 30,000 m^2 of two-level commercial and retail space;
- 3,400 car parking spaces;
- Internal network of streets and access ways;
- Pedestrian links to rail infrastructure; and
- River foreshore parkland.

3

Site Conditions

Refer to the site aerial photograph presented as **Figure 2** throughout this section.

3.1 General Features and Topography

Entry to the site is through the security gates in the southwest corner off James Ruse Drive. Site sheds and ablution facilities have been erected along the access road adjacent to the southern site boundary. A security fence runs along the perimeter of the site. The site entry access road runs along the southern boundary, while a central access road runs north to south dividing the southern part of the site and intersecting with the former River Road, which runs west to east. The access roads were formerly trafficable, but records show they were closed in 1971.

At present, the majority of the site is covered with either concrete or asphalt hard stand. Concrete surfaces cover approximately 75% of the site, while asphalt covers approximately 20%. Several stands of trees growing from unsealed ground exist predominantly along the western perimeter and along the central access road. The unsealed garden areas account for the remaining 5% surface area.

The site topography is featured by a raised area in the south east corner that drops to the south and east along a steep embankment (approximately 4 m). The lower ground in this area is bounded by the eastern and southern site boundaries. Historical evidence shows that this raised area in the southeast corner was significantly filled with waste. The land alongside the central access road slopes down gently northwards to the former River Road. The adjoining lower area in the south west corner was historically filled; however, this area was subsequently excavated and very limited fill material has been identified in test bores drilled across this part of the site. The remainder of the site, being the northern portion along the river, is relatively flat.

The northern boundary is a steep embankment down (approximately 3 m) to a thin belt of mangrove vegetation, which is a feature of the offsite river foreshore area. Asbestos waste piping, sheeting and other asbestos debris is evident along the entire foreshore embankment, as these materials have been observed to be protruding from the embankment or scattered amongst the mangroves on the muddy sediments.

The site elevation is approximately 3 to 6 m above sea level (<10 m AHD). Historical diagrams show surface water runoff and stormwater drainage flows toward the north to the Parramatta River. Storm water drain pits are present at a number of locations across the site surface, predominantly in the northern portion.

3.2 Geology

The regional geology of the site is reported in the Sydney Geological Series 1: 100 000 Sheet 9130 (NSW Department of Mineral Resources, 1983), to comprise uppermost Quaternary-aged sedimentary deposits, described as: “silty to peaty quartz sand, silt and clay”, with some iron-rich and biogenic cementations and common shell layers. These sediments are likely to have been deposited in a stream alluvial estuarine environment.

The site is shown to be covered by Quaternary deposits the local geology mapped in the vicinity of the site indicates that the is located close to the boundary between the black to dark grey Ashfield Shale of the Wianamatta Group and the earlier Hawkesbury Sandstone. Both lithologies are described as been formed during the mid-Triassic epoch.

Two reports of geotechnical investigations undertaken at the site were reviewed for this RAP and provide information on the local lithology at the site. Both investigations (Environmental Investigations (EI), 2008 and Asset Geotechnical Engineering Pty Ltd (Asset), 2011) reported a general stratigraphy of:

- An uppermost layer of fill materials (ranging in thickness between 0.0 m to approximately 4.0 m); overlying
- Alluvium units, such as silty clay, sandy clay, clayey sand and silty sand (extending to depths of 6.3 to 18.1 metres below ground level - mbgl); and then
- Sandstone bedrock, which is variably weathered and generally encountered in the geotechnical investigation bores (Asset 2011) at a depths ranging between 11 and 18.3 mbgl.

The sandstone bedrock was reported to be of variable strength and is described as "extremely weathered" at a number of locations. Asset reported one borehole location where weathered sandstone was encountered at the shallower depth of 6 mbgl in the northwest of the site, in proximity to the site boundary.

The soil in the region of the site is described in Soil Landscapes of the Sydney 1: 100 000 Sheet as 'Disturbed Terrain' (Chapman and Murphy, 1989), indicating that soils have been extensively disturbed by human activity to a depth of at least 1 m below ground level (mbgl). It is known that the site has been filled with a range of materials from onsite operations, to a depth of approximately 4.0 mbgl in some areas. Site filling occurred between 1917 until the mid-1960s, probably to raise the site elevation above the river flood level.

3.3 Hydrogeology and Groundwater Use

The previous RAP (Molino Stewart, 2011), reported the groundwater table to be relatively shallow, found at approximately 2.4 - 4.5 mbgl with a northerly to north-easterly expected flow direction, towards the Parramatta River.

Recent drilling works undertaken for the Supplementary Site Investigation (SSI) (URS, 2013) reported that:

- Standing water levels (SWL) across the site varied between 0.94 metres below top of casing (mBTOC) (G7) and 6.63 mbTOC (G1).
- A comparison of the SWLs between the shallow and deep nested well pair (SB20(S) & SB20(D) showed a variance of 0.14 m indicating a confining layer between the two screened intervals, and suggests that the groundwater consist of two separate layers. The potentiometric level in the deep groundwater well was above the shallow well which supports this statement.
- PSH was measured at SB20(S) at a thickness of 4 mm using a bailer. No PSH or hydrocarbon sheens were encountered in any other of the groundwater monitoring wells.
- Groundwater elevations across the site varied between -0.855 mAHD (MW01) and 2.060 mAHD (MW02). Local groundwater flow direction was calculated to be towards the Parramatta River (northerly direction) which is located on the northern boundary of the site.
- Groundwater field quality parameters showed:
  - The pH values ranged from 5.34 (SB1-12/MW1) to 7.19 (G6). An anomaly was reported at MW02 (pH 11.08)
  - Eh values ranged from 41.4 mV (G6) to 342.2 mV (G1)

3 Site Conditions

- DO values ranged from 0.03 ppm (G6) to 4.98 ppm (SB4/MW4)
- EC values ranged 347.8 uS/cm2 (SB4/MW4) to 7,490 uS/cm2 (G4)
- Temperature ranged from 18.5oC (MW03) to 24.8oC (SB20(D)/MW20(D))
- The estimated TDS values ranged between 233.026 mg/L (SB4/MW4) to 5018.3 mg/L (G4).

No bail-down, pumping or aquifer stress tests have been performed at the site to assess other groundwater properties.

A review of the NSW Natural Resources Database[1], found six groundwater bores, listed in **Table 3-1,** within a 500 m radius of the site. Groundwater bore locations within approximately 1 km of the site (including those listed below) are shown on **Figure 1**. All registered bores are used for monitoring of groundwater conditions and no groundwater usage was identified.

Table 3-1 Registered Groundwater Bores within 500m Radius of Site

Registered Bore ID	Distance and Direction from Site	Registered Use
GW111348	NW – 480 m	Monitoring Bore (RailCorp NSW)
GW111349	NW – 480 m	Monitoring Bore (RailCorp NSW)
GW111347	NW – 500 m	Monitoring Bore (RailCorp NSW)
GW109867	E – 300 m	Monitoring Bore (Local Govt.)
GW109869	E – 300 m	Monitoring Bore (Local Govt.)
GW109868	E – 400 m	Monitoring Bore (Local Govt.)

3.4 Heritage

The report of a Heritage Assessment undertaken at the site by NBRS and Partners (NBRS, 2012) was reviewed for this RAP. The report states that a number of identified heritage structures and environments are present within the region, but that all items are situated outside the defined boundaries of the site. The report concludes that the site “provides little evidence of its former character or uses” and that it therefore “does not demonstrate heritage significance” for historical evolution, historical associations or heritage social value (NBRS, 2012).

With respect to aesthetic values, the Heritage Assessment noted that the proposed redevelopment works would enhance the local riverside wetland environment and views toward the former Female Orphan School, (constructed between 1813 and 1818, situated across the Parramatta River and currently within the University of Western Sydney, Parramatta Campus). Although the report acknowledged that this characteristic is not of “heritage significance”, it is recommended that the wetlands environment and views towards the school be appropriately considered within redevelopment plans for the site (NBRS, 2012).

3.5 Acid Sulphate Soils

Acid sulfate soils (ASS) are naturally occurring soils or sediments that contain iron sulphide minerals that when exposed to air may undergo oxidation reactions, producing sulphuric acid. These soils may represent an environmental hazard when they are exposed to air through lowering of the water table or ground disturbance.

[1] Reference: <http://www.nratlas.nsw.gov.au/wmc/custom/homepage/home.html>

The Acid Sulfate Soil (ASS) distribution maps published as part of the Australian Soil Resource Information System (ASRIS), indicate that the site is situated within a “Builtup Area” with the region to the east of James Ruse Drive classified as “B4 – Low Probability/ Very Low Confidence” and the region to the west classified as “C4 - Extremely Low Probability/ Very Low Confidence”.

An acid sulfate soil assessment was completed during the URS SSI, 2013, in accordance with the NSW Acid Sulfate Soils Assessment Guidelines, Sections 2 and 3, and Laboratory Methods Guidelines, Section 4 (Ahern et al., 1998). As part of this assessment soil samples collected from twelve (12) drilling locations in accordance with the minimum number of sampling holes requirement of 2 holes per hectare (Ahern et al. 1998). Samples were collected from a range of depths in natural soils from 1.6 mbgl to 4.6 mbgl, in accordance with ASS Assessment Guidelines (Ahern et al. 1998) and were submitted to ALS for analysis of Suspension Peroxide Oxidation Combined Acidity and Sulphate (SPOCAS).

The targeted depth of sampling and SPOCAS analysis at each location was expected to represent materials either to be insitu and exposed, excavated or reside at depth below the base of an excavation or lowering of the water table. At present, these specific details are not known.

The NSW ASSM provides ‘Action Criteria’ that define trigger levels with respect to the percentage of oxidisable sulfur present, for categories of soil types from coarse to fine in texture. Samples were assessed against the action levels for coarse, sandy soils which represent the most conservative trigger values, with the following findings:

- Five samples met the Acidity Trail Action Level (18 mol H+/ tonne), for Titratable Peroxide Acidity (TPA), including samples SB2_4.2-4.3, SB3_3.0-3.1, SB9_3.4-3.5, SB12_3.5-3.6 and SB15_1.6-1.7. (Note: The value range shown as part of the sample identification indicates the sampling depth interval in mbgl, for each respective sample).
- Four samples met the Sulfur Trail Action Level (0.03 %S), for Peroxide Oxidisable Sulfur (POS). Samples exceeding the action level were SB2_4.2-4.3, SB6_3.9-4.0, SB7_4.5-4.6 and SB9_3.4-3.5.
- Net acidity was between <10 and 116 mole H^+/ tonne (in sample SB9_3.4-3.5).
- A liming rate was derived for six of the locations investigated, including SB2, SB3, SB6, SB9, SB12 and SB15. The recommended liming rate was between 2 kg CaCO3 per tonne of soil (for soils in the vicinity of SB3, SB6 and SB15) and 9 kg CaCO3 per tonne of soil (for soils near SB9).

ASS analytical results are presented in **Table 3**.

The identification of ASS at various locations across the site, predicates the need for an ASS management plan, where natural soils will be dewatered or exposed to the atmosphere during the proposed excavation works, as described in **Section 9./**.

3.6 Conceptual Site Model

Potential on-site sources of contamination at the site include:

- Leaks and spills from a former underground storage tank (UST) and associated infrastructure (e.g. dispensers and filling points), previously reported in the north east part of the site;
- Leaks and spills from former drum cleaning operations in the northeast part of the site;
- Potentially impacted soils around former UST, any ASTs and associated infrastructure;

3 Site Conditions

- Leaks and spills from historical site operations including the former Camellia Chemical Factory located centrally, close to the eastern boundary of the site;
- Land filling across most of the site using asbestos materials produced at the site; and
- Land filling in the southeast part of the site using combusted waste produced from former boiler operations ('boiler waste') located centrally, close to the western site boundary.

Potential off-site sources of impact at the site include the former industrial factory located immediately to the south of the site.

Graphical representations of the sub-soil profile, highlighting the impacted zones within the northeast and southeast parts of the site are presented in the attached conceptual site model (CSM) cross sections as **Figure 4** and **Figure 5**, respectively.

As illustrated in **Figure 4**, the existing data, for the northeast area of the site, indicates that the predominant volume of asbestos fill is unaffected by other contaminants. Hydrocarbon-impacted asbestos materials are considered to be concentrated within the underlying, sandy estuarine sediment layer situated beneath the buried concrete slab, which formed the platform for the former drum washing facility at this part of the site. It is believed that the localised joints, cracks and degraded concrete in the former drum facility platform provided the conduit for deeper vertical migration of hydrocarbons to the underlying, estuarine, sandy sediment layer.

The CSM cross section shown in **Figure 5** illustrates the conceptual distribution of buried boiler waste, within the asbestos fill layer. The boiler waste has been shown to comprise of ash and clinker material, and previous investigative drilling indicates that the material is limited to the southeast corner of the site, immediately to the south of a former, on-site boiler.

Site Contamination Status

Numerous environmental investigations have been undertaken at the site, which have identified significant areas of contamination. To provide an overview of the site status, this section will report the initial identified contamination and those that have been undertaken within the last 10 years, which are likely to represent the current site soil conditions.

The earlier site investigations (WWC, 1994 and WWC 1995) identified that of main concern was buried asbestos waste identified across most areas of the site, disposal of ash from a former coal fired boiler, aboveground/underground storage of materials (such as fuels), historical activities involved with drum recycling and chemical manufacturing (prior to JH occupation of the site).

The chemicals of concern identified in these earlier reports (WWC, 1994 and WWC 1995) translate to the findings of the later reports, as presented below, including asbestos waste fill and arsenic in soils and groundwater (at MB1).

4.1 Soils

The locations of previous sampling points are presented on **Figure 3**. The analytical results for previous fill and natural soil samples are provided in **Table 4** and **Table 5**.

4.1.1 Fill Materials

Asbestos

The results show the presence of asbestos in a significant portion of the fill materials, as follows:

- Of the 86 soil bores drilled (URS 2006, URS 2013), asbestos was visually identified in 68 soil bores (79% of soil bores).
- Of the 57 soil bores where at least one sample was analysed for the presence of asbestos, 36 tested positive (63% of soils) (Note: two samples were collected at some locations, but only one sample was analysed – testing of the additional samples would be expected to increase the proportion of positive detections to above 63%).

Asbestos waste was predominantly observed in two forms as:

- Manufactured, cement-bonded building materials as broken fibro sheeting or piping; and
- Pulp-mix fibrous material.

Asbestos types that have been identified through laboratory analysis include the three common mineral types: Chrysotile (white asbestos); Amosite (brown asbestos); and Crocidolite (blue asbestos).

The analytical results from URS 2013 show that for the trace analysis conducted on the samples no respirable fibres were detected (no trace analysis reported in URS 2006). Respirable fibres[2] are asbestos fibres less than 3 micrometres in width, and greater than 5 micrometres in length, and with a length to width ratio greater than 3 to 1. Fibres in this form are an airborne risk and would be considered harmful to human health if inhaled.

The distribution of asbestos fill across the site is represented on **Figure 6A**, while the distribution of total fill is represented on **Figure 6B**.

[2] AS 4964—2004 Australian Standard Method for the qualitative identification of asbestos in bulk samples (Definition).

4 Site Contamination Status

Boiler Waste

Boiler waste fill material was observed to exist in two forms, as **Ash** and **Clinker**. From previous reports it is known that a coal-fired boiler was operated at the site for many years. The buried waste ash and clinker are considered to have originated from the historical operation of the boilers.

Ash material was reported at various locations across the site. It was observed at 27 soil bores from a total of 86 soil bores (31%). The ash was observed as thin layers, or traces, at most locations and occurred in granular form, or mixed with other fill types. The colour of the ash was reported as predominantly grey or white (although black ash was recorded at some locations), and was primarily observed in the surface layers, down to a depth of 0.5 mbgl.

Ash is typically associated with PAH, TPH and heavy metal contamination. What is evident from the analytical results (URS 2006, as summarised in **Table 4-1**) is that the ash material described in this way (grey/white/some black) did not indicate elevated PAH above the land use criteria. This indicates that the fuel source used in the boilers was completely combusted resulting in a relatively inert ash material with little or negligible PAH, TPH or elevated metal concentrations (above HILs). The table below demonstrates the inert nature of the ash by comparison of the soil bore locations where ash was observed and the corresponding analytical PAH/TPH/heavy metal results.

Table 4-1 Summary table of identified ash with analytical results from former soil bore locations

Soil Bore Location (sample depth)	Analytical Results (mg/kg)			Soil Bore Location (sample depth)	Analytical Results (mg/kg)		
	TPH (C_{10}-C_{36})	Total PAHs	Heavy metals		TPH (C_{10}-C_{36})	Total PAHs	Heavy metals
Investigation Criteria	1,000	80	As 400, Cd 80 Pb 1,200	Investigation Criteria	1,000	80	As 400, Cd 80 Pb 1,200
WSB01 (0.5 mbgl)	100	ND	-	WSB25 (0.5 mbgl)	ND	1.4	-
WSB02 (1.3 mbgl)	640	ND	Pb **8,560** (1.3 m)	WSB28 (0.4 mbgl)	ND	ND	-
WSB04 (0.5 mbgl)	190	3.8	-	WSB34 (0.2 mbgl)	ND	ND	-
WSB06 (1.9 mbgl)	260	ND	-	WSB39 (0.2 mbgl)	NA	NA	-
WSB14 (0.6 mbgl)	340	ND	-	WSB40 (0.3 mbgl)	NA	NA	-
WSB15 (0.2 mbgl)	NA	NA	-	WSB41 (0.4/1.6m)	NA	NA	-
WSB17 (1.1 mbgl)	ND	ND	-	WSB42 (0.9 mbgl)	NA	NA	-
WSB19 (0.5 mbgl)	ND	ND	-	WSB44 (0.2 mbgl)	630	0.5	-
WSB22 (1.3 mbgl)	100	ND	-	WSB49 (0.6 mbgl) WSB49 (0.9 mbgl)	**1,140** ND	0.6 ND	As **1,550** (0.9 m)
				WSB50	NA	NA	-
WSB24 (0.2 mbgl)	240	ND	-	WSB 53	NA	NA	-

Note: NA = Not analysed, ND = Not Detected (<LOR), **Bolded values** indicate exceedence of Investigation Criteria: NSW EPA 1994 – *Threshold concentrations for sensitive land use – soils* (for TPH) and NEPC 1999 – *Column D Health Investigation Levels for residential sites with minimal soil access* (for other parameters), TPH C_6-C_9 was not detected in any sample. Only metal concentrations in excess of HIL-D levels are tabulated.

Clinker material was predominantly observed to exist as pockets or thin layers within the various fill materials in the south east corner of the site and delineated in this area (see **Figure 5**). The Clinker material component can be visually distinguished from the ash materials by its occurrence as large cobble or boulder like pieces which are glassy/shiny in appearance, as described in the soil bore logs from the 2006 and 2012 investigations (Ref. **Appendix D**). By definition, clinker is a waste resulting from industrial processes involving the burning of fossil fuels. Clinker often forms a loose, black deposit that can consist of coke, coal, slag, charcoal, and grit.

Plate 1 (**Appendix E**) was taken of Testpit 1 (eastern wall) showing a pocket or thin layer of the clinker material at 1.0 mbgl (sampled and labelled as PS1). This demonstrates how the clinker may have been laid down and buried within this south eastern area of the site.

From a total of 86 soil bores, clinker was recorded in the soil bore logs at four locations (WSB43, WSB45, WSB46 and TP01), all of which are grouped in the south eastern corner as shown on **Figure 3**, demonstrating that the Clinker material has limited lateral distribution. The vertical distribution is also limited as it is present in thin layers or pockets within the fill material. An estimate on the quantity of the clinker material is presented in **Section 4.5.3**.

At test pit TP1, a bulk sample of the clinker was collected for TCLP and neutral (ASLP) leaching tests, and reported low leaching potential in both instances (URS, 2013). The chemical nature of the clinker material was assessed by comparing the soil bore locations where clinker was observed and the corresponding analytical PAH/TPH results, as presented in **Table 4-2**. The results show that the Clinker material comprises significant concentrations of TPH and PAH, but is relatively non-leaching when total concentrations are compared to the leachable concentrations.

Table 4-2 Summary of Soil Bore Locations & Analytical Results for Identified Clinker Material

Soil Bore Location	Analytical Results		Leachability Results			
	TPH (mg/kg) C6-C9 / C10-C36	Total PAHs (mg/kg)	TCLP (µg/L)		ASLP (µg/L)	
Comparative Criteria [1]	65/1,000	100	-		-	
WSB 43 (3.0 mbgl)	<2/**193,360**	**15,326.4**	B(a)P	<0.5	NA	
WSB 45 (3.0 mbgl)	<2/**215,850**	**15,119.8**	B(a)P	<0.5	NA	
WSB 46 (3.8 mbgl)	<2/**62,000**	**5,005.1**	B(a)P	<0.5	NA	
TP1 (0.5 -0.7 mbgl)	<10/**110**	**4.1**	B(a)P	<0.5	B(a)P	<0.5
TP1_PS1 (approx. depth 1 mbgl – as shown in **Appendix E** Plates)	NA	**26,800**	B(a)P	<9.6	B(a)P	<9.6
			Total PAH	**186**	Total PAH	**196**

Notes: B(a)P = Benzo(a)pyrene; NA = Not analysed; Highest concentration at each location listed;
1 The Soil Investigation Criteria used for the SSI (URS, 2013) – NSW EPA Guidelines for Assessing Service Station Sites and NEPM 1999, HIL 'F' commercial/industrial land use.

The Clinker material also contained detectable concentrations of carbazole (772 mg/kg) and dibenzofuran (367 mg/kg) from the aniline/benzidine semi-volatile organic compounds (SVOC) group, as reported in the ALS analytical reports. Under the WHO IARC[3] classification, carbazole is classified as Group 2B: possibly carcinogenic to humans. Dibenzofuran is not classified specifically by WHO IARC, however dibenzofuran is similar in stoichiometry to polychlorinated dibenzofurans (PCDFs). PCDFs are a group of chemicals considered to be carcinogenic to humans (i.e. Group 1), relative to a specific cogener. Although dibenzofuran is not considered a PCDF chemical, because it is not a chlorinated chemical, the toxicity of dibenzofuran may be inferred from PCDF data.

[3] World Health Organisation International Agency for Research on Cancer < http://www.iarc.fr/>

4 Site Contamination Status

According to OSWER[4], both carbazole and dibenzofuran are toxic to humans, however, only dibenzofuran is sufficiently volatile[5] to pose a vapour risk to humans. It should be noted that the vapour pressure of dibenzofuran is relatively low suggesting that this chemical may only be semi volatile in nature. The partitioning coefficients for dibenzofuran (K_{oc} and K_{ow}) are elevated, indicating a propensity of this chemical to bind to soil/organic substances rather than dissolve in water or volatilise.

The Clinker material is therefore comprised of various chemicals that include PAHs (as reported previously), carbazole and dibenzofuran that have been or are likely to be carcinogenic to humans. The physical characteristics of carbazole and dibenzofuran suggest that these chemicals will bind to soil particles and will express a low mobility potential. No leaching data is available for carbazole or dibenzofuran from the SSI report.

Additional analytical data is to be collected from the Clinker (**section 5.6.3**) to provide greater certainty on the potential risk posed by the carbazole and dibenzofuran chemicals if the Clinker is contained onsite.

General Fill

General fill materials are also present as defined layers or mixed with asbestos fill. The general fill material consists of reworked natural soil (clay, sand, various clay and gravel mixtures), and does not contain elevated contaminant concentrations, above what is defined herein. Some of these materials can be salvaged during remediation if it can be shown that they do not contain asbestos and they meet the validation criteria for onsite reuse.

Metal impacts above the HIL D criteria have been identified in general fill material that may or may not include ash materials are:

Ash:

- WSB02 (1.3 mbgl) with total lead at 8,560 mg/kg and a TCLP lead result of 8.4 mg/L;
- WSB49 (0.9 mbgl) with total arsenic at 1,550 mg/kg and a TCLP arsenic result of 0.5 mg/L

Other fill:

- WSB02 (2.8 mbgl) with total arsenic at 574 mg/kg and a TCLP arsenic result of 0.7 mg/L
- WSB09 (0.5 mbgl) with total arsenic at 882 mg/kg and a TCLP arsenic result of 0.3 mg/L
- WSB16 (2.3 mbgl) with total lead at 1,880 mg/kg and a TCLP lead result of 3.6 mg/L, and total cadmium at 109 mg/kg
- WSB31 (1.3 mbgl) with total arsenic at 491 mg/kg and a TCLP arsenic result of 3.1 mg/L
- WSB32 (1.6 mbgl) with total arsenic at 1,360 mg/kg and a TCLP arsenic result of 4.2 mg/L
- SB23 (2.6-2.7 mbgl) with total lead at 1,540 mg/kg

The lead impact result for WSB02 precludes this material from burial in the proposed, onsite containment cells without prior treatment, or untreated with Regulator approval because the material would be classified as Hazardous Waste.

[4] US EPA, Office of Solid Waste and Emergency Response, Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002.
[5] Henry's Law Constant is 1 x 10-5 atm-m3/mol or greater.

4 Site Contamination Status

Under NSW Waste Regulations, making waste soils with these total lead and TCLP lead levels acceptable for landfill disposal would require immobilisation treatment to sufficiently reduce leachate concentrations for reclassification as either *Restricted Solid Waste* (RSW) or *General Solid Waste* (GSW) under a Specific Immobilisation Approval (SIA) granted through the NSW EPA, in accordance with the *Waste Classification Guidelines 2008*.

Arsenic impacts in the general fill at WSB02, WSB09, WSB16, WSB31, WSB32, WSB49 and SB23, cause these soils to be classified as RSW, as supported by the TCLP data presented in **Table 4**, which does not preclude this material from being interned within the onsite containment cell.

Concrete

Concrete material was reported buried as a discontinuous degraded slab at a number of locations primarily in the north east area of the site. The concrete slab sits above the natural silty clay and separates the natural soils from the overlying asbestos fill. This is represented in the Conceptual Site Model (CSM) of the northern corner (**Figure 4**).

4.1.2 Hydrocarbon Impacts

The north east corner of the site shows evidence of fuel-based hydrocarbon impacts beneath the 2.2 m (average) thick layer of asbestos waste fill (that covers this area) and a subsurface concrete slab at an approximate depth of 2.2 mbgl. The hydrocarbon-impacted soils extend from a depth starting at approximately 2.3 mbgl (beneath the subsurface slab) to approximately 5.0 mbgl. The SSI report delineated the lateral extent of the impacted area as shown on **Figure 3**, while the vertical extent is expected to be limited to the 3 m thick natural estuarine sediment layer described in **Figure 4** as *mangrove muds* comprising silty sand and silty sandy clay.

The hydrocarbons are predominantly fuel and fuel additive compounds consisting of:

- TPH (C_6-C_9) – maximum 1,750 mg/kg (SB9)
- TPH (C_{10}-C_{36}) – maximum 32,300 mg/kg (SB23)
- Ethylbenzene – maximum 8.8 mg/kg (SB9 and SB9A)
- Total Xylenes – maximum 324 mg/kg (SB9)
- Naphthalene – maximum 150 mg/kg (SB9)
- Total PAHs – maximum 120 mg/kg (SB9)

The above concentrations of TPH (C_6-C_9), TPH (C_{10}-C_{36}), total xylenes and total PAHs exceeded the adopted site investigation levels for protection of human health. These samples were not scheduled for ASLP analysis for the above contaminants.

The hydrocarbons also consist of MAH fuel additives and related compounds to a lesser extent, including:

- Isopropylbenzene (Cumene) – maximum 11.4 mg/kg (SB9A)
- n-Propylbenzene – maximum 19.9 mg/kg (SB9A)
- sec-Butylbenzene – maximum 10.1 mg/kg (SB9A)
- tert-Butylbenzene – maximum 0.9 mg/kg (SB9A and SB24)
- n-Butylbenzene – maximum 15.7 mg/kg (SB23)
- 1.3.5-Trimethylbenzene – maximum 48.2 mg/kg (SB9A)
- 1.2.4-Trimethylbenzene – maximum 119 mg/kg (SB9)
- p-Isopropyltoluene – maximum 6.7 mg/kg (SB9A)

While the presence of CBs was reported in relatively trace amounts, including:

- Chlorobenzene - maximum 5.7 mg/kg (SB24)
- 1.3-Dichlorobenzene - maximum 1.2 mg/kg (SB24)
- 1.4-Dichlorobenzene - maximum 3.2 mg/kg (SB24)

PAH compounds (other than naphthalene) were detected in some soil samples at concentrations similar to the laboratory limits of reporting (LOR), as shown in **Table 5a**; however, it is the concentration of naphthalene that drives the PAH to exceed the land use criteria and is therefore the main constituent of interest in the PAH suite of chemicals. Naphthalene has been included in the fuel compounds listed above.

4.2 Groundwater

Groundwater quality appears to be relatively unaffected by historical operations or leaching of impacted fill material covering the majority of the site. URS 2013 reported no TPH or PAH detections in the groundwater across the majority of the site. There are elevated arsenic impacts which appear to be localised in the vicinity of MB1 (central western site boundary), the source of which was associated with the former Camellia Chemical Factory located in this part of the site (WWC 1995). Arsenic impacts in the soil in the localised area of WSB09 and WSB32 are the likely source of the arsenic impacts to groundwater.

Other exceedances of groundwater investigation levels (GILs) were detected at G4 (arsenic), G5 (arsenic and zinc), G7 (arsenic), G9 (arsenic and zinc), MB1 (zinc), MW02 (copper), SB1/MW1 (zinc) and SB2/MW2 (copper). The exceedances are within the same order of magnitude as the GILs with the exception of arsenic at G4 (44 µg/L), which is in the vicinity of WSB02 where arsenic impacts in soil have been identified.

PSH was identified at groundwater well SB20(S) (4 mm thick), the source of which is attributed to the hydrocarbon impacts in the localised north eastern site area. Groundwater well SB20(S) is screened from 2.0 to 3.9 mbgl within the silty sand / silty sandy clay material described as 'mangrove muds', which underlies the gravelly clay fill material (containing asbestos waste). The lateral extent of PSH impacted groundwater is not known in this area, although it appears to be localised in the north east corner of the site as PSH was not measured at the nearest surrounding groundwater monitoring wells (i.e. approximately 30 m north to G3, approximately 60 m south to G6, and approximately 70 m west to G5). PSH has not been delineated east of SB20(S) and may extend to the eastern site boundary, either as PSH or in a dissolved phase state. The vertical extent is limited to the shallow groundwater in this area, which has an estimated depth range of 4.4 to 5.1 mbgl, and is confined by the underlying estuarine sediments (mangrove mud layer).

There are no detections of hydrocarbon contaminants in the deeper groundwater (well SB20(D)) and it can be said that the natural sediments are restricting the vertical migration of hydrocarbon contaminants, including PSH.

Figure 4 represents the CSM in the localised area, while **Section 5.6** presents proposed remedial investigation works to assess the site boundary in this area for potential groundwater impacts.

4.3 Vapour

A vapour assessment was undertaken as part of the SSI to assess the vapour emitting potential of the clinker materials buried in the south east area of the site. Although laboratory testing of clinker material samples (TP1_PS1) reported significantly elevated concentrations of PAH and the bulk sample of clinker material (PS1) collected from test pit TP1 was reported to be highly odorous, the vapour assessment data showed negligible concentrations of vapours existing in the sub-slab area of the south east corner of the site.

The results showed that the clinker material buried with fill material under the concrete sealed area in the south east portion of the site did not liberate vapours; in particular, the semi-volatile PAH constituent naphthalene was not detected. The source of the detectable, yet negligible concentrations of chemicals in the vapour samples was not known; however, given that the identified concentrations were close to the LOR, the sources was attributable to background levels in the fill material.

Analytical results of sub-slab soil vapour samples from URS (2013) have been compared to recommended reference concentrations adopted from NSW EPA (2010) *Vapour Intrusion: Technical Practice Note*, where available; and the National Environment Protection Measure 1999 as amended 2013 (Amended NEPM 1999).

Where no reference concentrations for other detected contaminants were available in NSW EPA (2010), concentrations have been compared to generic screening levels for *Target Shallow Soil Gas Concentrations* in *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils,* US EPA, Office of Solid Waste and Emergency Response (OSWER, 2002), as referenced in CRCCARE (2009) *Technical Report series, no. 13, Field Assessment of Vapours*.

No criteria for ethanol in soil vapour is available, and accordingly the detected concentration was compared to the 'Time Weighted Average (TWA)' exposure standard, as provided by the Hazardous Substances Information System (Safe Work Australia website, accessed April 2013).

Soil vapour sampling results are summarised in **Table 4-3**.

Table 4-3 Comparison of Sub Slab Soil Vapour Maximum Values Against Available Criteria

Analyte	Maximum Concentration (µg/m^3)	Location	Criteria (µg/m^3)
Acetone	50	SV1	3,500 [2]
Ethanol	33	SV3	1,880,000 [3]
Carbon Disulfide	29	SV1	7,000 [2]
Dichlorodifluoromethane	4.6	SV3	2,000 [2]
2-Butanone (MEK)	14	QC01	10,000 [2]
Chloroform	9.9	SV1	140 [1]
Tetrachloroethylene	6.8	SV3	2,000 [4]
o-Xylene	2.3	SV3	220,000 [4]

Sources:
1. NSW EPA (2010)
2. OSWER, (2002)
3. Hazardous Substances Information System (Safe Work Australia website, accessed April 2013)
4. NEPM 1999 as amended 2013.

Based on these findings, it is considered that placement of Clinker material within containment cells onsite will not present a vapour risk to human health.

It must be noted that only chemicals of sufficient volatility were analysed, which included naphthalene (as part of the TO15 method), while carbazole and dibenzofuran, as other detectable chemicals in the Clinker, where not analysed in the vapour phase. However, given that naphthalene was not detected in the vapour samples, and has a higher vapour pressure than carbazole and dibenzofuran, then it is unlikely that carbazole or dibezofuran would exist in the vapour phase (refer to **section 4.1.1 – Boiler Waste**).

4.4 Contaminants of Concern

For the purposes of this RAP, the contaminants of concern include:

- Asbestos;
- PAH (in clinker material);
- Hydrocarbons – TPH, TEX[6], Monocyclic Aromatic Hydrocarbons (MAHs) and CBs to a lesser extent;
- Metals – Pb (at location WSB02) and As (at locations WSB02, WSB09 and WSB32); and
- SVOCs –carbazole and dibenzofuran (in Clinker material).

4.5 Contamination and Volume Estimates

4.5.1 Total Fill and Total Asbestos

Using *Esri ArcGIS 10 - 3D Analyst*, estimates of total fill (materials other than natural, undisturbed soils) and total asbestos fill material were calculated as follows:

Fill Type	Estimated Volume (m^3)
Asbestos fill (asbestos-containing material - ACM)	67,507
Clinker material (occurring as ‘pockets' within the ACM)	683
Other fill (disturbed soils not containing asbestos)	20,833
Total estimated existing fill material	***89,023***

The estimates were produced by using field logged records of the top and bottom of the asbestos and general fill layers, from the 2006 and 2013 soil bore data sets[7]. The thickness of the waste fill was extrapolated to the site boundaries, taking into account field observations of the thickness in those areas.

The asbestos fill and total fill thicknesses are illustrated on **Figure 6A** and **Figure 6B**, respectively.

Previous estimates in 2006 accounted only for the asbestos waste materials, and in some areas this was not delineated vertically, therefore the asbestos fill estimate has increased.

[6] Toluene, Ethylbenzene and Total Xylenes (excludes Benzene).
[7] Bore logs from EI 2008 were not used because the URS 2006 and 2012 data gave sufficient site coverage.

4 Site Contamination Status

To calculate a volume estimate, initially two dimensional surfaces were generated, as follows:

1. asbestos waste 'top of fill' and 'bottom of fill'; and
2. the general fill 'top of fill' and 'bottom of fill'.

The 2D surfaces were generated by creating TIN files using 3D Analyst Extension for ArcGIS 10. The TIN files calculate triangulated values between the existing soil bore data points to estimate a height field across the entire site area.

The volume was obtained by generating the "surface difference" between the TIN files for each respective unit (Asbestos Waste and Total Fill).

4.5.2 Clinker Material

Clinker materials were identified in the south east portion of the site at TP1 during the recent SSI, corresponding with previous descriptions of a black, vitreous material (and slag) found during the 2006 field works, at locations WSB43, WSB45 and WSB46. The following table (**Table 4-3**) presents an estimate of the quantity of clinker material (coexisting with ash) that could be present in this area of the site. The estimate is based on the total thickness of fill material recorded in the soil logs and compared to the thickness of clinker/ash material. For the purposes of this estimate, only material that was described as glassy/black was included as likely clinker material. Clinker and ash coexist in most instances; however it is the glassy/black description that makes this material distinguishable from other fill and ash.

The surface area of the region in which pockets of clinker materials were identified is **4,880 m^2**, as presented on **Figure 3**, and the estimated thickness of fill in this area is 3.5 m (mean depth of fill in **Table 4-3**); therefore the volume of fill in this area is estimated to be **17,080 m^3**.

The proportion of Clinker material compared to fill material was estimated to be 4 %, as shown in **Table 4-4**, therefore the estimated volume of clinker material is **683 m^3** (17,080 m^3 x 4 %). The remaining 16,397 m^3 is estimated to consist of asbestos fill and general fill, described in **Section 4.5.1**.

URS acknowledge that the estimate of clinker material is provided for the purpose of reducing the uncertainty surrounding the quantity of material that may require specific management practices given the clinker's significantly elevated concentrations of TPH, PAH and other detectable chemicals that include carbazole and dibenzofuran. A management protocol to address the clinker material is presented in **Section 5.3.3**.

4.5.3 Hydrocarbon Impacted Natural Soil

The inferred lateral extent of hydrocarbon-impacted soils is illustrated on **Figure 3** and was calculated to cover an area of around **3,340 m^2**. The line of lateral delineation was inferred based on the centre point between an impacted sample location and a non-impacted sample location. The soil impacts have not been delineated laterally to the east or north and therefore the line of delineation extends to the site boundary in these directions. The vertical extent is estimated to be 3 m thick based on the thickness of the hydrocarbon-impacted soils. On this basis, a total volume of **10,020 m^3** of hydrocarbon- impacted soils is estimated for the north east corner of the site.

Table 4-4 Analysis of Estimated Quantity of Clinker Material

Soil Bore	Depth of fill (mbgl)	Clinker/Ash layer interval (mbgl)(a)	Clinker/Ash thickness (m)	% of fill thickness	Elevated TPH/PAH impacts (mbgl)
WSB43	3.2	2.6 – 3.2	0.6	19 %	3.0
WSB44	3.3	No discernible layer	-	0 %	None
WSB45	3.4	1.6 – 2.4 3.15 – 3.4	0.8 0.25	24 % 7 %	No fill data 3.0
WSB46	4.5(b)	2.7 – 2.9	0.2	4 %	3.8
G2	2.9	No discernible layer	-	0 %	No fill data
SB02	3.6	No discernible layer	-	0 %	None
SB06	3.5	No discernible layer	-	0 %	No fill data
SB07	3.8	No discernible layer	-	0 %	No fill data
TP1	3.3(b)	1 – 1.2	0.2	6 %	1.0
Totals	**31.5 m (cumulative)**	**-**	**1.45 m (cumulative)**	**4 %**	**-**

Note: (a) Distinguished by visual description.

(b) Borehole or test pit terminated in fill material.

4.5.4 Surface Hardstand

The following estimates are presented for the purpose of materials and waste management requirements.

- Concrete Hardstand – estimated to be **9,000 m^3** (**Note:** Concrete surfaces are estimated to cover 75% of 6 Ha (45,000 m^2) at a general thickness of 0.2 m).
- Asphalt Hardstand – estimated to be **1,200 m^3** (**Note:** Asphalt surfaces are estimated to cover 20% of 6 Ha (12,000 m^2) at a general thickness of 0.1 m).

4.5.5 Buried Concrete Hardstand

The north east area of the site is underlain by a concrete slab that was reported to be in various degrees of degradation. The buried slab or hardstand material will need to be removed to access the underlying, hydrocarbon-impacted soils. The following estimates are presented for the purpose of materials and waste management requirements.

Buried Concrete Hardstand – estimated to be **334 m^3** (**Note:** estimated from total area of north east corner impacted 3,340 m^2 at a general thickness of 0.1 m).

4.6 Summary of Estimated Quantities

A summary of the estimated, approximate quantities of specific material present at the site is provided in **Table 4-5**.

Table 4-5 Summary of Estimated Quantities of Materials Onsite

Material Type	Estimated Approximate Quantity (m^3)
Fill Material Intended for On-Site Containment in Cell(s):	
Asbestos waste fill (includes 683m^3 of Clinker Material*)	68,190
Other Fill Material intended to be reused on-site (if suitable):	
Disturbed soils (not containing asbestos)	20,833
Total Estimated Volume of Fill	**89,023**
Natural Material to be biologically treated and reused on-site:	
Hydrocarbon-impacted natural soil	10,020
Hardstand Material (ground level and buried):	
Concrete surface	9,000
Asphalt surface	1,200
Buried Concrete Hardstand (North east site area)	334

*Note: * the clinker material occurs as 'pockets' buried within asbestos waste fill distributed across the south east area of the site, as described in Section 4.5.2.*

4.7 Preliminary Waste Classification

As addressed in other parts of the RAP, on-site containment and reuse will be the preferred management approach for fill materials, with prior treatment of impacted natural soils, where necessary. For discussion purposes however, the following preliminary waste classifications were developed following guidance provided in the *Waste Classification Guidelines 2008* administered by the NSW EPA (Waste Guidelines).

- Asbestos materials are pre-classified as *General Solid Waste - Special Waste (Asbestos)* (GSW Special Waste).
- Ash materials are classified as *General Solid Waste (non-putrescible)* (GSW) based on reported total TPH and PAH concentrations.
- Clinker materials are classified as *Hazardous Waste* (HW).
- Hydrocarbon impacted soils in the vicinity of soil borehole SB23 hold a preliminary classification of *Hazardous Waste* (based on the total lead and /or total chromium concentrations), however further leachability analysis of heavy metals during remediation activities may reduce the waste classification. Other hydrocarbon-impacted soils are classified as *Restricted Solid Waste* (RSW), based on maximum values of TPH C_6-C_9, TPH C_{10}-C_{36} and heavy metals.
- Lead-impacted fill at WSB02 is classified as HW (based on the total lead concentration).
- Concrete materials (including surface slabs and buried slabs) are pre-classified as GSW (non-putrescible) provided they are free of asbestos waste and soil.
- Asphalt materials from the surface hardstand are pre-classified as GSW (non-putrescible) provided they are free of asbestos waste and soil.
- Soils in the vicinity of soil boreholes WSB02, WSB09, WSB16, WSB31, WSB32, WSB49 and SB23, hold a preliminary classification of RSW.
- Further leachability analysis of heavy metals during remediation activities may reduce the waste classification, unless the material has been identified to consist of Clinker material.

Remediation Plan

5.1 Remediation Goal

The remediation goal follows Statewide's long-term objectives for site use (refer to **Section 1.1**). The known asbestos contamination at the site is driving the need for diligent stakeholder involvement and the selected remediation strategy will be predominantly governed by the need to affect remediation of the asbestos material. Given the significant quantity of asbestos waste and the associated risk that would be posed to human health and the environment, it is understood that regulatory approval for the off-site removal option would be unobtainable. The remediation approach therefore, is to encapsulate the asbestos onsite in a series of containment cells managed under a long-term Environmental Management Plan (EMP), with approval granted from the NSW EPA. The plan for the site redevelopment is to incorporate the containment cells as part of redevelopment, whereby the cells will be constructed beneath vehicle access roads as shown in the concept design on **Figure 8**.

The selection of any appropriate remedial strategy for materials other than asbestos waste is governed by the construction of the containment cells. On the provision that the cells will be built regardless, it is planned to utilise the available space in the cells for not only asbestos waste, but also any other onsite materials that need to be remediated and would be suited to containment.

5.2 Remediation Policy

The remediation policy adopted for this RAP follows the hierarchy as published in the Australia and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC 1992) and adopted by the NSW EPA. The ANZECC 1992 guidelines state the preferred order of options for remediation to be:

- On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level; and
- Off-site treatment of excavated soil which, depending on the residual levels of contamination in the treated material, is then returned to the site, removed to an approved waste disposal facility or used as landfill.

Should it not be possible for either of these options to be implemented, then other options that should be considered include:

- Removal of a contaminated soil to an appropriate site or facility, followed where necessary by replacement with clean fill;
- Isolation of the soil on the site by covering with a properly designed barrier;
- Choosing a less sensitive land use to minimise the need for remedial works, which may include partial remediation; and
- Leaving contaminated material in-situ providing there is no immediate danger to the environment or community and the site has appropriate controls in place.

If remediation is likely to cause a greater adverse effect on any aspect of the Site or surrounds than what would occur if the Site was left undisturbed, then remediation should not proceed.

5.3 Remediation Options Appraisal

In accordance with state and national environmental policy, contamination must be managed by utilising technologies that are compatible with the chemicals of concern and the identified contaminated material. As presented in **Section 4** the site contamination issues that need to be managed, may be outlined as follows:

- Asbestos waste fill – spread across the majority of the site in thick layers (**Figure 6A**);
- Ash material – spread across some areas of the site in thin layers or mixed with other materials including asbestos waste;
- Clinker material– delineated in the south east area of the site (**Figure 3** and **Figure 5**) mixed with asbestos fill amongst other types of fill;
- Hydrocarbon-impacted soils – delineated in the north east area of the site (**Figure 3** and **Figure 4**);
- PSH-impacted groundwater – existing in the north east area of the site (**Figure 3** and **Figure 4**) within the footprint of the hydrocarbon impacted soil;
- Arsenic-impacted fill – identified at WSB02 at 2.8 mbgl, WSB09 at 0.5 mbgl, WSB31 at1.3 mbgl, WSB32 at 1.6 mbgl and WSB49 at 0.9 mbgl, the extent of which is localised;
- Lead and cadmium-impacted fill – identified at WSB16 at 2.3 mbgl, the extent of which is localised; and
- Lead-impacted fill – identified at WSB02 at 1.3 mbgl and SB23 at 2.6-2.7 mbgl, the extent of which is localised.

Remediation alternatives were evaluated for each identified form of contamination in consideration of the proposed construction of the containment cells and based on the following aspects of the proposed site remediation process: effectiveness, technology risk, timeframe, permissibility, compatibility, cost and ongoing management requirements. The findings of the remediation alternatives appraisal process are described in **Sections 5.3.1** to **5.3.6**.

5.3.1 Asbestos Fill

Remediation options for asbestos are limited given there are no commercially available methods for the destruction of asbestos into an inert form; therefore, treatment of the asbestos fill is not an option.

Given that asbestos is a contaminant that has physical, rather than chemical form, exposure to asbestos waste is typically controlled by physical barrier techniques that are designed to mitigate human exposure and prevent the dispersion of asbestos fibres. This can be achieved either by offsite removal to an EPA-licenced landfill facility, or by capping the asbestos-impacted materials onsite under a surface layer, or within a purpose-built containment cell.

The estimated quantity of asbestos fill (including clinker material) is **68,190 m^3** and the estimated quantity of the total fill material onsite is **89,023 m^3**, as detailed in **Table 4-5**.

5.3.1.1 Offsite Disposal

The option to remove the fill materials to an offsite facility would be unlikely to receive regulatory approval based on the projected volumes of asbestos fill material requiring transport offsite for disposal and the associated increased potential risk to human health and the environment.

5.3.1.2 Onsite Encapsulation

Remediation by onsite management strategies minimises risks to the community by removing the need to transport the asbestos fill along public thoroughfares to offsite facilities. Onsite containment (rather than offsite disposal) will also allow the site to be remediated in a shorter time period by removing limitations imposed by traffic management plans and external landfill access times.

To facilitate the proposed development it is planned to transfer and encapsulate the affected materials within a system of engineered, onsite containment cells located beneath roadways, as illustrated in **Figures 6A, 6B, 7 and 8** The asbestos-affected fill would thereby be located in inaccessible areas of the site.

The containment cells will be managed under a long term EMP to ensure system integrity, as described in **Section 10**.

The excavation, safe handling and containment of asbestos waste will be conducted in accordance with the Asbestos Safe Work Method Statement September 2013, Benbow Environmental (Asbestos SWMS). Key aspects to this document are presented in **Section 9**.

5.3.2 Ash

The ash materials have been historically used as fill material along with asbestos waste. The construction of the containment cells for the onsite storage of asbestos waste enables the option for onsite containment to be a preferred option for ash materials. The chemical results indicate that the ash is relatively inert and would not preclude the material from being buried within the containment cell along with asbestos materials. For aesthetic purposes however, the ash materials will be capped and contained within the constructed containment cells.

5.3.3 Clinker

Notwithstanding suitable treatments, the construction of the containment cells for the onsite storage of asbestos waste enables the option for onsite containment to be a preferred option for clinker materials from the outset, if it can be demonstrated that the clinker has a low propensity to leach and emit low and acceptable odour/vapour levels.

The total volume of clinker material (from **Section 4.5.3**), is estimated to be approximately 683 m^3, comprising clinker materials coexisting with ash material. The overall quantity of clinker material is therefore, not considered to be a significant part of the overall process of site remediation in comparison to other significant volumes of materials presented in **Table 4-5**.

In its existing condition the Clinker material contains high total PAH and TPH concentrations and is classified as *Hazardous Waste* for offsite disposal purposes. Under this classification the NSW EPA restricts the option for offsite disposal and requires the contaminants in the waste to be destroyed or reduced to enable the material to be classified either as RSW or GSW, before the offsite disposal option is considered.

Although offsite disposal is not a proposed option for the reasons presented above, the requirement to treat the clinker materials, to reduce the PAH and TPH leaching potential before the Clinker is assigned for onsite encapsulation, is considered necessary in order to ensure that contaminants will not mobilise after burial, such that groundwater is adversely impacted.

5 Remediation Plan

The treatment of impacted soils classified as *Hazardous Waste* is usually conducted with NSW EPA consent under a Specific Immobilisation Approval (SIA), prior to gaining regulatory approval for off-site disposal, as was discussed for lead-impacted general fill in **Section 4.1.1**. As off-site disposal is not being considered in this case, URS will seek Site Auditor acceptance of specific immobilisation treatment methodologies, for clinker materials at the site, if warranted. The following discussion considers feasibility of onsite encapsulation as a management option for the clinker materials, in respect to PAH, TPH and volatiles, separately:

Clinker Management Options in Regards to PAH

Under Clause 50 of the Protection of the Environment Operations (Waste) Regulations 2005 (POEO – Waste Regulations), the NSW EPA has enacted a series of general approvals that enable waste classification of specific contaminants in wastes according to the Toxicity Characteristic Leaching Procedure (TCLP) of the contaminant alone.

The NSW EPA General Approval for Immobilisation (GAI) - Approval # 1999/05 – can be applied to ash, ash-contaminated natural excavated materials or coal-contaminated natural excavated materials (the ash GAI), whereby the PAH contaminants are naturally immobilised within a vitrified mass. This general approval is considered relevant also for the clinker pieces identified within the ash layer in the south east area of the site, given its low propensity to leach PAH, suggesting that natural immobilisation of PAH has occurred.

This option is subject to the discretionary approval of the NSW EPA, and may require a SIA for onsite containment.

Analytical tests show that the clinker material is characterised by relatively low TCLP concentrations for PAH (including Benzo(a)pyrene), and results show the material can be reclassified as GSW under the ash GAI, given that the TCLP concentration of B(a)P meets the TCLP1 criterion (Waste Guidelines). In relation to PAH therefore, onsite encapsulation is considered to be a feasible option for the management of clinker materials, with respect to PAH.

Clinker Management Options in Regards to TPH

The clinker material contains elevated TPHs that cause the material to be classified as Hazardous Waste, since the total concentration of TPH (C_{10}-C_{36}) exceeds the SCC2 criteria (Waste Guidelines). ASLP tests will be conducted to assess TPH leachability for the clinker material to assess the need for immobilisation treatment, prior to onsite encapsulation:

- Should ‘low’ to negligible TPH concentrations (i.e. below or within 10 times the LOR) be confirmed for the clinker material under a neutral (ASLP) leachability assessment, onsite encapsulation of the clinker materials will be considered to be a feasible option with regards to TPH; however,
- Should high TPH concentrations (i.e. not ‘low’) be confirmed for the clinker material under a neutral leachability assessment, onsite encapsulation of the clinker materials will be considered subject to successful immobilisation treatment, using a suitable methodology (to be specified if warranted), with Site Auditor, or NSW EPA approval.

Clinker Management Options in Regards to Odours and Vapours

Based on the vapour assessment findings of the SSI, which indicated low to negligible concentrations of vapours and no chemicals of concern vapours within the sub-slab area of the south east corner of the site, it is considered that the clinker materials are suitable for onsite encapsulation. The need for further vapour monitoring for confirmation/validation purposes will be reviewed however, should clinker materials be identified to be noticeably odorous during excavation.

Clinker Material Segregation

For the purposes of separate management of the clinker, it can be separated from the bulk of the fill by selective removal during bulk excavation of asbestos fill from the south east corner, and other locations where clinker material is visually identified. The clinker material will be contained in a designated area of the site in stockpiles or in bins, where it will await further assessment from the Site Auditor/Regulator, prior to onsite containment.

5.3.4 Hydrocarbons in Soil

The quantity of hydrocarbon impacted soil is estimated to be around **10,020 m^3** (**Section 4.5.2**) and is laterally delineated in the north east corner of the site (**Figure 3**).

Ultimately the goal of remediating soil impacted with hydrocarbons will be to reuse the material in a beneficial sense onsite considering it is not likely to contain asbestos waste. In the event that hydrocarbon-impacted soils cannot be reused beneficially onsite, the alternative options would be to either bury the material in the containment cells or dispose of the material offsite.

In-situ remediation techniques will not be considered because of the potential lengthy timeframes, uncertainty associated with target depths and delays that would be experienced to qualify an in-situ technique.

Ex-situ remedial techniques involving prior excavation of the impacted soil are more amenable to the application of alternative technologies, such that a remediation end point can be achieved within a reasonable timeframe.

The constituents of the hydrocarbons listed in **Section 4.1.2** are compatible with remediation techniques that involve biological degradation. Biodegradation techniques meet the evaluation aspects primarily because:

- they are well developed and well documented technologies with a proven track record;
- they are standalone technologies and are not reliant on the performance of other remedial aspects; and
- in comparison to other methods, they:
  - require low degrees of operation and maintenance;
  - require low capital investment;
  - are cost effective; and
  - can typically be completed within suitable timeframes (typically within 12 months).

Biodegradation utilises native microbes in the soil to destroy the chemicals in the first instance. The biomass can be stimulated by addition of enhancing amendments such as nitrates, microbiological enhancements, or by environmental controls (pH, oxygen, moisture). Biodegradation is typically first order decay, therefore the rate of decay is aligned with the biomass available to degrade the contaminants. This technique is highly amenable to enhancement.

The techniques available for biodegradation include:

- Biopiling;
- Composting; and
- Land farming.

Of the three methods, composting is considered the least preferred given that it involves adding significant quantities of materials to the bulk of the soil, which may prohibit reuse or restrict onsite containment. If offsite disposal was required, composting would significantly increase disposal quantities and costs.

The co-presence of potential asbestos in the hydrocarbon-impacted soils may be prohibitive of the landfarming technique, which will require the careful consideration of OH&S issues associated with the liberation of dust and airborne asbestos fibres during soil turning activities. **Note:** Hydrocarbon-impacted soils identified to contain asbestos will not be remediated by landfarming.

Application of the biopiling option will require the placement of excavated hydrocarbon-impacted soils into a static pile that is covered and sealed to mitigate the generation of dusts and asbestos fibres, while enabling capture and management of vapours.

In view of the above factors, biopiling is a feasible remediation technique for soils impacted by both asbestos and TPH; whereas, land farming would be suitable for soils affected only with hydrocarbons. It is expected therefore that a combination of the two techniques will be applicable for the site, with post treatment, either to beneficially reuse the soil onsite or, space permitting, intern it within the containment cell. Laboratory and field-scale trials are needed to assess the efficacy of either treatment option or a combination. This is discussed further in **Section 5.4.2**.

5.3.5 Heavy Metal Impacted Fill

The fill material at WSB02 (located close to the northern site boundary) at a depth of 1.3 mbgl is impacted by lead and is classified as *Hazardous Waste*. Fill from this area should therefore not be landfilled without prior treatment or Regulator approval. This area needs to be delineated to quantify the volume of lead-impacted fill and to develop an appropriate strategy, which should include onsite treatment through immobilisation of lead followed by emplacement in the onsite containment cell, or disposed offsite to a landfill facility. Treatment may be needed as a precursor to disposal to reduce the lead levels below the RSW or GSW threshold criteria.

Other impacted fill areas are classified as RSW and will be managed by internment in the containment cell.

5.3.6 Groundwater

As part of the soil remediation strategy to affect hydrocarbon/metals remediation; prevention or minimising further migration of contaminants from soil source materials to groundwater will be a beneficial outcome of soil remediation to the improvement of groundwater quality.

The DEC NSW Guidelines for the Assessment and Management of Groundwater Contamination (Groundwater Guidelines) (2007) provide a hierarchy of clean-up objectives for contaminated groundwater. Using these objectives, the soil remediation strategy to affect source control can extend to the long-term objective of groundwater clean-up. It should be noted that this RAP primarily addresses the remediation of soil materials, while remediation of groundwater will be an outcome of this process.

The hierarchy of remediation objectives for contaminated groundwater, in order of preference, as described in the Groundwater Guidelines, is as follows:

1. Clean up so that the natural background water quality is restored;
2. Clean-up to protect the relevant environmental values of groundwater, and human and ecological health; and
3. Clean-up to the extent practicable (including in the case of NAPL).

5.3.6.1 Phase-Separated Hydrocarbons

The hydrocarbon impacted soil in the north east corner is the source of impact to groundwater in this area of the site. The concentrations of some chemicals (as listed in **Section 4**) exceed the limits of their respective effective solubility and have partitioned from the dissolved phase into the free phase occurring as Non Aqueous Phase Liquids (NAPL). In this case, the mixtures of chemicals are less dense than the groundwater and hence float. For this reason they are given the term Light NAPL (LNAPL). The term LNAPL is synonymous with Phase Separated Hydrocarbons (PSH) and the terms are interchangeable throughout this RAP.

Potentially suitable remedial options for addressing the PSH in groundwater include:

Remedial Option	Potential Technology
In-situ physical or chemical	Passive or active recovery
	Air sparging
	Multi phase extraction
Ex situ physical or chemical	Advanced oxidation processes
	Pump and treat - GAC
	Excavate source area

The DEC NSW Groundwater Guidelines provides guidance on a remedial strategy to affect contamination source removal as a strategy to manage contaminated groundwater. This strategy is documented in the guidelines under section 3.5 – Source Control. Specifically, the following actions should be applied to the site:

- Non-Aqueous Phase Liquid (NAPL) must be cleaned up to the extent practicable; and
- Contaminated soils should be remediated to remove the potential risks to groundwater quality, considering the leaching potential of contaminants from soil to groundwater, and that HILs do not take groundwater protection into account.

Of particular importance at the site is control of hydrocarbons in soil material, and following the guidance provided in the Groundwater Guidelines, the remedial strategy should meet the following remedial goals:

- facilitate the protection of human and ecological health against hydrocarbon impacts;
- reduce the migration of contaminants from subsurface soils to groundwater; and
- reduce NAPL mass to the extent practicable.

URS considers that the preferred remedial option for PSH removal is source excavation given that hydrocarbon impacted soils will be removed and treated, whilst accumulated water in excavated pits will be pumped and treated. Alternative methods are applicable, however are not preferred because:

- the extent of the PSH is localised in one groundwater well;
- the in-well thickness of PSH (4 mm) would not be conducive to the application of active PSH removal systems; and
- timeframes to meet PSH remedial end points may not compliment expected site redevelopment programme.

The Groundwater Guidelines state that the remedial approach should ultimately strive to restore water quality to its natural background condition. Therefore, the soil remediation strategy should consider the potential for ongoing impacts to groundwater. In that regard and considering that groundwater restoration should be a remedial goal, a program of groundwater monitoring will complement soil remediation in this area of the site to monitor and understand the ongoing impacts to groundwater along the site boundaries of the north east corner. This is to be incorporated into the proposed remedial investigations work described in **Section 5.6**.

Generic Groundwater Investigation Levels (GILs) and background groundwater quality will be used to compare the groundwater quality prior to, during and post remediation of the soils. Baseline conditions are to be established prior to soil remediation in this area of the site.

Generic GILs will be adopted from the guideline sources documented in **Section 7.1**.

Considering the above, the approach to protect groundwater from ongoing impacts will be based on the remedial strategy to affect remediation of the hydrocarbon impacted soils in the north east corner of the site.

5.3.6.2 Dissolved Phase Impacts

Hydrocarbons

Although no dissolved phase hydrocarbons in groundwater have been detected at the site, there is a high likelihood that these impacts exist in the shallow groundwater proximal to MW20(S) given that PSH was measured at this location. The hydrocarbon soils in the north east site area will be excavated and treated, thereby removing the source of any dissolved phase. This activity will require dewatering of accumulated groundwater (and stormwater). Water removed from the excavated areas is likely to include dissolved phase hydrocarbon impacts. This water will be subjected to treatment through the wastewater treatment system, as discussed in **Section 5.4.2** (Wastewater Treatment).

Heavy Metals

The arsenic in the localised groundwater at MB1 and G4 will be addressed in a similar fashion to the PSH, where addressing the source of the arsenic contamination in the soil will ameliorate the groundwater impacts and consequently improve the water quality.

The soil impacts will be managed along with the asbestos materials, whereby the preferred option is internment in a containment cell.

Water removed from any formed excavation pit will be subjected to treatment through the wastewater treatment system, as discussed in **Section 5.4.2** (Wastewater Treatment).

Other heavy metal impacts detected in groundwater samples and exceeding the groundwater acceptance criteria (i.e. arsenic, copper and zinc) were reported to be within the same order of magnitude as the groundwater acceptance criteria and do not warrant remediation.

5.4 Preferred Remediation Approach

5.4.1 Onsite Containment

The preferred remedial approach for the majority of the buried wastes is internment within purpose-built containment cells onsite. Some materials may need Regulator approval for this to be done; however, it is proposed to contain the following materials in the cells:

- Asbestos waste
- Clinker materials – dependent on Regulator approval
- Treated hydrocarbon soils – post onsite biological treatment
- Lead-impacted soils – post delineation and potential onsite treatment
- General Fill – includes ash and other soil material mixtures if shown to be unsuitable for reuse

Three containment cells are proposed for the site as shown on **Figure 7**.

The cells will be excavated into the underlying soils to an estimated depth of between 6.5 – 8.0 mbgl (of existing ground level). If it is practicable, the cell depth will not extend to the level of the saturated zone to reduce the potential for groundwater to seep into the cells; however, the design of the cells is to be confirmed. The containment cells will be lined to ensure there is no potential for the movement of water into the cells. Following construction of the cells, their location will be surveyed and recorded on site plans.

Preliminary design of the cells is presented in **Appendix C**. The cells are to be located in an area where little asbestos fill or general fill has been identified as shown **Figure 6A** and **Figure 6B**. Prior to excavating the area for cell construction, in-situ soil materials are to be sampled and analysed in consideration of the NSW EPA Sampling Design Guidelines 1995 following a systematic sampling pattern over the footprint of the area to be excavated for the cells. Sampling frequency must consider minimum requirements for characterising materials for onsite reuse, offsite reuse or waste disposal, specifically, sampling frequencies must follow the conditions set out in the Excavated Natural Material (ENM) exemption 2012' for potential offsite reuse.

The outcome of this testing data, including the existing data from previous samples, will be to assess the material to be excavated from the cell locations to determine if it is:

- suitable to remain onsite – as either validated material or requiring containment;

- suitable for beneficial reuse on another site (further sampling, analysis and characterisation may be required, in general accordance with the ‘Excavated natural material exemption 2012’, under Part 6, Clause 51 and 51A of the Protection of the Environment Operations (Waste) Regulation 2005); or
- unsuitable for beneficial onsite or off-site reuse and will therefore require disposal offsite to an appropriately-licensed landfill facility (further sampling, analysis and characterisation may be required, in general accordance with the ‘NSW DECC (2008) Waste Classification Guidelines, ‘Part 1: Classifying Waste’).

The containment cell will be reinstated to the designated final land level and compacted to the standard required for engineering (slab construction) purposes; however, installing piers into the containment cell as filling proceeds should be considered.

Sequential excavation, transport and emplacement of the asbestos wastes in the cells will follow the planned staging works as described in Attachment 2 of Asbestos Safe Work Method Statement – Camellia Remediation Project, September 2013, Benbow Environmental (Asbestos SWMS September 2013).

Concrete will be underlain with an impervious layer of clay or synthetic material and will comprise the cap for the containment cell.

Should materials with residual vapours be discovered during the course of the remediation works, for the purposes of achieving regulatory approval to contain materials with residual vapours, then capturing the vapours by a suitably constructed vapour barrier and extraction system will need to be considered as part of the overall cap design.

Placement of the materials within the cells will be managed, such that where possible all asbestos containing materials will be emplaced first. This will ensure that if groundwater enters the cells in the future, then the materials with no potential or lesser potential to leach will be placed in the deeper sections and more likely to be in contact with the groundwater.

5.4.2 Soil Treatment – Hydrocarbons

This section presents information on the chosen treatment approach to address the hydrocarbon impacted soils detected in the north east corner of the Site.

The expected treatment area is shown on **Figure 7** on the sealed concrete ground. This will either require that underlying asbestos waste be removed after bioremediation works in this area, or included as a stage for a later part of the overall remediation works.

Data Requirements

A comprehensive design for biodegradation treatment of contaminated soil will need the following data:

- Site characterisation;
- Contaminant characterisation;
- Laboratory and/or field treatability studies; and
- Pilot testing and/or field demonstrations.

5 Remediation Plan

Site and contaminant characterisation is used to:

- Identify and quantify contaminants;
- Determine requirements for soil amendments (additives used to accelerate biodegradation rates);
- Identify potential safety issues; and
- Determine requirements for excavation, staging, and movement of contaminated soil.

Laboratory and field treatability studies are needed to identify:

- Amendment mixtures that best promote microbial activity;
- Potential toxic degradation by-products;
- Precent reduction and lower concentration limit of contaminant achievable; and
- The potential degradation rate.

Biopiles

Biopile treatment will only be used for materials where hydrocarbon impacted soil and asbestos wastes co-exist. This may only be the immediate soils underlying the asbestos waste layer as shown on **Figure 4**. The buried concrete slab may be an effective barrier between the two material types, however, the presence and integrity of the slab across the entire north east area is uncertain.

Biopile treatment is a technology in which excavated soils are mixed with soil amendments and placed on a treatment area that includes leachate collection and aeration systems. It is used to reduce concentrations of petroleum constituents in excavated soils through the use of biodegradation and enhanced by controlling the moisture, heat, nutrients, oxygen, and pH of the soils being remediated.

Water drainage from the materials will be captured in a bunded system and passed through a mobile water treatment plant, prior to discharge to the Parramatta River, pending Regulatory approval.

The biopiles should be formed up to 3 m in height to maximise available space and will be aerated through an air distribution system buried under the soil mass to enable the passage of air through the soil by vacuum.

The piles will be covered with plastic to control runoff, evaporation and volatilization, and to promote heating. The VOCs present in the soil will volatilize into the air stream and the air leaving the soil will be treated to remove or destroy the VOCs before they are discharged to the atmosphere. Air discharge treatment systems must be capable of receiving and treating air extracted from the biopiles and should utilise granular activated carbon (GAC) filter(s) with appropriate sizing to remove potentially malodorous or harmful constituents.

Biopiling is ideal for treatment of the VOCs and fuel hydrocarbons that are impacting the soils in the north east corner of the site.

Limiting factors of the biopiling technique include:

- Excavation of contaminated soils is required;
- Treatability testing must be conducted to determine the biodegradability of contaminants and appropriate oxygenation and nutrient loading rates;
- Static treatment processes may result in less uniform treatment than processes that involve periodic mixing; and
- Asbestos waste identified with the soils will need to be managed to mitigate dust and generation of airborne fibres.

Landfarming

Landfarming treatment will only be used for materials impacted by hydrocarbons. Materials impacted by asbestos will preclude the landfarming technique given the risk of generating and dispersing asbestos fibres. The landfarming technique is expected to be applied to the majority of the volume of hydrocarbon impacted soils in the north east site area because of the unlikelihood of asbestos waste being mixed at depth with natural soils. This is represented on **Figure 4**.

Landfarming is a technology in which contaminated soils are turned over (i.e. tilled) and allowed to interact with the climate at the site. The waste, soil, climate and biological activity interact dynamically as a system to degrade, transform and immobilize waste constituents. Wastes are periodically tilled to aerate the waste.

The landfarm soil pad can be prepared on the sealed concrete area of the northern portion of the site as a mass of soil spread out over the area, or in formed windrows.

Soil conditions will be controlled to optimise the rate of contaminant degradation, which include:

- Moisture content (by water spray);
- Aeration (by tilling the soil is mixed and aerated);
- pH (buffered near neutral pH by adding crushed limestone or agricultural lime); and
- Other amendments, such as nitrogen and phosphorus nutrients.

Landfarming requires diligent environmental controls to manage uncontrolled releases of contamination. Landfarming is successful in treating petroleum hydrocarbons in soil. The volatile components are attenuated rapidly through their volatility.

Limiting factors of the landfarming technique include:

- A large amount of space is required;
- Conditions affecting biological degradation are largely uncontrolled;
- Volatile contaminants may need specific management to prevent releases into the atmosphere;
- Dust control and asbestos fibre release is an important consideration, especially during tilling and other material handling operations.

Wastewater Treatment

Dewatering of excavation areas is likely to be required during the remediation works to remove hydrocarbon impacted soils. The known contamination impacts to site groundwater are likely to preclude any excavation pit water being discharged directly to stormwater.

The options for the disposal of excavation pit water include:

- onsite treatment (if required) and discharge to sewer, requiring a permit and approval from Sydney Water utilising their Trade Waste option; or
- collection and off-site disposal by a liquid waste contractor for treatment/disposal to an appropriate waste treatment/processing facility.

Discharging to sewer under Sydney Water approval needs to comply with Acceptance Standards, which often requires waste streams to undergo some preliminary treatment (pre-treatment) before discharging to the sewer. The equipment used to pre-treat the wastewater may also require a permit.

All excavation pit water must be analysed for suspended solid concentrations, pH and any contaminants of concern identified during previous contamination site investigation.

An experienced environmental consultant should be engaged to undertake treatment, monitoring and sampling of any water discharged from the Site.

Dewatering at the site will be pursuant to acquisition of a water use approval from the Office of Water, of the NSW Department of Primary Industries.

5.4.3 Soil Treatment – Lead in Soil

A decision on whether the lead impacted soil located at WSB02 can be treated on site or offsite will be made subsequent to the proposed delineation work (refer to **Section 5.6**). Statistical analysis of new data may show that treatment is not warranted if the data set representing the lead-impacted soil can be given a waste classification of GSW or RSW.

In general, soil materials impacted by inorganics are treated by immobilising the leachable component of the chemical of concern. The process must be approved by the NSW EPA through an exemption or through the SIA process, as discussed in **Section 4.1.1** (General Fill).

Typically contaminated soils are treated based on the results of the bench trials and subsequent detailed remediation treatment design.

5.4.4 PSH and Dissolved Phase Impacts

The preferred approach to remediating PSH and dissolved phase impacts in groundwater is to affect removal of the contamination source by treating or removing the contaminated soils, as described previously.

Water produced from dewatering of excavations will be subjected to onsite wastewater treatment, as described in **Section 5.4.2** (Wastewater Treatment).

5.5 Contingency

A number of potential risks have been identified that require a contingency measure to prevent an escalation of the risk.

5.5.1 Containment Cell Capacity

If the capacity of the cells has been reached, then any surplus materials that cannot be validated for use onsite will need to be removed from the site. The options for removal offsite include:

- Beneficial reuse (e.g. as VENM or ENM); or
- Landfill disposal (under specific waste classification).

5.5.2 Co-Presence of Asbestos in Soils

There is potential for cross contamination of asbestos with the hydrocarbon-impacted soils in the north east corner. Where this has occurred, the layers of soil impacted by asbestos (or where the upper asbestos waste has penetrated into the underlying natural soil), will need to be stripped off and stockpiled separately to the soils that have not been cross contaminated. An assessment will be made on whether this material can be treated onsite with the remaining hydrocarbon impacted soils, or whether an alternative remedial approach is specifically needed.

The CSM of this area (**Figure 4**) shows that there is a buried concrete slab providing a physical barrier between the natural (hydrocarbon-impacted) soil and the overlying asbestos fill. This layer of buried concrete could prevent any cross contamination from occurring, however the slab is likely to be degraded and potentially non-existent at some locations.

5.5.3 Underground Storage Tanks

Historical reports indicated the presence of an Underground Storage Tank (UST) in the north east area of the site; however a Ground Penetrating Radar (GPR) scan of the area during the SSI (URS 2013) did not identify a UST or any related pipework and it is unlikely that this tank exists.

Should the UST or any other UST be located during site remediation activities however, then the tank/s and associated fuel-lines must be decommissioned ex-situ in accordance with the Australian Standard titled *The Removal and Disposal of Underground Petroleum Storage Tanks* (AS 4976 – 2008) and the Australian Institute of Petroleum's Code of Practice 22.

5.5.4 Unexpected Finds

Ground conditions between sampling points can vary and further contamination may arise from unexpected sources and/or in unexpected locations. As a precautionary measure therefore, to ensure the protection of the workforce and to enable effective remediation of the site, should any other contamination be identified, the area is to be isolated while the type of contamination is assessed through sampling and chemical analysis.

Unexpected finds may include the discovery of underground storage tanks, waste drums, oil, sludge, discoloured soils, sweet/petrol odours, or any other types of waste that have not been addressed in this RAP.

5.5.5 Excessive Odours

The Asbestos SWMS September 2013 (**Appendix F**) presents management procedures for odorous materials. **Section 9.2** provides an outline of the odour management procedures.

5.5.6 Contamination Beyond Site Boundaries

It is not known if contamination extends beyond the site boundaries and therefore considerations must be given to immediate offsite environments. The site boundary conditions must be understood especially in the case of impacted groundwater at the north east site area. **Section 5.6** includes additional site assessment works to assess groundwater migration offsite in this area. If the findings of this work show a likelihood of offsite migration of impacted groundwater, then additional offsite assessment will be warranted to delineate any groundwater plume originating from the site.

At the northern boundary, asbestos waste is visible in the foreshore embankment and will be addressed as part of this remediation project. Contingency measures at this boundary are not warranted.

5.5.7 LNAPL

In the event that LNAPL is observed to exist at much greater extent that what is currently known, then alternative remediation strategies will need to be assessed following those techniques identified in **Section 5.3.6.1**.

5.6 Remediation Investigations

The following investigations are needed prior to implementing remediation to reduce the uncertainty surrounding the following issues. Details of the investigation work will be presented in a sampling plan (Remediation Investigation Sampling Plan) for review and approval by the Site Auditor. The findings will be presented in a Remediation Investigations Report.

5.6.1 Groundwater Migration

Groundwater monitoring along the site boundary in the north east corner of the site is needed, the objectives of which are to:

- assess the lateral/vertical extent of groundwater impacts (both PSH and dissolved phase);
- assess the offsite/onsite migration potential; and
- monitor groundwater boundary conditions during hydrocarbon-impacted soil removal works.

A series of groundwater wells will be installed as shown on **Figure 7** to meet these objectives. Existing groundwater wells G3 and G4 will be included in the network of monitoring locations. The new groundwater wells will be a combination of shallow and shallow/deep grouped pairs, such that the quality of the perched groundwater and the deeper groundwater can be assessed.

It is proposed to install:

- Three singular shallow wells; and
- Three paired shallow/deep wells.

The groundwater wells forming the monitoring network in this area must be retained for the duration of the remediation to assess groundwater impacts over the long term.

The findings of the initial groundwater monitoring work should be used to assess the potential for offsite migration, whereby a contingency for offsite assessment would be warranted (refer to **Section 5.5.6**).

Any new groundwater monitoring wells will need to be licensed under Part 5 of the Water Act 1912.

5.6.2 Well Decommissioning

Decommissioning of groundwater well SB20(D) is needed because it will be destroyed during bulk earthworks and therefore must be removed to mitigate the potential for surface PSH and dissolved phase contamination to migrate vertically to the underlying deeper groundwater prior to remediation works commencing. Decommissioning must be undertaken in accordance with the industry best practice procedure presented in the NUDLC (2012) *Minimum Construction Requirements for Water Bores in Australia*.

All other groundwater wells do not extend into the underlying deeper groundwater system. These wells will not require specific decommissioning techniques and will be destroyed during bulk earthworks activities for remediation.

5.6.3 Clinker Material

The potential for TPH to leach from Clinker material is unknown, as is the presence and distribution of carbazole and dibenzofuran. This analysis will need to be undertaken such that an assessment of the potential to intern the Clinker material within the containment cell can be considered by the NSW EPA and the Site Auditor.

Seven samples of the Clinker material, or one per 100 m^3, will be scheduled for Total, TCLP and ASLP analysis for TPH compounds, carbazole and dibenzofuran.

5.6.4 Heavy Metals Impacted Soil

The URS 2006 report estimated the lead-impacted soil at WSB02 to be 2,520 m^3. There remains considerable uncertainty associated with this estimate, and given the hazardous waste classification, this material will require considerable effort to treat the lead impacts. The lead impacts will need to be delineated to assess whether the lead is localised or widespread within the fill such that more certainty can be placed on the effort required to treat the waste. More data is required on the source of this contamination such that a remedial approach can be developed. At present the material will need to undergo immobilisation treatment onsite, or at a licenced offsite facility prior to offsite disposal or returning to the site for burial in the containment cell, because the lead concentrations cause the material to be classified as Hazardous Waste.

The lead impacts will be delineated by collecting soil samples from a series of four (4) boreholes surrounding location WSB02, which will be confirmed by GPS coordinates. The new bores and soil samples will be used to assess the source of the lead contamination and delineate the lateral and vertical extent of the lead source material.

Other heavy metals impacted material (refer to **Section 4.1.1** at General Fill and **Section 4.7**) can be classified as RSW or GSW which does not preclude this material being contained onsite. Additional delineation or characterisation is not warranted.

5.6.5 In-situ Validation of Soil

In reference to **Section 5.4.1**, in preparation of bulk excavations to accommodate the containment cells, in-situ sampling and laboratory analysis of the soils is needed at the locations where the cells are to be constructed so that a better understanding of the soil quality can be gained to determine its suitability for onsite reuse, offsite reuse or disposal options.

Each cell location will be marked on the ground surface and a grid-based sampling pattern is proposed over each of the cell areas. Soil samples will be collected from the surface to the proposed depth of construction of the cells. The soil material should be sampled on a frequency of no less than 1 sample per 100 m^3 of in-situ material.

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If the material is considered to be suitable for beneficial reuse on another site, further sampling, analysis and characterisation may be required, in general accordance with the ENM exemption 2012', under Part 6, Clause 51 and 51A of the Protection of the Environment Operations (Waste) Regulation 2005).

Remediation Works Program

6.1 Remediation Schedule

An outline of the proposed remediation schedule is as follows:

- Complete remediation investigations (described in **Section 5.6**).
- Plan and implement the soil treatment field trial for biodegradation of hydrocarbon-impacted soils (described in **Section 5.4.2**).
- Engage with the NSW EPA for approvals.
- Implement full scale soil treatment – biodegradation and lead impacts if necessary.
- Align sequential staging of events with the proposed schedule presented in Asbestos SWMS September 2013 (**Appendix F**) and summarised with staging presented in **Section 6.2**.

6.2 Staging of Earthworks Activities

The sequential process of staging of the earthworks onsite is presented in detail in the Asbestos SWMS September 2013 (**Appendix F**) and summarised in extracts as follows:

- *The site has been separated into a number of zones. The Zones are designated by letter A – I, whereby Zone H is the river bank.*
- *Each Zone will commence with an excavation 6-8m wide and a length generally up to 80 m in length. Therefore each work cell would be constrained in size.*
- *Stage 1 of the Work Programme involves excavating Environmental Cell 1.*
- *Stage 2 is to excavate Zone D so that the asbestos containing material is trucked directly across to Environmental Cell 1.*
- *Stage 3 shows the Works area in filling Environmental Cell 1 has extended to include (besides Zone B), Zone C and Zone D. Zone B involves excavating the asbestos containing material and, to avoid stockpiling, transport loads directly across to Environmental Cell 1.*
- *Stage 4 shows the extension of the works programme to include Zone E and F.*
- *Stage 5 shows Zones E and F continue to be excavated. Environmental Cell 1 is partially full, while Environmental Cell 2 is being filled.*
- *Stage 6 shows filling of Environmental Cell 2.*
- *Stage 7 and Stage 8 shows the ongoing filling of the Environmental Cell 2 to completion at Stage 9.*

6.3 Containment Cells

The cells will have a capacity of approximately 90,000 m^3 having similar construction detail to a landfill waste cell, ensuring no ingress of groundwater or stormwater and to ensure secure containment of the contaminated fill. Drawings of the containment cell are presented in **Appendix C**.

The site will be stratified to allow the staged excavation and validation of each area. In this way disturbance and exposure of the contaminated fill is minimised. Site areas and staging is presented in the earthworks program as above.

Excavation will commence at the southern end (eastern corner) of the site and will be progressed in strips perpendicular to the pit, moving north. Heavy earthmoving equipment will remove the contaminated materials, which will be placed into covered transport vehicles. These vehicles will travel by a dedicated path to the containment cell where the contaminated soils will be tipped directly into the cell.

The current capping material (concrete/asphalt) will be stockpiled on site in a designated area if it has been assessed as not containing asbestos. This material will be crushed for recycling if appropriate.

The details of the safe handling of asbestos waste are presented in **Section 9.1 - Asbestos**.

The containment cell will be reinstated to the designated final land level and compacted to the standard required for engineering (slab construction) purposes.

6.4 North East Corner Impacts

The overlying asbestos fill will need to be removed from this area in a staged fashion to expose the underlying concrete slab, under which exists the hydrocarbon-impacted natural soil.

There is potential for a zone of mixed asbestos, concrete and soil, whereby cross contamination has occurred. These layers will be excavated separately, as described in **Section 5.5.2**.

The groundwater investigation will precede any excavation in this area to:

- ascertain the potential impacts in soil and groundwater at the site boundaries, as discussed in **Section 5.6.1**. If impacts are present, then the option to install a vertical "cut-off" wall will need to be considered; and
- prevent impacts on the soil to be biopiled by management of the LNAPL.

Treatment Trials

A Soil Treatment Trial Preliminary Design Plan will need to be prepared for Site Auditor approval, and subsequently the findings of the trial will be reported in a Remediation Design and Works Plan. Detailed design will be presented in a separate Remediation Design Report.

Sediment Segregation

The hydrocarbon-impacted sediments will be segregated into three types of material that will be managed separately:

1. Hazardous (contains asbestos) – TPH-impacted material from the upper part of the layer potentially containing asbestos fill; and
2. Non hazardous (no asbestos) - TPH-impacted material from the lower part of the layer.

6.5 Groundwater and Stormwater

6.5.1 Containment Cells Wastewater

Groundwater is likely to be encountered during the construction of the containment cells. A dewatering and slope stability plan will be needed to address management of groundwater seepage. Water removed from the excavations can be stored onsite in a sediment pond, where samples will be collected and assessed for the presence of asbestos. Once the water is verified to be free of asbestos, it may be used for dust suppression purposes, as necessary during remediation.

After construction of the cells, stormwater collected in the cells will be managed in a similar fashion.

6.5.2 Wastewater at North East Corner

Groundwater and stormwater is expected to accumulate in any formed excavation in the north east part of the site during removal of the impacted soils. Water extracted from this area must be stored and treated by an onsite water treatment system utilising granular activated carbon (GAC) technologies to remove the expected PSH and dissolved phase hydrocarbons.

A suitably scaled water treatment unit will be required to treat wastewater from dewatering activities from excavated zones in this area. The location of this unit should be adjacent to the proposed soil treatment area shown on **Figure 7**.

Water treatment is expected to be greater at the beginning of earthworks as shallow perched water discharges into open excavations. The quantity of water stored in the perched aquifer is likely to be limited and discontinuous and is expected to discharge into excavations rapidly upon commencement of excavation works. Discharge will reduce to seepage as the perched groundwater system approaches a state of depletion.

As discussed in **Section 5.4.2**, wastewater may be collected and disposed offsite by a licensed facilitator or a Trade Waste Licence may be obtained that enables treated wastewater to be discharged into the sewer network. Residues from water treatment, including activated granulated carbon, should be disposed offsite at a waste landfill facility. In this regard, a general approval of immobilisation provided by the NSW DECC (#1999/04) can apply to activated granulated carbon wastes for offsite disposal.

7

Site Validation

This section presents the criteria, procedures and protocols to validate the site remediation. Prior to any site validation work being conducted, a Validation Plan must be prepared to document the data quality objectives (DQOs), validation program, sampling methods, analytical suites and other field procedures required to collect appropriate validation data during the site remediation.

7.1 Validation Criteria

The primary component of remediation is to address unacceptable human health risks and to protect the environment from ongoing impacts. A set of criteria is needed that define an appropriate end point to the extent of remediation that considers the protection of these sensitive receptors.

7.1.1 Human Health Protection

Future site users will be residents of apartment blocks, long term employees of retail premises and short-term construction/maintenance workers. To address the human health risks, these receptors would need protection from impacted soils and groundwater through the exposure routes of ingestion, inhalation and dermal contact.

To assess the potential for post-remedial exposure the validation criteria for the site remediation are generic criteria adopted from the following guidelines:

- The Amended National Environmental Protection (Assessment of Site Contamination) Measure, 1999 (Amended NEPM, 1999), incorporating the following guidelines.
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000).

The future land use considered most sensitive is considered to be high-rise residential. The permanent residential population will need to be protected in the first instance and therefore the validation criteria will be adopted from the generic criteria for Health-based Investigation levels – *Residential B* (HIL-B) from the Amended NEPM 1999 . Under this land use setting the following generic criteria will be adopted:

- Interim soil gas HILs for Volatile Organic Chlorinated compounds;
- Level B Health-based Screening Levels (HSL-B) for high density residential land uses, based on final depth and soil-type, as specified for soil, groundwater and soil-gas;
- HIL - B for high density residential sites; and
- TPH Management Limits for Residential sites, based on soil-type, which consider the formation of phase separated hydrocarbons, fire and explosion risks, damage to buried infrastructure and aesthetics.

Note: the generic criteria adopted for HSLs Residential B land use will only apply if there is no ground floor car parking or no basement car parking under the residential apartment blocks. Should this not be the case, then the validation criteria can be substituted for the generic criteria for commercial land use as HSL-D Commercial/industrial.

The Western Australian Department of Health (2009) guidelines have been adopted in the DRAFT NEPM 2010 and provide investigation criteria and “clean-up goals” for asbestos, asbestos containing materials (ACM), fibrous asbestos (FA) and asbestos fines (AF). The generic criteria for “residential - minimal soil access” will be adopted as validation criteria.

7.1.2 Aesthetics

In accordance with Schedule B1, section 3.6 of the Amended NEPM 1999, consideration must be given to malodorous soils, discoloured soils, hydrocarbon sheens or inert anthropogenic materials in the site soils. The TPH Management Limits for Residential Sites can be used to gauge the level of odours that may be acceptable at the soil surface, however any discoloured soils, sheens or soils containing excessive quantities of anthropogenic waste materials must be removed from the surface soils.

Also, in consideration of the NSW DEC (2006) decision-making process for assessing urban redevelopment sites, soils exhibiting odours and discoloured soils should be assessed for their suitability at the site given the proposed land use. In this regard, odorous and discoloured soils would be considered unsuitable at the final ground surface.

7.2 Environmental Assessment

Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) are used for assessment of potential for risk to natural ecosystems, including plants and animals. <u>EILs/ESLs will not be adopted as validation criteria for soil under slabs, roads and buildings.</u> In other areas where soils are accessible, EILs/ESLs will be considered. The Amended NEPM 1999 recommends a Tier 1 derivation of criteria specific to land use and soil type. The procedures in this guideline will be adopted to establish applicable EILs/ESLs under a Tier 1 assessment to be used to assess residual soils that are likely to be within 2 m vertically of the final grade site surface once remediation has been completed.

EILs/ESLs will be derived using the publically available spread sheet (through NEPC), as part of a Tier 1 risk assessment.

7.3 Validation Programme

7.3.1 Soil Validation at Excavation Surfaces

A systematic sampling pattern should be employed to validate any exposed surface after excavation to remove asbestos or contaminated soil.

Sample locations will follow the recommended minimum number of sampling locations as recommended in the NSW EPA (1995) Sampling Design Guidelines. According to the size of the excavated area, the minimum number of sampling locations will be selected from Table A of the Sampling Design Guidelines.

An appropriate sampling frequency and rate of analysis will be developed in the Validation Plan in consultation with the Excavation Works sequencing Plan and will be implemented after approval by the Site Auditor.

To apply the WA Guidelines, the required sampling frequency will be doubled to accommodate the requirement to apply the asbestos validation criteria.

In any respect, the sampling pattern must provide a sample density that is based on the 95% probability of detecting a circular contamination hotspot of suitable diameter. This approach will be followed for all excavation floor and wall areas.

7 Site Validation

A suitable data set must be collected from each area such that an Upper Confidence Limit (UCL) of the arithmetic mean of each contaminant can be calculated and compared to each respective validation criterion.

Wall surfaces of an excavation will be sampled every 10 lineal metres and at vertical depths corresponding to the HSL depth-based criteria.

Consideration must be given to material types to ensure that samples representative of each fill/soil type are collected during validation.

7.3.2 Treated Soil Material

Subject to onsite biodegradation treatment, treated soil material will be stockpiled according to soil type and sampled for assessment against the validation criteria. Stockpiled treated material will be sampled at the following frequencies:

- 1 per 25m^3 for batches less than 1,000m^3; and
- 1 per 50 m^3 for batches over 1,000 m^3.

Any treated soil cannot be reused onsite within 2 m vertically of the finished surface grade level for the HSL validation criteria to be applied to this site. In other words, soils remediated by biopiling or landfarming will not be reused at depths shallower than 2 mbgl. This restriction is to account for using the soil HSL nominated in **Section 7.1.1** as validation criteria.

7.3.3 Liquid Wastes

Liquid wastes should be sampled to obtain representative concentrations of chemicals in the waste and subsequently given a waste classification prior to removal from the site.

7.3.4 Beneficial Reuse of Site Soils

Soil that was excavated to construct the cells will be validated in-situ and compared against the validation criteria for reuse on site. Materials exhibiting qualities that preclude reuse should be considered for internment or subject to waste classification. The materials could not be considered as VENM or ENM if the concentrations of chemicals in the materials exceed validation criteria.

7.3.5 Imported Material Validation

Redevelopment of the site is likely to require introduction of imported materials to provide both validated fill material for established excavations and surface topsoil for areas of the site that are proposed for landscape gardens.

As a general guide it is proposed that all imported backfill material will be virgin excavated natural material (VENM) or similar validated material that is proven to be suitable for reuse on the site (e.g. excavated natural material – ENM) and will need to be validated by assessing the imported material in accordance with NSW EPA (1995) *Section 4.1.2 Backfill Material Validation* This involves visiting the source site and confirming that the source material is classified as suitable.

Samples will be collected from imported materials at the following sampling frequency to verify the status of VENM:

- 1 (one) sample every 100m^3 for imported volumes up to 1,000m^3, with a minimum of five samples collected per source site; and
- 1 (one) sample every 250m^3 for imported volumes greater than to 1,000m^3, with a minimum of five samples collected per source site.

If ENM is identified as a potential material for backfilling purposes then the protocol provided in the Excavated Natural Material Exemption 2012, EPA Waste and Resource Strategy (NSW EPA, 2012) shall be followed, including comparing analytical results to the assessment criteria provided in Table 2 of the ENM Exemption (NSW EPA, 2012).

7.3.6 Waste Classification

Any waste materials that are produced by the remedial works will be classified in accordance with the NSW DECC (2009) Waste Classification Guidelines, Part 1: Classifying Waste (Waste Guidelines). Contaminant threshold values for waste classification without doing the leaching test are adopted from Table 1 of the Waste Guidelines. Maximum values for leachable concentration (TCLP) and total concentration (SCC) when used together are adopted from Table 2 of the Waste Guidelines.

7.3.7 Containment Cell

Validation of the containment cells will be done by physical comparison against the "as-built" diagrams. This will be done by photographic record and measurements of the cell construction process, the cell filling process and the cell capping layer construction.

7.4 Comparison of Analytical Data

The statistical methodology used for comparison of the site data to validation criteria is based on the methods referred to in the Sampling Design Guidelines and the DRAFT NEPM 2010 guidelines, namely:

- Comparison of the 95% upper confidence limit of the arithmetic mean concentration (95% UCL) of each soil contaminant to the validation criteria;
- Comparison of individual analytical results to 250% of the nominated validation criteria to identify contamination 'hotspots; and
- Comparison of calculated standard deviations to a value of 50% of the nominated validation criteria.

7.5 Reporting

It is anticipated that the following reports will be needed to provide detailed specifications for the remedial approach and validation methodology documented in this RAP:

- Remediation Investigation Sampling Plan
- Remediation Investigations Report
- Soil Treatment Trial Preliminary Design Plan
- Remediation Design and Works Plan
- Remediation Design Report

- Validation Plan
- Site Validation Report

It is expected that where possible, reports will be amalgamated to prevent duplication of detail and to maximise efficiency.

Once the remediation has been implemented and goals have been achieved, a Site Validation Report will be prepared that details the remediation works and demonstrates validation was achieved. The site validation report must be written in consideration of the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 1997).

7.6 Quality Assurance and Quality Control Program

7.6.1 Field Data Samples

Field data quality samples should be collected as part of the QA/QC program. Field data quality samples that should be collected include:

- Field Duplicates/Intra-Laboratory Duplicates at a frequency of 1/20 primary samples;
- Split Duplicates/Inter-Laboratory Duplicates at a frequency of 1/20 primary samples;
- Equipment Rinsate Blanks (not for disposable items) at a frequency of 1/piece of equipment/sampling day;
- Trip Blanks at a frequency of 1/sample batch; and
- Spiked Trip Blanks at a frequency of 1/sample batch (were volatile analysis is requested only).

The combination of Field duplicates and Split duplicates corresponds to a field QA/QC program that consist 10% of primary samples.

7.6.2 Laboratory Data Samples

The analytical laboratories undertaking the chemical analysis of samples must be accredited by the National Association of Testing Authorities (NATA) for each analytical method.

The following is a summary of the laboratory quality control samples that will be analysed by the selected laboratory and reported with the chemical analysis results:

- Method Blanks;
- Laboratory Duplicates;
- Laboratory Control Samples;
- Matrix Spikes; and
- Surrogate Spikes.

7.6.3 Data Quality Assessment

An assessment of data quality and the validity of the QA/QC program should be undertaken based on an evaluation of the Data Quality Indicators (DQIs). This assessment should be based on a nominated set of PARCC parameters (i.e. precision, accuracy, representativeness, completeness and comparability).

The DQI parameters will be required to be defined within the Validation Plan to be developed for the remediation and validation works. Achievement of the project DQOs will be required to be assessed against the DQIs for both field and laboratory procedures.

7.6.4 Waste Tracking

A materials tracking system should be implemented to control and track the movement of materials on and off the Site. This system should control each of the different material handling phases that occur during the project including excavation, stockpiling, processing (screening and crushing), re-use, off site treatment and off-site disposal.

The system will track all site materials from "cradle-to-grave" and will provide detailed and accurate information about the location and quantity of all materials both on and off-site.

Waste tracking data shall be reconciled with documentation provided by waste transporters and waste receivers.

7.6.5 Fieldwork Quality

Soil Sampling

Soil samples of excavated surfaces will be sampled directly from the excavator bucket or the bulk of the treated soil stockpile by hand whilst wearing disposable nitrile gloves and placed into acid-washed glass jars with Teflon® lids provided by the laboratory.

Decontamination

In accordance with URS Field Procedures all equipment to be used for soil sampling will be decontaminated prior to field work.

Specifically, re-useable equipment, such as trowels, spatulas, hand augers will be decontaminated between sampling events by removing encrusted materials by scraping, followed by scrubbing with brushes and Decon 90 solution, and rinsed with potable water. Nitrile gloves will be changed between each sample.

General Field Quality

Field data and observations will be recorded on field data sheets or in field logbooks. Field logbooks and field data sheets will be prepared in blue or black permanent ink. Errant entries in field logbooks and on field data sheets will be marked with a single slash and initialled.

Bound field logbooks will provide the means for recording field activity records and observations. Items that will be recorded into the field logbook include:

- All aspects of sample collection (including sample and duplicate sample IDs).
- Field measurements.
- Health and safety documentation.
- Equipment calibration documentation; and
- Site diary detailing all activities undertaken during the day.

Field documentation will include the following information as is applicable to the specific task at hand:

- Project name and number;
- Date, time, weather conditions;
- Personnel present;
- Sampling location;
- Type of sample;

- Sampling method;
- Sample number and time of collection;
- Visual descriptions including aesthetics of the sediments will be considered as part of the characterisation process;
- Sample container type, shipping and analysis requirements;
- Photograph numbers (where applicable); and
- Other information and observations.

Other field information and data may be collected and recorded on specific field data sheets.

Each sample container will be clearly labelled and marked with waterproof ink in the field. Sample labels will include the following information:

- Job number;
- Sampling date;
- Sample point number/designation;
- Comments, as required; and
- Unique sample numbers will be added to samples collected from each sampling location.

Chain of custody (CoC) procedures shall be carried out in accordance with URS Standard Procedures. A CoC record will be utilised by field personnel to document possession of samples collected for chemical analysis. The CoC record will include the following information:

- Project name and number;
- Name(s) of sampler(s);
- Sample type, identification number and location;
- Date and time of collection;
- Number, type and size of containers; and
- Required analyses.

Sample containers will be packed in ice from the time of collection and transported under chain of custody procedures to the analytical laboratory. Copies of the chain of custody documents will be reproduced in the Site Validation Report.

Once each sample is collected, it will immediately be placed into an ice filled esky. Samples will be kept secure and chilled in ice filled eskies during the field program and subsequent transportation to the laboratory. Storage of the samples will be under the custody of the URS field personnel during the field program.

Samples will be transported to the laboratories under CoC documentation. Prior to transportation, the eskies will be security-sealed.

7.6.6 Laboratory Analysis Quality

The testing laboratories will undertake the analyses utilising their own internal procedures and their test methods (for which they are NATA, or equivalent, accredited) and in accordance with their own quality assurance system which forms part of their accreditation.

The analytical methodologies that will be used for the duration of this project must be in accordance with Australian Standards (AS4482.1 2005 and AS4482.2 1999), and United States Environment Protection Agency (US EPA) methods referred to in “Test Methods for Evaluating Solid Waste (SW-846), Revision A, July 1992, US EPA.”.

Legislation and Approvals

8.1 Legislative Requirements

The NSW Environmental Planning and Assessment Regulation (2000), under the Environmental Planning and Assessment Act (EP&A) 1979 (NSW Government, 1979), provides the legislative framework within which notifications and approvals must be made for redevelopment of the site.

The site is understood to be a Designated Development, within the definition provided in Schedule 3 of the EP&A Regulation (1979), for the Contaminated Soil Treatment Works category. The Managing Contaminated Lands: Planning Guidelines (1999) (NSW State Environmental Planning Policy No. 55 (SEPP 55)) classifies the remediation proposed works as Category 1 and requiring development consent.

The remediation works (involving handling potentially contaminated soil materials) to be undertaken will comply with applicable environmental regulatory and legislative requirements. The following provides a summary of the general requirements for the proposed works.

Table 8-1 Summary of General Legislative Requirements

Legislation/Regulation	Key Project Requirements
Protection of the Environment Operations Act 1997 (POEO Act).	Undertake all activities so as to minimise harm to the environment (in particular pollution of air and water and noise emissions) and not cause an offence under the Act. Transporters of particular waste types are required to be licensed under the Act.
Protection of the Environment Operations (Waste) Regulation 2005.	Some waste disposal/processing facilities (including those receiving restricted solid waste, hazardous waste) are required to be licensed under the Act.
The Waste Avoidance and Resource Recovery Act 2001.	Minimise the amount of waste for disposal. Where possible recycle.
Environmental Planning and Assessment Act (NSW Government 1979); and The Managing Contaminated Lands: Planning Guidelines (SEPP 55–Remediation of Land, 1998).	Development consent is required for remediation of the site, which is a 'Designated development' under category 15, Schedule 3 of the EP&A regulation Planning authorities to establish remediation and validation requirements. The RAP to be submitted with Development Application (DA). When DA approval granted and remediation completed, a validation report is to be submitted.
Contaminated Land Management Act 1997	Statutory Site Audit requirement
Conveyancing Act 1919	Provisions under section 88B must be followed to account for the Sydney Water easement in the south east area of the site.
Work Health and Safety Act 2011	Specific provisions related to asbestos risk work environments, including work practices in accordance with Work Health and Safety Regulation 2011 – in reference to **Appendix F.**

8.2 Licensing and Permit Requirements

All works related to the site remediation will be undertaken with the appropriate regulatory approvals, licences and/or certificates in place and shall comply with applicable environmental regulatory and legislative requirements.

8 Legislation and Approvals

A summary of the approvals which will be required prior to initiating works are listed below:

- WorkCover issued licence to manage asbestos materials and asbestos containing waste.
- EPA issued licence to treat/store soil –Schedule 1 activity under the POEO Act - disturbing more than an aggregate of 3 Hectares of land.
- EPA issued licence to treat water/discharge – Schedule 1 activity under the POEO Act – operating mobile plant.
- EPA issued licence to crush concrete - Schedule 1 activity under the POEO Act – processing greater than 150 tonnes of concrete per day.
- Notification must be given or approval must be obtained from the owners of the service lines prior to implementing works.
- Notification must be given or approval must be obtained from State Government Body responsible for the adjoining rail corridor prior to implementing works.

Remediation Management

9.1 Asbestos and Dust Management

The information provided in the following sections is presented in full in the Asbestos SWMS September 2013 and provided in **Appendix F** for reference.

9.1.1 Earthworks Activities

The following information includes extracts from Asbestos SWMS (**Appendix F**). Control of asbestos dust during earthworks activities is based on the following:

- *Use of portable wind mitigating devices that surround the work areas on at least one side that is the work Cells within the larger work zones. The wind mitigating devices prevent wind from impacting on the work Cell. The wind mitigating devices would provide an environment free of air currents so that water fogging would maintain a saturated condition of the asbestos containing material.*
- *Prior to excavation holes would be drilled into the concrete using drill rigs filled with dust capture and HEPA air filtration. The holes would be flooded with water to saturate the subsoil. The volumes of water expected would typically be 10 L/square metre or equivalent to a 10 mm depth on the surface. Holes would initially be spaced 1 m apart in the first work cell. Re-appraisal of the water volumes would be undertaken during the pilot trial and excavation and during the start of the project.*
- *Prior to excavation concrete slabs would be numbered, then cut into manoeuvrable pieces within the wind mitigating device, lifted and washed down.*
- *The Occupational Hygienist would examine the surface of the slab and require more washing down until the surface is clean of any asbestos fibres. Surface dust samples from each slab would be collected and analysed on site in a laboratory to be permanently manned on site.*
- *The concrete slab would be removed once given the clearance. It would be removed to a designated clean area to await recycling on or off site.*
- *The excavation would be made available for the operation of the excavator. Prior to the first removal of the sub surface, it would be saturated until a layer of water with wetting agent rests on the upper surface.*
- *As the bucket of the excavator breaks the surface of the ACM, a dust foam suppressant would be applied to envelope the disturbed surface in foam.*
- *The application of foam would continue under the surface of ACM that is exposed.*
- *There are several biodegradable foams available:*
  - *Foamshield; and*
  - *SDC 1200 from Midwest Industries.*
- *The exact product that would be used would be determined prior to the pilot trial programme. More than one type may be trialled. Biodegradability has been considered in the design of foam dust suppressants.*
- *These products are designed to be non-hazardous.*
- *The excavator once full would then be covered with the foam.*
- *The bucket would then be emptied into the dump truck. Water fogging would occur over the body of the dump truck during this step.*
- *These steps would be completed until the dump truck is full. The wheels of the dump truck and the sides of the body would be washed down before the truck leaves the end of the wind mitigating device through an opening that would be immediately closed after the dump truck has passed out*

of the wind mitigating device. While the travel of the dump truck is occurring or until a second truck is ready to enter through the same end of the wind mitigating device, the excavated surface would again be saturated.

- *This process would continue until the asbestos containing materials have been excavated.*
- *The wind mitigating device could be mounted on wheels and would have sufficient rigidity that it is able to be moved to the next Cell of the work zone to be excavated.*
- *Typically two or more wind mitigating devices would be used in unison. The first one removing the concrete and then being shifted to the adjacent surface to permit the excavator and dump truck to extract the asbestos containing materials.*
- *The excavator would remain behind the wind mitigating device and not be relocated as this would avoid the tracks becoming a source of asbestos dust and debris (ADD).*
- *The dump truck would follow a designated roadway to shift the material to either a stockpile in the first instance and once one of this Environmental Cells is formed directly into a Cell to avoid stockpiling.*
- *The wind mitigating device would have a long side with returns that would prevent eddies entering the work cell. The need for the excavator and filling of the Cells to be undertaken behind a windbreak is the site.*
- *The wind mitigating devices would have a polythene layer inside and be constructed from an impermeable canvas/polymer material that provide the necessary strength against wind erosion.*
- *Dimensions of the wind mitigating devices would suit the width of the excavation and the height of the excavator.*
- *The wind mitigating devices would have a structural steel frame around the closed long side and would be able to have ends formed from separate wind mitigating devices if ends are found to be needed from the pilot trial programme. The design of the base of these devices would be based on being able to be braced to withstand wind loads. During winds that would cause air currents within the work zone that would prevent the dust controls working then work would stop. The excavation would be covered by a tarpaulin if the hygienist considers that dust and fibres may be released.*
- *Along the river bank a different type of wind mitigating device to accommodate the wet river bank and the steep slope would be designed.*
- *The method relies on the following factors:*
  - *A defined work zone and Cells within the work zones;*
  - *A work area protected from wind;*
  - *A work area with one open side that can also be closed;*
  - *A defined roadways to use for traffic on site;*
  - *Prevention of the spread of asbestos generation of asbestos dust or possible release of asbestos fibres;*
  - *High level of effectiveness of preventing generation of asbestos dust or possible release of asbestos fibres;*
  - *Use of a foam dust suppressant to envelope the disturbed or damaged surfaces of the ACM with foam as a blanket to prevent airborne release of asbestos fibres;*
  - *Use of water fogging nozzles; and*
  - *Constant vigilance of trained operators occupational hygienists.*

9.1.2 Airborne Asbestos Monitoring

The following section presents an overview of the air monitoring program presented in the Asbestos SWMS September 2012. Reference is made to **Appendix F** for full details.

Methodology:

Sample collection and analysis will be conducted in accordance with the National Occupational Health and Safety Commission (NOHSC) “Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust [NOHSC: 3003 (2005)].

Sampling will be done with portable asbestos air monitoring pumps fitted with a sampling cartridge housing the asbestos sampling filter.

The sampling filters will be analysed in a NATA accredited laboratory for asbestos fibre concentration on the filters over the known volume of air sampled, expressed as fibres/mL (of air).

Samples will be analysed by way of phase contrast microscopy (PCM) with a detection limit of <0.01 fibres/mL of air collected.

Exposure Criteria:

The Safe Work Australia occupational exposure standard for all forms of asbestos is 0.1 fibres/mL in accordance with the “Workplace Exposure Standards for Airborne Contaminants”, 2011.

All exposure sampling will be compared to this criteria, however all personnel that are sampled will be wearing appropriate respirators. All workers inside the asbestos removal work area will wear the proper respirator for the asbestos concentration in the work environment.

Control air monitoring will be carried out outside the asbestos removal area at the boundary to the remediation site/zones and/or the overall site boundary as well as at other strategic sampling locations as required.

The concentration of fibres at these control sampling site locations should not exceed <0.01fibres/mL of air (i.e. the detection limit).

Sampling Plan:

A proposed sampling plan is presented in section 6.4 of the Asbestos SWMS, including sampling points for ground personnel, machine operators, and compliance points such as work zones and site boundaries.

Emergency Procedures:

The following presents the extracts from section 6.6 of the Asbestos SWMS:

The following steps are proposed in the event that an activity involves elevated asbestos fibres:

1. The Asbestos Removal Contractor is to be notified to clean the affected area(s) by following the Safe Work Method Statements and advise the Occupational Hygiene Consultant;

2. The work area is to be inspected and the cause of the elevated result investigated by the Occupational Hygiene Consultant;

3. Occupational Hygiene Consultant to advise on appropriate control strategies, where necessary;

4. After clean up works have been completed, a further visual inspection will be undertaken by the Occupational Hygiene Consultant. Further clearance air monitoring shall be conducted to ensure that asbestos exposure levels are at an acceptable level (i.e. <0.01 fibre/mL); and

5. Subsequent to completion of successful investigation of the cause of the elevated readings, a successful visual inspection and monitoring results must be <0.01 fibres/ml before an 'all clear' can be given.

Decontamination and PPE:

The following presents the extracts from section 7 of the Asbestos SWMS:

- *As the asbestos material being handled is potentially of a friable nature and the known level of asbestos cement contamination in the subject soils may be relatively high in density, the potential for clothing, etc. (on personnel conducting the works) to become significantly contaminated with free asbestos fibres is considered medium to high. Decontamination procedures and wet decontamination facilities will be required for this site and these would be provided by the Class A licensed asbestos contractor.*
- *All personnel in working within the Work Zones with or in any other way being affected by asbestos contaminated material will be required to decontaminate at the end of each work shift (i.e. before morning tea, lunch and afternoon tea) and at the end of the work day.*
- *A decontamination area would be established on site for the use of the personnel conducting the asbestos related works. The decontamination area will comprise a segregated area where the contaminated work clothing and respirators are removed and discarded. This area is to be connected to the wet decontamination unit and all access to and from work area should be done via this 'change room' area.*
- *Prior to any work commencing on any of the Work Zones, suitable barricades are to be erected around the boundary of the work site. Asbestos Warning Signage will be provided at suitable intervals and at all entrances detailing the restriction of access to the site.*
- *The Change Area is the area in which potentially contaminated PPE must be removed prior to leaving the Designated Work Area. It is to be located at the entry to the work Designated Work Area. It must not be used for purposes other than decontamination. It must not be used as a materials storage area. All personnel leaving the asbestos work area must use the Change Area prior to leaving the site. Personnel will remove disposable protective clothing prior and will be required to ensure that no asbestos soiled clothes or PPE leave the decontamination area to the 'clean end' of the area.*
- *Personal protective equipment (PPE) is to be provided to all personnel working in the Designated Work Areas and must be available within the decontamination area. The PPE which is required will be to the standards required for the asbestos removal work detailed in this AMP.*
- *Access to site will be determined by the PM for the work site. The asbestos work site shall be deemed not accessible to non-employees or personnel not inducted for work within the contaminated areas until a final clearance has been given by the occupational hygienist company.*
- *Where personnel are working on the ground within the designated asbestos areas and are required to handle, or are likely to come into direct contact with asbestos material:*

  — *High visibility vests;*
  — *Disposable coveralls with booties;*
  — *Safety boots with rubber soles;*

  - *Safety glasses;*
  - *Gloves;*
  - *Hard Hats; and*
  - *Respirators - half or full face P3 including organic vapour filter (where other contamination is identified in the soil).*
- *The protective clothing will be provided daily to employees at the commencement of their work shift at the Change Area. Protective clothing is only for use in the Designated Work Area and will not be used outside of this area.*
- *Once workers are inside the Work Zones, they are not permitted outside of that area without proceeding through the appropriate decontamination procedures.*
- *No employee is permitted to remove any disposable protective clothing from the site. Contaminated overalls and PPE is to be disposed of with the asbestos contaminated waste materials in appropriately labelled waste bins or bags.*

9.2 Odours

The remediation works for the hydrocarbon impacted soils in the north east portion of the site will expose odorous soils. The protocols for handling and management of hydrocarbon contaminated soil are detailed in section 10 of the Asbestos SWMS (refer to **Appendix F**). The protocols include:

- *Hydrocarbon contaminated soils will be removed for treatment. As this may also contain asbestos contaminated materials, the Work Zone involving these soils will be required to apply the asbestos dust controls.*
- *Air monitoring using passive samplers or thermal desorption tubes (charcoal tubes) and constant flow air sampling pumps will be needed during the removal of the first loads of these soils.*
- *P3 level of protection half or full face respirators that can provide asbestos fibre and hydrocarbon protection will be needed until the hygienists establish the level of protection required.*
- *The air monitoring for hydrocarbons will also include locations in the exclusion zone to establish if PPE with hydrocarbon removal is required to be worn at the exclusion zone.*
- *The hydrocarbon contaminated soils would be removed to a designated area. The stockpiles are to be covered by an impermeable cover that would be sealed with sand bags or equivalent method to prevent the stockpiles being exposed during wind.*
- *A risk hazard assessment of the hydrocarbon soil handling, storage, treatment activities would be undertaken prior to commencing these activities.*
- *The risk assessment team would include a hygienist, an environmental engineer or scientist as well as the contractors and CEJ P/L project staff.*
- *The validation of the treated hydrocarbon soils is the subject of the Remedial Action Plan.*

9.3 Work Health and Safety

A site specific WHS plan will be prepared by Statewide for approval prior to any site works commencing.

An overview of what the WHS plan should include is presented here.

In general terms, the Remediation Contractor will be responsible for the site WHS and obligated to train and protect workers on the site. The Remediation Contractor will be required to produce the following WH&S documentation:

- A Project Safety Management Plan (PSMP) to describe the specific safety resources, consultation arrangements, risk management process, responsibilities, procedures and practices for the project. The PSMP is also to include the following documents;
- Site-Specific Safety Management Plans (SSMP) to identify the hazards and risk control measures and the proposed scope of work;
- Work plans relating to specific hazardous activities, including but not limited to the removal of asbestos materials, excavation and shoring works, and hazardous waste handling and/or treatment; and
- Safe Work Method Statements (SWMS) for particular construction-related activities.

The SSMP will be required to document the health and safety requirements and protection procedures to minimise the potential for exposure and injuries to site personnel. The SSMP will be used to convey important information to all site personnel including:

- Project specific objectives and performance measures;
- Project contacts, personnel responsibilities and details;
- Conduct standards;
- Incident/near miss reports and procedures;
- Hazards and hazard controls;
- Project specific SWMS;
- Project specific contaminants and exposure scenarios;
- Project specific Personal Protective Equipment (PPE) – based on appraisal of specific work tasks;
- Decontamination procedures;
- Safety training and site inductions; and
- Emergency response details.

9.4 Community

At the time of preparing this RAP, Benbow Environmental was preparing an Environmental Impact Statement (EIS) for the site redevelopment. Reference is made to this document for all community and stakeholder matters.

9.5 Traffic

Details of traffic management are documented in the Traffic Management Plan (TMP), Mott Macdonald June 2012. This document is attached as **Appendix G**. Refer to this document for information on the TMP.

9.6 Waste

Details of the waste management are documented in the Waste Management Plan (WMP), Mott Macdonald June 2012. This document is attached as **Appendix H**. Refer to this document for information on the WMP.

9.7 Soil and Water

9.7.1 Soil and Water Management Plan

Details of the soil and water management are documented in the Soil and Water Management Plan (SWMP), Mott Macdonald June 2012. This document is attached as **Appendix I**. Refer to this document for information on the SWMP. The following overview of the SWMP contents is presented for guidance purposes.

The SWMP should be based on the NSW EPA (1997) guidelines “Managing Urban Stormwater: Treatment Techniques” and the NSW Department of Housing (1998) guidelines “Managing Urban Stormwater Soils and Construction”. The aims of the SWMP will be to minimise the potential for erosion, minimise the risk of contamination from construction equipment and to avoid contamination migrating from the Site.

The soil and water management plan should address the following issues:

- erosion and sediment control measures;
- contamination control measures (e.g. measures to manage existing contamination and potential for remediation machinery spillages, etc.);
- the methods for handling and storage of impacted soil or water to minimise potential exposure to the materials or migration offsite;
- monitoring requirements (testing procedures, frequency of sampling, etc.);
- specific methods of on-site reuse and disposal of soil and wastewater generated during construction;
- reference to the Occupational Health and Safety Plan for procedures to minimise the risk of exposure of construction employees to potential contaminants;
- diversion of clean stormwater runoff around construction sites and areas (where possible);
- use of crushed rock or similar material on construction site and parking; and
- bunding of temporary fuel and chemical storage areas in accordance with DEC requirements.

Surface Water Run-Off Containment

Sediment and contaminated soil will be prevented from leaving site by the inclusion of sediment trapping fences, pits and diversion drains that divert potentially sediment laden runoff to sediment basins designed in accordance with Managing Urban Water – Soils and Construction (The Blue Book). Details are provided in the attached SWMP (**Appendix I**);

There are no action levels in relation to sediment control during rainfall events. Inspections are required to be carried out at least weekly and before any site closures. Inspections are required to be carried out immediately following any rainfall events greater than 5mm.

9.7.2 Water Quality Monitoring (Parramatta River)

Surface water has the potential to migrate off site during the site remediation, although the potential can be minimised by implementing surface water controls during remediation works and landscaping following remediation. Generic criteria for protecting marine water ecosystems should be adopted from ANZECC 2000. The trigger values provided in these guidelines should be used to protect human health and environmental receptors using the Parramatta River.

Monitoring of the water quality of the river along the foreshore will be undertaken on a monthly basis via collecting water samples and chemical analysis for the contaminants of concern at the site (refer to **Section 4.4**).

Given that the Parramatta River is tidal, up and down gradient is governed by the tide cycles. Three monitoring stations should be established to assess water quality: upstream, adjacent to and downstream of the site.

9.8 Acid Sulphate Soils

The presence of ASS at this site requires a specific management plan to detail the measures to be implemented for the protection of surface water, groundwater, ecology and the community during remediation and excavation works when the following occurs:

- Saturated zone natural soils are exposed to the atmosphere; and
- Groundwater levels are reduced to expose natural soils;

It is expected that the above scenarios are likely to occur at some locations. Due to the confirmed presence of localised ASS (**Section 3.5**) an ASS management plan (ASSMP) will be prepared to account for the presence of ASS at the site and specify measures to mitigate the generation of acidic drainage. The ASSMP must be prepared prior to the commencement of remediation works and in accordance with the NSW Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998).

9.9 Noise and Vibration

An acoustic assessment is proposed to be undertaken as part of the Environmental Impact Assessment being completed for the site, the scope of which was underway at the time of preparing this RAP.

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Long Term Site Management

The preferred remedial strategy will involve an ongoing monitoring and management commitment by the site owner or the notional site owner. A Site Management Plan (SMP) will be developed after the completion of the remediation to account for:

1. potential ongoing risks to future Site users from residual contamination;
2. management of the containment cells; and
3. monitoring and management of potential groundwater impacts.

The EMP will document the potential exposure risks posed by post-remediation residual contamination and provide detailed procedures for undertaking works where risks may be encountered.

10.1 Governance

The site is currently maintained by the NSW EPA under a Public Positive Covenant, under section 88E (3) of the Conveyancing Act 1919. After site remediation, the site will be maintained under the Public Positive Covenant or the EPA will instruct orders of an Ongoing Maintenance Order under section 29 of the Contaminated Land Management Act 1997.

The SMP will form the main document to communicate the status of the site and details of the containment of contamination, the final cell locations and dimensions, as well as relevant environmental safeguards and occupational health and safety measures.

Provisions must be made for updating the status of the site on EP&A Act Section 149 Planning Certificates administered by the local authority.

The provisions to be considered for the SMP will need to include:

- Limitations on construction of any kind within a specified area of the containment cells, including new buildings and underground services/structures.
- A surveyed plan of the final cell location and dimensions is required and needs to be made available to relevant title holders.
- Maintenance of the concrete capping is required to ensure ongoing integrity. This may include regular inspections for cracking or movement.
- Procedures for sub service works within the vicinity of the containment cell need to be established to limit any potential for breaches.
- Management of appropriate on-going use of the capped area, consistent with its intended purpose as sealed vehicle roadway or access.
- Monitoring of groundwater to ensure containment of the materials.

10.2 Site Monitoring Programme

The SMP will detail the requirements for long term site monitoring to assess the integrity of the containment cells and detect potential leaks or degradation in groundwater quality adjacent to the cells or along the eastern boundary. The eastern boundary has been identified as an area of uncertainty whether groundwater impacts are potentially migrating onsite. Greater certainty surrounding this issue will be gained by implementing the proposed monitoring for remediation investigations (refer to **Section 5.6**).

10 Long Term Site Management

The long term site monitoring programme should comprise:

- A network of groundwater monitoring locations for ambient, onsite and flux boundary monitoring.
- Containment cell observation points to monitor cell leachate, groundwater seepage and vapour generation.
- A scheduled program of environmental site monitoring, whereby sampling frequency is lowered over time if monitoring indicates negligible long term effects from onsite containment.

Figure 8 is a schematic plan of potential site monitoring locations to be used for this purpose.

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11 References

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Limitations

This Plan is provided strictly in accordance with and subject to the following limitations:

a) This Plan was prepared for Statewide Planning Pty Ltd in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this Plan, and any previous site investigation and assessment reports referred to in this Plan.
b) This Plan has been prepared for the sole benefit of Statewide Planning Pty Ltd and neither the whole nor any part of this Plan may be used or relied upon by any party other than Statewide Planning Pty Ltd.
c) This Plan should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by URS for use of any part of this Plan in any other context.
d) This Plan is based solely on the scope of work agreed between URS and Statewide Planning Pty Ltd and described in Section 1.2 ("Scope of Works") of this Plan.
e) This Plan should be read in conjunction with the Attached Reports. No responsibility is accepted by URS for use of this Plan in any other context.
f) This Plan is based solely on the investigations and findings contained in the Attached Reports and on the conditions encountered and information reviewed at the time of preparation of each Attached Report.
g) This Plan is subject to all limitations and recommendations included in the Attached Reports.
h) Where any Attached Report indicates that information has been provided to URS by third parties, URS has made no independent verification of this information except as expressly stated in the Attached Report. URS assumes no liability for any inaccuracies in or omissions to that information.
i) URS has only considered those chemicals specifically referred to in this Plan. URS makes no statement or representation as to the existence (or otherwise) of any other chemicals.
j) This Plan has been prepared to address on-site contamination issues only (within the context of and limited to the Scope of Work).
k) Investigations undertaken prior to this Plan are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and contamination may have been identified prior to this Plan.
l) Subsurface conditions can vary across a particular site and cannot be exhaustively defined by the investigations carried our prior to this Plan. It is unlikely therefore that the results and estimations expressed or used to compile this Plan will represent conditions at any location removed from the specific points of sampling.
m) A site which appears to be unaffected by contamination at the time the Attached Reports were prepared may later, due to natural phenomena or human intervention, become contaminated
n) Except as specifically stated above, URS makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.
o) Use, development or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority and accredited site auditor approvals. URS offers no opinion as to whether the current use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals for development or redevelopment of the site, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.
p) URS makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.
q) The ongoing use of the site and/or the use of the site for any different purpose may require the owner/user to manage and/or remediate site conditions, such as contamination and other conditions, including but not limited to conditions referred to in the Attached Reports.
r) Except as required by law, no third party may use or rely on, this Plan unless otherwise agreed by URS in writing. Where such agreement is provided, URS will provide a letter of reliance to the agreed third party in the form required by URS.
s) To the extent permitted by law, URS expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or

12 Limitations

reliance on, any information contained in this Plan. URS does not admit that any action, liability or claim may exist or be available to any third party.

t) Except as specifically stated in this section, URS does not authorise the use of this Plan by any third party.

u) It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

A

Appendix A Figures

STATEWIDE PLANNING PTY LTD

CAMELLIA WEST REMEDIAL ACTION PLAN
181 JAMES RUSE DRIVE, CAMELLIA NSW

URS

Site Locality Map

Figure: 1

File No: **43218346.002.wor** Drawn: **SJB/STB** Approved: **AS** Date: **01-03-2013** Rev.**A** A3

Legend

- Site Boundary
- NSW Cadastre 2007
- Change in Slope
- Fall — General direction of falling ground surface topography

N
W E
S

0 5 10 20 Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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FILE NO: 43218346.023

DRAWN: SJB/STB APPROVED: AS DATE: 25/02/2013

STATEWIDE PLANNING PTY LTD

CAMELLIA WEST REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE, CAMELLIA, NSW

SITE FEATURES MAP

URS Figure: 2
Rev. A A3

Legend

- Soil Bore and Testpit Locations (URS, 2012)
- Existing Soil Bores (URS, 2006)
- Delineation Soil Bores (URS Dec, 2012)
- Sub Slab Vapour Implants (URS, 2012)
- Monitoring Wells (URS, 2012)

Pre-existing Wells Sampled Oct, 2012

- EI, 2009
- URS, 2006
- WWC, 1995
- Cross Sections for Conceptual Site Models*
- Site Boundary
- Approximate Extent of Clinker Materials
- Approximate Extent of Hydrocarbon Soil Impacts
- NSW Cadastre 2007

Extent of Soil Hydrocarbon Impacts:
Approximate Area 3340 m2

Conceptual Site Model Cross Section A - A1
(ref. Figure 4)

Extent of Clinker Materials:
Approximate Area 4880 m2

Conceptual Site Model Cross Section B - B1
(ref. Figure 5)

N
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0 5 10 20
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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FILE NO: 43218346.021

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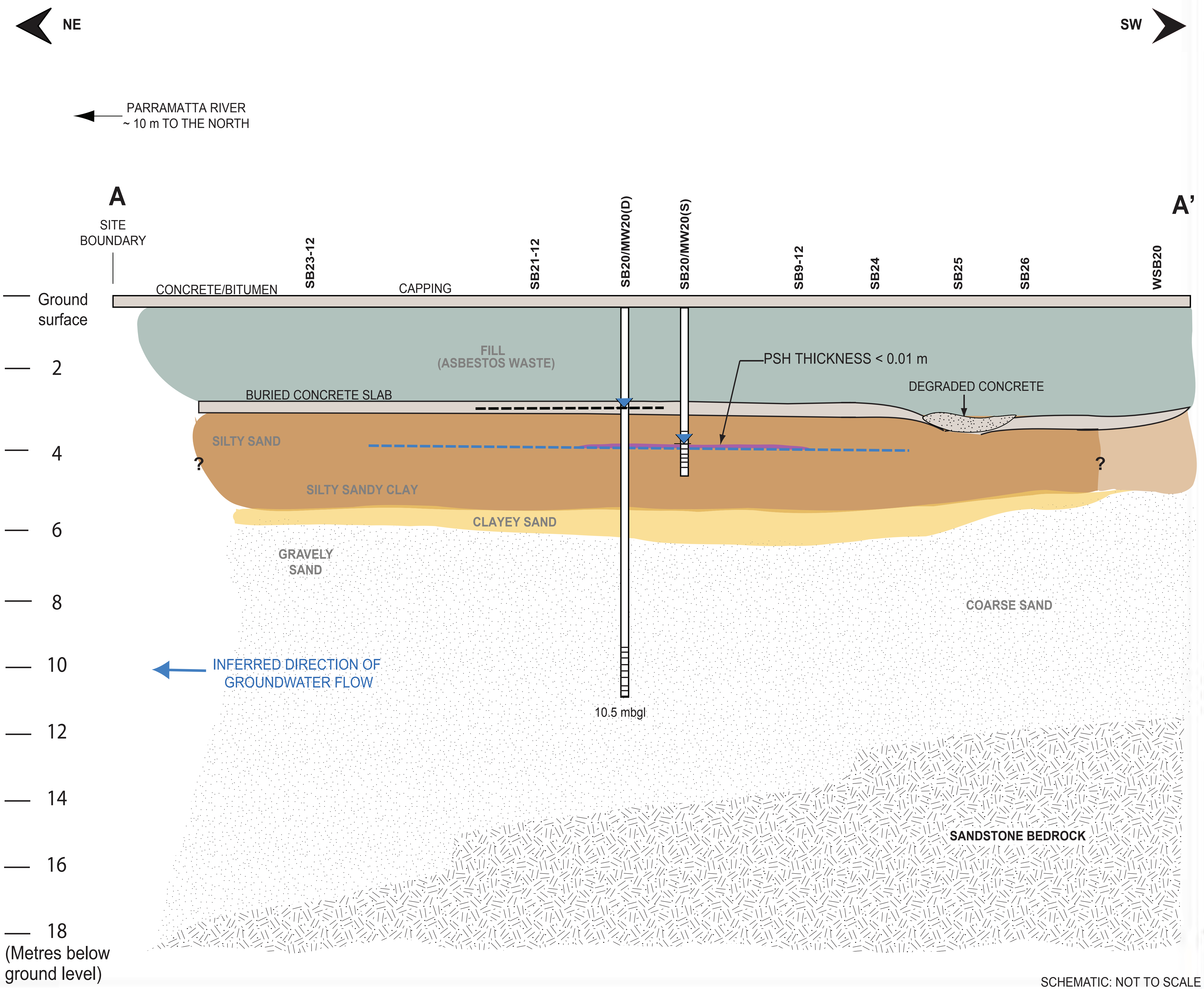
STATEWIDE PLANNING
PTY LTD

CAMELLIA WEST
REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE,
CAMELLIA, NSW

INFERRED EXTENT OF SOIL IMPACTS WITH HYDROCARBONS & CLINKER

URS Figure: 3
Rev. A A3



SCHEMATIC: NOT TO SCALE

LEGEND:

- Fill (incl. Asbestos Waste)

FINE ALLUVIAL SEDIMENTS:

- Silty Sand/Silty Sandy CLAY (Mangrove Muds) Hydrocarbon-impacted Sediments
- Silty Sand/Silty Sandy CLAY (Mangrove Muds)
- Concrete/Bitumen
- Clayey SAND
- Phase Separated Hydrocarbon (PSH)

COARSE ALLUVIAL SEDIMENTS:

- Gravely SAND/Coarse SAND
- Potentiometric Surface (Perched groundwater level)
- Potentiometric Surface (Coarse Alluvial Aquifer)
- ? Extent of Hydrocarbon Impacts not Delineated
- Monitoring Well
- Screen Interval

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FILE NO: 43218346.025.ai

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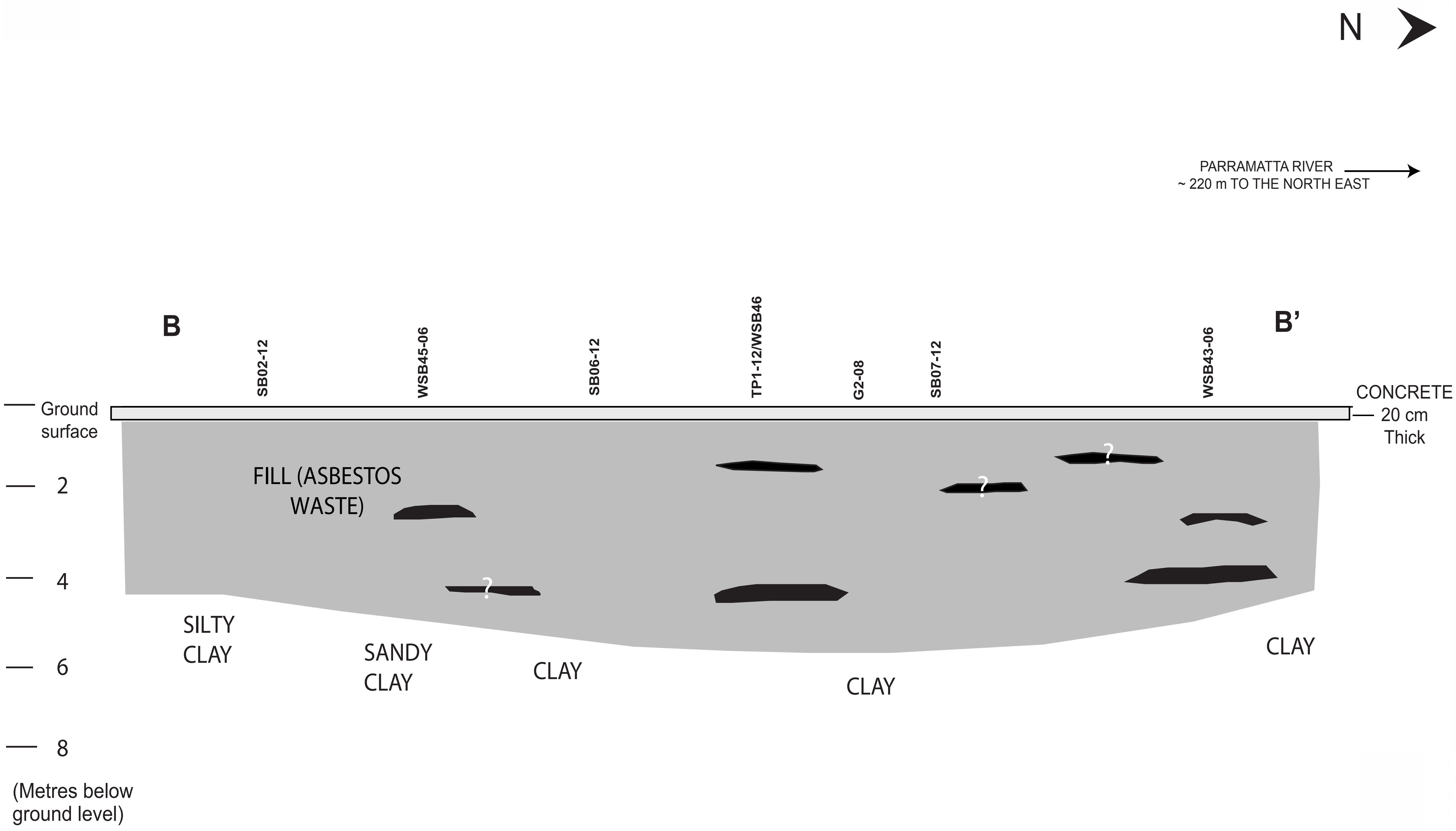
STATEWIDE PLANNING PTY LTD

CAMELLIA WEST REMEDIAL ACTION PLAN
181 JAMES RUSE DRIVE, CAMELLIA, NSW.

CONCEPTUAL SITE MODEL NORTH EAST CORNER OF SITE

URS Figure: 4
Rev: A A3



SCHEMATIC: NOT TO SCALE

LEGEND:

- Fill Material/Asbestos Waste
- Clinker Material/ “?” Denotes Hypothetical Occurrence

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FILE NO: 43218346.026.ai

DRAWN: STB/SB APPROVED: AS DATE: 06/03/2013

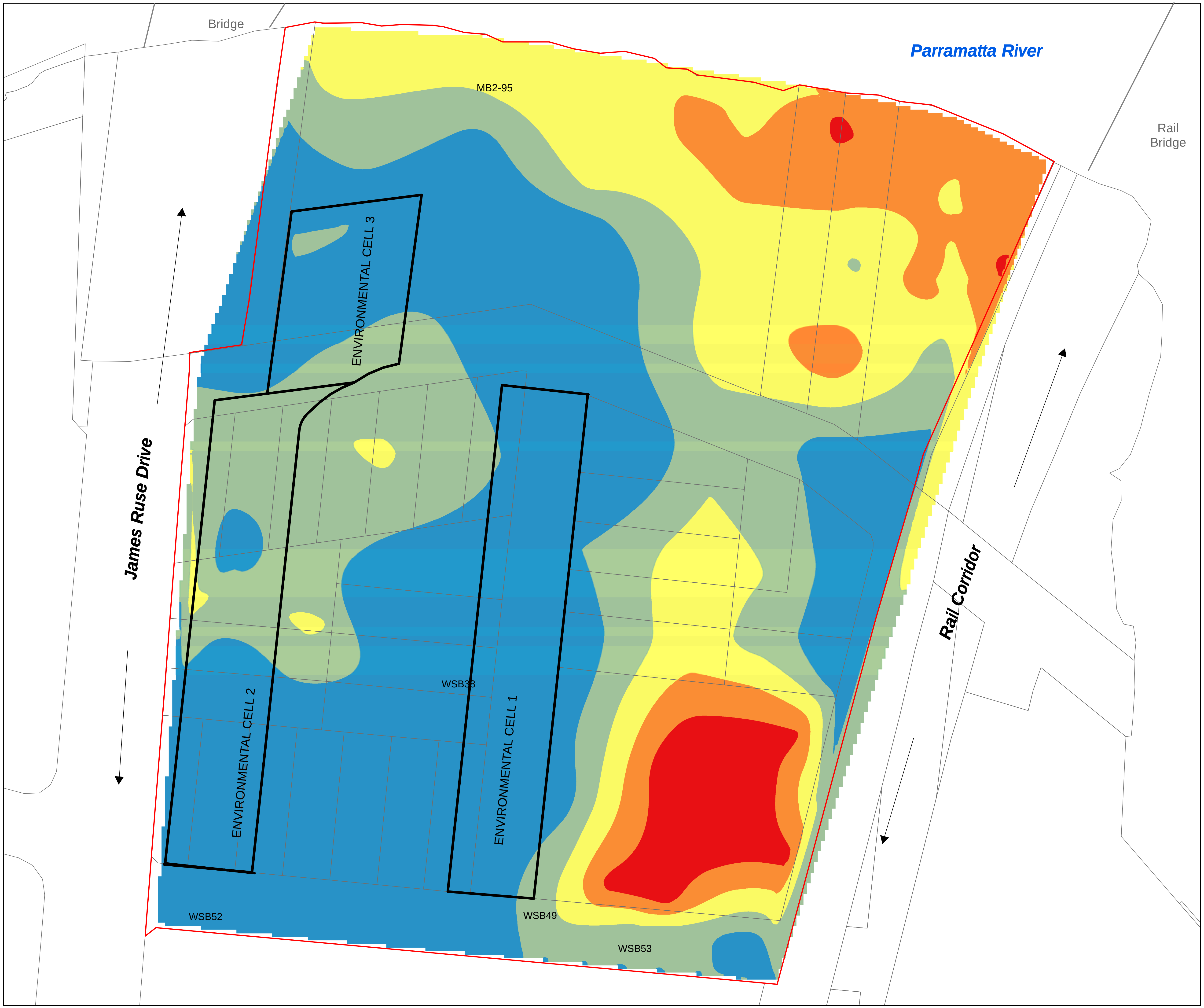
STATEWIDE PLANNING PTY LTD

CAMELLIA WEST
REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE,
CAMELLIA, NSW.

CONCEPTUAL SITE MODEL
SOUTH EAST CORNER
OF SITE

URS Figure: 5
Rev: A A3



Legend

- Proposed Locations for Containment Cells
- Site Boundary
- NSW Cadastre 2007

Buried Asbestos Waste

Estimated thickness (m)

- 0 - 0.7
- 0.7 - 1.4
- 1.4 - 2.1
- 2.1 - 2.8
- 2.8 - 3.48

Estimated Total Volume
of Buried Asbestos - 68,190 m3

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Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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FILE NO: 43218346.018_

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STATEWIDE PLANNING
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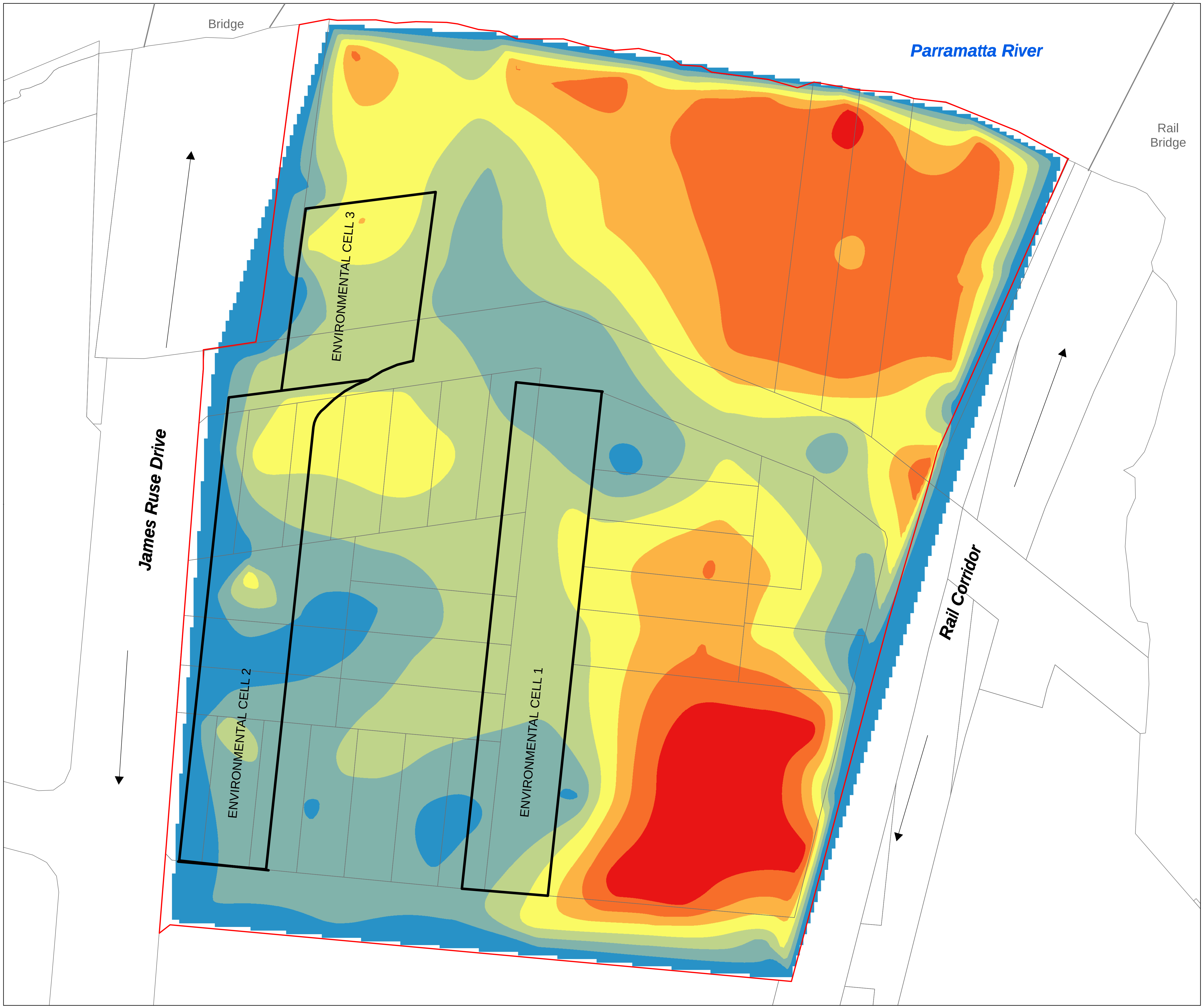
CAMELLIA WEST
REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE,
CAMELLIA, NSW

EXTENT OF ASBESTOS WASTE AND PROPOSED CONTAINMENT CELL LOCATIONS

URS Figure: 6A
Rev. A A3



Legend

- Proposed Locations for Containment Cells
- Site Boundary
- NSW Cadastre 2007

Thickness of Fill (Incl.Asbestos) (m)

- 0.00 - 0.35
- 0.35 - 0.75
- 0.75 - 1.16
- 1.16 - 1.65
- 1.65 - 2.15
- 2.15 - 2.85
- 2.85 - 3.78

Estimated Total Volume of Fill:
89 023 m3

N
W E
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0 5 10 20
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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STATEWIDE PLANNING
PTY LTD

CAMELLIA WEST
REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE,
CAMELLIA, NSW

EXTENT OF TOTAL FILL MATERIALS AND PROPOSED CONTAINMENT CELL LOCATIONS

URS Figure: 6B
Rev. A A3

Legend

- Soil Bore and Testpit Locations (URS, 2012)
- Existing Soil Bores (URS, 2006)
- Delineation Soil Bores (URS Dec, 2012)
- Sub Slab Vapour Implants (URS, 2012)
- Monitoring Wells (URS, 2012)

Pre-existing Wells Sampled Oct, 2012

- EI, 2009
- URS, 2006
- WWC, 1995
- Proposed Soil Treatment Area
- Proposed Location of Containment Cells
- Site Boundary
- Approximate Extent of Clinker Ash Impacts
- Approximate Extent of Hydrocarbon Impacts
- NSW Cadastre 2007

Proposed New Monitoring Wells

- Deep
- Shallow

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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STATEWIDE PLANNING PTY LTD

CAMELLIA WEST REMEDIAL ACTION PLAN

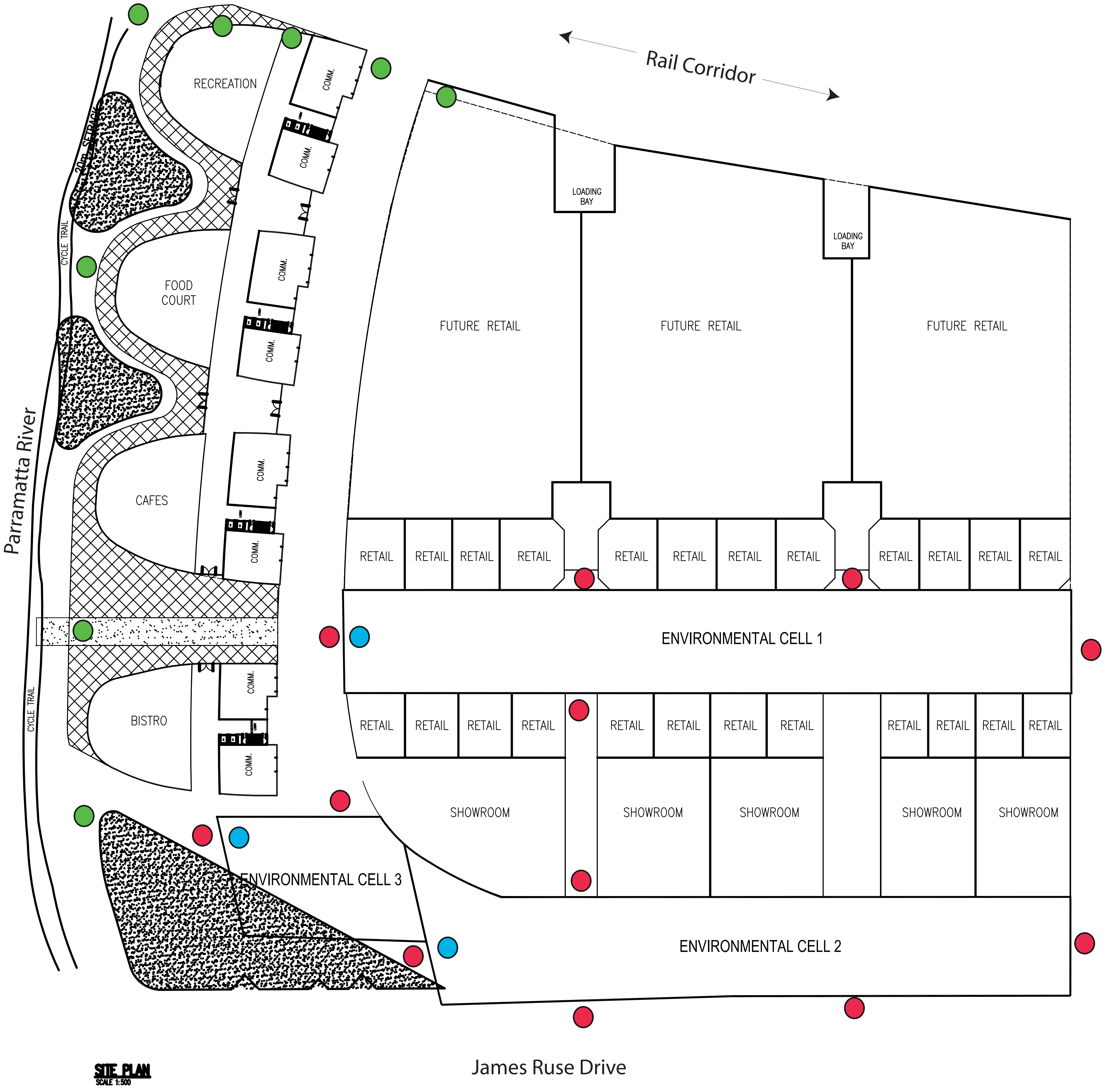
181 JAMES RUSE DRIVE, CAMELLIA, NSW

NEW MONITORING WELLS, PROPOSED SOIL TREATMENT AREA AND SOIL CONTAINMENT CELL LOCATIONS

URS

Figure: 7

Rev. A A3



LEGEND:

- Containment Cell Monitoring Well
- Observation Well
- Site Boundary Well

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STATEWIDE PLANNING

CAMELLIA WEST
REMEDIAL ACTION PLAN

181 JAMES RUSE DRIVE,
CAMELLIA, NSW.

PROPOSED SITE REDEVELOPMENT AND GROUNDWATER MONITORING POINTS

URS Figure: 8 Rev: A A3

B

Appendix B Tables

Table 1: Summary of Asbestos Analytical Results from Soil Bore Locations (URS 2006 and URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Asbestos Observation Results			Asbestos Analytical Results		
Location	Top of Asbestos (m)	Bottom of Asbestos (m)	Sample Identification	Sample Results	Trace Analysis Results (2013 Samples Only)
WSB01	0.20	1.90	WSB01_0.5	Chrysotile, Amosite	
WSB02	0.70	2.80	WSB02_2.8	Chrysotile	
WSB03	0.40	0.50	WSB03_0.5	Chrysotile, Amosite, Crocidolite	
WSB04	0.60	2.40	WSB04_1.9	Chrysotile, Amosite, Crocidolite	
WSB05	0.20	2.20	WSB05_2.0	Chrysotile, Amosite, Crocidolite	
WSB06	0.30	2.00	WSB06_0.5	Chrysotile, Amosite, Crocidolite	
WSB07	0.00	0.00	WSB07_0.2	No Asbestos Detected	
WSB08	0.60	0.80	WSB08_0.5	No Asbestos Detected	
WSB09	0.50	0.90	WSB09_0.5	Chrysotile, Amosite, Crocidolite	
WSB10	0.00	0.00	WSB10_0.6	No Asbestos Detected	
WSB11	0.00	1.70	WSB11_1.0	Chrysotile, Amosite, Crocidolite	
WSB12	0.30	2.60	WSB12_1.0	Chrysotile, Amosite, Crocidolite	
WSB13	0.10	2.30	WSB13_2.5	Chrysotile	
WSB14	0.50	2.20	WSB14_2.1	Chrysotile, Amosite, Crocidolite	
WSB15	0.70	1.30	WSB15	No sample analysed	
WSB16	0.30	2.00	WSB16_0.5	Chrysotile, Amosite	
WSB17	0.70	1.20	WSB17_1.1	Chrysotile, Amosite	
WSB18	0.00	0.00	WSB18_1.2	No Asbestos Detected	
WSB19	0.00	0.00	WSB19_0.5	Chrysotile, Amosite, Crocidolite	
WSB20	1.20	2.20	WSB20_2.2	Chrysotile, Amosite	
WSB21	0.00	0.00	WSB21_0.9	No Asbestos Detected	
WSB22	0.20	2.70	WSB22_1.3	Chrysotile, Amosite	
WSB23	0.50	2.30	WSB23_2.0	Chrysotile, Amosite	
WSB24	0.00	0.50	WSB24_0.2	No Asbestos Detected	
WSB25	0.00	0.00	WSB25_0.2	No Asbestos Detected	
WSB26	0.30	1.30	WSB26_0.7	Chrysotile, Amosite	
WSB27	0.00	1.00	WSB27_0.2	No Asbestos Detected	
WSB28	0.00	0.60	WSB28_0.4	Chrysotile, Amosite	
WSB29	0.00	1.20	WSB29_	No sample analysed	
WSB30	0.00	0.00	WSB30	No sample analysed	
WSB31	0.00	1.30	WSB31	No sample analysed	
WSB32	0.00	1.40	WSB32	No sample analysed	
WSB33	0.00	0.00	WSB33	No sample analysed	
WSB34	0.00	1.40	WSB34	No sample analysed	
WSB35	0.00	0.00	WSB35_0.2	Chrysotile	
WSB36	0.00	0.00	WSB36	No sample analysed	
WSB37	0.00	0.00	WSB37_	No sample analysed	
WSB38	0.80	1.10	WSB38_0.5	Chrysotile	
WSB39	0.00	0.70	WSB39	No sample analysed	
WSB40	0.00	0.00	WSB40	No sample analysed	
WSB41	0.30	2.20	WSB41	No sample analysed	
WSB42	0.30	2.20	WSB42	No sample analysed	
WSB43	0.30	3.20	WSB43_0.5	Chrysotile, Amosite	
WSB44	0.30	3.40	WSB44_3.0	Chrysotile, Amosite	
WSB45	0.30	3.40	WSB45_3.0	Chrysotile, Amosite	
WSB46	0.10	3.60	WSB46_3.8	Chrysotile, Amosite	
WSB47	0.00	0.30	WSB47	No sample analysed	
WSB48	0.50	1.20	WSB48_1.0	Chrysotile, Amosite	
WSB49	0.70	1.40	WSB49_0.5	Chrysotile, Amosite, Crocidolite	
WSB50	0.00	0.40	WSB50	No sample analysed	
WSB51	0.00	0.70	WSB51	No sample analysed	
WSB52	0.00	0.00	WSB52_0.5	No Asbestos Detected	
WSB53	0.40	1.30	WSB53	No sample analysed	
WSB54	0.00	0.00	WSB54_0.1	No Asbestos Detected	
WSB55	0.00	0.00	WSB55_1.0	No Asbestos Detected	
SB1/ D01	-	-	SB1_2.3	No Asbestos Detected	No respirable fibres detected
SB2/ D02	0.50	3.60	SB2_2.7-2.8	Chrysotile and Amosite Detected	No respirable fibres detected
			SB2_4.5-4.7	No Asbestos Detected	No respirable fibres detected
SB3/ D03	0.50	2.40	SB3_1.0-1.1	Chrysotile, Amosite, Crocidolite Detected	No respirable fibres detected
			SB3_2.8-2.9	No Asbestos Detected	No respirable fibres detected
SB4/ D04	0.40	1.30	SB4_0.5-0.6	Chrysotile, Amosite, Crocidolite Detected	No respirable fibres detected
			SB4_2.0-2.1	No Asbestos Detected	No respirable fibres detected
			SB4_3.2-3.3	No Asbestos Detected	No respirable fibres detected
SB5/ D05	-	-	SB5_1.7-1.8	No Asbestos Detected	No respirable fibres detected
			SB5_2.8-2.9	No Asbestos Detected	No respirable fibres detected
SB6/ D06	0.30	3.50	SB6_4.0-4.1	No Asbestos Detected	No respirable fibres detected
			SB6_4.7-4.8	No Asbestos Detected	No respirable fibres detected

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 1: Summary of Asbestos Analytical Results from Soil Bore Locations (URS 2006 and URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Asbestos Observation Results			Asbestos Analytical Results		
Location	Top of Asbestos (m)	Bottom of Asbestos (m)	Sample Identification	Sample Results	Trace Analysis Results (2013 Samples Only)
SB7/D07	0.40	3.80	SB7_4.3-4.4	No Asbestos Detected	No respirable fibres detected
			SB7_5.4-5.5	No Asbestos Detected	No respirable fibres detected
SB8/ D08	0.26	1.50	SB8_1.7-1.8	Chrysotile and Amosite Detected	No respirable fibres detected
			SB8_2.5-2.6	No Asbestos Detected	No respirable fibres detected
SB9/ D09	0.16	1.90	SB9_2.2-2.3	No Asbestos Detected	No respirable fibres detected
			SB9_3.2-3.3	No Asbestos Detected	No respirable fibres detected
SB10/ D10	0.16	2.30	SB10_2.1-2.2	No Asbestos Detected	No respirable fibres detected
			SB10_3.1-3.2	No Asbestos Detected	No respirable fibres detected
SB11/ D11	0.20	2.40	SB11_2.5-2.6	Chrysotile and Amosite Detected	No respirable fibres detected
			SB11_3.0-3.1	No Asbestos Detected	No respirable fibres detected
SB12/D12	0.18	2.3	SB12_2.4-2.5	Chrysotile, Amosite, Crocidolite Detected	No respirable fibres detected
			SB12_3.5-3.6	Chrysotile, Amosite, Crocidolite Detected	No respirable fibres detected
SB13/D13	0.13	0.9	SB13_0.8-0.9	Chrysotile, Amosite, Crocidolite Detected	No respirable fibres detected
			SB13_2.8-2.9	No Asbestos Detected	No respirable fibres detected
SB14/ D14	0.05	0.6	SB14_0.5-0.6	Chrysotile Detected	No respirable fibres detected
			SB14_1.8-1.9	No Asbestos Detected	No respirable fibres detected
SB15/ D15	-	-	SB15_0.5-0.6	No Asbestos Detected	No respirable fibres detected
			SB15_1.8-1.9	No Asbestos Detected	No respirable fibres detected
SB16/ D16	-	-	SB16_1.1-1.2	No Asbestos Detected	No respirable fibres detected
			SB16_2.3-2.4	No Asbestos Detected	No respirable fibres detected
SB17/ D17	-	-	SB17_0.5-0.6	No Asbestos Detected	No respirable fibres detected
			SB17_2.0-2.1	No Asbestos Detected	No respirable fibres detected
SB18/ D18	-	-	SB18_1.0-1.1	No Asbestos Detected	No respirable fibres detected
			SB18_1.7-1.8	No Asbestos Detected	No respirable fibres detected
SB19/ D19	-	-	SB19_2.1-2.2	No Asbestos Detected	No respirable fibres detected
SB20(D)	0.45	2.1	No samples Analysed for Asbestos	No samples Analysed for Asbestos	No samples Analysed for Asbestos
SB21	0.15	1.4			
SB22	0.2	2.4			
SB23	0.16	2.3			
SB24	0.16	2.7			
SB25	0.15	2.1			
SB26	0.15	2.2			
SB27	0.14	1.4			
SB28	0.15	2.7			
SB9A	0.18	2.5			

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 2: Coordinates and Measured Thickness of Asbestos Fill (URS 2006 and URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Bore Hole Location Data				Asbestos Fill					Total Fill		
Soil Bore Location	Easting	Northing	AHD Heights (assummed top of concrete for 2006 data)	Top of Asbestos (mgbl)	Base of Asbestos (mbgl)	Thickness	Top of Asbestos (mAHD)	Bottom of Asbestos (mAHD)	Top of Fill (0.2m taken as standard concrete thickness) mAHD	Bottom of fill/Fill thickness (mbgl)	Bottom of fill (mAHD)
WSB01	317218.6	6256606.0	3.66	0.20	2.80	2.60	3.46	0.86	3.46	2.80	0.66
WSB02	317177.2	6256618.7	3.77	0.70	2.80	2.10	3.07	0.97	3.57	2.80	0.77
WSB03	317152.0	6256621.4	3.70	0.40	2.40	2.00	3.30	1.30	3.50	2.40	1.10
WSB04	317105.7	6256627.9	3.58	0.60	2.40	1.80	2.98	1.18	3.38	2.40	0.98
WSB05	317073.3	6256632.2	3.52	0.20	2.20	2.00	3.32	1.32	3.32	2.20	1.12
WSB06	317023.4	6256636.0	3.74	0.30	2.30	2.00	3.44	1.44	3.54	2.30	1.24
WSB07	317011.1	6256594.1	3.82	0.00	0.00	0.00	3.82	3.82	3.62	0.40	3.22
WSB08	317066.0	6256605.4	3.81	0.60	0.80	0.20	3.21	3.01	3.61	0.80	2.81
WSB09	316996.6	6256538.8	3.84	0.50	0.90	0.40	3.34	2.94	3.64	1.00	2.64
WSB10	317098.0	6256547.1	3.35	0.00	0.00	0.00	3.35	3.35	3.15	0.50	2.65
WSB11	317101.3	6256598.0	3.77	0.00	1.70	1.70	3.77	2.07	3.57	1.70	1.87
WSB12	317149.2	6256598.1	3.84	0.30	2.60	2.30	3.54	1.24	3.64	2.60	1.04
WSB13	317182.6	6256592.0	3.76	0.10	2.30	2.20	3.66	1.46	3.56	2.30	1.26
WSB14	317215.4	6256587.3	3.82	0.50	2.20	1.70	3.32	1.62	3.62	2.20	1.42
WSB15	317212.8	6256567.6	3.77	0.70	2.00	1.30	3.07	1.77	3.57	2.00	1.57
WSB16	317181.2	6256571.7	3.78	0.30	2.00	1.70	3.48	1.78	3.58	2.00	1.58
WSB17	317146.6	6256576.0	3.80	0.70	2.40	1.70	3.10	1.40	3.60	2.40	1.20
WSB18	317099.3	6256579.9	3.79	0.00	0.00	0.00	3.79	3.79	3.59	1.60	1.99
WSB19	317062.6	6256585.7	3.81	0.00	0.00	0.00	3.81	3.81	3.61	0.50	3.11
WSB20	317209.3	6256540.4	3.80	1.20	2.20	1.00	2.60	1.60	3.60	2.20	1.40
WSB21	317201.9	6256506.4	3.75	0.00	0.00	0.00	3.75	3.75	3.55	2.70	0.85
WSB22	317177.3	6256540.6	3.72	0.20	2.70	2.50	3.52	1.02	3.52	2.70	0.82
WSB23	317142.0	6256546.2	3.89	0.50	2.30	1.80	3.39	1.59	3.69	2.30	1.39
WSB24	317173.7	6256514.9	2.70	0.00	0.50	0.50	2.70	2.20	2.50	0.50	2.00
WSB25	317183.6	6256476.9	2.82	0.00	0.00	0.00	2.82	2.82	2.62	0.60	2.02
WSB26	317155.7	6256454.8	2.89	0.30	1.30	1.00	2.59	1.59	2.69	1.30	1.39
WSB27	317138.1	6256520.8	2.54	0.00	1.00	1.00	2.54	1.54	2.34	1.00	1.34
WSB28	317055.7	6256563.5	3.81	0.00	0.60	0.60	3.81	3.21	3.61	0.60	3.01
WSB29	317039.2	6256528.2	4.58	0.00	1.20	1.20	4.58	3.38	4.38	1.20	3.18
WSB30	317037.2	6256510.6	4.69	0.00	1.50	1.50	4.69	3.19	4.49	1.50	2.99
WSB31	317022.9	6256521.9	4.65	0.00	1.30	1.30	4.65	3.35	4.45	1.30	3.15
WSB32	316994.8	6256510.3	4.62	0.00	1.40	1.40	4.62	3.22	4.42	1.40	3.02
WSB33	317085.1	6256502.7	4.82	0.00	0.50	0.50	4.82	4.32	4.62	1.00	3.62
WSB34	317138.6	6256498.9	4.82	0.00	1.40	1.40	4.82	3.42	4.62	1.40	3.22
WSB35	316990.3	6256479.8	4.72	0.00	0.00	0.00	4.72	4.72	4.52	0.20	4.32
WSB36	316986.6	6256443.4	4.72	0.00	0.00	0.00	4.72	4.72	4.52	0.10	4.42
WSB37	317011.1	6256402.8	4.74	0.00	0.00	0.00	4.74	4.74	4.54	0.30	4.24
WSB38	317053.9	6256437.6	4.77	0.50	1.10	0.60	4.27	3.67	4.57	1.10	3.47
WSB39	317098.8	6256482.4	4.97	0.00	0.70	0.70	4.97	4.27	4.77	1.50	3.27
WSB40	317092.9	6256451.2	5.86	0.00	0.00	0.00	5.86	5.86	5.66	1.00	4.66
WSB41	317134.5	6256477.1	5.31	0.30	2.20	1.90	5.01	3.11	5.11	2.20	2.91
WSB42	317131.6	6256448.4	5.47	0.30	2.20	1.90	5.17	3.27	5.27	2.20	3.07
WSB43	317165.5	6256424.9	5.45	0.30	3.20	2.90	5.15	2.25	5.25	3.20	2.05
WSB44	317162.6	6256386.6	5.58	0.30	3.30	3.00	5.28	2.28	5.38	3.30	2.08
WSB45	317125.3	6256374.0	5.49	0.30	3.40	3.10	5.19	2.09	5.29	3.40	1.89
WSB46	317127.4	6256414.5	5.66	0.30	3.80	3.50	5.36	1.86	5.46	3.80	1.66
WSB47	317092.7	6256404.8	5.70	0.00	0.30	0.30	5.70	5.40	5.50	0.30	5.20
WSB48	317156.7	6256357.2	2.80	0.50	1.20	0.70	2.30	1.60	2.60	1.20	1.40
WSB49	317079.3	6256365.7	5.24	0.70	1.40	0.70	4.54	3.84	5.04	1.40	3.64
WSB50	317054.4	6256367.7	5.65	0.00	0.40	0.40	5.65	5.25	5.45	0.40	5.05

Prepared by: SJB
Checked by: BM
Date: 20.02.13

Table 2: Coordinates and Measured Thickness of Asbestos Fill (URS 2006 and URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Soil Bore Location	Easting	Northing	AHD Heights (assummed top of concrete for 2006 data)	Top of Asbestos (mgbl)	Base of Asbestos (mbgl)	Thickness	Top of Asbestos (mAHD)	Bottom of Asbestos (mAHD)	Top of Fill (0.2m taken as standard concrete thickness) mAHD	Bottom of fill/Fill thickness (mbgl)	Bottom of fill (mAHD)
WSB51	317018.6	6256369.5	6.07	0.00	0.70	0.70	6.07	5.37	5.87	0.70	5.17
WSB52	316981.7	6256372.6	5.57	0.00	0.00	0.00	5.57	5.57	5.37	0.40	4.97
WSB53	317115.6	6256362.7	3.37	0.40	1.30	0.90	2.97	2.07	3.17	1.30	1.87
WSB54	317007.4	6256564.4	3.59	0.00	0.00	0.00	3.59	3.59	3.39	0.20	3.19
WSB55	317050.8	6256399.3	4.75	0.00	0.00	0.00	4.75	4.75	4.55	0.20	4.35
SB01/MW01-12	317150.61	6256358.67	2.93	0.00	0.00	0.00	2.93	2.93	2.73	0.50	2.23
SB02/MW02-12	317108.13	6256378.37	5.65	0.50	3.60	3.10	5.15	2.05	5.45	3.60	1.85
SB03/MW03-12	317152.64	6256617.73	3.76	0.50	2.40	1.90	3.26	1.36	3.56	2.40	1.16
SB04/MW04-12	317009.77	6256576.09	3.81	0.40	1.30	0.90	3.41	2.51	3.61	1.30	2.31
SB05/MW05-12	317015.71	6256552.68	3.71	0.30	0.80	0.50	3.41	2.91	3.51	0.80	2.71
SB06-12	317134	6256388.82	5.68	0.30	3.50	3.20	5.38	2.18	5.48	3.50	1.98
SB07-12	317147.04	6256414.8	5.57	0.00	3.80	3.80	5.57	1.77	5.37	3.80	1.57
SB08	317161.29	6256474.03	3	0.20	1.50	1.30	2.80	1.50	2.80	1.50	1.30
SB09-12	317211.56	6256566.74	3.78	0.20	1.90	1.70	3.58	1.88	3.58	2.00	1.58
SB9A-12	317210.6	6256566.62	3.8	0.20	2.00	1.80	3.60	1.80	3.60	2.30	1.30
SB10-12	317214.7	6256586.76	3.83	0.20	2.40	2.20	3.63	1.43	3.63	2.30	1.33
SB11-12	317133.22	6256620.53	3.63	0.2	2.4	2.20	3.43	1.23	3.43	2.40	1.03
SB12-12	317093.93	6256624.96	3.69	0.2	2.3	2.10	3.49	1.39	3.49	2.30	1.19
SB13-12	317026	6256584	3.81	0.2	0.9	0.70	3.61	2.91	3.61	1.70	1.91
SB14-12	317077.81	62526523.2	4.51	0.05	0.6	0.55	4.46	3.91	4.31	0.60	3.71
SB15-12	317109.06	6256506.96	4.85	0.00	0.00	0.00	4.85	4.85	4.65	0.20	4.45
SB16-12	317033.4	6256463.72	4.74	0.00	0.00	0.00	4.74	4.74	4.54	0.40	4.14
SB17-12	317027.91	6256415.42	4.75	0.00	0.00	0.00	4.75	4.75	4.55	1.00	3.55
SB18-12	316983.74	6256424.99	4.72	0.00	0.00	0.00	4.72	4.72	4.52	1.00	3.52
SB19-12	316991.46	6256473.3	4.71	0.20	1.50	1.30	4.51	3.21	4.51	1.50	3.01
SB20-12	317213.88	6256572.07	3.8	0.20	2.10	1.90	3.60	1.70	3.60	2.10	1.50
SB21-12	317214.18	6256586.35	3.85	0.2	2.3	2.10	3.65	1.55	3.65	2.40	1.25
SB22-12	317219.14	6256586.35	3.82	0.1	2.70	2.60	3.72	1.12	3.62	2.70	0.92
SB23-12	317218.67	6256604.49	3.71	0.2	2.3	2.10	3.51	1.41	3.51	2.80	0.71
SB24-12	317206.05	6256565.91	3.78	0.2	2.7	2.50	3.58	1.08	3.58	2.70	0.88
SB25-12	317216.73	6256565.91	3.75	0.2	2.1	1.90	3.55	1.65	3.55	2.10	1.45
SB26-12	317210.88	6256561.76	3.77	0.2	2.2	2.00	3.57	1.57	3.57	2.20	1.37
SB27-12	317181.67	6256571.46	3.8	0.2	1.3	1.10	3.60	2.50	3.60	2.20	1.40
SB28-12	317178.32	6256616.19	3.8	0.2	3.3	3.10	3.60	0.50	3.60	3.30	0.30

Legend:

mBGL = Metres below ground level

mAHD = Metres Australian Height Datum (survey data)

Coordinates are provided in Geocentric Datum of Australia (GDA 94), UTM Zone 56.

Notes regarding Estimates of Fill Thickness:

2.8	> 1.9 m (used neighbouring SB23)
2.4	> 1 m (used neighbouring SB03)
2.3	> 2 m (used neighbouring G9)
2.7	> 1.3 (used neighbouring SB09)
2.4	>1.3 (used neighbouring G5)
2.7	> 0.9 (used neighbouring G6)
1.5	Approximated from WSB 29 and 31
3.8	> 4.5 (used neighbouring SB07)

Prepared by: SJB
Checked by: BM
Date: 20.02.13

Table 3: Analytical Results from the Acid Sulphate Soils Assessment (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample Location				SB1	SB2	SB3	SB4	SB6	SB7	SB8	SB9	SB12	SB14	SB15	SB19
Sample I.D				SB1_3.5-3.6	SB2_4.2-4.3	SB3_3.0-3.1	SB4_3.6-3.7	SB6_3.9-4.0	SB7_4.5-4.6	SB8_2.9-3.0	SB9_3.4-3.5	SB12_3.5-3.6	SB14_4.5-4.6	SB15_1.6-1.7	SB19_2.1-2.2
Sample Date				15/10/2012	15/10/2012	15/10/2012	16/10/2012	17/10/2012	17/10/2012	17/10/2012	16/10/2012	16/10/2012	17/10/2012	17/10/2012	17/10/2012
Sample Type				N	N	N	N	N	N	N	N	N	N	N	N
Analyte	**LOR**	**Units**	**Action Criteria***												
pH Measurements															
pH (KCl)	0.1	pH unit		**4.9**	**4.8**	**4.6**	**5.1**	**6.9**	**8**	**5.5**	**4.8**	**4.1**	**5.5**	**4.8**	**5**
pH OX (23B)	0.1	pH unit		**5**	**4.4**	**4.2**	**5.2**	**5.1**	**6.6**	**5**	**2.7**	**4.1**	**5.4**	**4.9**	**6.1**
Acidity Trail															
Titratable Actual Acidity (23F)	2	moleH+/t	**18**	**10**	**24**	**24**	**6**	< 2	< 2	**5**	**10**	**29**	**2**	**21**	**11**
Titratable Peroxide Acidity (23G)	2	moleH+/t	**18**	< 2	**75**	**35**	< 2	**7**	< 2	< 2	**108**	**27**	**3**	**23**	**6**
Titratable Sulfidic Acidity (23H)	2	moleH+/t	**18**	< 2	**51**	**11**	< 2	**7**	< 2	< 2	**98**	< 2	< 2	< 2	< 2
sulfidic - Titratable Actual Acidity (s-23F)	0.02	% pyrite S		< 0.02	**0.04**	**0.04**	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	**0.04**	< 0.02	**0.03**	< 0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	0.02	% pyrite S		< 0.02	**0.12**	**0.06**	< 0.02	< 0.02	< 0.02	< 0.02	**0.17**	**0.04**	< 0.02	**0.04**	< 0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	0.02	% pyrite S		<0.02	**0.08**	<0.02	<0.02	<0.02	<0.02	<0.02	**0.16**	<0.02	<0.02	<0.02	<0.02
Sulfur Trail:															
KCl Extractable Sulfur (23Ce)	0.02	% S		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Peroxide Oxidisable Sulfur (23E)	0.02	% S	**0.03**	< 0.02	**0.07**	< 0.02	< 0.02	**0.13**	**0.03**	< 0.02	**0.17**	**0.02**	< 0.02	< 0.02	< 0.02
Peroxide Sulfur (23De)	0.02	% S	**0.03**	< 0.02	**0.07**	< 0.02	< 0.02	**0.13**	**0.03**	< 0.02	**0.17**	**0.02**	< 0.02	< 0.02	< 0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	10	moleH+/t		< 10	**44**	< 10	< 10	**80**	**22**	< 10	**106**	**13**	< 10	< 10	< 10
Calcium Values															
KCl Extractable Calcium (23Vh)	0.02	% Ca		< 0.02	**0.07**	**0.03**	**0.03**	**0.26**	**0.1**	< 0.02	< 0.02	< 0.02	< 0.02	**0.06**	< 0.02
Peroxide Calcium (23Wh)	0.02	% Ca		< 0.02	**0.06**	**0.04**	**0.03**	**0.21**	**0.11**	< 0.02	< 0.02	< 0.02	< 0.02	**0.06**	< 0.02
Acid Reacted Calcium (23X)	0.02	% Ca		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
acidity - Acid Reacted Calcium (a-23X)	10	moleH+/t		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
sulfidic - Acid Reacted Calcium (s-23X)	0.02	% S		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Magnesium Values:															
KCl Extractable Magnesium (23Sm)	0.02	% Mg		**0.03**	**0.04**	<0.02	**0.03**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.09**
Peroxide Magnesium (23Tm)	0.02	% Mg		**0.03**	**0.04**	< 0.02	**0.03**	< 0.02	**0.03**	< 0.02	< 0.02	< 0.02	< 0.02	**0.04**	**0.09**
Acid Reacted Magnesium (23U)	0.02	% Mg		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	**0.03**	< 0.02	< 0.02	< 0.02	< 0.02	**0.04**	< 0.02
sulfidic - Acid Reacted Magnesium (s-23U)	0.02	% S		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	**0.04**	< 0.02	< 0.02	< 0.02	< 0.02	**0.05**	< 0.02
Acidity - Acid Reacted Magnesium (a-23U)	10	moleH+/t		< 10	< 10	< 10	< 10	< 10	**27**	< 10	< 10	< 10	< 10	**30**	< 10
Acid Base Accounting															
ANC Fineness Factor	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	1.5	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (acidity units)	10	moleH+/t		< 10	**68**	**24**	< 10	**31**	< 10	< 10	**116**	**64**	< 10	**21**	**11**
Net Acidity (sulfur units)	0.02	% S		< 0.02	**0.11**	**0.04**	< 0.02	**0.05**	< 0.02	< 0.02	**0.18**	**0.1**	< 0.02	**0.03**	< 0.02
Liming Rate	1	kg CaCO3/t		< 1	**5**	**2**	< 1	**2**	< 1	< 1	**9**	**5**	< 1	**2**	< 1
Other															
Excess Acid Neutralising Capacity (23Q)	0.02	% CaCO3		-	-	-	-	-	**0.12**	-	-	-	-	-	-
sulfidic - Excess Acid Neutralising Capacity (s-23	0.02	% S		-	-	-	-	-	**0.04**	-	-	-	-	-	-
HCl Extractable Sulfur (20Be)	0.02	% S		-	-	-	-	-	-	-	-	**0.05**	-	-	-
Acid Base Accounting															
acidity - Net Acid Soluble Sulfur (a-20J)	10	moleH+/t		-	-	-	-	-	-	-	-	**23**	-	-	-
Net Acid Soluble Sulfur (20Je)	0.02	% S		-	-	-	-	-	-	-	-	**0.05**	-	-	-

Action Criteria* Source: Stone, Y, Ahern C R, and Blunden B (1998). Acid Sulfate Soils Manual 1998. Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia. From **Table 4.4**, page 28.

Legend:

LOR = Limit of Reporting

N= Normal sample

Exceeds Acid Sulphate Soil Action Level

Results in **Bold** indicate results above LOR.

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			NSW EPA Service Station Guidelines	NEPM EILs	NEPC (1999) HIL 'E'	NEPC (1999) HIL 'D'	NEPC (1999) HIL 'F'	WSB01_0.5	WSB01_1.0	WSB02_1.3	WSB02_2.8	WSB03_0.5	WSB03_0.9	WSB04_0.5	WSB04_1.9	WSB05_0.5
Date								5/12/2005	5/12/2005	6/12/2005	6/12/2005	6/12/2005	6/12/2005	6/12/2005	6/12/2005	6/12/2005
QC Informations	Units	LOR														
Total Metals																
Arsenic	mg/kg	5		20	200	400	500	16	<5	107	574	8	8	<5	6	6
Cadmium	mg/kg	1		3	40	80	100	<1	<1	14	<1	<1	2	7	<1	<1
Chromium	mg/kg	2		400	24000	48000	60000	13	20	317	8	25	32	17	33	66
Copper	mg/kg	5		100	2000	4000	5000	161	15	3300	14	20	20	32	152	15
Lead	mg/kg	5		600	600	1200	1500	89	<5	8560	29	31	38	16	17	7
Nickel	mg/kg	2		60	600	2400	3000	18	40	66	3	15	46	34	60	97
Zinc	mg/kg	5		200	14000	28000	35000	743	80	24100	41	204	686	1770	363	56
Total Mercury																
Mercury	mg/kg	0.1		1	30	60	75	<0.1	<0.1	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Polynuclear Aromatic Hydrocarbons																
Naphthalene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1	<0.5	<0.5
Anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1	<0.5	<0.5
Fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	2.6	1	<0.5	<0.5
Pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	2.7	0.8	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5			2	4	5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5
Total PAHs	*mg/kg*				40	80	100	0	0	0	0	0	13.5	3.8	0	0
Total Petroleoum Hydrocarbons																
C6 - C9 Fraction	mg/kg	2	65					<2	<2	<2	<2	<2	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50						<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100						100	<100	300	<100	<100	210	190	<100	1490
C29 - C36 Fraction	mg/kg	100						<100	<100	340	<100	<100	<100	<100	<100	1020
TPH C10 - C36	*mg/kg*		1000					100	0	640	0	0	210	190	0	2510
BTEX																
Benzene	mg/kg	0.2	1					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.2	1.4					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.2	3.1					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	mg/kg	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Xylene	*mg/kg*		14					0	0	0	0	0	0	0	0	0
TCLP Leachate																
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	-	0.7	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-

Prepared by: SJB
Checked by: AS

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**WSB05_2.0**	**QC101_06/12/05**	**QC201_06/12/05**	**WSB06_0.5**	**WSB06_1.9**	**WSB07_0.2**	**WSB07_2.0**	**WSB08_0.5**	**WSB08_1.5**	**WSB09_0.5**	**WSB09_1.0**	**WSB10_0.2**
Date			**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**6/12/2005**	**7/12/2005**	**7/12/2005**	**7/12/2005**
QC Informations	**Units**	**LOR**	**WSB05_2.0 Duplicate and Triplicate**											
Total Metals														
Arsenic	mg/kg	5	<5	<5	**4**	**15**	<5	<5	**6**	<5	<5	882	8	<5
Cadmium	mg/kg	1	<1	<1	<0.1	2	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	mg/kg	2	**30**	**37**	**42**	**27**	**8**	**7**	**20**	**10**	**11**	**15**	8	20
Copper	mg/kg	5	**13**	**18**	**16**	**99**	**89**	**75**	**15**	**15**	**13**	**53**	<5	76
Lead	mg/kg	5	**10**	**7**	**71**	**263**	**14**	<5	**23**	**32**	13	116	10	<5
Nickel	mg/kg	2	**51**	**69**	**7**	**23**	**28**	**63**	**4**	**3**	**2**	17	<2	**107**
Zinc	mg/kg	5	**33**	**30**	**40**	**455**	**186**	**34**	**22**	**38**	16	160	6	32
Total Mercury														
Mercury	mg/kg	0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.5	<0.1	<0.1
Polynuclear Aromatic Hydrocarbons														
Naphthalene	mg/kg	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
Acenaphthylene	mg/kg	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
Acenaphthene	mg/kg	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
Fluorene	mg/kg	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
Phenanthrene	mg/kg	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
Anthracene	mg/kg	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
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
Benz(a)anthracene	mg/kg	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
Chrysene	mg/kg	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
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	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
Indeno(1.2.3.cd)pyrene	mg/kg	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
Dibenz(a.h)anthracene	mg/kg	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
Benzo(g.h.i)perylene	mg/kg	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
Total PAHs	*mg/kg*		0	0	0	0	0	0	0	0	0	**1.2**	0	0
Total Petroleoum Hydrocarbons														
C6 - C9 Fraction	mg/kg	2	<2	<2	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100	<100	**130**	<100	<100	**260**	**260**	<100	<100	<100	<100	<100	<100
TPH C10 - C36	*mg/kg*		0	**130**	0	0	**260**	**260**	0	0	0	0	0	0
BTEX														
Benzene	mg/kg	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
Toluene	mg/kg	0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0
TCLP Leachate														
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	-	-	0.3	-	-
Lead	mg/L	0.1	-	-	-	<0.1	-	-	-	-	-	-	-	-

Prepared by: SJB
Checked by: AS

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			WSB10_1.3	WSB11_0.5	WSB11_1.0	WSB12_1.0	QC102_07/12/05	WSB12_2.2	WSB13_0.5	WSB13_2.5	WSB14_0.6	WSB14_2.1	WSB16_0.5	WSB16_2.3	WSB17_0.2
Date			7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005
QC Informations	**Units**	**LOR**				**WSB12_1.0 Duplicate**									
Total Metals															
Arsenic	mg/kg	5	7	<5	<5	6	31	13	6	8	<5	9	<5	22	30
Cadmium	mg/kg	1	<1	<1	<1	<1	1	6	<1	<1	<1	4	<1	109	<1
Chromium	mg/kg	2	14	54	53	28	35	32	13	8	18	23	20	84	30
Copper	mg/kg	5	12	16	13	31	34	85	22	6	13	49	25	418	15
Lead	mg/kg	5	11	7	14	33	89	279	19	11	21	189	17	**1880**	247
Nickel	mg/kg	2	2	86	89	24	48	41	16	4	20	27	22	28	14
Zinc	mg/kg	5	13	286	120	104	764	2740	222	22	80	749	55	2440	75
Total Mercury															
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8	0.3	<0.1	<0.1
Polynuclear Aromatic Hydrocarbons															
Naphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	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
Acenaphthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	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
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	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
Dibenz(a.h)anthracene	mg/kg	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
Benzo(g.h.i)perylene	mg/kg	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
Total PAHs	*mg/kg*		0	0	0	**4.4**	0	0	0	0	0	**11.6**	0	0	0
Total Petroleoum Hydrocarbons															
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	**51**	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	**1400**	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	**140**	<100	**220**	**490**	**270**	<100	<100	**200**	**7930**	<100	**9720**	<100
C29 - C36 Fraction	mg/kg	100	<100	<100	<100	**140**	**230**	**160**	<100	<100	**140**	**7670**	<100	**9970**	<100
TPH C10 - C36	*mg/kg*		0	**140**	0	**360**	**720**	**430**	0	0	**340**	**17000**	0	**19690**	0
BTEX															
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2
Toluene	mg/kg	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	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
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.2	<0.2	<0.2
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0.9	0	0	0
TCLP Leachate															
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
Lead	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	3.6	0.2

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**WSB17_1.1**	**WSB18_0.5**	**WSB18_1.2**	**QC103_07/12/05**	**QC202_07/12/05**	**WSB19_0.2**	**WSB19_0.5**	**WSB20_0.9**	**WSB20_2.2**	**WSB21_0.2**	**WSB21_0.9**	**WSB22_1.3**
Date			7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	7/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005
QC Informations	**Units**	**LOR**			**WSB18_1.2 Duplicate and Triplicate**									**WSB22_1.3**
Total Metals														
Arsenic	mg/kg	5	5	<5	<5	6	**44**	<5	6	**64**	<5	<5	<5	5
Cadmium	mg/kg	1	<1	<1	<1	<1	0.6	<1	<1	1	<1	<1	<1	<1
Chromium	mg/kg	2	21	16	18	25	28	9	10	36	2	17	21	14
Copper	mg/kg	5	18	36	48	53	42	7	17	74	5	**109**	75	25
Lead	mg/kg	5	67	6	11	16	37	<5	168	560	7	<5	<5	22
Nickel	mg/kg	2	17	18	26	32	50	23	5	9	6	**108**	**64**	10
Zinc	mg/kg	5	330	105	79	96	**220**	14	120	**606**	24	51	34	137
Total Mercury														
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.21	<0.1	0.5	0.4	<0.1	<0.1	<0.1	<0.1
Polynuclear Aromatic Hydrocarbons														
Naphthalene	mg/kg	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
Acenaphthylene	mg/kg	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
Acenaphthene	mg/kg	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
Fluorene	mg/kg	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
Phenanthrene	mg/kg	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
Anthracene	mg/kg	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
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.4**	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	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
Benzo(g.h.i)perylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5
Total PAHs	*mg/kg*		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12.2**	**0**	**0**	**0**	**0**
Total Petroleoum Hydrocarbons														
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<10	<2	<2	<2	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	110	<100	<100	<100	100
C29 - C36 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	110	<100	<100	<100	<100
TPH C10 - C36	*mg/kg*		0	0	0	0	0	0	0	220	0	0	0	100
BTEX														
Benzene	mg/kg	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
Toluene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0
TCLP Leachate														
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**QC104_08/12/05**	**WSB22_2.1**	**WSB23_0.6**	**WSB23_2.0**	**WSB24_0.2**	**WSB24_1.2**	**WSB25_0.2**	**WSB25_0.5**	**WSB26_0.2**	**WSB26_0.7**	**WSB27_0.2**	**WSB27_1.2**	**WSB28_0.4**	**WSB28_1.0**
Date			**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**	**8/12/2005**
QC Informations	**Units**	**LOR**	**Duplicate**													
Total Metals																
Arsenic	mg/kg	5	10	20	<5	55	<5	6	<5	**52**	<5	14	<5	<5	<5	<5
Cadmium	mg/kg	1	<1	<1	<1	11	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	mg/kg	2	30	27	18	63	17	8	7	12	14	48	12	7	6	12
Copper	mg/kg	5	11	5	14	12	66	6	<5	22	70	25	57	6	9	8
Lead	mg/kg	5	29	23	60	<5	<5	<5	10	203	6	120	<5	7	27	12
Nickel	mg/kg	2	12	6	16	98	80	<2	<2	18	**146**	**65**	**119**	3	4	2
Zinc	mg/kg	5	4960	18	204	2790	42	7	<5	115	52	176	45	7	31	9
Total Mercury																
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1	0.2	<0.1
Polynuclear Aromatic Hydrocarbons																
Naphthalene	mg/kg	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
Acenaphthylene	mg/kg	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
Acenaphthene	mg/kg	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
Fluorene	mg/kg	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
Phenanthrene	mg/kg	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
Anthracene	mg/kg	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
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	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
Chrysene	mg/kg	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
Benzo(b)fluoranthene	mg/kg	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
Benzo(k)fluoranthene	mg/kg	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
Benzo(a)pyrene	mg/kg	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
Indeno(1.2.3.cd)pyrene	mg/kg	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
Dibenz(a.h)anthracene	mg/kg	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
Benzo(g.h.i)perylene	mg/kg	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
Total PAHs	*mg/kg*		0	0	0	0	0	0	0	1.4	0	1.4	0	0	0	0
Total Petroleoum Hydrocarbons																
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	<100	250	<100	<100	<100	<100	<100	**140**	<100	**460**	<100	<100	<100
C29 - C36 Fraction	mg/kg	100	<100	<100	180	<100	**240**	<100	<100	<100	**450**	<100	**1450**	<100	<100	<100
TPH C10 - C36	*mg/kg*		0	0	430	0	**240**	0	0	0	**590**	0	**1910**	0	0	0
BTEX																
Benzene	mg/kg	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
Toluene	mg/kg	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	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
meta- & para-Xylene	mg/kg	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
ortho-Xylene	mg/kg	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
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCLP Leachate																
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			WSB29_0.2	WSB29_1.4	WSB30_0.2	WSB30_1.0	WSB31_0.7	WSB31_1.3	WSB32_0.5	WSB32_1.3	WSB32_1.6	WSB33_0.5	WSB33_1.3	WSB34_0.2	QC105_08/12/05	QC203_08/12/05
Date			8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005	8/12/2005
QC Informations	**Units**	**LOR**													**WSB34_0.2 Duplicate and Triplicate**	
Total Metals																
Arsenic	mg/kg	5	16	5	11	<5	**21**	**491**	13	-	1360	<5	<5	15	69	20
Cadmium	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	1	0.2
Chromium	mg/kg	2	11	13	18	3	25	8	19	-	13	12	16	20	37	17
Copper	mg/kg	5	29	<5	41	<5	28	5	17	-	17	<5	7	21	78	19
Lead	mg/kg	5	24	13	37	<5	536	9	15	-	21	17	11	29	31	7
Nickel	mg/kg	2	31	4	51	<2	20	3	13	-	3	4	4	8	36	36
Zinc	mg/kg	5	183	17	100	<5	**349**	10	22	-	33	6	13	103	242	48
Total Mercury																
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.3	<0.1	<0.1	<0.1	<0.1	<0.05
Polynuclear Aromatic Hydrocarbons																
Naphthalene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<1
Benzo(k)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<1
Benzo(a)pyrene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Total PAHs	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Petroleoum Hydrocarbons																
C6 - C9 Fraction	mg/kg	2	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<10
C10 - C14 Fraction	mg/kg	50	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
TPH C10 - C36	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0	0	0
BTEX																
Benzene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.5
Ethylbenzene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.5
meta- & para-Xylene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<1
ortho-Xylene	mg/kg	0.2	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.5
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCLP Leachate																
B[a]p	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	3.1	-	-	4.2	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Prepared by: SJB
Checked by: AS

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**WSB34_2.2**	**WSB35_0.2**	**WSB35_0.5**	**WSB38_0.5**	**QC106**	**WSB38_1.0**	**WSB40_0.1**	**WSB40_1.4**	**WSB43_0.5**	**QC107**	**QC204**	**WSB43_3.0**	**WSB44_0.2**	**WSB44_3.0**	**WSB45_0.5**
Date			**8/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**	**9/12/2005**
QC Informations	**Units**	**LOR**				**WSB 38_0.5 Duplicate**					**WSB43_0.5 Duplicate and Triplicate**						
Total Metals																	
Arsenic	mg/kg	5	6	94	<5	<5	<5	6	8	7	<5	<5	4	**33**	15	<5	<5
Cadmium	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.1	**20**	<1	<1	<1
Chromium	mg/kg	2	17	16	6	6	7	10	7	14	42	47	38	61	21	8	54
Copper	mg/kg	5	11	15	10	7	7	14	35	10	18	10	12	**1060**	17	6	**198**
Lead	mg/kg	5	19	17	8	6	7	11	13	13	10	33	9	440	44	20	63
Nickel	mg/kg	2	7	9	<2	6	6	8	15	3	**61**	57	**64**	**75**	18	5	**105**
Zinc	mg/kg	5	28	34	12	26	33	47	66	19	32	59	32	**709**	142	22	**401**
Total Mercury																	
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.09	<0.1	0.2	<0.1	0.1
Polynuclear Aromatic Hydrocarbons																	
Naphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	167	<0.5	<0.5	**1.4**
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	17.4	<0.5	<0.5	**1.4**
Acenaphthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	441	<0.5	<0.5	**3.5**
Fluorene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	379	<0.5	<0.5	**1.9**
Phenanthrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2580	0.5	<0.5	**38**
Anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	824	<0.5	<0.5	**12.2**
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2720	<0.5	<0.5	**59.2**
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2700	<0.5	<0.5	**60.8**
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1230	<0.5	<0.5	**29.7**
Chrysene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1200	<0.5	<0.5	**31**
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	706	<0.5	<0.5	**28**
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	651	<0.5	<0.5	**26.2**
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	951	<0.5	<0.5	**39.1**
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	306	<0.5	<0.5	**20**
Dibenz(a.h)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	116	<0.5	<0.5	**6.5**
Benzo(g.h.i)perylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	338	<0.5	<0.5	**25.7**
Total PAHs	*mg/kg*		**0**	**0**	**0**	**0**	**0**	**0**	**0.6**	**0**	**0**	**0**	**0**	**15326.4**	**0.5**	**0**	**384.6**
Total Petroleoum Hydrocarbons																	
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<2	<2	**9**	<2	<2	<2	-	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	**1060**	<50	<50	**200**
C15 - C28 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	170	<100	<100	<100	<100	**119000**	**480**	<100	**6580**
C29 - C36 Fraction	mg/kg	100	<100	<100	<100	<100	<100	110	260	<100	<100	<100	<100	**73300**	**150**	<100	**7440**
TPH C10 - C36	*mg/kg*		0	0	0	0	0	110	430	0	0	0	0	**193360**	**630**	0	**14220**
BTEX																	
Benzene	mg/kg	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
Toluene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2
Total Xylene	*mg/kg*		0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0
TCLP Leachate																	
B[a]p	mg/L	0.5	-	-	-	-	-	-	<0.5	-	<0.5	-	-	<0.5	-	-	<0.5
Arsenic	mg/L	0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	-	<0.1	-	-	<0.1	-	-	-

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**WSB45_3.0**	**WSB46_0.5**	**WSB46_3.8**	**WSB48_0.4**	**WSB48_1.0**	**WSB49_0.6**	**QC108**	**WSB49_0.9**	**WSB52_0.5**	**WSB52_4.0**	**WSB54_0.1**	**QC109_13.12.05**	**QC205**	**WSB54_2.0**
Date			9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	13/12/2005	13/12/2005	13/12/2005	13/12/2005
QC Informations	**Units**	**LOR**						**WSB-49 Duplicate**					**WSB54_0.1 Duplicate and Triplicate**			
Total Metals																
Arsenic	mg/kg	5	<5	9	<5	<5	<5	<5	<5	1550	11	7	<5	<5	1	<5
Cadmium	mg/kg	1	<1	**17**	<1	1	<1	2	**8**	<1	<1	<1	<1	<1	2.8	<1
Chromium	mg/kg	2	44	22	288	23	15	16	15	35	16	14	4	6	9	9
Copper	mg/kg	5	18	6	26	10	9	9	17	67	14	18	54	54	86	10
Lead	mg/kg	5	74	25	92	27	23	8	21	107	15	18	<5	<5	3	9
Nickel	mg/kg	2	**71**	7	**176**	25	17	24	27	**79**	5	8	33	40	**65**	6
Zinc	mg/kg	5	72	**333**	**4200**	41	24	86	**344**	**493**	30	44	23	28	52	24
Total Mercury																
Mercury	mg/kg	0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1
Polynuclear Aromatic Hydrocarbons																
Naphthalene	mg/kg	0.5	**184**	<0.5	**27.6**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5	**16.8**	<0.5	**9.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5	**432**	<0.5	**125**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5	**402**	<0.5	**107**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5	**2740**	**2.1**	**876**	**1.2**	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5	**842**	**0.6**	**273**	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5	**2720**	**3.4**	**963**	**1.8**	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	**2660**	**3.7**	**924**	**1.7**	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	**1160**	**1.6**	**396**	**0.8**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	**1100**	**1.6**	**373**	**0.7**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5	**648**	**0.8**	**205**	**<0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5
Benzo(k)fluoranthene	mg/kg	0.5	**560**	**0.9**	**190**	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5
Benzo(a)pyrene	mg/kg	0.5	**936**	**1.2**	**312**	**0.6**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	**293**	<0.5	**95.7**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5	**108**	<0.5	**27.6**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5	**318**	**0.6**	**101**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total PAHs	*mg/kg*		**15119.8**	**16.5**	**5005.1**	**7.8**	**1.4**	**0.6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Petroleoum Hydrocarbons																
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	<2
C10 - C14 Fraction	mg/kg	50	**1150**	<50	<250	<50	<50	**110**	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	**139000**	<100	**39200**	<100	<100	**770**	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100	**75700**	<100	**22800**	<100	<100	**260**	<100	<100	<100	<100	<100	<100	<100	<100
TPH C10 - C36	*mg/kg*		**215850**	0	**62000**	0	0	**1140**	0	0	0	0	0	0	0	0
BTEX																
Benzene	mg/kg	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
Toluene	mg/kg	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	<0.5	<0.2
Ethylbenzene	mg/kg	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	<0.5	<0.2
meta- & para-Xylene	mg/kg	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	<1	<0.2
ortho-Xylene	mg/kg	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	<0.5	<0.2
Total Xylene	*mg/kg*		0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCLP Leachate																
B[a]p	mg/L	0.5	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.1	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-
Lead	mg/L	0.1	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-

Table 4: Soil Analytical Results Tables - PAh, TPH, BTEX and TCLP Leachate (URS 2006)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample ID			**WSB55_0.2**	**WSB55_1.0**
Date			**13/12/2005**	**13/12/2005**
QC Informations	**Units**	**LOR**		
Total Metals				
Arsenic	mg/kg	5	<5	<5
Cadmium	mg/kg	1	<1	<1
Chromium	mg/kg	2	10	7
Copper	mg/kg	5	80	11
Lead	mg/kg	5	<5	13
Nickel	mg/kg	2	59	<2
Zinc	mg/kg	5	34	18
Total Mercury				
Mercury	mg/kg	0.1	<0.1	<0.1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	mg/kg	0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5	<0.5	<0.5
Fluorene	mg/kg	0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5	<0.5	<0.5
Anthracene	mg/kg	0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5	<0.5	<0.5
Pyrene	mg/kg	0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5	<0.5	<0.5
Total PAHs	*mg/kg*		**0**	**0**
Total Petroleoum Hydrocarbons				
C6 - C9 Fraction	mg/kg	2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	<100
C29 - C36 Fraction	mg/kg	100	<100	<100
TPH C10 - C36	*mg/kg*		0	0
BTEX				
Benzene	mg/kg	0.2	<0.2	<0.2
Toluene	mg/kg	0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.2	<0.2	<0.2
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2
ortho-Xylene	mg/kg	0.2	<0.2	<0.2
Total Xylene	*mg/kg*		0	0
TCLP Leachate				
B[a]p	mg/L	0.5	-	-
Arsenic	mg/L	0.1	-	-
Lead	mg/L	0.1	-	-

Legend and Investigation levels:
NSW EPA Service Station Guidelines (1994)
National Environmental Protection Measure (1999) Ecological Investigation Level
National Environmental Protection Council (1999) Health Based Investigation Level D
National Environmental Protection Council (1999) Health Based Investigation Level E
National Environmental Protection Council (1999) Health Based Investigation Level F
LOR = Limit of Reporting
' - ' = Not calculated/not analysed

Table 5a: Soil Analytical Results Tables - TPH/TRH, BTEX, Heavy Metals and PAHs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

						Sample Location	SB1				SB02			SB3	SB3	SB4			SB5			SB6			
						Primary Sample																		SB6_3.6-3.7	SB6_3.6-3.7
						Sample I.D	SB1_0.5-0.6	SB1_1.0-1.1	SB1_2.0-2.1	SB1_3.5-3.6	SB2_0.5-0.6	SB2_2.7-2.8	SB2_4.5-4.6	SB3_0.5-0.6	SB3_2.7-2.8	SB4_0.5-0.6	SB4_2.2-2.3	SB4_3.0-3.1	SB5_1.5-1.6	SB5_3.0-3.1	SB5_4.2-4.3	SB6_3.6-3.7	SB6_4.6-4.7	QC103	QC203
						Sample Date	15/10/2012	15/10/2012	15/10/2012	15/10/2012	15/10/2012	15/10/2012	15/10/2012	15/10/2012	15/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012
						Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FT
				Health Based IL's																					
Analyte	LOR 1	LOR 2	Units	Health-based Investigation Levels - HIL D (NEPM, 1999)	NSW EPA 1994 - Guidelines for Assessing Service Stations	Ecological Investigation Levels - EILs (NEPM, 1999)																			
Total Petroleum Hydrocarbons																									
C6 - C9 Fraction	10	25	mg/kg	-	65	-	< 10	< 10	< 10	< 10	< 10	< 25	< 10	< 10	< 10	< 25	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 25
C10 - C14 Fraction	50	50	mg/kg	-		-	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-
C15 - C28 Fraction	100	100	mg/kg	-		-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
C29 - C36 Fraction	100	100	mg/kg	-		-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
C10 - C36 Fraction	50	50		-	1000	-	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-
Total Recoverable Hydrocarbons TRH - NEPM 2010 DRAFT																									
C6 - C10 Fraction	10	10	mg/kg	-	-	-	< 10	< 10	< 10	< 10	< 10	-	< 10	< 10	< 10	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-
C6 - C10 Fraction minus BTEX (F1) EP080	10	10	mg/kg	-	-	-	< 10	< 10	< 10	< 10	< 10	-	< 10	< 10	< 10	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-
>C10 - C16 Fraction	50	50	mg/kg	-	-	-	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-
>C16 - C34 Fraction	100	100	mg/kg	-	-	-	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	< 100	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-
>C34 - C40 Fraction	100	100	mg/kg	-	-	-	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	< 100	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-
>C10 - C40 Fraction (sum)	50	50	mg/kg	-	-	-	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-
BTEXN																									
Benzene	0.2	0.2	mg/kg	-	1	-	< 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	< 0.2
Toluene	0.5	0.5	mg/kg	-	130	-	< 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	0.5	1	mg/kg	-	50	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1
m&p-Xylene	0.5	2	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2
ortho-Xylene	0.5	1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1
Total Xylenes	0.5	0.5	mg/kg	-	25	-	< 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
Sum of BTEX	0.2	0.2	mg/kg	-	-	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1
Naphthalene	1		mg/kg	-	-		< 1	-	< 1	< 1	-	-	< 1	< 1	< 1	-	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	-
Metals																									
Arsenic	5	4	mg/kg	400	-	20	< 5	< 5	< 5	**6**	< 5	**8**	< 5	**20**	**41**	**12**	< 5	< 5	< 5	< 5	6	< 5	< 5	**8**	**7**
Cadmium	1	0.5	mg/kg	80	-	3	< 1	< 1	< 1	< 1	**1**	< 0.5	< 1	< 1	< 1	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 0.5
Chromium	2	1	mg/kg	400	-	1	**8**	**4**	**6**	**6**	**10**	**33**	**12**	**10**	**4**	**34**	**5**	**10**	**10**	**7**	**10**	**7**	**7**	**16**	**13**
Copper	5	1	mg/kg	4000	-	100	**6**	**5**	**6**	**10**	**11**	**14**	**12**	**29**	< 5	**27**	**5**	**16**	**13**	**7**	**13**	**9**	**7**	**16**	**16**
Lead	5	1	mg/kg	1200	-	600	**20**	< 5	**6**	**8**	**12**	**8**	**16**	**100**	**6**	**51**	**6**	**14**	**13**	**6**	**11**	**5**	**5**	**15**	**13**
Nickel	2	1	mg/kg	2400	-	60	**3**	**3**	< 2	**6**	**5**	**52**	< 2	**15**	< 2	**26**	**2**	**8**	**10**	**3**	**10**	< 2	< 2	**3**	**3**
Zinc	5	1	mg/kg	28000	-	200	**7**	< 5	**7**	**22**	**19**	**24**	< 5	**100**	< 5	**90**	**7**	**31**	**28**	**12**	**35**	**5**	< 5	**25**	**18**
Mercury	0.1	0.1	mg/kg	60	-	1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	**0.1**	< 0.1	**0.4**	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Polnuclear Aromatic Hydrocarbons																									
Naphthalene	0.5	0.5	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Acenaphthylene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Acenaphthene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Fluorene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Phenanthrene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Anthracene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Fluoranthene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**1.1**	< 0.1	< 0.5	< 0.5	< 0.5	**0.1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Pyrene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**1.3**	< 0.1	< 0.5	< 0.5	< 0.5	**0.1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Benz(a)anthracene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**0.6**	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Chrysene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**0.6**	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Benzo(b)fluoranthene	0.5	0.5	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**0.6**	-	< 0.5	< 0.5	< 0.5	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
Benzo(k)fluoranthene	0.5	0.5	mg/kg	-	-	-	< 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	-
Benzo(a)pyrene	0.5	0.05	mg/kg	4	-	-	< 0.5	< 0.5	< 0.5	< 0.5	**0.5**	< 0.05	< 0.5	< 0.5	< 0.5	**0.07**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.05
Indeno(1.2.3.cd)pyrene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Dibenz(a.h)anthracene	0.5	0.5	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Benzo(g.h.i)perylene	0.5	0.1	mg/kg	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1
Benzo(b) & Benzo(k)fluoranthene	0.5	0.2	mg/kg	-	-	-	-	-	-	-	-	< 0.2	-	-	-	< 0.2	-	-	-	-	-	-	-	-	< 0.2
Sum of PAHs	0.5		mg/kg	80	-	-	<0.5	<0.5	<0.5	<0.5	**4.7**	<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

Legend:

PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted HIL - NEPM HIL D
Exceeds the Adopted HIL - Service Stations
Exceeds the Adopted EIL - NEPM HIL D
Exceeds both Health and Ecological IL's

Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5a: Soil Analytical Results Tables - TPH/TRH, BTEX, Heavy Metals and PAHs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Analyte	LOR 1	LOR 2	Units	SB7			SB8		SB9	SB9	SB9A				SB10		SB11		SB12		SB13		SB14	
				SB7_4.0-4.2	SB7_5.6-5.7	SB7_4.0-4.2 QC102	SB8_1.8-1.9	SB8_2.8-2.9	SB9_2.3-2.4	SB9_3.3-3.4	SB9A_3.6-3.8	SB9A_3.6-3.8 QC103_041212	QC203	SB9A_4.9-5.0	SB10_2.2-2.3	SB10_3.4-3.5	SB11_3.1-3.2	SB11_3.8-3.9	SB12_2.3-2.4	SB12_3.3-3.4	SB13_2.0-2.1	SB13-4.3-4.4	SB14_1.8-1.9	SB14_3.5-3.6
				17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	16/10/2012	16/10/2012	4/12/2012	4/12/2012	4/12/2012	4/12/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	16/10/2012	17/10/2012	17/10/2012
				N	N	FD	N	N	N	N	N	FD	FT	N	N	N	N	N	N	N	N	N	N	N
Total Petroleum Hydrocarbons																								
C6 - C9 Fraction	10	25	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10	**1750**	**384**	**571**	**290**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
C10 - C14 Fraction	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	**6350**	**2530**	**3900**	**4500**	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
C15 - C28 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	**1360**	**6750**	**3020**	**2000**	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
C29 - C36 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	**1230**	**2280**	**1650**	**1100**	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
C10 - C36 Fraction	50	50		< 50	< 50	< 50	< 50	< 50	< 50	**8940**	**11600**	**8570**	**7600**	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Total Recoverable Hydrocarbons TRH - NEPM 2010 DRAFT																								
C6 - C10 Fraction	10	10	mg/kg	< 10	< 10	< 10	< 10	< 10	**12**	**3780**	**768**	**1410**	**1300**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
C6 - C10 Fraction minus BTEX (F1) EP080	10	10	mg/kg	< 10	< 10	< 10	< 10	< 10	**12**	**3450**	**679**	**1300**	**1200**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
>C10 - C16 Fraction	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	**4210**	**3580**	**4180**	**3800**	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
>C16 - C34 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	**1890**	**7160**	**3490**	**2300**	< 50	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
>C34 - C40 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	<100	**1300**	**1280**	**970**	**600**	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
>C10 - C40 Fraction (sum)	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	**7400**	**12000**	**8640**	**6700**	< 100	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
BTEXN																								
Benzene	0.2	0.2	mg/kg	< 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	< 0.2	< 0.2	< 0.2
Toluene	0.5	0.5	mg/kg	< 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	0.5	1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**8.8**	**8.8**	**4.2**	**3**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylene	0.5	2	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**323**	**59.7**	**88.6**	**82**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
ortho-Xylene	0.5	1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1**	**20.3**	**17.1**	**16**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total Xylenes	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**324**	**80**	**106**	**98**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sum of BTEX	0.2	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	**333**	**88.8**	**110**	**101**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Naphthalene	1		mg/kg	< 1	< 1	< 1	< 1	< 1	**2**	**150**	**24**	**57**	**90**	< 1	**2**	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Metals																								
Arsenic	5	4	mg/kg	< 5	**10**	< 5	< 5	< 5	**5**	**5**	9	**10**	**7**	< 5	**7**	**10**	**8**	**14**	**8**	< 5	< 5	< 5	**5**	< 5
Cadmium	1	0.5	mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	<0.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chromium	2	1	mg/kg	**12**	**16**	**14**	**11**	**5**	**4**	**3**	**7**	**5**	**3**	**3**	**7**	**3**	**7**	**7**	**9**	**6**	**5**	**6**	**15**	**3**
Copper	5	1	mg/kg	**13**	**37**	**12**	**13**	**9**	< 5	< 5	**5**	**5**	**3**	< 5	**7**	< 5	**6**	< 5	**10**	< 5	**5**	< 5	**11**	< 5
Lead	5	1	mg/kg	**17**	**6**	**17**	**22**	**6**	< 5	< 5	**12**	**9**	**8**	< 5	**19**	**6**	**12**	< 5	**20**	< 5	**5**	**5**	**19**	< 5
Nickel	2	1	mg/kg	**3**	**4**	**3**	**2**	< 2	< 2	< 2	< 2	< 2	<1	**3**	**2**	< 2	< 2	**10**	**4**	< 2	< 2	< 2	**5**	< 2
Zinc	5	1	mg/kg	**6**	**32**	**7**	**10**	**9**	**6**	< 5	**6**	< 5	**2**	< 5	**23**	< 5	**18**	**41**	**24**	< 5	**5**	**7**	**16**	< 5
Mercury	0.1	0.1	mg/kg	< 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	< 0.1	< 0.1	**0.1**	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Polnuclear Aromatic Hydrocarbons																								
Naphthalene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2**	**120**	**39**	**73.7**	**110**	< 0.5	**2.2**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**0.3**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**0.3**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.1**	**0.7**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2.2**	**1.2**	**0.7**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**0.5**	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**0.9**	< 0.5	**0.1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b)fluoranthene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	0.5	mg/kg	< 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
Benzo(a)pyrene	0.5	0.05	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.5	<0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	<0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.5	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b) & Benzo(k)fluoranthene	0.5	0.2	mg/kg	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-
Sum of PAHs	0.5		mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	**2**	**120**	**42.6**	**76**	**112.1**	< 0.5	**2.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted HIL - NEPM HIL D
Exceeds the Adopted HIL - Service Stations
Exceeds the Adopted EIL - NEPM HIL D
Exceeds both Health and Ecological IL's

Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5a: Soil Analytical Results Tables - TPH/TRH, BTEX, Heavy Metals and PAHs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Analyte	LOR 1	LOR 2	Units	SB15		SB16			SB17				SB18		SB19		SB20D		SB21		SB22		SB23	
				SB15_4.3-4.4	SB15-2.8-2.9	SB16_1.6-1.7	SB16_2.7-2.9	SB16_2.7-2.9 QC101	SB17_1.0-1.1	SB17_1.5-1.8	SB17_1.5-1.8 QC100	SB17_1.5-1.8 QC200	SB18_1.8-1.9	SB18_3.2-3.3	SB19_1.6-1.7	SB19_3.0-3.1	SB20D_2.8-2.9	SB20D_6.5-6.6	SB21_2.8-2.9	SB21_5.0-5.1	SB22_2.6-2.7	SB22_5.0-5.1	SB23_2.6-2.7	SB23_6.2-6.3
				17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	17/10/2012	3/12/2012	3/12/2012	4/12/2012	4/12/2012	4/12/2012	4/12/2012	4/12/2012	4/12/2012
				N	N	N	N	FD	N	N	FD	FT	N	N	N	N	N	N	N	N	N	N	N	N
Total Petroleum Hydrocarbons																								
C6 - C9 Fraction	10	25	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 25	< 10	< 10	< 10	< 10	**17**	< 10	**175**	< 10	< 10	< 10	**151**	< 10
C10 - C14 Fraction	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	<50	< 50	< 50	< 50	< 50	**150**	< 50	**2440**	< 50	**100**	< 50	**3840**	< 50
C15 - C28 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	**1150**	< 100	**11600**	< 100	**1110**	< 100	**18000**	< 100
C29 - C36 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	**670**	< 100	**11700**	< 100	**790**	< 100	**10500**	< 100
C10 - C36 Fraction	50	50		< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	**1970**	< 50	**25700**	< 50	**2000**	< 50	**32300**	< 50
Total Recoverable Hydrocarbons TRH - NEPM 2010 DRAFT																								
C6 - C10 Fraction	10	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-	< 10	< 10	< 10	< 10	**28**	< 10	**346**	< 10	< 10	< 10	**335**	< 10
C6 - C10 Fraction minus BTEX (F1) EP080	10	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-	< 10	< 10	< 10	< 10	**28**	< 10	**346**	< 10	< 10	< 10	**329**	< 10
>C10 - C16 Fraction	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	**300**	< 50	**2830**	< 50	**200**	< 50	**5580**	< 50
>C16 - C34 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	< 100	< 100	**1500**	< 100	**19700**	< 100	**1620**	< 100	**23800**	< 100
>C34 - C40 Fraction	100	100	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	< 100	< 100	**380**	< 100	**6420**	< 100	**430**	< 100	**6160**	< 100
>C10 - C40 Fraction (sum)	50	50	mg/kg	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	**2180**	<50	**29000**	<50	**2250**	<50	**35500**	<50
BTEXN																								
Benzene	0.2	0.2	mg/kg	< 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	< 0.2	< 0.2	< 0.2
Toluene	0.5	0.5	mg/kg	< 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	0.5	1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.2**	< 0.5
m&p-Xylene	0.5	2	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2.8**	< 0.5
ortho-Xylene	0.5	1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2.3**	< 0.5
Total Xylenes	0.5	0.5	mg/kg	< 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	**5.1**	< 0.5
Sum of BTEX	0.2	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	**6.3**	< 0.2
Naphthalene	1		mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	**18**	< 1
Metals																								
Arsenic	5	4	mg/kg	< 5	**5**	< 5	< 5	< 5	**6**	**8**	< 5	<4	< 5	**6**	< 5	< 5	**12**	< 5	< 5	**7**	**7**	**5**	**15**	**11**
Cadmium	1	0.5	mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	**4**	< 1
Chromium	2	1	mg/kg	**3**	**8**	**12**	**7**	**11**	**9**	**8**	**6**	**5**	**5**	**16**	**6**	**4**	**7**	< 2	**4**	**4**	**13**	**2**	**156**	**8**
Copper	5	1	mg/kg	< 5	**6**	**11**	< 5	< 5	**20**	**18**	**11**	**10**	< 5	**13**	**6**	< 5	**7**	< 5	< 5	< 5	**24**	< 5	**273**	**6**
Lead	5	1	mg/kg	< 5	**9**	**10**	< 5	**6**	**15**	**15**	**9**	**10**	< 5	**14**	**6**	< 5	**11**	< 5	**40**	< 5	**290**	< 5	**1540**	**8**
Nickel	2	1	mg/kg	< 2	**3**	**4**	**2**	**3**	**3**	< 2	< 2	**2**	**3**	**6**	< 2	**2**	< 2	< 2	< 2	**4**	**5**	**7**	**35**	**11**
Zinc	5	1	mg/kg	< 5	**11**	**20**	**9**	**12**	**16**	**11**	**7**	**7**	**10**	**22**	**6**	**11**	**10**	**20**	**27**	**8**	**328**	**46**	**3380**	**88**
Mercury	0.1	0.1	mg/kg	< 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	< 0.1	< 0.1	< 0.1	< 0.1	**0.1**	< 0.1	**0.9**	< 0.1
Polnuclear Aromatic Hydrocarbons																								
Naphthalene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**14.4**	< 0.5
Acenaphthylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**3.4**	< 0.5	< 0.5	< 0.5	**4**	< 0.5
Fluorene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**3.8**	< 0.5	< 0.5	< 0.5	**6.2**	< 0.5
Phenanthrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**9.5**	< 0.5	< 0.5	< 0.5	**10.6**	< 0.5
Anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.2**	< 0.5	< 0.5	< 0.5	**1.4**	< 0.5
Fluoranthene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2.1**	< 0.5	< 0.5	< 0.5	**2.8**	< 0.5
Pyrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**2.8**	< 0.5	< 0.5	< 0.5	**3.2**	< 0.5
Benz(a)anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.6**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b)fluoranthene	0.5	0.5	mg/kg	< 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
Benzo(k)fluoranthene	0.5	0.5	mg/kg	< 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
Benzo(a)pyrene	0.5	0.05	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b) & Benzo(k)fluoranthene	0.5	0.2	mg/kg	-	-	-	-	-	-	-	-	< 0.2	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PAHs	0.5		mg/kg	<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	**24.4**	< 0.5	< 0.5	< 0.5	**42.6**	< 0.5

Legend:

PS = Primary Sample

FD = Field Duplicate

FT = Field Triplicate

LOR = Limit of Reporting

mg/kg = milligrams per kilogram

ND = Not Detected

'-' = Not Analysed

Exceeds the Adopted HIL - NEPM HIL D

Exceeds the Adopted HIL - Service Stations

Exceeds the Adopted EIL - NEPM HIL D

Exceeds both Health and Ecological IL's

Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5a: Soil Analytical Results Tables - TPH/TRH, BTEX, Heavy Metals and PAHs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

				SB24		SB25		SB26		SB27	SB27		SB28		TP1	
				SB24_2.6-2.7	SB24_5.0-5.1	SB25_2.0	SB25_6.3	SB26_2.7	SB26_5.1	SB27_2.7	SB27_5.1	SB27_5.1 QC201	SB28_3.3	SB28_6.3	TP1_0.5-0.7	TP1_3.0-3.2
				4/12/2012	4/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	5/12/2012	19/10/2012	19/10/2012
				N	N	N	N	N	N	N	N	FD	N	N	N	N
Analyte	**LOR 1**	**LOR 2**	**Units**													
Total Petroleum Hydrocarbons																
C6 - C9 Fraction	10	25	mg/kg	**252**	< 10	**38**	< 10	**24**	< 10	< 10	< 10	< 10	< 10	< 10	<10	< 10
C10 - C14 Fraction	50	50	mg/kg	**850**	< 50	**5920**	< 50	**1630**	< 50	< 50	< 50	< 50	< 50	< 50	<50	< 50
C15 - C28 Fraction	100	100	mg/kg	**4260**	< 100	**14600**	< 100	**5630**	< 100	< 100	< 100	< 100	< 100	< 100	**110**	< 100
C29 - C36 Fraction	100	100	mg/kg	**2700**	< 100	**2130**	< 100	**1470**	< 100	< 100	< 100	< 100	< 100	< 100	<100	< 100
C10 - C36 Fraction	50	50		**7810**	< 50	**22600**	< 50	**8730**	< 50	< 50	< 50	< 50	< 50	< 50	**110**	< 50
Total Recoverable Hydrocarbons TRH - NEPM 2010 DRAFT																
C6 - C10 Fraction	10	10	mg/kg	**395**	< 10	**82**	< 10	**59**	< 10	< 10	< 10	< 10	< 10	< 10	<10	< 10
C6 - C10 Fraction minus BTEX (F1) EP080	10	10	mg/kg	**393**	< 10	**82**	< 10	**59**	< 10	< 10	< 10	< 10	< 10	< 10	<10	< 10
>C10 - C16 Fraction	50	50	mg/kg	**1360**	< 50	**10600**	< 50	**3100**	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
>C16 - C34 Fraction	100	100	mg/kg	**5720**	< 100	**11500**	< 100	**5280**	< 100	< 100	< 100	< 100	< 100	< 100	**140**	< 50
>C34 - C40 Fraction	100	100	mg/kg	**1540**	< 100	**780**	< 100	**870**	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
>C10 - C40 Fraction (sum)	50	50	mg/kg	**8620**	<50	**22900**	<50	**9250**	<50	<50	<50	<50	<50	<50	**140**	< 100
BTEXN																
Benzene	0.2	0.2	mg/kg	< 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
Toluene	0.5	0.5	mg/kg	< 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	0.5	1	mg/kg	< 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
m&p-Xylene	0.5	2	mg/kg	**1.1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
ortho-Xylene	0.5	1	mg/kg	**0.7**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total Xylenes	0.5	0.5	mg/kg	**1.8**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	<0.5
Sum of BTEX	0.2	0.2	mg/kg	**1.8**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	< 0.2
Naphthalene	1		mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	<1	< 1
Metals																
Arsenic	5	4	mg/kg	**19**	**5**	**5**	< 5	**10**	< 5	**25**	< 5	< 5	**43**	< 5	<5	< 5
Cadmium	1	0.5	mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	**7**	< 1
Chromium	2	1	mg/kg	**9**	**2**	**34**	< 2	**10**	< 2	**17**	< 2	**3**	**13**	< 2	**29**	**41**
Copper	5	1	mg/kg	**29**	< 5	**17**	< 5	**14**	< 5	**9**	< 5	< 5	**10**	< 5	**20**	**17**
Lead	5	1	mg/kg	**219**	< 5	**192**	< 5	**16**	< 5	**15**	< 5	< 5	**13**	< 5	**32**	**114**
Nickel	2	1	mg/kg	**9**	**6**	**8**	< 2	**3**	< 2	**3**	**3**	**2**	**3**	< 2	**50**	**38**
Zinc	5	1	mg/kg	**848**	**21**	**516**	< 5	**30**	< 5	**18**	**12**	**7**	**15**	< 5	**781**	**60**
Mercury	0.1	0.1	mg/kg	0.5	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	**0.2**	**0.2**
Polnuclear Aromatic Hydrocarbons																
Naphthalene	0.5	0.5	mg/kg	**5.1**	< 0.5	**0.6**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Acenaphthylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Acenaphthene	0.5	0.1	mg/kg	**3.7**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Fluorene	0.5	0.1	mg/kg	**7.6**	< 0.5	< 0.5	< 0.5	**3.5**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Phenanthrene	0.5	0.1	mg/kg	**13.2**	< 0.5	< 0.5	< 0.5	**3.8**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**0.9**	< 0.8
Anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Fluoranthene	0.5	0.1	mg/kg	**2.4**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.1**	< 0.8
Pyrene	0.5	0.1	mg/kg	**3.8**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**1.1**	< 0.8
Benz(a)anthracene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Chrysene	0.5	0.1	mg/kg	**2.2**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Benzo(b)fluoranthene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Benzo(k)fluoranthene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Benzo(a)pyrene	0.5	0.05	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Indeno(1.2.3.cd)pyrene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Dibenz(a.h)anthracene	0.5	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Benzo(g.h.i)perylene	0.5	0.1	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	<0.5	< 0.8
Benzo(b) & Benzo(k)fluoranthene	0.5	0.2	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PAHs	0.5		mg/kg	**38**	< 0.5	**0.6**	< 0.5	**7.3**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	**4.1**	<0.5

Legend:

PS = Primary Sample

FD = Field Duplicate

FT = Field Triplicate

LOR = Limit of Reporting

mg/kg = milligrams per kilogram

ND = Not Detected

'-' = Not Analysed

Exceeds the Adopted HIL - NEPM HIL D
Exceeds the Adopted HIL - Service Stations
Exceeds the Adopted EIL - NEPM HIL D
Exceeds both Health and Ecological IL's

Results in **Bold** indicate results above the LOR

Table 5b: Soil Analytical Results Tables - VOCs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Sample Location			SB9A	SB21	SB23	SB24	SB26
Sample I.D			SB9A_3.6-3.8	SB21_2.8-2.9	SB23_2.6-2.7	SB24_2.6-2.7	SB26_2.7
Sample Date			4/12/2012	4/12/2012	4/12/2012	4/12/2012	5/12/2012
Sample Type			N	N	N	N	N
Analyte	**LOR**	**Units**					
PCBs							
Total Polychlorinated biphenyls	0.1	mg/kg	-	-	-	-	-
Monocyclic Aromatic Compounds							
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Isopropylbenzene (Cumene)	0.5	mg/kg	**11.4**	**5.1**	**3.7**	**6.8**	< 0.5
n-Propylbenzene	0.5	mg/kg	**19.9**	**14**	**8.9**	**13.7**	**0.6**
1.3.5-Trimethylbenzene	0.5	mg/kg	**48.2**	< 0.5	**9.1**	< 0.5	< 0.5
sec-Butylbenzene	0.5	mg/kg	**10.1**	**5.4**	< 0.5	**9.6**	**0.6**
1.2.4-Trimethylbenzene	0.5	mg/kg	**119**	< 0.5	**35**	**1.1**	< 0.5
tert-Butylbenzene	0.5	mg/kg	**0.9**	< 0.5	< 0.5	**0.9**	< 0.5
p-Isopropyltoluene	0.5	mg/kg	**6.7**	< 0.5	**4.3**	< 0.5	< 0.5
n-Butylbenzene	0.5	mg/kg	**8.1**	**8.9**	**15.7**	**10.7**	< 0.5
Oxygenated Compounds							
Vinyl Acetate	5	mg/kg	< 5	< 5	< 5	< 5	< 5
2-Butanone (MEK)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-pentanone (MIBK)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
2-Hexanone (MBK)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Sulfonated Compounds							
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Fumigants							
2.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane (EDB)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Halogenated Aliphatic Compounds							
Dichlorodifluoromethane (Freon 12)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Chloromethane	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Vinyl chloride	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Bromomethane	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Chloroethane (Ethyl chloride)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane (Freon 11)	5	mg/kg	< 5	< 5	< 5	< 5	< 5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.4-Dichloro-2-butene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromo-3-chloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobutadiene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Pentachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloropropylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.4-Dichloro-2-butene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Halogenated Aromatic Compounds							
Chlorobenzene	0.5	mg/kg	< 0.5	**1.1**	**1.8**	**5.7**	< 0.5
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
2-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	**1.2**	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	**1.8**	**3.2**	< 0.5
1.2.4-Trichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trihalomethanes							
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
-' = Not Analysed
Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5c: Soil Analytical Results Tables - Leachability Procedures TCLP and ASLP (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

i. TCLP - Leachable metals

		Sample Location	TP1	TP1
		Primary Sample		
		Sample I.D	TP1_0.5-0.7TCLP	TP1_3.0-3.2TCLP
		Sample Date	19/10/2012	19/10/2012
		Sample Type	N	N
Analyte	LOR	Units		
Total Metals by ICP-AES (as presented in Table 4a.)				
Arsenic	5	mg/kg	<5	<5
Cadmium	1	mg/kg	**7**	< 1
Chromium	2	mg/kg	**29**	**41**
Copper	5	mg/kg	**20**	**17**
Lead	5	mg/kg	**32**	**114**
Nickel	2	mg/kg	**50**	**38**
Zinc	5	mg/kg	**781**	**60**
Mercury	0.1	mg/kg	**0.2**	**0.2**
Leachable Metals				
Arsenic	0.01	mg/L	<0.1	<0.1
Cadmium	0.05	mg/L	< 0.05	< 0.05
Lead	0.1	mg/L	< 0.1	< 0.1
Nickel	0.1	mg/L	< 0.1	< 0.1
Mercury	0.001	mg/L	< 0.001	< 0.001
Polynuclear Aromatic Hydrocarbons				
Benzo(a)pyrene	0.5	µg/L	<0.5	< 0.5
TCLP Leach				
Initial pH	0.1	pH unit	**10.3**	**10.8**
pH (KCl)	0.1	pH unit	**2.1**	**6.1**
Extraction Fluid Number	1	-	**1**	**2**
Final pH	0.1	pH unit	**5.9**	**6.1**
Moisture Content (dried @ 40°C)	1	%	**29.4**	**55**

Legend:

LOR = Limit of Reporting

mg/kg = milligrams per kilogram

ug/L = micrograms per kilogram

ND = Not Detected

-' = Not Analysed

TCLP = Toxicity Characteristic Leaching Procedure

Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5c: Soil Analytical Results Tables - Leachability Procedures TCLP and ASLP (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

ii. ASLP - Water Leachable Metals by ICP-MS

Sample Location	mple Location	Sample Location	TP1	TP1
Primary Sample	imary Sample	Primary Sample		
Sample I.D	Sample I.D	Sample I.D	TP1_0.5-0.7ASLP	TP1_3.0-3.2ASLP
Sample Date	Sample Date	Sample Date	19/10/2012	19/10/2012
Sample Type	Sample Type	Sample Type	N	N
Analyte	LOR	Units		
Water Leachable Metals				
Arsenic	0.001	mg/L	**0.001**	< 0.001
Cadmium	0.0001	mg/L	< 0.0001	< 0.0001
Lead	0.001	mg/L	< 0.001	< 0.001
Mercury	0.0001	mg/L	< 0.0001	< 0.0001
Nickel	0.001	mg/L	< 0.001	< 0.001
Polynuclear Aromatic Hydrocarbons				
Benzo(a)pyrene	0.5	µg/L	< 0.5	< 0.5
Acidity/ Alkalinity				
Final pH	0.1	pH unit	**9.3**	**10.8**

Legend:
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ug/L = micrograms per kilogram
ND = Not Detected
-' = Not Analysed
ASLP =Australian Standard Leaching Procedure

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5d: Soil Analytical Results Tables - Clinker Material Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

				Sample Location	TP1
				Sample I.D	TP1_PS1
				Sample Date	25/10/2012
				Sample Type	N
			Health Based IL's		
Analyte	**LOR**	**Units**	**Health-based Investigation Levels - HIL D (NEPM, 1999)**	**NSW EPA 1994 - Guidelines for Assessing Service Stations**	
Monocyclic Aromatic Hydrocarbons					
Benzene	0.5	mg/kg	-	1	<0.5
Toluene	0.5	mg/kg	-	130	<0.5
Ethylbenzene	0.5	mg/kg	-	50	<0.5
meta- & para-Xylene	0.5	mg/kg	-	-	<1.0
Styrene	0.5	mg/kg	-	-	<0.5
ortho-Xylene	0.5	mg/kg	-	-	<0.5
Isopropylbenzene	0.5	mg/kg	-	-	<0.5
n-Propylbenzene	0.5	mg/kg	-	-	<0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	-	-	<0.5
sec-Butylbenzene	0.5	mg/kg	-	-	<0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	-	-	<0.5
tert-Butylbenzene	0.5	mg/kg	-	-	<0.5
p-Isopropyltoluene	0.5	mg/kg	-	-	<0.5
n-Butylbenzene	0.5	mg/kg	-	-	<0.5
Metals					
Arsenic	5	mg/kg	400	-	< 5
Cadmium	1	mg/kg	80	-	< 1
Chromium	2	mg/kg	400	-	<2
Copper	5	mg/kg	4000	-	<5
Lead	5	mg/kg	1200	-	<5
Nickel	2	mg/kg	2400	-	<2
Zinc	5	mg/kg	28000	-	**12**
Mercury	0.1	mg/kg	60	-	< 0.1
Polnuclear Aromatic Hydrocarbons					
Naphthalene	0.5	mg/kg	-	-	**378**
2-Methylnaphthalene	0.5	mg/kg	-	-	**263**
2-Chloronaphthalene	0.5	mg/kg	-	-	<100
Acenaphthylene	0.5	mg/kg	-	-	<100
Acenaphthene	0.5	mg/kg	-	-	**898**
Fluorene	0.5	mg/kg	-	-	**670**
Phenanthrene	0.5	mg/kg	-	-	**4890**
Anthracene	0.5	mg/kg	-	-	**1620**
Fluoranthene	0.5	mg/kg	-	-	**4090**
Pyrene	0.5	mg/kg	-	-	**4130**
N-2-Fluorenyl Acetamide	0.5	mg/kg	-	-	<100
Benz(a)anthracene	0.5	mg/kg	-	-	**2250**
Chrysene	0.5	mg/kg	-	-	**2170**
Benzo(b) & Benzo(k)fluoranthene	1	mg/kg	-	-	**2420**
7.12-Dimethylbenz(a)anthracene	0.5	mg/kg	-	-	<100
Benzo(a)pyrene	0.5	mg/kg	4	-	**2090**
3-Methylcholanthrene	0.5	mg/kg	-	-	<100
Indeno(1.2.3.cd)pyrene	0.5	mg/kg	-	-	**480**
Dibenz(a.h)anthracene	0.5	mg/kg	-	-	**121**
Benzo(g.h.i)perylene	0.5	mg/kg	-	-	**553**
Sum of PAHs	0.5	mg/kg	80	-	**26800**
Oxygenated Compounds					
Vinyl Acetate	5	mg/kg	-	-	<5
2-Butanone (MEK)	5	mg/kg	-	-	<5
4-Methyl-2-pentanone (MIBK)	5	mg/kg	-	-	<5
2-Hexanone (MBK)	5	mg/kg	-	-	<5
Sulfonated Compounds					
Carbon disulfide	0.5	mg/kg	-	-	<0.5
Fumigants					
2.2-Dichloropropane	0.5	mg/kg	-	-	<0.5
1.2-Dichloropropane	0.5	mg/kg	-	-	<0.5
cis-1.3-Dichloropropylene	0.5	mg/kg	-	-	<0.5
trans-1.3-Dichloropropylene	0.5	mg/kg	-	-	<0.5
1.2-Dibromoethane (EDB)	0.5	mg/kg	-	-	<0.5
Halogenated Aliphatic Compounds					
Dichlorodifluoromethane	5	mg/kg	-	-	<5
Chloromethane	5	mg/kg	-	-	<5
Vinyl chloride	5	mg/kg	-	-	<5
Bromomethane	5	mg/kg	-	-	<5
Chloroethane	5	mg/kg	-	-	<5
Trichlorofluoromethane	5	mg/kg	-	-	<5
1.1-Dichloroethene	0.5	mg/kg	-	-	<0.5
Iodomethane	0.5	mg/kg	-	-	<0.5
trans-1.2-Dichloroethene	0.5	mg/kg	-	-	<0.5
1.1-Dichloroethane	0.5	mg/kg	-	-	<0.5
cis-1.2-Dichloroethene	0.5	mg/kg	-	-	<0.5
1.1.1-Trichloroethane	0.5	mg/kg	-	-	<0.5
1.1-Dichloropropylene	0.5	mg/kg	-	-	<0.5
Carbon Tetrachloride	0.5	mg/kg	-	-	<0.5
1.2-Dichloroethane	0.5	mg/kg	-	-	<0.5
Trichloroethene	0.5	mg/kg	-	-	<0.5
Dibromomethane	0.5	mg/kg	-	-	<0.5
1.1.2-Trichloroethane	0.5	mg/kg	-	-	<0.5
1.3-Dichloropropane	0.5	mg/kg	-	-	<0.5

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5d: Soil Analytical Results Tables - Clinker Material Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

				Sample Location	TP1
				Sample I.D	TP1_PS1
				Sample Date	25/10/2012
				Sample Type	N
			Health Based IL's		
Analyte	**LOR**	**Units**	**Health-based Investigation Levels - HIL D (NEPM, 1999)**	**NSW EPA 1994 - Guidelines for Assessing Service Stations**	
Tetrachloroethene	0.5	mg/kg	-	-	<0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	-	<0.5
trans-1.4-Dichloro-2-butene	0.5	mg/kg	-	-	<0.5
cis-1.4-Dichloro-2-butene	0.5	mg/kg	-	-	<0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	-	<0.5
1.2.3-Trichloropropane	0.5	mg/kg	-	-	<0.5
Pentachloroethane	0.5	mg/kg	-	-	<0.5
1.2-Dibromo-3-chloropropane	0.5	mg/kg	-	-	<0.5
Halogenated Aromatic Compounds					
Chlorobenzene	0.5	mg/kg	-	-	<0.5
Bromobenzene	0.5	mg/kg	-	-	<0.5
2-Chlorotoluene	0.5	mg/kg	-	-	<0.5
4-Chlorotoluene	0.5	mg/kg	-	-	<0.5
1.2.3-Trichlorobenzene	0.5	mg/kg	-	-	<0.5
Trihalomethanes					
Chloroform	0.5	mg/kg	-	-	<0.5
Bromodichloromethane	0.5	mg/kg	-	-	<0.5
Dibromochloromethane	0.5	mg/kg	-	-	<0.5
Bromoform	0.5	mg/kg	-	-	<0.5
Organochlorine Pesticides					
alpha-BHC	0.5	mg/kg	-	-	<100
beta-BHC	0.5	mg/kg	-	-	<100
gamma-BHC	0.5	mg/kg	-	-	<100
delta-BHC	0.5	mg/kg	-	-	<100
Heptachlor	0.5	mg/kg	-	-	<100
Aldrin	0.5	mg/kg	-	-	<100
Heptachlor epoxide	0.5	mg/kg	-	-	<100
alpha-Endosulfan	0.5	mg/kg	-	-	<100
4.4`-DDE	0.5	mg/kg	-	-	<100
Dieldrin	0.5	mg/kg	-	-	<100
Endrin	0.5	mg/kg	-	-	<100
beta-Endosulfan	0.5	mg/kg	-	-	<100
4.4`-DDD	0.5	mg/kg			<100
Endosulfan sulfate	0.5	mg/kg			<100
4.4`-DDT	1	mg/kg			<100
Organophosphorus Pesticides					
Dichlorvos	0.5	mg/kg	-	-	<100
Dimethoate	0.5	mg/kg	-	-	<100
Diazinon	0.5	mg/kg	-	-	<100
Chlorpyrifos-methyl	0.5	mg/kg	-	-	<100
Malathion	0.5	mg/kg	-	-	<100
Fenthion	0.5	mg/kg	-	-	<100
Chlorpyrifos	0.5	mg/kg	-	-	<100
Pirimphos-ethyl	0.5	mg/kg	-	-	<100
Chlorfenvinphos	0.5	mg/kg	-	-	<110
Prothiofos	0.5	mg/kg	-	-	<100
Ethion	0.5	mg/kg	-	-	<100
Anilines and Benzidines					
Aniline	0.5	mg/kg	-	-	<100
4-Chloroaniline	0.5	mg/kg	-	-	<100
2-Nitroaniline	1	mg/kg	-	-	<100
3-Nitroaniline	1	mg/kg	-	-	<100
Dibenzofuran	0.5	mg/kg	-	-	**367**
4-Nitroaniline	0.5	mg/kg	-	-	<100
Carbazole	0.5	mg/kg	-	-	**772**
3.3`-Dichlorobenzidine	0.5	mg/kg	-	-	<100
Chlorinated Hydrocarbons					
1.3-Dichlorobenzene	0.5	mg/kg	-	-	<100
1.4-Dichlorobenzene	0.5	mg/kg	-	-	<100
1.2-Dichlorobenzene	0.5	mg/kg	-	-	<100
Hexachloroethane	0.5	mg/kg	-	-	<100
1.2.4-Trichlorobenzene	0.5	mg/kg	-	-	<100
Hexachloropropylene	0.5	mg/kg	-	-	<100
Hexachlorobutadiene	0.5	mg/kg	-	-	<100
Hexachlorocyclopentadiene	2.5	mg/kg	-	-	<100
Pentachlorobenzene	0.5	mg/kg	-	-	<100
Hexachlorobenzene (HCB)	1	mg/kg	-	-	<100
Haloethers					
Bis(2-chloroethyl) ether	0.5	mg/kg	-	-	<100
Bis(2-chloroethoxy) methane	0.5	mg/kg	-	-	<100
4-Chlorophenyl phenyl ether	0.5	mg/kg	-	-	<100
4-Bromophenyl phenyl ether	0.5	mg/kg	-	-	<100
Phthalate Esters					
Dimethyl phthalate	0.5	mg/kg	-	-	<100
Diethyl phthalate	0.5	mg/kg	-	-	<100
Di-n-butyl phthalate	0.5	mg/kg	-	-	<100
Butyl benzyl phthalate	0.5	mg/kg	-	-	<100
bis(2-ethylhexyl) phthalate	5	mg/kg	-	-	<100
Di-n-octylphthalate	0.5	mg/kg	-	-	<100

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5d: Soil Analytical Results Tables - Clinker Material Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

				Sample Location	TP1
				Sample I.D	TP1_PS1
				Sample Date	25/10/2012
				Sample Type	N
			Health Based IL's		
Analyte	**LOR**	**Units**	**Health-based Investigation Levels - HIL D (NEPM, 1999)**	**NSW EPA 1994 - Guidelines for Assessing Service Stations**	
Nitrosamines					
N-Nitrosomethylethylamine	0.5	mg/kg	-	-	<100
N-Nitrosodiethylamine	0.5	mg/kg	-	-	<100
N-Nitrosopyrrolidine	1	mg/kg	-	-	<100
N-Nitrosomorpholine	0.5	mg/kg	-	-	<100
N-Nitrosodi-n-propylamine	0.5	mg/kg	-	-	<100
N-Nitrosopiperidine	0.5	mg/kg	-	-	<100
N-Nitrosodibutylamine	0.5	mg/kg	-	-	<100
N-Nitrosodiphenyl & Diphenylamine	1	mg/kg	-	-	<200
Methapyrilene	0.5	mg/kg	-	-	<100
Nitroaromatics and Ketones					
2-Picoline	0.5	mg/kg	-	-	<100
Acetophenone	0.5	mg/kg	-	-	<100
Nitrobenzene	0.5	mg/kg	-	-	<100
Isophorone	0.5	mg/kg	-	-	<100
2.6-Dinitrotoluene	1	mg/kg	-	-	<100
2.4-Dinitrotoluene	1	mg/kg	-	-	<100
1-Naphthylamine	0.5	mg/kg	-	-	<100
4-Nitroquinoline-N-oxide	0.5	mg/kg	-	-	<100
5-Nitro-o-toluidine	0.5	mg/kg	-	-	<100
Azobenzene	1	mg/kg	-	-	<100
1.3.5-Trinitrobenzene	0.5	mg/kg	-	-	<100
Phenacetin	0.5	mg/kg	-	-	<100
4-Aminobiphenyl	0.5	mg/kg	-	-	<100
Pentachloronitrobenzene	0.5	mg/kg	-	-	<100
Pronamide	0.5	mg/kg	-	-	<100
Dimethylaminoazobenzene	0.5	mg/kg	-	-	<100
Chlorobenzilate	0.5	mg/kg	-	-	<100

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
-' = Not Analysed
Results in **Bold** indicate results above the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5e: Soil Analytical Results Tables - Clinker Material Leachability Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

i. ASLP Procedure

		Sample Location	TP1
		Primary Sample	
		Sample I.D	TP1_PS1
		Sample Date	26/10/2012
		Sample Type	ASLP
Analyte	LOR	Units	
Water Leachable PAH			
Naphthalene	1	µg/L	**77.8**
Acenaphthylene	1	µg/L	<9.8
Acenaphthene	1	µg/L	**32.7**
Fluorene	1	µg/L	**20.8**
Phenanthrene	1	µg/L	**42.5**
Anthracene	1	µg/L	**12.3**
Fluoranthene	1	µg/L	**10.2**
Pyrene	1	µg/L	<9.8
Benz(a)anthracene	1	µg/L	<9.8
Chrysene	1	µg/L	<9.8
Benzo(b)fluoranthene	1	µg/L	<9.8
Benzo(k)fluoranthene	1	µg/L	<9.8
Benzo(a)pyrene	0.5	µg/L	<9.8
Indeno(1.2.3.cd)pyrene	1	µg/L	<9.8
Dibenz(a.h)anthracene	1	µg/L	<9.8
Benzo(g.h.i)perylene	1	µg/L	<9.8
Sum of polycyclic aromatic hydrocarbons	0.5	µg/L	**196**
Benzo(a)pyrene TEQ (WHO)	0.5	µg/L	<9.8
Bottle Leaching Procedure			
Final pH	0.1	pH unit	10.3

Legend:
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ug/L = micrograms per kilogram
ND = Not Detected
-' = Not Analysed
ASLP =Australian Standard Leaching Procedure

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 5e: Soil Analytical Results Tables - Clinker Material Leachability Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

ii) TCLP Procedure Results

		Sample Location	TP1
		Primary Sample	
		Sample I.D	TP1_PS1
		Sample Date	26/10/2012
		Sample Type	TCLP
Analyte	LOR	Units	
Leachable PAH			
Naphthalene	1	µg/L	**85.1**
Acenaphthylene	1	µg/L	<9.6
Acenaphthene	1	µg/L	**31.2**
Fluorene	1	µg/L	**20.5**
Phenanthrene	1	µg/L	**38.9**
Anthracene	1	µg/L	**9.9**
Fluoranthene	1	µg/L	<9.6
Pyrene	1	µg/L	<9.6
Benz(a)anthracene	1	µg/L	<9.6
Chrysene	1	µg/L	<9.6
Benzo(b)fluoranthene	1	µg/L	<9.6
Benzo(k)fluoranthene	1	µg/L	<9.6
Benzo(a)pyrene	0.5	µg/L	<9.6
Indeno(1.2.3.cd)pyrene	1	µg/L	<9.6
Dibenz(a.h)anthracene	1	µg/L	<9.6
Benzo(g.h.i)perylene	1	µg/L	<9.6
Sum of polycyclic aromatic hydrocarbons	0.5	µg/L	**186**
Benzo(a)pyrene TEQ (WHO)	0.5	µg/L	<9.6
TCLP Leach			
Initial pH	0.1	pH unit	**6.8**
pH (KCl)	0.1	pH unit	**1.6**
Extraction Fluid Number	1	-	1
Final pH	0.1	pH unit	**4.9**

Legend:
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ug/L = micrograms per kilogram
ND = Not Detected
-' = Not Analysed
TCLP = Toxicity Characteristic Leaching Procedure

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 6: Most Recent Groundwater Well Gauging Data (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Well ID	Date of Installation	Date Gauged	Top of Casing mAHD	Well Depth mbtoc	Depth of Screen Top mbgl	Depth of Screen Top mAHD	Depth of Screen Bottom mbgl	Screen Length	Stabilised Depth to Groundwater mbtoc	Groundwater Elevation mAHD	Depth to PSH mbTOC	PSH Thickness m	Corrected Groundwater Elevation mAHD	PID Well Head	Well Condition
G1	13/11/2008	22/10/2012	6.210	7.5	4	2.210	7.8	3.8	6.63	-0.420	NA	Nil	-0.420	0.2	Gatic, good
G2	13/11/2008	22/10/2012	5.575	7.5	1.7	3.875	7.9	6.2	4.7	0.875	NA	Nil	0.875	0	Gatic, good
G3	13/11/2008	22/10/2012	3.605	7.45	1.5	2.105	7.7	6.2	3.4	0.205	NA	Nil	0.205	1.1	Gatic, good
G4	13/11/2008	23/10/2012	3.55	6.69	1.7	1.850	7.9	6.2	3.56	-0.010	NA	Nil	-0.010	0	Gatic, good
G5	13/11/2008	22/10/2012	3.57	7.23	1.6	1.970	7.8	6.2	2.99	0.580	NA	Nil	0.580	0	Gatic, good
G6	13/11/2008	22/10/2012	3.58	7.39	1.7	1.880	7.7	6	2.61	0.970	NA	Nil	0.970	0.3	Gatic, good
G7	13/11/2008	22/10/2012	2.685	7.51	1.7	0.985	7.8	6.1	0.94	1.745	NA	Nil	1.745	0.1	Gatic, good
G9	13/11/2008	22/10/2012	3.58	7.51	1.7	1.880	7.7	6	2.5	1.080	NA	Nil	1.080	0	Gatic, good
G10	13/11/2008	22/10/2012	5.550	7.51	4.7	0.850	7.7	3	6.3	-0.750	NA	Nil	-0.750	0	Gatic, mud in well head
MB1	NK	22/10/2012	5.010	6.9	NK	NK	NK	NK	3.68	1.330	NA	Nil	1.330	0	Standpipe
MW01	NK	22/10/2012	5.565	7.61	4.5	1.065	8	3.5	6.42	-0.855	NA	Nil	-0.855	0	Gatic, swivel cover, fine
MW02	NK	22/10/2012	3.37	3.74	1	2.370	4	3	1.31	2.060	NA	Nil	2.060	0	Gatic, swivel cover, fine
MW03	NK	23/10/2012	3.59	4.42	2	1.590	5	3	2.23	1.360	NA	Nil	1.360	0	Gatic, mud in well head
SB1/MW1	17/10/2012	22/10/2012	2.93	4.87	1	1.930	4.87	3.87	2.57	0.360	NA	Nil	0.360	0	Locked Standpipe
SB2/MW2	17/10/2012	22/10/2012	5.65	6.99	3	2.650	7	4	4.47	1.180	NA	Nil	1.180	0	Locked Standpipe
SB3/MW3	17/10/2012	22/10/2012	3.76	4.71	0.9	2.860	4.7	3.8	3.79	-0.030	NA	Nil	-0.030	0	Locked Standpipe
SB4/MW4	18/10/2012	22/10/2012	3.81	5.3	1.5	2.310	5.3	3.8	3.51	0.300	NA	Nil	0.300	0	Locked Standpipe
SB5/MW5	18/10/2012	22/10/2012	3.71	6.02	2	1.710	6.02	4.02	2.76	0.950	NA	Nil	0.950	0	Locked Standpipe
SB20(S)	3/10/2012	13/12/2012	3.8	5.1	2	1.800	4	2	4.42	-0.620	4.38	0.004	-0.617	25.1	Locked Standpipe
SB20(D)	5/10/2012	13/12.12	3.82	10.67	8	-4.180	10	4	4.3	-0.480	NA	Nil	-0.480	1.4	Locked Standpipe

Notes:

mAHD: metres Australia Height Datum

mbtoc: metres below top of casing

mbgl: metres below ground level, measured after monitoring well construction

'-': Data not available

PSH: Phase Separated Hydrocarbon

ppm: parts per million

ND: Not Detected

NA: Not Applicable

NK: Not known

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 7: Most Recent Measured Groundwater Field Parameters (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

Well ID	Date	Volume Removed	Dissolved Oxygen	EC	TDS[1]	pH	Redox		Temp.	PID	Comments
		(L)	(ppm)[2]	(uS/cm)[3]	mg/L[4]		E_r (mV)	E_h (mV)[5]	(˚C)[6]	(ppm)	(Color, turbidity)
G3	22/10/2012	11	0.63	404.2	270.814	6.68	-120.9	78.1	22.6	1.1	Clear
G6	22/10/2012	9	0.03	918	615.06	7.19	-157.6	41.4	21.6	0.3	Clear
G7	22/10/2012	16	0.15	596	399.32	6.93	-117.3	81.7	19.9	0.1	Clear
SB3/MW3	23/10/2012	4	3.51	465.4	311.818	6.39	-11	188	20.2	0	Clear, low turbidity
G5	23/10/2012	6	0.9	715	479.05	6.42	-21.6	177.4	22.5	0	Clear, pale yellow, sulphide odour
SB1/MW1	24/10/2012	4.5	1.17	469.5	314.565	5.34	69.3	268.3	22.2	0	Light orange, turbid
MW02	24/10/2012	8	1.97	599	401.33	11.08	-3.5	195.5	21.8	0	Clear, no odour
MW01	24/10/2012	3	0.55	1372	919.24	6.4	75	274	20.9	0	Light brown, highly turbid
G1	24/10/2012	1.5	0.87	4139	4139	5.8	143.2	342.2	21.1	0	Clear, low turbidity. No recovery of water level during purging.
G10	23/10/2012	4.6	1.32	637	426.79	5.43	115.8	314.8	22.1	0	Slightly cloudy, brown
G2	24/10/2012	6	1.63	822	550.74	6	32.3	231.3	22.6	0	Clear, low turbidity
MB1	23/10/2012	5.5	2.44	1467	982.89	5.77	74.2	273.2	18.9	0	Cloudy
SB5/MW5	23/10/2012	6.8	4.98	451.3	302.371	6.3	76.4	275.4	20	0	Orange, cloudy, moderate turbidity
SB4/MW4	23/10/2012	6	0.95	347.8	233.026	6.21	77.5	276.5	19.5	0	Clear, low turbidity
G9	23/10/2012	3.5	0.78	1824	1222.08	6.12	-66.7	132.3	20.9	0	Amber, cloudy
SB2/MW2	23/10/2012	4.7	2.13	805	539.35	7.01	29.2	228.2	20.7	0	Slightly cloudy, brown
G4	23/10/2012	4.5	1.73	7490	5018.3	6.39	95	294	20.2	0	Clear, low turbidity
MW03/WSB54	23/10/2012	5.5	0.84	393.5	263.645	6.2	-72	127	18.5	0	Slightly cloudy
SB20(S)	13/12/2012		Not sampled - Product visually identified							25.1	Product visually identified
SB20(D)	13/12/2012	3	2.01	450.1	301.567	5.86	-126.8	123.2	24.8	1.4	Light brown, high turbidity
Maximum Value:			4.98	7490	5018.3	11.08	143.2	342.2	24.8	25.1	
Minimum Value:			0.03	347.8	233.026	5.34	-157.6	41.4	18.5	0	
Mean Value:			1.46	1015.15	756.72	6.54	11.01	210.01	21.12		

Notes:

(1) Estimated TDS based on electrical conductivity(us/cm), multiplied by 0.67 (ANZECC Guidelines Volume 1 , Section 4.3.3.5, p. 4.3-4)

(2) ppm - parts per million

(3) uS/cm - micro Siemens per centimetre

(4) mg/L - milligrams per litre

(5) Eh = Er + 199mV

(6) ˚C - degrees celsius

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 8a. Groundwater Analytical Results - TPH, BTEXN, PAHs and Heavy Metals (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

			Location:	G2	G3	G4	G5	G6	G7
			Sample ID:	G2_121024	G3_121022	G4_121023	G5_121023	G6_121022	G7_121022
			Date:	24/10/2012	22/10/2012	23/10/2012	23/10/2012	22/10/2012	22/10/2012
				N	N	N	N	N	N
	LOR	**Units**	**GAC***						
Total Petroleum Hydrocarbons									
C6 - C9 Fraction	20	µg/L	**-**	< 20	< 20	< 20	< 20	< 20	< 20
C10 - C14 Fraction	50	µg/L	**-**	< 50	< 50	< 50	< 50	< 50	< 50
C15 - C28 Fraction	100	µg/L	**-**	< 100	< 100	< 100	< 100	< 100	< 100
C29 - C36 Fraction	50	µg/L	**-**	< 50	< 50	< 50	< 50	< 50	< 50
C10 - C36 Fraction	50	µg/L	**-**	< 50	< 50	< 50	< 50	< 50	< 50
BTEXN									
Benzene	1	µg/L	**700**	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	2	µg/L	**180**	< 2	< 2	< 2	< 2	< 2	< 2
Ethylbenzene	2	µg/L	**80**	< 2	< 2	< 2	< 2	< 2	< 2
m&p-Xylene	2	µg/L	**-**	< 2	< 2	< 2	< 2	< 2	< 2
ortho-Xylene	2	µg/L	**-**	< 2	< 2	< 2	< 2	< 2	< 2
Total Xylenes	2	µg/L	**200**	< 2	< 2	< 2	< 2	< 2	< 2
Sum of BTEX	1	µg/L	**-**	< 1	< 1	< 1	< 1	< 1	< 1
Naphthalene	5	µg/L	**70**	< 5	< 5	< 5	< 5	< 5	< 5
Metals									
Arsenic	0.001	µg/L	**2.3 (a)**	<1	**2**	**44**	**5**	**2**	**6**
Cadmium	0.0001	µg/L	**5.5**	<0.1	<0.1	<0.1	<0.1	<0.1	<1
Chromium	0.001	µg/L	**4.4**	<1	<1	<1	<1	<1	<0.1
Copper	0.001	µg/L	**1.3**	<1	<1	<1	<1	<1	<1
Lead	0.001	µg/L	**4.4**	<1	<1	<1	<1	<1	<1
Mercury	0.0001	µg/L	**0.4**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	0.001	µg/L	**70**	<0.1	<0.1	<0.1	<0.1	<0.1	**3**
Zinc	0.005	µg/L	**15**	**14**	**7**	**7**	**16**	<5	**10**
Polynuclear Aromatic Hydrocarbons									
Naphthalene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthylene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluorene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenanthrene	1	µg/L	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Anthracene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoranthene	1	µg/L	1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Pyrene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benz(a)anthracene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chrysene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(b)fluoranthene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(k)fluoranthene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(a)pyrene	0.5	µg/L	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibenz(a.h)anthracene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(g.h.i)perylene	0.5	µg/L	**-**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of PAHs	0.5	µg/L	**-**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	1	µg/L	**-**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted GAC*

*GAC = ANZECC (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Marine Ecological - 95% Level of Protection.
Results in **Bold** exceed the LOR

a) ANZECC 2000 Low Reliability Trigger Value for AS (III)

(b) Taken as Cr (VI) Trigger Value, ANZECC 2000.

'-' Trigger value not available
Where there are two guideline values the most appropriate value based on land use has been chosen.
LOR: Limit of reporting
mg/kg: milligrams per kilogram

Table 8a. Groundwater Analytical Results - TPH, BTEXN, PAHs and Heavy Metals (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

			Location:	G9		G10	MB1	MW01	MW02
			Sample ID:	G9_121023	QC100_121023	G10_121023	MB1_121023	MW01_121024	MW02_121024
			Date:	23/10/2012	23/10/2012	23/10/2012	23/10/2012	24/10/2012	25/10/2012
				N	N	N	N	N	N
	LOR	**Units**	**GAC***						
Total Petroleum Hydrocarbons									
C6 - C9 Fraction	20	µg/L	-	< 20	< 20	<20	< 20	< 20	< 20
C10 - C14 Fraction	50	µg/L	-	< 50	< 50	<50	< 50	< 50	< 50
C15 - C28 Fraction	100	µg/L	-	< 100	< 100	<100	< 100	< 100	< 100
C29 - C36 Fraction	50	µg/L	-	< 50	< 50	<50	< 50	< 50	< 50
C10 - C36 Fraction	50	µg/L	-	< 50	< 50	<50	< 50	< 50	< 50
BTEXN									
Benzene	1	µg/L	**700**	< 1	< 1	<1	< 1	< 1	< 1
Toluene	2	µg/L	**180**	< 2	< 2	<2	< 2	< 2	< 2
Ethylbenzene	2	µg/L	**80**	< 2	< 2	<2	< 2	< 2	< 2
m&p-Xylene	2	µg/L	-	< 2	< 2	<2	< 2	< 2	< 2
ortho-Xylene	2	µg/L	-	< 2	< 2	<2	< 2	< 2	< 2
Total Xylenes	2	µg/L	**200**	< 2	< 2	<2	< 2	< 2	< 2
Sum of BTEX	1	µg/L	-	< 1	< 1	<1	< 1	< 1	< 1
Naphthalene	5	µg/L	**70**	< 5	< 5	<5	< 5	< 5	< 5
Metals									
Arsenic	0.001	µg/L	**2.3 (a)**	**3**	**3**	**1**	**468**	<1	**2**
Cadmium	0.0001	µg/L	**5.5**	<1	<1	<0.1	<1	<0.1	<0.1
Chromium	0.001	µg/L	**4.4**	<0.1	<0.1	<1	<0.1	<1	<1
Copper	0.001	µg/L	**1.3**	<1	<1	<1	**1**	<1	**5**
Lead	0.001	µg/L	**4.4**	<1	<1	<1	<1	<1	<1
Mercury	0.0001	µg/L	**0.4**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	0.001	µg/L	**70**	**3**	**3**	<0.1	**6**	<0.1	**2**
Zinc	0.005	µg/L	**15**	**62**	**63**	**12**	**19**	**13**	**10**
Polynuclear Aromatic Hydrocarbons									
Naphthalene	1	µg/L		< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Acenaphthylene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Acenaphthene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Fluorene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Phenanthrene	1	µg/L	2	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Anthracene	1	µg/L		< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Fluoranthene	1	µg/L	1.4	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Pyrene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Benz(a)anthracene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Chrysene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Benzo(b)fluoranthene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Benzo(k)fluoranthene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Benzo(a)pyrene	0.5	µg/L	0.2	< 0.5	< 0.5	<1.0	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Dibenz(a.h)anthracene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0
Benzo(g.h.i)perylene	0.5	µg/L	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of PAHs	0.5	µg/L	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	1	µg/L	-	< 1.0	< 1.0	<1.0	< 1.0	< 1.0	< 1.0

Legend:

PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted GAC*

*GAC = ANZECC (2000), Australian and New Zealand Guidelines
Results in **Bold** exceed the LOR

a) ANZECC 2000 Low Reliability Trigger Value for AS (III)

(b) Taken as Cr (VI) Trigger Value, ANZECC 2000.

'-' Trigger value not available
Where there are two guideline values the most appropriate value based c
LOR: Limit of reporting
mg/kg: milligrams per kilogram

Table 8a. Groundwater Analytical Results - TPH, BTEXN, PAHs and Heavy Metals (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

			Location:	MW02		MW03/WSB54	SB1/MW1	SB2/MW2	SB3/MW3
			Sample ID:	MW02_121026	QC101_121026	MW03_121023	SB1_121024	SB2_121023	SB3_121023
			Date:	26/10/2012	26/10/2012	23/10/2012	24/10/2012	23/10/2012	23/10/2012
				FD	FT	N	N	N	N
	LOR	**Units**	**GAC***						
Total Petroleum Hydrocarbons									
C6 - C9 Fraction	20	µg/L	-	< 20	< 20	< 20	< 20	< 20	< 20
C10 - C14 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	< 50
C15 - C28 Fraction	100	µg/L	-	< 100	< 100	< 100	< 100	< 100	< 100
C29 - C36 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	< 50
C10 - C36 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	< 50
BTEXN									
Benzene	1	µg/L	**700**	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	2	µg/L	**180**	< 2	< 2	< 2	< 2	< 2	< 2
Ethylbenzene	2	µg/L	**80**	< 2	< 2	< 2	< 2	< 2	< 2
m&p-Xylene	2	µg/L	-	< 2	< 2	< 2	< 2	< 2	< 2
ortho-Xylene	2	µg/L	-	< 2	< 2	< 2	< 2	< 2	< 2
Total Xylenes	2	µg/L	**200**	< 2	< 2	< 2	< 2	< 2	< 2
Sum of BTEX	1	µg/L	-	< 1	< 1	< 1	< 1	< 1	< 1
Naphthalene	5	µg/L	**70**	< 5	< 5	< 5	< 5	< 5	< 5
Metals									
Arsenic	0.001	µg/L	**2.3 (a)**	**2**	**2**	<1	<1	**2**	**3**
Cadmium	0.0001	µg/L	**5.5**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	0.001	µg/L	**4.4**	<1	<1	<1	<1	<1	<1
Copper	0.001	µg/L	**1.3**	**2**	**1**	<1	<1	**2**	<1
Lead	0.001	µg/L	**4.4**	<1	<1	<1	<1	<1	<1
Mercury	0.0001	µg/L	**0.4**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	0.001	µg/L	**70**	**2**	**2**	**1**	**12**	**3**	<1
Zinc	0.005	µg/L	**15**	<5	<5	**8**	**29**	**8**	**10**
Polynuclear Aromatic Hydrocarbons									
Naphthalene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthylene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluorene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenanthrene	1	µg/L	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Anthracene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoranthene	1	µg/L	1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Pyrene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benz(a)anthracene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chrysene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(b)fluoranthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(k)fluoranthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(a)pyrene	0.5	µg/L	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibenz(a.h)anthracene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(g.h.i)perylene	0.5	µg/L	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of PAHs	0.5	µg/L	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Legend:

PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted GAC*

*GAC = ANZECC (2000), Australian and New Zealand Guidelines
Results in **Bold** exceed the LOR

a) ANZECC 2000 Low Reliability Trigger Value for AS (III)

(b) Taken as Cr (VI) Trigger Value, ANZECC 2000.

'-' Trigger value not available
Where there are two guideline values the most appropriate value based c
LOR: Limit of reporting
mg/kg: milligrams per kilogram

Prepared by:
Checked by: AS
Date: 19.02.13

Table 8a. Groundwater Analytical Results - TPH, BTEXN, PAHs and Heavy Metals (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

			Location:	SB4/MW4	SB5/MW5	SB20(D)/MW20(D)	
			Sample ID:	SB4_121023	SB5_121023	SB20(D)_131212	QC100_131212
			Date:	23/10/2012	23/10/2012	13/12/2012	13/12/2012
				N	N	N	FD
	LOR	**Units**	**GAC***				
Total Petroleum Hydrocarbons							
C6 - C9 Fraction	20	µg/L	-	< 20	< 20	< 20	< 20
C10 - C14 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50
C15 - C28 Fraction	100	µg/L	-	< 100	< 100	< 100	< 100
C29 - C36 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50
C10 - C36 Fraction	50	µg/L	-	< 50	< 50	< 50	< 50
BTEXN							
Benzene	1	µg/L	**700**	< 1	< 1	< 1	< 1
Toluene	2	µg/L	**180**	< 2	< 2	< 2	< 2
Ethylbenzene	2	µg/L	**80**	< 2	< 2	< 2	< 2
m&p-Xylene	2	µg/L	-	< 2	< 2	< 2	< 2
ortho-Xylene	2	µg/L	-	< 2	< 2	< 2	< 2
Total Xylenes	2	µg/L	**200**	< 2	< 2	< 2	< 2
Sum of BTEX	1	µg/L	-	< 1	< 1	< 1	< 1
Naphthalene	5	µg/L	**70**	< 5	< 5	< 5	< 5
Metals							
Arsenic	0.001	µg/L	**2.3 (a)**	<1	<1	**2**	<1
Cadmium	0.0001	µg/L	**5.5**	<0.1	<0.1	<0.1	<0.1
Chromium	0.001	µg/L	**4.4**	<1	<1	**4**	**4**
Copper	0.001	µg/L	**1.3**	<1	<1	<1	<1
Lead	0.001	µg/L	**4.4**	<1	<1	<1	<1
Mercury	0.0001	µg/L	**0.4**	<0.1	<0.1	<0.1	<0.1
Nickel	0.001	µg/L	**70**	<1	<1	<1	<1
Zinc	0.005	µg/L	**15**	<5	**13**	**9**	**9**
Polynuclear Aromatic Hydrocarbons							
Naphthalene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthylene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Fluorene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Phenanthrene	1	µg/L	2	< 1.0	< 1.0	< 1.0	< 1.0
Anthracene	1	µg/L		< 1.0	< 1.0	< 1.0	< 1.0
Fluoranthene	1	µg/L	1.4	< 1.0	< 1.0	< 1.0	< 1.0
Pyrene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Benz(a)anthracene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Chrysene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(b)fluoranthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(k)fluoranthene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(a)pyrene	0.5	µg/L	0.2	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3.cd)pyrene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Dibenz(a.h)anthracene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(g.h.i)perylene	0.5	µg/L	-	<0.5	<0.5	<0.5	<05.
Sum of PAHs	0.5	µg/L	-	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	1	µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted GAC*

*GAC = ANZECC (2000), Australian and New Zealand Guidelines
Results in **Bold** exceed the LOR

a) ANZECC 2000 Low Reliability Trigger Value for AS (III)

(b) Taken as Cr (VI) Trigger Value, ANZECC 2000.

'-' Trigger value not available
Where there are two guideline values the most appropriate value based c
LOR: Limit of reporting
mg/kg: milligrams per kilogram

Prepared by:
Checked by: AS
Date: 19.02.13

Table 8b: Groundwater Analytical Results -VOCs (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

			Sample ID:	G2_121024	G3_121022	G7_121022	MW02_121024	SB3_121023	SB20(D)_131212	QC100_131212
			Date:	24/10/2012	22/10/2012	22/10/2012	25/10/2012	23/10/2012	13/12/2012	13/12/2012
			Sample Type:	N	N	N	N	N	N	FD
	LOR	Units	GAC							
MAHs										
Styrene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Isopropylbenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
n-Propylbenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.3.5-Trimethylbenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
sec-Butylbenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2.4-Trimethylbenzene	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5
tert-Butylbenzene	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5
p-Isopropyltoluene	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5
n-Butylbenzene	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5
Oxygenated Compounds										
Vinyl Acetate	50	µg/L	-	<50	<50	<50	<50	<50	<50	<50
2-Butanone (MEK)	50	µg/L	-	<50	<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	50	µg/L	-	<50	<50	<50	<50	<50	<50	<50
2-Hexanone (MBK)	50	µg/L	-	<50	<50	<50	<50	<50	<50	<50
Sulfonated Compounds										
Carbon disulfide	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5
Fumigants										
2.2-Dichloropropane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2-Dichloropropane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
cis-1.3-Dichloropropylene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
trans-1.3-Dichloropropylene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2-Dibromoethane (EDB)	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Halogenated Aliphatic Compounds										
Dichlorodifluoromethane (Freon 12)	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
Chloromethane	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
Vinyl chloride	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
Bromomethane	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
Chloroethane (Ethyl chloride)	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
Trichlorofluoromethane (Freon 11)	50	µg/L	-	< 50	< 50	< 50	< 50	< 50	<50	<50
1.1-Dichloroethene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Iodomethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
trans-1.2-Dichloroethene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1-Dichloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
cis-1.2-Dichloroethene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1.2-Trichloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1.1.2-Tetrachloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1.1-Trichloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1.2.2-Tetrachloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Carbon Tetrachloride	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
cis-1.4-Dichloro-2-butene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5

Prepared by:
Checked by: AS
Date: 19.02.13

1.2-Dichloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Trichloroethene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2-Dibromo-3-chloropropane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Hexachlorobutadiene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Pentachloroethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Tetrachloroethene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.1-Dichloropropylene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2.3-Trichloropropane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
trans-1.4-Dichloro-2-butene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Dibromomethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.3-Dichloropropane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Halogenated Aromatic Compounds										
Chlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Bromobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
2-Chlorotoluene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
4-Chlorotoluene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.3-Dichlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.4-Dichlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2.4-Trichlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2.3-Trichlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
1.2-Dichlorobenzene	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Trihalomethanes										
Chloroform	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Dibromochloromethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Bromodichloromethane	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5
Bromoform	5	µg/L	-	< 5	< 5	< 5	< 5	< 5	<5	<5

Legend:
PS = Primary Sample
FD = Field Duplicate
FT = Field Triplicate
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
ND = Not Detected
'-' = Not Analysed

Exceeds the Adopted GAC*

GAC = ANZECC (2000)
Results in **Bold** exceed the LOR

Prepared by:
Checked by: AS
Date: 19.02.13

Table 9: Sub Slub Vapour Sample Analytical Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

		Sample ID:	SV1	SV2	SV3	QC01
		Date:	13/12/2012	13/12/2012	13/12/2012	13/12/2012
		Sample Type:	N	N	N	FD
Analyte	**LOR**	**Unit**				
Propene	0.9	ug/m3	<0.9	<0.9	<0.9	<0.9
Dichlorodifluoromethane	2	ug/m3	**5**	**3.7**	**4.6**	**4.3**
Chloromethane	3	ug/m3	<3	<3	<3	<3
1,2-Dichlorotetrafluoroethane	3	ug/m3	<3	<3	<3	<3
Vinyl chloride	1	ug/m3	<1	<1	<1	<1
1,3-Butadiene	1	ug/m3	<1	1	<1	<1
Bromomethane	8	ug/m3	<10	<20	<20	<10
Chloroethane	1	ug/m3	<1	<1	<1	<1
Acrolein	1	ug/m3	<1	<1	<1	<1
Acetone	3	ug/m3	**50**	**17**	**40**	**45**
Ethanol	2	ug/m3	**25**	**14**	**33**	**25**
2-Propanol	1	ug/m3	<1	<1	<1	<1
Trichlorofluoromethane	3	ug/m3	4	<3	<3	<3
1,1-Dichloroethene	2	ug/m3	<2	<2	<2	<2
Dichloromethane	4	ug/m3	**5**	<4	<5	<4
1,1,2-Trichloro-1,2,2 trifluoroethane	4	ug/m3	<4	<4	<4	<4
Carbon disulfide	2	ug/m3	**29**	**2.1**	**3**	**15**
trans-1,2-Dichloroethene	2	ug/m3	<2	<2	<2	<2
1,1-Dichloroethane	2	ug/m3	<2	<2	<2	<2
Methyl-tert-butylether (MTBE)	2	ug/m3	<2	<2	<2	<2
Vinyl acetate	2	ug/m3	<2	<2	<2	<2
2-Butanone (MEK)	1	ug/m3	**11**	**5.6**	<10	**14**
cis-1,2-Dichloroethene	2	ug/m3	<2	<2	<2	<2
Hexane	2	ug/m3	<2	<2	<2	<2
Chloroform	2	ug/m3	**9.9**	<2	**4.2**	**4.9**
Ethyl Acetate	2	ug/m3	<2	<2	<2	<2
Tetrahydrofuran	1	ug/m3	<1	<1	<1	<1
1,2-Dichloroethane	2	ug/m3	<2	<2	<2	<2
1,1,1-Trichloroethane	3	ug/m3	<3	<3	<3	<3
Benzene	4	ug/m3	<4	<4	<5	<4
Carbon tetrachloride	3	ug/m3	<3	<3	<3	<3
Cyclohexane	2	ug/m3	<2	<2	<2	<2
1,2-Dichloropropane	2	ug/m3	<2	<2	<2	<2
Bromodichloromethane	3	ug/m3	<3	<3	<3	<3
Trichloroethene	3	ug/m3	<3	<4	<3	<3
1,4-Dioxane	2	ug/m3	<2	<2	<2	<2
Heptane	2	ug/m3	<2	<2	<2	<2
Methyl methacrylate	2	ug/m3	<2	<2	<2	<2
cis-1,3-Dichloropropene	2	ug/m3	<2	<2	<2	<2
4-Methyl-2-pentanone (MIBK)	2	ug/m3	<2	<2	<2	<2
trans-1,3-Dichloropropene	2	ug/m3	<2	<2	<2	<2
1,1,2-Trichloroethane	3	ug/m3	<3	<3	<3	<3
Toluene	2	ug/m3	<2	<2	<2	<2

Prepared by: SJB
Checked by: AS
Date: 19.02.13

Table 9: Sub Slub Vapour Sample Analytical Results (URS 2013)
Camellia West Remedial Action Plan
Statewide Planning Pty Ltd
181 James Ruse Drive, Camellia, NSW
URS Job No. 43218346

2-Hexanone (MBK)	2	ug/m3	<2	<2	<2	<2
Dibromochloromethane	4	ug/m3	<4	<4	<4	<4
1,2-Dibromoethane	4	ug/m3	<4	<4	<4	<4
Tetrachloroethylene	3	ug/m3	**4.3**	<3	**6.8**	**5.6**
Chlorobenzene	2	ug/m3	<2	<2	<2	<2
Ethylbenzene	2	ug/m3	<2	<2	<2	<2
Bromoform	5	ug/m3	<5	<5	<5	<5
m & p-Xylenes	5	ug/m3	<5	<5	<5	<5
Styrene	2	ug/m3	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	3	ug/m3	<3	<3	<3	<3
o-Xylene	2	ug/m3	<2	<2	**2.3**	<2
4-Ethyltoluene	2	ug/m3	<2	<2	<2	<2
1,3,5-Trimethylbenzene	2	ug/m3	<2	<2	<2	<2
1,2,4-Trimethylbenzene	2	ug/m3	<2	<2	<2	<2
Benzyl Chloride	3	ug/m3	<3	<3	<3	<3
1,3-Dichlorobenzene	3	ug/m3	<3	<3	<3	<3
1,4-Dichlorobenzene	3	ug/m3	<3	<3	<3	<3
1,2-Dichlorobenzene	3	ug/m3	<3	<3	<3	<3
1,2,4-Trichlorobenzene	4	ug/m3	<4	<4	<4	<4
Hexachlorobutadiene	5	ug/m3	<5	<5	<5	<5
Naphthalene	3	ug/m3	<3	<3	<4	<4

Legend:

PS = Primary Sample

FD = Field Duplicate

FT = Field Triplicate

LOR = Limit of Reporting

ug/m3 = micrograms per cubic metre

ND = Not Detected

'-' = Not Analysed

Results in **Bold** exceed the LOR

Prepared by: SJB
Checked by: AS
Date: 19.02.13

C

Appendix C Containment Cell Design

CAMELLIA WEST
JAMES RUSE DRIVE, CAMELLIA

GENERAL

G1 THESE DRAWINGS ARE FOR INFORMATION PURPOSES ONLY. THEY ARE DIAGRAMMATIC ONLY AND DO NOT NECESSARILY FORM PART OF THE DEVELOPERS REQUIREMENTS

G2 STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION, ARCHITECTURAL, CIVIL & RELEVANT ENGINEERING SERVICES DOCUMENTS AND WITH OTHER SUCH WRITTEN INSTRUCTIONS AS MAY BE ISSUED.

G3 ALL DIMENSIONS SHOWN SHALL BE VERIFIED ON SITE. ENGINEERS DRAWINGS MUST NOT BE SCALED.

G4 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION & NO PART SHALL BE OVERSTRESSED.

G5 ALL MATERIALS & WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION.

G6 UNLESS OTHERWISE NOTED ALL LEVELS ARE IN METRES & ALL DIMENSIONS ARE IN MILLIMETRES.

G7 U.N.O. DENOTES UNLESS NOTED OTHERWISE.

FOOTINGS

F1 REQUIRED MINIMUM ULTIMATE BEARING CAPACITY OF MATERIAL SHALL BE 150 kPa FOR PILES. REPORT BY ASSET GEOTECHNICAL REFERENCE 1694-A, 17th JUNE 2011

F2 THIS SITE HAS BEEN CLASSIFIED AS CLASS M IN ACCORDANCE WITH AS2870

F3 FOUNDATION MATERIAL SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER FOR SAFE BEARING CAPACITY BEFORE CONSTRUCTION OF THE FOOTINGS.

SUBGRADE PREPARATION

SP1 THE SITE SHALL BE EXCAVATED TO THE LEVELS SHOWN ON THE RELEVANT DRAWINGS.

SP2 SELECTED FILLINGS\HARDCORE ETC. & SAND BLINDING UNDER SLABS SHOWN ON DRAWINGS SHALL BE PLACED IN LOOSE LAYERS NOT EXCEEDING 150mm & COMPACTED TO 98% OF MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 E1.1 (DENOTED AS STRUCTURAL FILLING).

SP3 ALL STRUCTURAL FILL TO BE APPROVED BY THE ENGINEER.

SP4 200 THICK LAYER OF SUBGRADE SHALL BE PROVIDED AS MENTIONED ON REPORT BY DICKSON & ASSOCIATES.

BRICKWORK AND BLOCKWORK

B1 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT SAA MASONARY CODE, AS 3700 EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

B2 ALL LOAD BEARING BRICKS SHALL BE LAID FROGS UP EXCEPT FOR THE TOP COURSE,WHICH SHALL BE LAID FROGS DOWN. WHEN SUPPORTING A CONCRETE SLAB OR BEAM BRICKWORK SHALL HAVE A LAYER OF MORTAR PLACED ON THE TOP AND TROWELLED SMOOTH, THE TOP 2 COURSES OF BRICKS SHALL BE LAID WITH REINFORCEMENT IN THE JOINTS.

B3 WHERE WALLS ARE NON LOAD BEARING AT EITHER HORIZONTAL OR VERTICAL FACES THEY SHALL BE SEPERATED FROM THE CONCRETE BY 20mm THICK 'CANEITE' OR EXPANDED POLYSTYRENE U.N.O.

B4 NO HOLES OR CHASES SHALL BE CUT IN LOAD BEARING BRICKWORK OR BLOCKWORK WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

B5 ALL CONCRETE BLOCK WALLS SHALL BE BUILT TO A GAUGE CONCRETE BLOCK SUCH THAT BLOCK-PLANS-JOINT DIMENSIONS ARE MULTIPLES OF 100mm USING STRETCHER BOND UNLESS SPECIFIED OTHERWISE.

B6 CONCRETE BLOCKS SHALL BE GRADE 12 UNITS CONFORMING TO AS 2733

B7 MORTAR SHALL BE FRESHLY PREPARED AND COMPOSED OF CEMENT: LIME:SAND IN THE RATIO OF 1:1:6 AND SHALL CONFORM TO AS AS3700.

B8 CORES TO BE FILLED WHERE REQUIRED WITH CONCRETE OF STRENGTH F'c = 20 MPa, 10mm MAX. AGGREGATE SIZE AND A MAX. SLUMP OF 230mm, IN LIFTS NOT MORE THAN 1200 mm HIGH.

B9 CLEAN OUT OPENINGS ARE REQUIRED AT THE BASE OF ALL REINFORCED WALLS AND ABOVE HORIZONTAL CONSTRUCTION JOINTS.

B10 REINFORCEMENT SHALL BE POSITIONED AS SHOWN AND HAVE A MINIMUM CONCRETE COVER OF 20mm U.N.O.

B11 JOINT REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS 3700.

B12 VERTICAL CONTROL JOINTS IN BLOCK RETAINING WALLS TO BE SPACED AS SHOWN OR AT 8000mm MAX. APART AND IN MASONARY BRICKWORK AT 6000mm CTS. MAX APART.

B13 A 300mm WIDE STRIP OF COARSE GRAINED MATERIAL IS TO BE PLACED BEHIND ALL RETAINING WALLS.

B14 STAINLESS STEEL TIES TO BE USED IN BRICKWORK U.N.O.

B15 ALL MASONARY BRICKWORK TO UTILISE SALT RESISTANT BRICKS

CONCRETE

C1 ALL CONCRETE, CONCRETE WORK AND REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE SPECIFICATION.

C2 REFER TO INDIVIDUAL CONCRETE DRAWINGS FOR CONCRETE QUALITY

C3 ALL REINFORCEMENT TO BE AS FOLLOWS:

SYMBOL	TYPE
R	STRUCTURAL GRADE PLAIN BARS TO AS 1302 (230 MPa)
RF	FABRIC TO AS 1304 (500 MPa)
N	HOT ROLLED DEFORMED BARS TO AS 1302 (500 MPa)

NOTE THE NUMBER FOLLOWING R OR Y INDICATES THE BAR DIAMETER IN MILLIMETRES.

C4 CLEAR COVER TO REINFORCEMENT (INCLUDING FITMENTS) SHALL BE AS FOLLOWS U.N.O. WHERE NOT SPECIFICALLY DESIGNATED COVER IS TO BE IN ACCORDANCE WITH AS3600.

CONCRETE	CAST AGAINST FORMWORK	CAST AGAINST GROUND		
CHARACTERISTIC STRENGTH F'c	NOT EXPOSED TO WATER *	EXPOSED TO WATER OR WEATHER	PROTECTED BY WATERPROOF MEMBRANE	NOT PROTECTED BY MEMBRANE
20	20	-	60	70
25	20	60	40	50
32	20	40	35	45
40	20	30	30	40
50	20	25	30	40

* ADD EXTRA 20mm COVER FOR COLUMNS (U.N.O.)

C5 SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF ANY APPLIED FINISHES.

C6 BEAM DEPTHS ARE NOTED FIRST AND INCLUDE THE THICKNES OF THE SLAB IF ANY.

C7 CONSTRUCTION JOINTS WHERE NOT SHOWN ON THE DRAWINGS SHALL BE LOCATED TO THE APPROVAL OF THE ENGINEER.

C8 FORMS SHALL BE CHAMFERED FOR RE-ENTRANT ANGLES AND FILLETED FOR CORNERS. WHERE THESE WILL BE EXPOSED TO VIEW IN THE COMPLETED PROJECT THE FACE OF THE BEVEL IN EACH CASE SHALL BE 25mm WIDE U.N.O.

C9 NO HOLES,CHASES OR EMBEDMENTS OF PIPES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

C10 DISTRUBUTION BARS TO MAIN REINFORCEMENT IN SLABS SHALL BE N12 AT 300mm CENTRES U.N.O.

C11 NO REINFORCEMENT SPLICES SHALL BE MADE IN POSITIONS OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.

C12 MINIMUM LAP FOR FABRICS SHALL BE TWO TRANSVERSE WIRES PLUS 25mm MINIMUM LAP LENGTHS FOR DEFORMED BARS INCLUDING DISTRIBUTION REINFORCEMENT SHALL BE AS FOLLOWS U.N.O.

BAR TYPE AND SIZE	VERTICAL BARS	HORIZONTAL BARS		90° COG LENGTH *	135° or 180° COG LENGTH *
		MORE THAN 300mm OF CONC. BELOW BAR	OTHER LOCATIONS		
12	450	550	450	170	70
16	700	800	700	200	70
20	1000	1250	1000	250	80
24	1200	1500	1200	300	95
28	1400	1750	1400	350	115
32	1550	1900	1550	400	130
36	1700	2150	1700	450	145

* COG LENGTH MEASURED FROM END OF BEND.

C13 WELDING OF REINFORCEMENT IS NOT PERMITTED UNLESS SHOWN ON THE DRAWINGS OR APPROVED BY THE ENGINEER.

C14 CLOSED FITMENTS U.N.O. SHALL HAVE CORNER SPLICES THUS:

135° HOOKS

C15 TOP AND BOTTOM REINFORCEMENT IN SLABS SHALL BE SUPPORTED ON APPROVED PLASTIC TIPPED CHAIRS,IN BOTH DIRECTIONS AT MAXIMUM CENTRES OF 600mm FOR 10mm DIA BARS, 900mm FOR 12mm AND 16mm DIA BARS, 1200mm FOR 20mm DIA BARS AND 750mm CENTRES FOR FABRIC.

C16 ALL FORMWORK AND PROPS UNDER SUSPENDED CONCRETE WORK SHALL BE REMOVED BEFORE ANY BRICKWORK OR BLOCKWORK IS BUILT ABOVE.

C17 THE MINIMUM CLEAR SPACING BETWEEN CONDUITS, CABLES, PIPES AND BARS SHALL BE AS REQUIRED BY AS 3600 BUT NOT LESS THAN THREE DIAMETERS HORIZONTALLY FOR HORIZONTAL CONDUITS ETC IN SLABS WALLS, AND FOOTINGS AND NOT LESS THAN ONE DIAMETER FOR ALL OTHER CONDUITS ETC.

C18 TYPICAL REINFORCEMENT NOTATION :- 23N24-200.2
23........DENOTES NUMBER OF BARS REQUIRED
N.........DENOTES GRADE OF REINFORCEMENT
24........DENOTES BAR DIAMETER IN MILLIMETRES
200.......DENOTES BAR SPACINGS IN MILLIMETRES
.2 ....DENOTES SECOND LAYER OF REINFORCEMENT LAID
TYPICAL ABBREVIATIONS :-
B.........DENOTES BARS IN BOTTOM
T.........DENOTES BARS IN TOP
ALT ......DENOTES BARS ALTERNATING
STAG .....DENOTES BARS STAGGERED
NF........DENOTES BARS IN NEAR FACE
FF........DENOTES BARS IN FAR FACE
EF........DENOTES BARS IN EACH FACE
NSOP......DENOTES NOT SHOWN ON PLAN
NSOE......DENOTES NOT SHOWN ON ELEVATION

C19 CONCRETE TO BE KEPT FREE OF SUPPORTING BRICKWORK BY 'SWAN' SLIDING JOINT OR EQUAL U.N.O.

C20 VERTICAL FACES OF CONCRETE SHALL BE SEPERATED BY 12mm THICK 'CANEITE' OR EXPANDING CORK U.N.O.

C21 PLACING OF REINFORCEMENT SHALL BE CO-ORDINATED TO SUIT PLACING OF PRESTRESSING TENDONS.

STRUCTURAL STEELWORK NOTES

S1 ALL MATERIALS, WORKMANSHIP, FABRICATION AND ERECTION SHALL COMPLY WITH THE REQUIREMENTS OF AS4100, AS1538, AS1554 AND THE SPECIFICATION.

S2 UNLESS SHOWN OTHERWISE, ALL STEEL SHALL BE IN ACCORDANCE WITH AS1204 GRADE 300. ALL STEEL HOLLOW SECTIONS SHALL BE GRADE 350 U.N.O. AND SHALL BE IN ACCORDANCE WITH AS1163.
ALL PRESSED METAL PURLINS AND GIRTS SHALL BE GRADE 450 STEEL IN ACCORDANCE WITH AS1538

S3 UNLESS SHOWN OTHERWISE ON THE DRAWINGS, ALL CONNECTIONS SHALL BE IN ACCORDANCE WITH THE FOLLOWING MINIMUM REQUIREMENTS:

(i) ALL WELDS SHALL BE 6MM CONTINUOUS FILLET WELDS ALL ROUND.
(ii) ALL BOLTS SHALL BE M20 - 8.8/S, WITH A MINIMUM OF 2 BOLTS PER CONNECTION.
PURLIN BOLTS TO BE M12 - 4.6/S WITH A MINIMUM OF 2 BOLTS PER PURLIN END.
(iii) ALL GUSSET AND CLEAT PLATES SHALL BE 10mm THICK. (U.N.O.)
(iv) ALL CAP PLATES SHALL BE 10 mm THICK. (U.N.O.)
(v) ALL BASE PLATES SHALL BE 10 mm THICK. (U.N.O.)

S4 BOLT DESIGNATION:
4.6/S REFERS TO COMMERCIAL BOLTS OF STRENGTH GRADE 4.6 TO AS1111 TIGHTENED TO A SNUG TIGHT CONDITION.

8.8/S REFERS TO HIGH STRENGTH STRUCTURAL BOLTS OF GRADE 8.8 TO AS1252 TIGHTENED TO A SNUG TIGHT CONDITION.

8.8/TB REFERS TO HIGH STRENGTH STRUCTURAL BOLTS OF GRADE 8.8 TO AS1252 FULLY TENSIONED TO AS4100 AS A BEARING JOINT.

8.8/TF REFERS TO HIGH STRENGTH STRUCTURAL BOLTS OF GRADE 8.8 TO AS1252 FULLY TENSIONED TO AS4100 AS A FRICTION JOINT.

S5 HIGH STRENGTH BOLTED JOINTS SHALL BE IN ACCORDANCE WITH AS1511. THE SPECIFIED BOLT TENSION SHALL BE OBTAINED BY USE OF THE "PART TURN" METHOD OF TIGHTENING.

S6 ALL WELDS SHALL BE SP (SPECIAL PURPOSE) IN ACCORDANCE WITH AS1554. ALL ELECTRODES SHALL BE CLASS E48. ALL BUTT WELDS SHALL BE FULL STRENGTH COMPLETE PENETRATION WELDS.

S7 SUBSTITUTIONS FOR STEEL SECTIONS SHOWN ON DRAWINGS SHALL NOT BE MADE WITHOUT THE APPROVAL OF THE ENGINEER.

S8 ALL STEELWORK BELOW GROUND OR FINISHED SURFACE LEVEL IS TO BE ENCASED IN 75mm MIN. CONCRETE ALL ROUND.

S9 ALL STEELWORK, EXCEPT THAT WHICH IS TO BE CONCRETE ENCASED, FIRE SPRAYED OR CONTACT SURFACES OF FRICTION TYPE JOINTS, SHALL BE SURFACE CLEANED AND PAINTED IN ACCORDANCE WITH THE SPECIFICATION.

S10 STEELWORK THAT IS CONCRETE ENCASED, FIRE SPRAYED OR FACING SURFACES OF FRICTION TYPE JOINTS SHALL BE LEFT UNPAINTED AND FREE FROM SCALE.

S11 THE CONTRACTOR SHALL PROVIDE ALL CLEATS AND DRILL ALL HOLES NECESSARY FOR FIXING STEEL, TIMBER AND OTHER ELEMENTS TO STEEL WHETHER OR NOT DETAILED ON THE DRAWINGS.

S12 THE FABRICATION AND ERECTION OF THE STRUCTURAL STEELWORK SHALL BE SUPERVISED BY QUALIFIED PERSONNEL EXPERIENCED IN SUCH SUPERVISION TO ENSURE THAT ALL REQUIREMENTS OF THE DESIGN ARE MET. DETAILS OF ERECTION SEQUENCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF ERECTION.

S13 COLUMNS AND MULLIONS SHALL HAVE THEIR BASE PLATES FULLY GROUTED IN ACCORDANCE WITH THE SPECIFICATIONS AFTER PLUMBING AND LEVELLING ON STEEL PACKERS.

S14 THREE (3) SETS OF STEELWORK SHOP DETAIL DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF ANY FABRICATION. THE CHECK SHALL NOT COVER LAYOUT AND MEMBER DIMENSIONS.

S15 CONCRETE ENCASED STRUCTURAL STEELWORK TO BE ENCLOSED BY F41 MESH PLACED CLEAR OF STEELWORK, ENCASING TO PROVIDE 50mm MIN. COVER TO STEELWORK U.N.O. ON THE DRAWINGS. COVER TO MESH TO BE 20mm MIN. MAXIMUM AGGREGATE SIZE = 10mm, CONCRETE f'c = 20 MPa.

S16 UNLESS SPECIFIED OTHERWISE, STEELWORK SHALL BE PREPARED TO CLASS 2.5 FINISH IN ACCORDANCE WITH AS1627.4 AND GIVEN TWO (2) COATS OF ZINC PHOSPHATE TO A TOTAL DRY FILM THICKNESS OF 70 MICRONS.

S17 WELDING SHALL COMPLY WITH AS/NZS 1554.1
a- MINIMUM WELD SIZE SHALL BE:
FOR 12MM PLATE & UNDER 5MM CONTINOUS FILLET UNO
FOR 16MM PLATE & OVER 6MM CONTINOUS FILLET UNO
b- ALL FILLET WELDS TO BE GP TO AS/NZS 1554.1 UNO
ALL BUTT WELDS TO BE SP TO AS/NZS 1554.1 UNO
C- WELDING TO ALL SECTIONS LESS THAN 40MM THICK SHALL BE WITH ELECTRODES E48XX TO AS 1553 UNO. WELDING TO ALL SECTIONS GREATER THAN 40MM ELECTRODES E48XXLH TO AS 1553 UNO.
d- FOR WORK EXPOSED TO THE WEATHER SEAL WELD SHALL BE MADE WHETHER SHOWN ON DRAWINGS OR NOT, UNLESS SPECIFICALLY NOTED AS NOT REQUIRED.
e- ALL WELDING SHALL BE SUBJECT TO NON DESTRUCTIVE EXAMINATION (NDE) TO THE MAXIMUM LEVEL ASS SUGGESTED BY AS/NZS 1554.1 TABLE 7.4
f- THE CONTRACTOR SHALL EMPLOY AN INDEPENDENT QUALIFIED WELDING INSPECTOR AS SPECIFIED IN AS/NZS 1554.1.
g- THE ENGINEER RESERVES THE RIGHT TO APPROVE A PROPOSED WELDING INSPECTOR.

GA6. GROUTING SHALL CONFORM TO THE REQUIREMENTS OF AS3600 AND THE CONCRETE INSTITUTES "RECOMMENDED PRACTICE FOR GROUTING, 1982".

GA7. ANY VARIATION OF LOCATION OR INCLINATION OF ANCHORS WILL REQUIRE RECALCULATION OF THE REQUIRED WORKING LOADS AND SHALL BE NOTIFIED TO THE SUPERINTENDENT FOR APPROVAL.

GA8. WORKING LOAD SHOWN IS THE FORCE REQUIRED AFTER ALL LOSSES OF PRESTRESS INCLUDING DRAW IN.

GA9. ALL ANCHORS SHALL BE LOCATED SO AS TO AVOID ALL SERVICES PRIOR TO INSTALLING.

GA10. ALL ANCHOR WORKING LOADS TO BE 60% MIN. BREAKING LOAD.

GA11. IF TENDONS ARE CUT BACK, THEN THE LENGTH OF TENDON PROTRUDING BEYOND WEDGE GRIP IS TO BE NOT LESS THAN 600MM.

GA12. CONTRACTOR TO ENSURE ALL ANCHORS HAVE ADEQUATE CORROSION RESISTANCE, MIN FIVE YEAR LIFE. (SEMI-PERMINANT ANCHORS).

GA13. CONTRACTOR TO ALLOW FOR RETURNING TO SITE AND DETENSIONING OF ANCHORS AT TIME TO BE ADVISED.

GA14. CONFIRM SETOUT OF ALL ITEMS WITH BUILDER PRIOR TO INSTALLATION.

GA15. ANCHORS TO BE DESTRESSED AFTER EACH ADJACENT FLOOR SLAB IS CONSTRUCTED. PROVIDE A DESTRESSING METHOD AND PROGRAM TO THE ENGINEERS FOR REVIEW PRIOR TO ANY CONSTRUCTION.

GA16. AFTER THE DESTRESSING ANCHORS - REMOVE ANCHOR HEAD AND WALERS. MAKE GOOD PILES WITH AN APPROVED CEMENTIOUS MORTAR.

FORM WORK

F1 FORM WORK HAS TO BE DONE ACCORDING TO AS3610.

F2 REFER TO ARCH., ELECTRICAL, MECHANICAL, AND OTHER SERVICE ENG. FOR PENETRATION, AND CONSULT STRUCTURAL ENG. TO APPROVE. *INCLUDE THESE IN THE TENDERING.

F3 CHAMFER, FILLET, DROP GROOVER...... TO ARCH. SPECIFICATIONS AND BUILDER REQUIREMENTS.

GROUND ANCHORS

GA1. ANCHOR HOLES SHOULD BE THOROUGHLY CLEANED AND THE BOND GROUT SHOULD BE ALLOWED TO CURE FOR A MINIMUM OF 3 DAYS BEFORE PROOF STRESSING, ASSUMING TYPE D CEMENT OR EQUIVALENT AT A WATER/CEMENT RATIO OF 0.4.

GA2. AFTER THE REQUIRED CURING TIME, WALINGS SHOULD BE INSTALLED AND THE ANCHORS PROOF STRESSED, ONE AT A TIME, TO 1.33 TIMES THE DESIGN LOAD.

GA3. RECORDS OF ALL ANCHOR EXTENSIONS ARE TO BE SUBMITTED TO THE SITE ENGINEER FOR APPROVAL.

GA4. A MINIMUM FREE STRESSING LENGTH OF 5 METRES SHALL BE ADOPTED.

GA5. THE SUPPLY, INSTALLATION AND TENSIONING OF POST TENSIONED GROUND

CODE. ANCHORAGE LENGTHS SHALL BE DETERMINED BY THE BUILDER AND SHALL REMAIN HIS RESPONSIBILITY.

ANCHORS SHALL BE CARRIED IN COMPLIANCE WITH AS3600 THE SAA CONCRETE

B1 0 1 2 3 4 5 6 7 8 9 10

No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE
F	ISSUED FOR C.C.	G.K.	G.K.	12.06.12										
E	ISSUED FOR C.C.	G.K.	S.A.H	19.08.11										
D	ISSUED FOR C.C.	G.K.	T.K.	09.08.11										
C	ISSUED FOR APPROVAL	E.C	A.A.H	15.12.10										
B	ISSUED FOR APPROVAL	E.C	A.A.H	08.12.10										
A	ISSUED FOR APPROVAL	A.S.H.	P.A.	08.12.10	G	ISSUED FOR C.C.	G.K.	G.K.	22.06.12					

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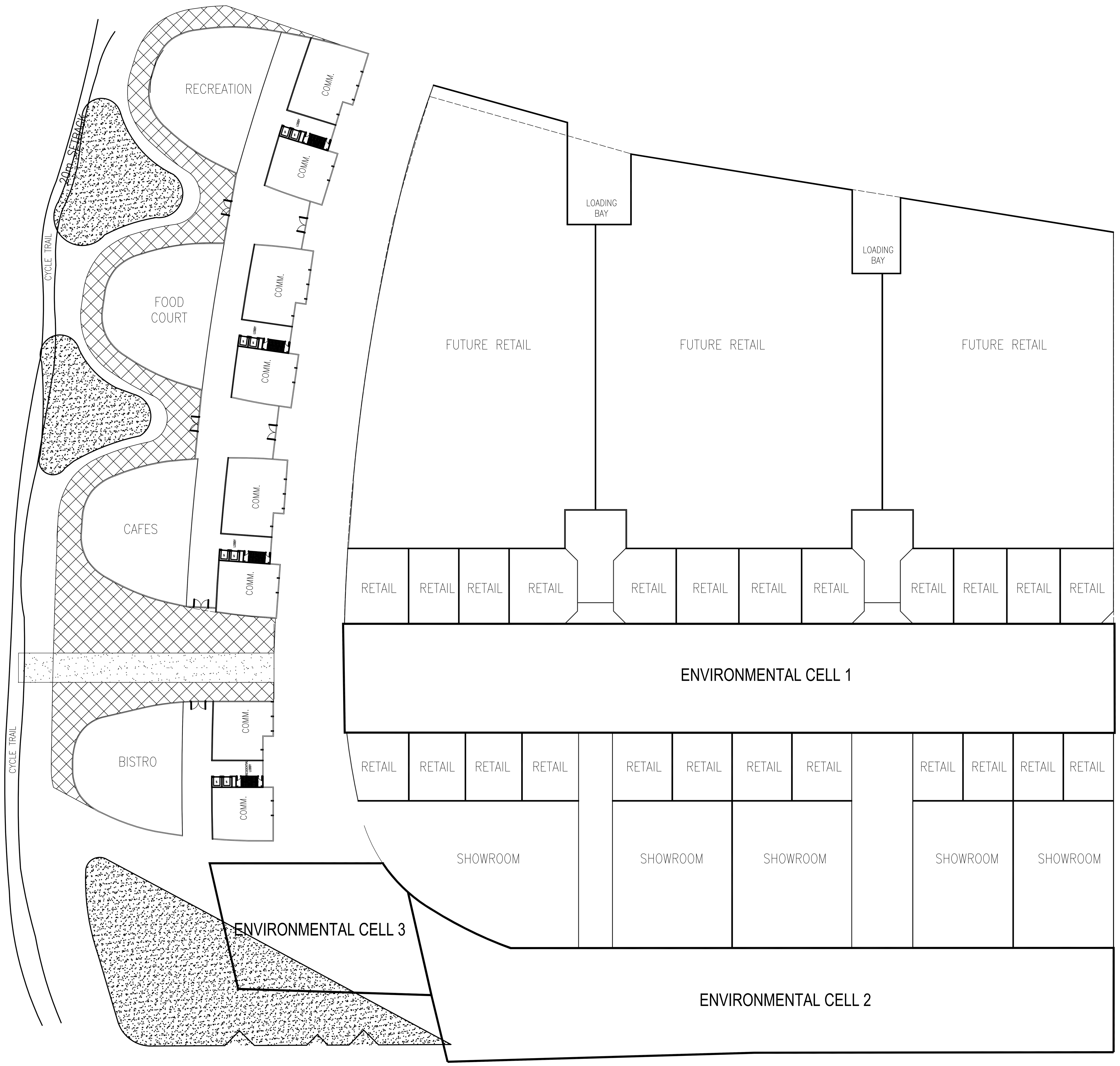
PROJECT
CAMELLIA WEST
JAMES RUSE DRIVE
CAMELLIA

SHEET SUBJECT
GENERAL NOTES

CAD FILE JAMES RUSE DRIVE, CAMELLIA
DATE NOV 10 | DRAWN P.A. | DESIGNED G.K. | CHECKED A.S.H.
SCALE @ B1 AS ABOVE | JOB No 10AH454
AUTHORISED | DRG No S000 | REV G



SITE PLAN
SCALE 1:500

B1 0 1 2 3 4 5 6 7 8 9 10

No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE
F	ISSUED FOR C.C.	G.K.	G.K.	12.06.12										
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B	ISSUED FOR APPROVAL	E.C.	A.S.H.	15.12.10										
A	ISSUED FOR APPROVAL	A.S.H.	P.A.	08.12.10	G	ISSUED FOR C.C.	G.K.	G.K.	22.06.12					

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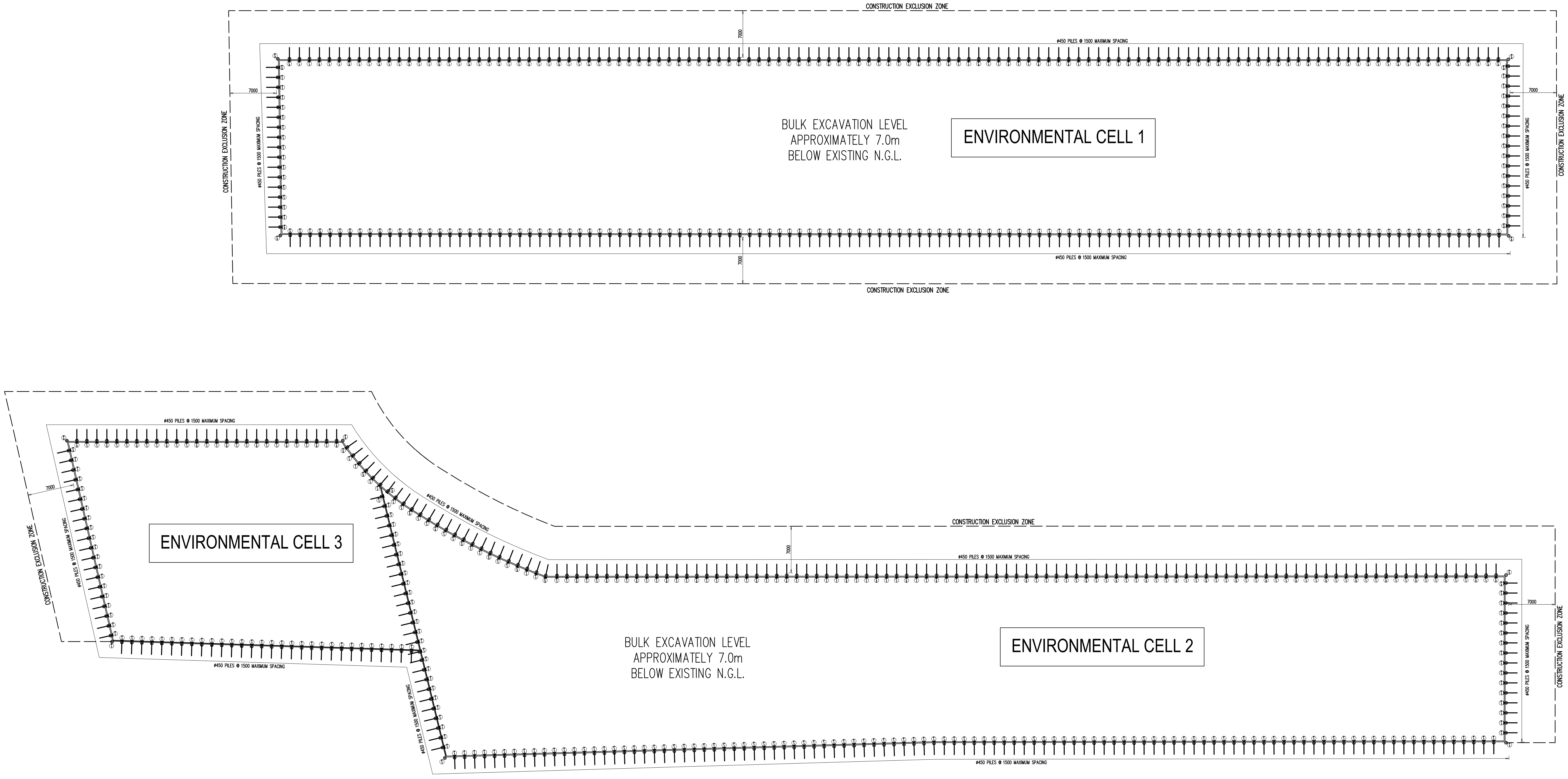
PROJECT
CAMELLIA WEST
JAMES RUSE DRIVE
CAMELLIA

SHEET SUBJECT
SHORING DETAILS

CAD FILE JAMES RUSE DRIVE, CAMELLIA			
DATE NOV 10	DRAWN P.A.	DESIGNED G.K.	CHECKED A.S.H.
SCALE @ B1 AS ABOVE		JOB No 10AH454	
AUTHORISED		DRG No S100	REV G



CONCRETE QUALITY				
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	f'c
SHOTCRETE	80mm	20mm	A	32MPa
PILES	180mm	10mm	A	32MPa
CAPPING BEAM	80mm	20mm	A	32MPa

REINFORCEMENT COVER SCHEDULE				
MEMBER	COVER (mm)			EXPOSURE CLASSIFICATION
	TOP	BOTTOM	SIDES	
SHOTCRETE	40mm	40mm	40mm	B1
PILES	50mm	50mm	50mm	B1
CAPPING BEAM	50mm	50mm	50mm	B1

"SBV" TO BE CHECKED & APPROVED BY GEOTECHNICAL ENGINEER BEFORE POURING CONCRETE.

ANCHOR UNFACTORED SERVICE LOAD SCHEDULE		
ELEMENT	LOAD (TONNES)	ANGLE (DEGREE)
A	35	30°

WORK METHOD STATEMENT FOR SHORING AND PILING WORK

1. INSTALL PILES TO REACH THE SPECIFIED BEARING CAPACITY LEVEL WITH THE REQUIRED SOCKET LENGTH.
2. EXCAVATE IN 1500mm INTERVALS UP TO APPROXIMATELY 500mm BELOW THE TOP ANCHOR LEVEL
3. AS EXCAVATION PROCEED, ENSURE THAT GEOTECHNICAL ENGINEER INSPECT, CHECK AND APPROVE.
4. STRUCTURAL ENGINEER TO INSPECT AND APPROVE
5. INSTALL AND STRESS ANCHORS.
6. STRUCTURAL ENGINEER TO INSPECT AND APPROVE
7. EXCAVATE DOWN TO BULK EXCATION LEVEL IN 1500mm INTERVALS.
8. PILING CONTRACTORS TO ENSURE TO AVOID EXCESSIVE AND UNCONTROLLED HOLLOWS WITH A POTENTIAL TO LEAD TO SINKHOLE FORMATION AT ROAD LEVELS.

SHORING PLAN

SCALE: 1:300

NOTES:
1. REFER PLAN FOR MAXIMUM SPACING OF ANCHORS
2. IF GROUND WATER IS ENCOUNTERED WHILE DRILLING, SULPHATE RESISTANT CEMENT TO BE USED AND GEOTECH ENGINEER TO BE CONSULTED
3. B.E.L. DENOTES BULK EXCAVATION LEVEL. REDUCED LEVELS TO BE CONFIRMED
4. BULK EXCAVATION LEVEL TO BE CONFIRMED.
5. GEOTECHNICAL ENGINEER TO CONFIRM THE SAFE BEARING CAPACITY OF THE FOUNDING MATERIAL AND TO ENSURE THE MINIMUM REQUIRED SOCKET IS ACHIEVED INTO BOTH THE CLAY AND THE ROCK.
6. ALL DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE TO AS5100 & AS3600
7. THE DESIGN HAS ALLOWANCE FOR UNPLANNED EXCAVATION IN ACCORDANCE WITH AS5100.3
8. ENSURE THAT ANY LOOSE / SOFT FILL MATERIALS ARE ADEQUATELY SUPPORTED DURING CONSTRUCTION AND IN THE LONG TERM.

10. P 1 DENOTES PILE TYPE 1

11. P 2 DENOTES PILE TYPE 2

GEOTECHNICAL NOTES:

1. BUILDER TO REFER TO GEOTECH REPORT PREPARED BY ASSET GEOTECHNICAL REFERENCE: 1694-A DATED 17 JUNE 2011 AS WELL AS EI GROUND WATER ASSESSMENT ADDITIONAL INVESTIGATION DATED 15 DECEMBER 2009
2. IF WATER TABLE IS HIGH IN SULFIDES THEN SULFIDE RESISTANT CONCRETE IS TO BE USED OR CONCRETE STRENGTH MAY BE INCREASED TO 50MPa
3. SEEK PERMISSION FROM COUNCIL AND NEIGHBOURING PROPERTY BEFORE INSTALLING ANCHORS.
4. GEOTECHNICAL PARAMETERS.
   $K_o = 0.5$
   $K_a = 0.3$
   $K_p = 3$
   Soil = 18kN/m
5. ANY CHANGE IN SOIL PARAMETERS DURING CONSTRUCTION CONSULT WITH GEOTECHNICAL ENGINEERS AND STRUCTURAL ENGINEERS TO CHECK

LOADING NOTES:

1. CONSTRUCTION SURCHARGE LOAD = 5kPa
2. RTA ROAD SURCHARGE = 20kPa
3. AS EXCAVATION PROCEEDS PLEASE ENSURE THAT ANY GAPS BETWEEN THE PILES ARE PLUGGED WITH 1:3 SAND TO CEMENT RATIO PRIOR TO SHOTCRETING.

GENERAL NOTES

1. THESE DRAWINGS ARE FOR STRUCTURAL PURPOSES ONLY AND ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATIONS, ARCHITECTURAL DRAWINGS, OTHER CONTRACT DOCUMENTATION AND THE REQUIREMENTS OF THE RELEVANT AUTHORITIES.
2. VERIFY ALL SETTING OUT DIMENSIONS WITH THE ARCHITECT.
3. DO NOT SCALE FROM THESE STRUCTURAL DRAWINGS.
4. SHOULD ANY AMBIGUITY, ERROR, OMISSION, DISCREPANCY, INCONSISTENCY OR OTHER FAULT EXIST OR SEEM TO EXIST IN THE CONTRACT DOCUMENTS, IMMEDIATELY NOTIFY IN WRITING TO THE SUPERINTENDENT.
5. MAINTAIN THE STRUCTURE IN A STABLE CONDITION DURING CONSTRUCTION. TEMPORARY BRACING/SHORING SHALL BE PROVIDED BY THE CONTRACTOR TO KEEP THE STRUCTURE AND EXCAVATIONS STABLE AT ALL TIMES, ENSURING THAT NO PART OF THE DOCUMENTED STRUCTURE BECOMES OVER STRESSED. FOR ALL TEMPORARY BATTERS OBTAIN GEOTECHNICAL ENGINEERS RECOMMENDATIONS
6. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF CURRENT SAA CODES AND THE BYLAWS, ORDINANCES OR OTHER REQUIREMENTS OF THE RELEVANT BUILDING AUTHORITIES.
7. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH ALL WORK COVER REQUIREMENTS AND OCCUPATIONAL HEALTH AND SAFETY ACT REGULATIONS.
8. CONSTRUCTION USING THESE DRAWINGS SHALL NOT COMMENCE UNTIL A CONSTRUCTION CERTIFICATE IS ISSUED BY THE PRINCIPAL CERTIFYING AUTHORITY.

DIAL BEFORE DIG

NOTES:
1. BUILDER TO ENSURE THE EXACT LOCATIONS OF THE SERVICES PRIOR TO START OF ANY CONSTRUCTION WORK. ALSO BUILDER TO ENSURE ENSURE THE 'DIAL BEFORE YOU DIG' TO THE AUTHORITIES CONCERNED TO CONFIRM THE THE LOCATIONS OF THE SERVICES IN THE EVENT THAT ANY ANTICIPATION THE SERVICES MAY BE AFFECTED WITH STRUCTURAL WORK, STRUCTURAL ENGINEER TO BE NOTIFIED AND CONSULTED IMMEDIATELY FOR REVIEWING THE STRUCTURAL DETAILS.

NOTES:
BUILDERS AND CONTRACTORS TO ENSURE THAT FOR ANCHORING, PRIOR APPROVAL IS OBTAINED FROM NEIGHBOURING PROPERTIES

NOTES:
IF GROUND CONDITIONS CHANGE DURING EXCAVATION, PLEASE NOTIFY ENGINEER, AND SEEK FURTHER INSTRUCTIONS.

ACID SULPHATE WARNING

ENGINEER TO BE ADVISED IF ACID SULPHATE SOILS ARE PRESENT. IN THE EVENT THAT ACID SULPHATE SOILS ARE PRESENT, THE BUILDER IS STRONGLY ADVISED TO ENSURE PROTECTIVE MEASURES ARE TAKEN TO MINIMISE THE EFFECT OF AN ACID SULPHATE ATTACK ON THE SHORING STRUCTURAL ELEMENTS.

SHORING NOTES:
1. TEST RECORDS SHALL BE PROVIDED FOR TEST LOADINGS OF ALL ANCHORS.
2. ANY VARIATION IN THE LOCATION OR INCLINATION OF ANCHORS WILL REQUIRE RE-CALCULATION OF THE REQUIRED WORKING LOADS AND SHALL BE NOTIFIED TO THE ENGINEERS FOR APPROVAL.
3. ALL ANCHORS SHALL BE LOCATED SO AS TO AVOID ALL SERVICES AND PITS.

GROUND ANCHORS
1. THE DESIGN, SUPPLY, INSTALLATION AND TENSIONING OF GROUND ANCHORS SHALL BE CARRIED OUT IN COMPLIANCE WITH THE RELEVANT AUSTRALIAN STANDARDS AND THE SPECIFICATION. ANCHORAGE LENGTHS AND CURING TIMES SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL REMAIN THE CONTRACTOR'S RESPONSIBILITY.
2. ANCHOR HOLES SHOULD BE THOROUGHLY CLEANED AND THE BOND GROUT SHOULD BE ALLOWED TO CURE BEFORE PROOF STRESSING.
3. GROUTING SHALL CONFORM TO THE REQUIREMENTS OF AS 3600 AND THE CONCRETE INSTITUTE "RECOMMENDED PRACTICE FOR GROUTING 1982" 4. FOR PROOF STRESSING LOADS REFER TO THE SPECIFICATION.
5. RECORDS OF ALL ANCHOR EXTENSIONS AND TEST LOADINGS ARE TO BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW.
6. MODIFICATIONS TO THE ARRANGEMENT SHOWN ON THE DRAWINGS WILL REQUIRE RECALCUATION OF THE REQUIRED WORKING LOADS AND SHALL BE NOTIFIED TO THE SUPERINTENDENT FOR APPROVAL.
7. SAFE WORKING LOAD SHOWN IS THE FORCE REQUIRED AFTER ALL LOSSES OF PRESTRESS, INCLUDING DRAW IN.
8. ALL ANCHORS SHALL BE LOCATED SO AS TO AVOID ALL SERVICES AND PITS ETC.THE CONTRACTOR IS TO DETERMINE THE LOCATION OF ALL SERVICES ETC PRIOR TO INSTALLATION OF ANCHORS.
9. ANY VARIATION IN LOCATION OR INCLINATION OF ANCHORS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL.
10. FOR RATIO OF ULTIMATE LOAD CAPACITY OF ANCHOR TO SAFE WORKING LOAD REFER TO THE SPECIFICATION.
11. FOR TEMPORARY AND SEMI-PERMANENT ANCHORS THE LENGTH OF TENDON PROTRUDING BEYOND WEDGE GRIP IS NOT TO BE LESS THAN 600MM TO ENABLE MONITORING.
12. FOR CORROSION PROTECTION REQUIREMENTS REFER TO THE SPECIFICATION.
13. DO NOT DESTRESS TEMPORARY OR SEMI-PERMANENT ANCHORS UNTIL AFTER ALL PROPPING TO FLOOR SLABS HAS BEEN COMPLETED AND ENGINEERS APPROVAL HAS BEEN OBTAINED.
14. FOR TEMPORARY AND SEMI-PERMANENT ANCHORS : AFTER DESTRESSING ANCHORS, REMOVE ANCHOR HEAD AND WALERS. CUT STRANDS AT THE FACE OF PILE AND GROUT FILL DUCTS. MAKE GOOD PILES WITH AN APPROVED EPOXY REPAIR MORTAR.

NOTE: THIS IS A MINIMUM REQUIREMENT. CONTRACTOR IS TO REFER TO COUNCIL REQUIREMENTS IF ANCHORS ARE TO BE FULLY REMOVED.

B1 0 1 2 3 4 5 6 7 8 9 10

No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE
F	ISSUED FOR C.C.	G.K.	G.K.	12.06.12										
E	ISSUED FOR C.C.	G.K.	S.A.H	19.08.11										
D	ISSUED FOR C.C.	G.K.	S.A.H	15.08.11										
C	ISSUED FOR C.C.	G.K.	T.K.	09.08.11										
B	ISSUED FOR APPROVAL	E.C.	A.S.H.	15.12.10	H	ISSUED FOR C.C.	G.K.	G.K.	26.06.12					
A	ISSUED FOR APPROVAL	A.S.H.	P.A.	08.12.10	G	ISSUED FOR C.C.	G.K.	G.K.	22.06.12					

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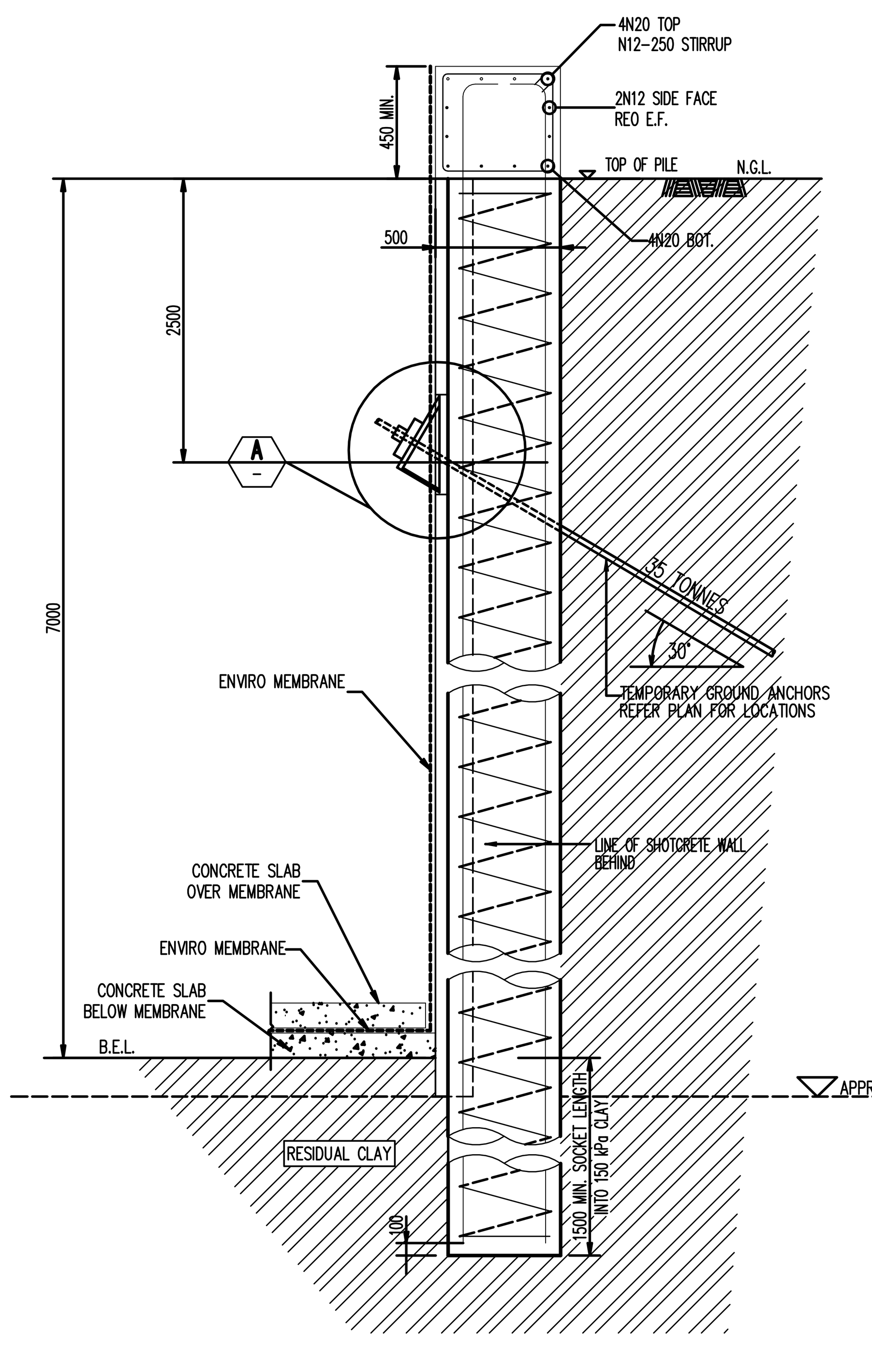
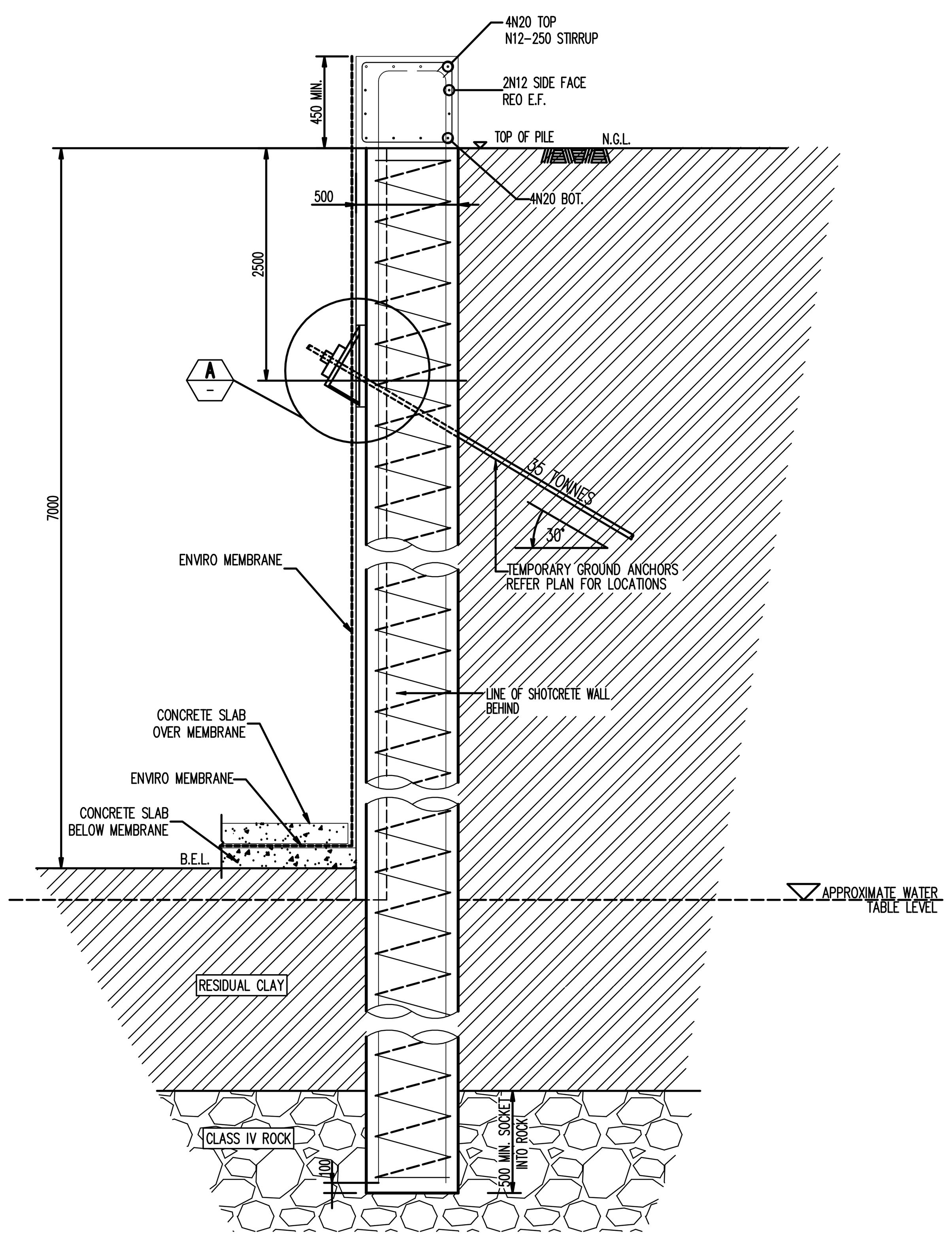
PROJECT
CAMELLIA WEST
JAMES RUSE DRIVE
CAMELLIA

SHEET SUBJECT
SHORING PLAN

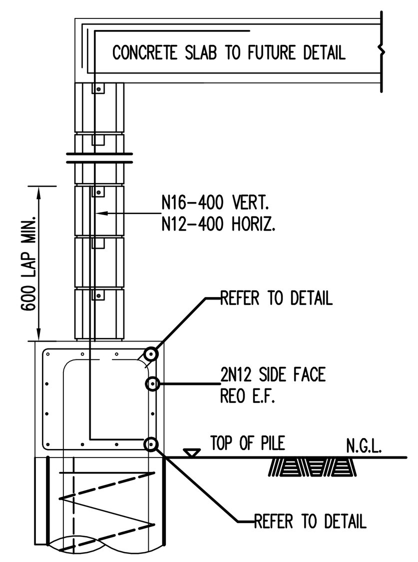
CAD FILE: JAMES RUSE DRIVE, CAMELLIA			
DATE: NOV 10	DRAWN: P.A.	DESIGNED: G.K.	CHECKED: A.S.H.
SCALE @ B1: 1:20 U.N.O		JOB No: 10AH454	
AUTHORISED		DRG No: S101	REV: H



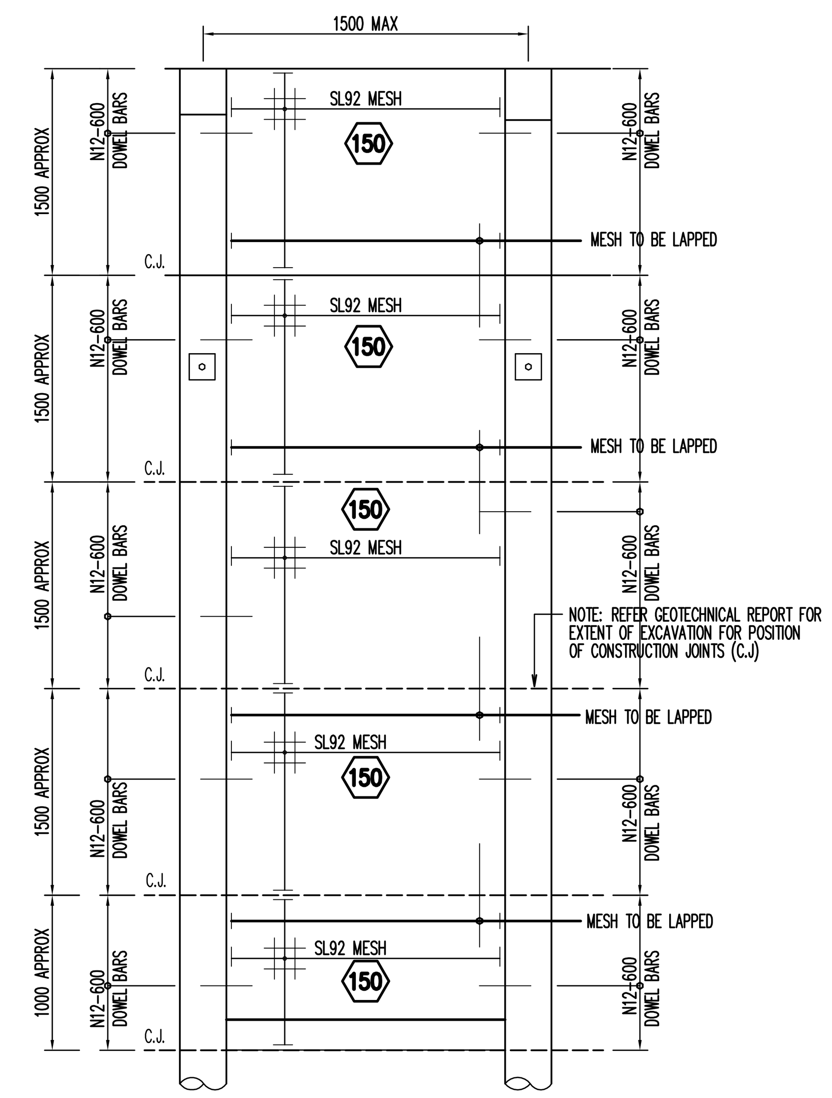
TYPICAL SHORING WALL DETAIL
P1 ELEVATION



TYPICAL SHORING WALL DETAIL
P2 ELEVATION



CAPPING BEAM ALTERNATIVE

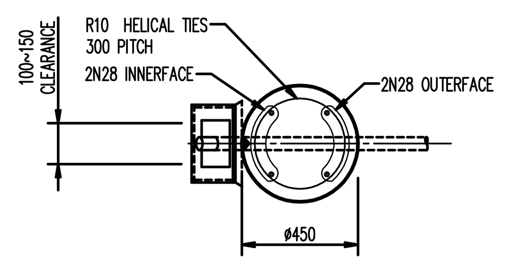


TYPICAL SHOTCRETE WALL REINFORCEMENT LAYOUT

SCALE: 1:50

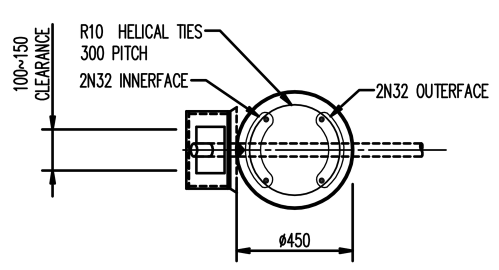
NOTES:

1. I.F DENOTES INSIDE FACE
2. FABRIC ON INSIDE FACE BASEMENT SIDE OF SHOTCRETE WALL TO BE A CONTINUOUS SHEET BETWEEN PILE AND LAP AT PILES
3. FABRIC ON OUTSIDE FACE OF SHOTCRETE WALL TO BE A CONTINUOUS SHEET AT PILE AND LAP AT MIDSPAN OF THE WALL BETWEEN PILES



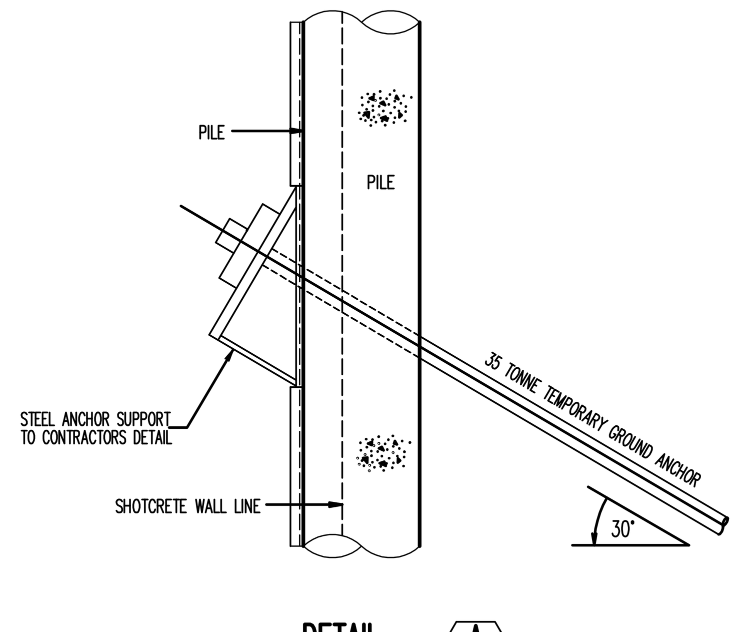
TYPICAL SECTION THROUGH
PILES TYPE 'P1'

NOTE: f'c = 32 MPa PILES & CAPPING BEAM

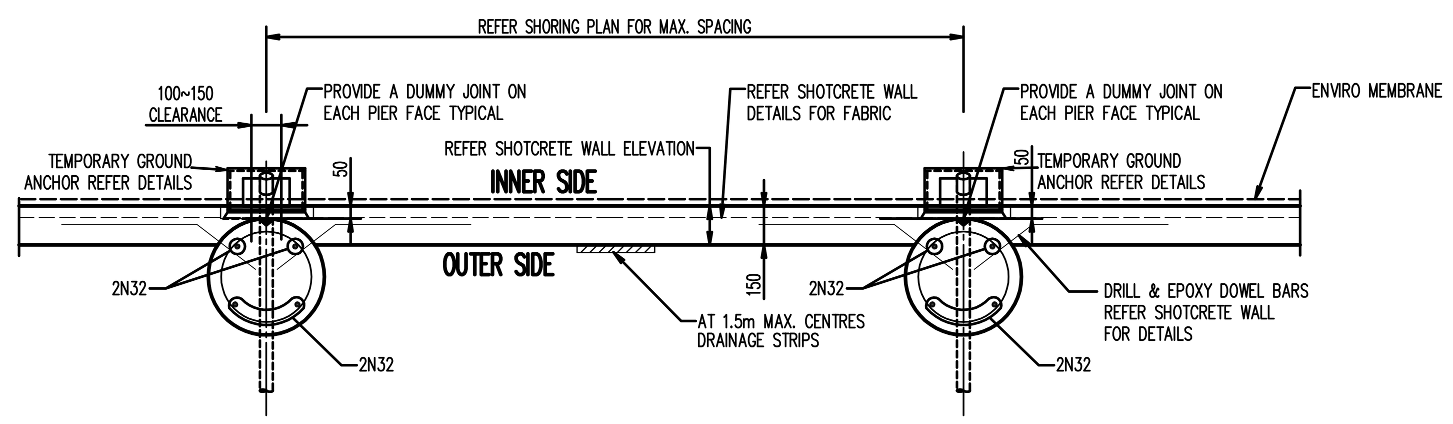


TYPICAL SECTION THROUGH
PILES TYPE 'P2'

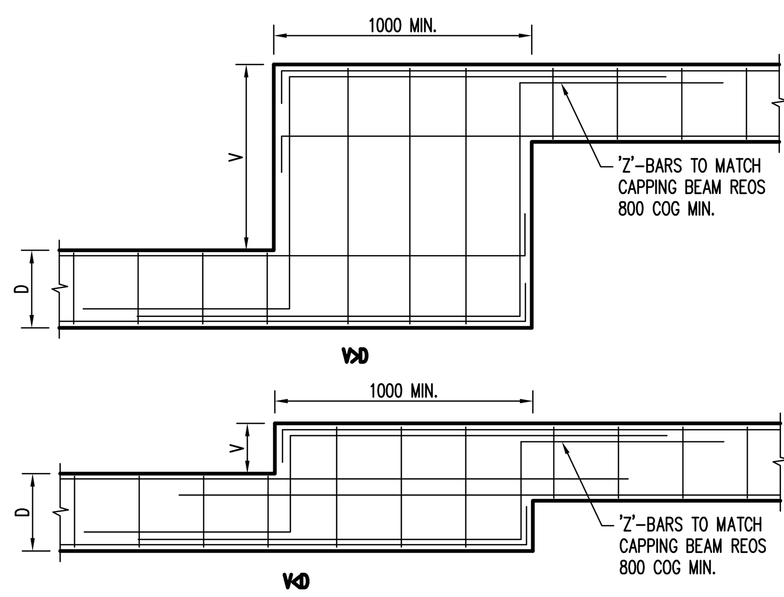
NOTE: f'c = 32 MPa PILES & CAPPING BEAM



DETAIL A
SCALE 1:20



PLAN OF SHOTCRETE WALL



TYPICAL STEP IN CAPPING BEAM DETAILS

B1 0 1 2 3 4 5 6 7 8 9 10

No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE	No	AMENDMENT	ENG	DRAFT	DATE
F	ISSUED FOR C.C.	G.K.	G.K.	12.06.12										
E	ISSUED FOR C.C.	G.K.	S.A.H	19.08.11										
D	ISSUED FOR C.C.	G.K.	S.A.H	15.08.11										
C	ISSUED FOR C.C.	G.K.	T.K.	09.08.11										
B	ISSUED FOR APPROVAL	E.C.	A.S.H.	15.12.10										
A	ISSUED FOR APPROVAL	A.S.H.	P.A.	08.12.10	G	ISSUED FOR C.C.	G.K.	G.K.	22.06.12					

CLIENT
CEJ CONSTRUCTIONS PTY LTD

ARCHITECT
tony owen ptnrs
Unit 2, Ground Floor, 5-11 Queen Street Chippendale NSW 2008
P 6122 9698 2900
F 6122 8399 0243
E info@tonyowen.com.au

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
SHOP 2-141 CONCORD RD NORTH STRATHFIELD NSW 2137
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: anthonyh@aceeng.com.au

PROJECT
CAMELLIA WEST
JAMES RUSE DRIVE
CAMELLIA

SHEET SUBJECT
SHORING PLAN

CAD FILE JAMES RUSE DRIVE, CAMELLIA

DATE	DRAWN	DESIGNED	CHECKED
NOV 10	P.A.	G.K.	A.S.H.

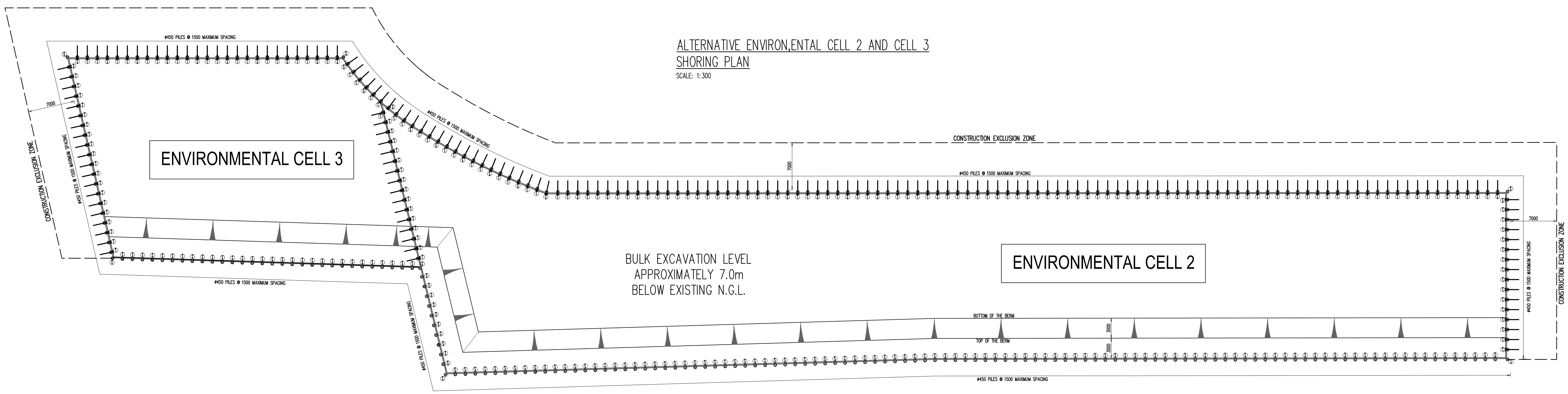
SCALE @ B1: 1:20 U.N.O

JOB No: 10AH454

AUTHORISED

DRG No: S102

REV: G



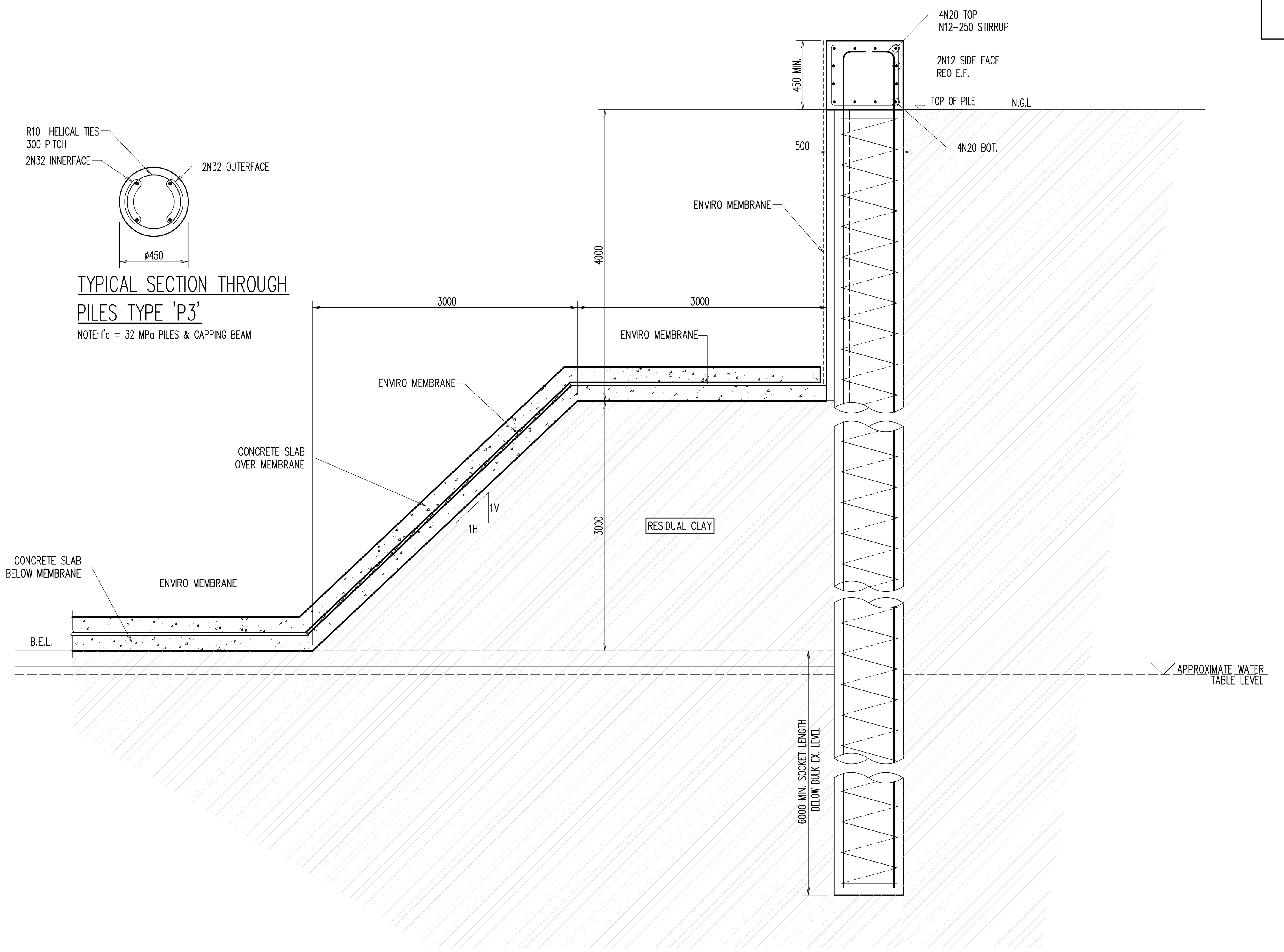
CONCRETE QUALITY				
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	f'c
SHOTCRETE	80mm	20mm	A	32MPa
PILES	180mm	10mm	A	32MPa
CAPPING BEAM	80mm	20mm	A	32MPa

REINFORCEMENT COVER SCHEDULE				
MEMBER	COVER (mm)			EXPOSURE CLASSIFICATION
	TOP	BOTTOM	SIDES	
SHOTCRETE	40mm	40mm	40mm	B1
PILES	50mm	50mm	50mm	B1
CAPPING BEAM	50mm	50mm	50mm	B1

"SBV" TO BE CHECKED & APPROVED BY GEOTECHNICAL ENGINEER BEFORE POURING CONCRETE.

ANCHOR UNFACTORED SERVICE LOAD SCHEDULE		
ELEMENT	LOAD (TONNES)	ANGLE (DEGREE)
A	35	30°

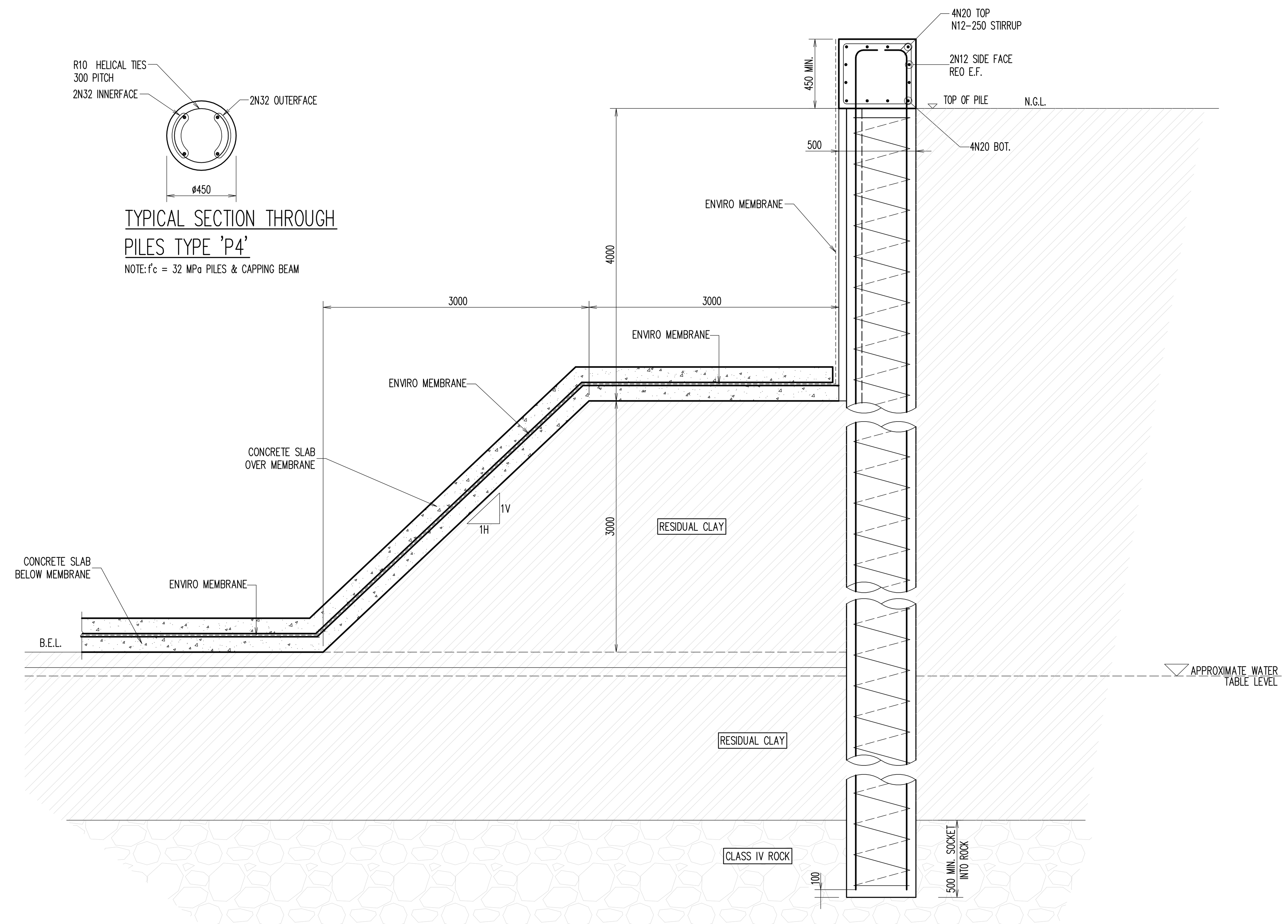
SLOPE STABILITY AND ANALYSIS AND DESIGN CERTIFICATION TO BE CARRIED OUT BY A QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION COMMENCING. SHORING DESIGN TO BE CONFIRMED AND REINFORCEMENT TO BE CONFIRMED.



TYPICAL SECTION THROUGH PILES TYPE 'P3'

NOTE: f'c = 32 MPa PILES & CAPPING BEAM

TYPICAL SHORING WALL DETAIL
P3 ELEVATION



TYPICAL SECTION THROUGH PILES TYPE 'P4'

NOTE: f'c = 32 MPa PILES & CAPPING BEAM

TYPICAL SHORING WALL DETAIL
P3 ELEVATION

No	AMENDMENT	ENG	DRAFT	DATE
B	ISSUED FOR C.C.	G.K.	G.K.	26.05.12
A	ISSUED FOR C.C.	G.K.	G.K.	25.06.12

CLIENT: CEJ CONSTRUCTIONS PTY LTD

ARCHITECT: tony owen ptnrs

AUSTRALIAN CONSULTING ENGINEERS. PTY LTD - A.C.N. 084 059 941
SHOP 2-141 CONCORD RD NORTH STRATHFIELD NSW 2137
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: anthonyh@aceeng.com.au

PROJECT: CAMELLIA WEST
JAMES RUSE DRIVE
CAMELLIA

SHEET SUBJECT: ALTERNATIVE
CELL 2 AND CELL 3
SHORING PLAN AND DETAILS

CAD FILE: JAMES RUSE DRIVE, CAMELLIA			
DATE: NOV 10	DRAWN: G.K.	DESIGNED: G.K.	CHECKED: A.S.H.
SCALE @ B1: 1:20 U.N.O		JOB No: 10AH454	
AUTHORISED		DRG No: S103	REV: B

D

Appendix D Borelogs - URS 2006 and URS 2012

URS

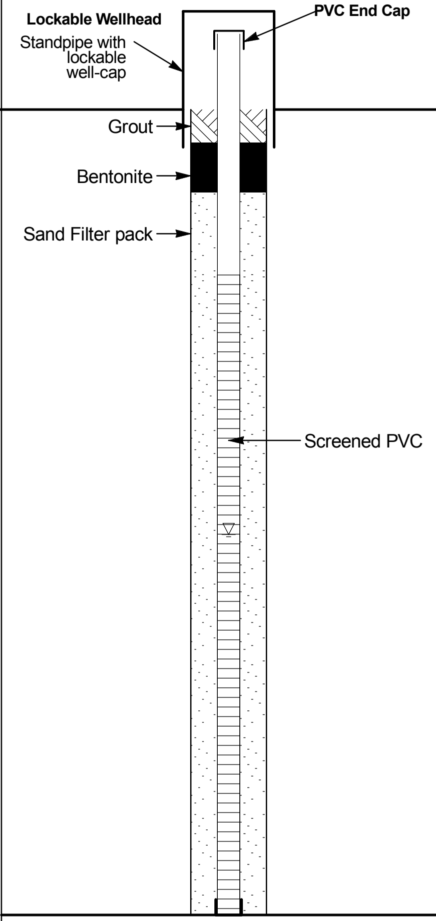
MONITORING WELL SB01-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	Numac Drilling Services Pty Ltd
Project Reference:	Camellia West SSI and Delineation Survey
Project No.:	43218436
Client:	Statewide Planning Pty Ltd
Location:	181 James Ruse Drive, Camellia, NSW
Logged By:	Shahin Falahati
Checked By:	Tanya Stanton
Date Started:	15-10-12
Date Finished:	15-10-12
Bore Size:	125 mm
Total Depth:	4.87 m
Casing Size:	50mm PVC mm
Relative Level:	2.93 mAHD
Coordinates:	6256358.67 N 317150.61 E
Permit No:	
Drill Type:	Pushtube
Drill Model:	Geoprobe
Drill Fluid:	Water

Sample Interval	PID (ppm)	Sample ID	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations	Classification	Depth (m)	Moisture Condition
			Concrete 150 mm		0	Dry
			FILL: GRAVEL (roadbase); coarse, grey/dark-grey, angular, trace of fine to medium sand, dense, dry.	GP		D
⧓	0.0	SB1_0.5-0.6	Sandy CLAY; brown/orange, medium to high plasticity, coarse sand, trace of fine angular gravel, soft to firm, moist.	CL		M
⧓	0.1	SB1_1.0-1.1	SAND; fine to medium, red/grey, poorly graded, trace of angular gravel, loose, moist.	SP	1	M
⧓	0.1	SB1_2.0-2.1	Sandy CLAY; orange/brown, medium to high plasticity, loose, moist to wet.	CL	2	M/W
⧓		SB1_2.3 (ASB)				
			Becoming wet		3	
⧓	0	SB1_3.5-3.6 (SPOCAS)	SAND; fine to medium, orange/brown, poorly sorted, loose, wet.	SP		W
					4	
			End of hole 4.87 m (target depth).		5	
					6	
					7	

WELL CONSTRUCTION DETAILS



URS

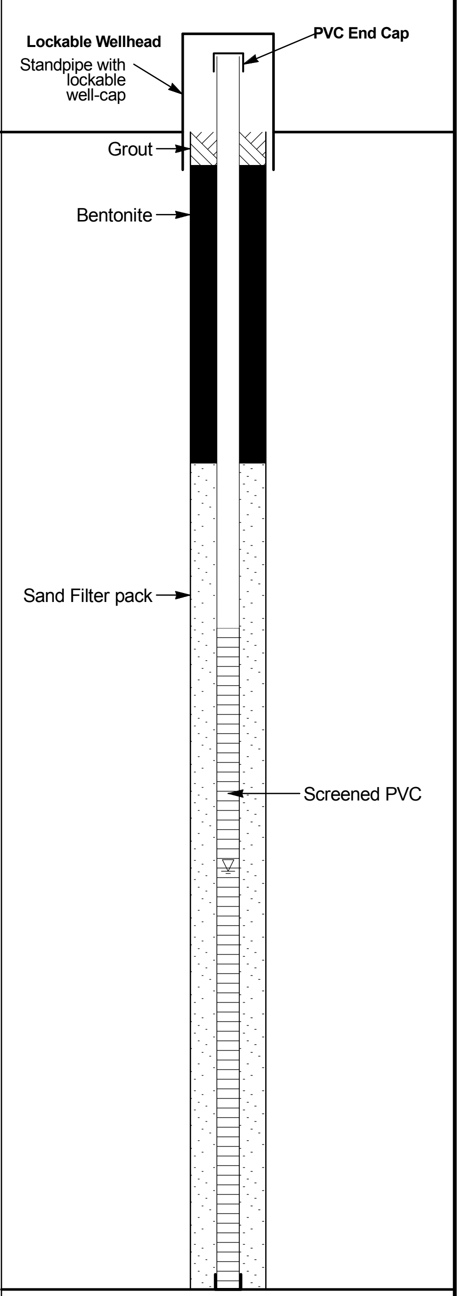
MONITORING WELL SB02-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**7.00 m**
Date Started:	**15-10-12**	Casing Size:	**50 mm PVC mm**
Date Finished:	**15-10-12**	Permit No:	
Relative Level:	**5.65 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256378.37 N** **317108.13 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations	Classification	Depth (m)	Moisture Condition
				Concrete 140 mm		0	
				FILL: Clayey GRAVEL; medium to coarse grained, brown/dark brown, poorly graded, angular, loose, moist.			M
	0	SB2_0.5-0.6		FILL: Sandy CLAY; orange/brown, medium plasticity, fine to medium sand, with trace of subangular gravel. Broken asbestos pipe fragments.			D D/M
				FILL: ASBESTOS; fragments of bonded asbestos piping and compacted friable white asbestos material.		1	
	0	SB2_2.7-2.8 (ASB)				2 3	
				Becoming wet			
				Silty CLAY; black/brown, low to medium plasticity, soft, wet.			W
	0	SB2_4.2-4.3 (SPOCAS)				4	
	0 0	SB2_4.5-4.7 (ASB) SB4.5-4.6				5 6 7	
				End of hole 7.0 m (target depth).			

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

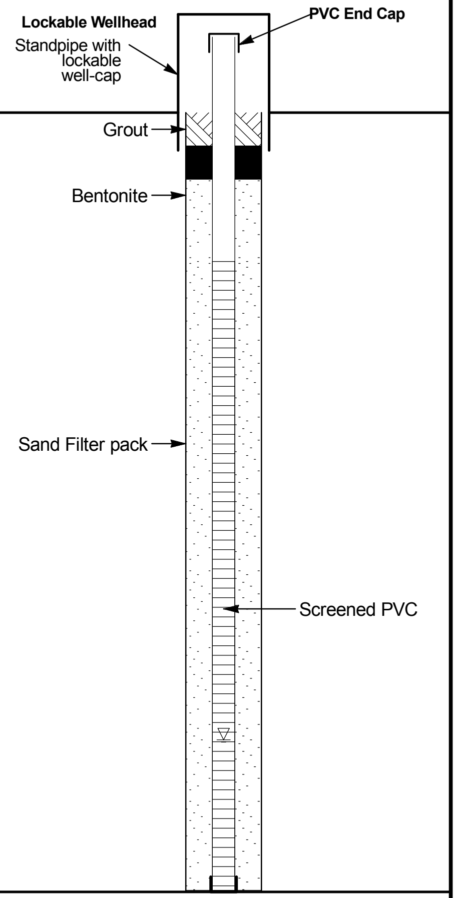
MONITORING WELL SB03-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	**Camellia West SSI and Delineation Survey**	Client:	**Statewide Planning Pty Ltd**
Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Location:	**181 James Ruse Drive, Camellia, NSW**
Project No.:	**43218436**		
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**4.71 m**
Date Started:	**15-10-12**	Casing Size:	**50 mm PVC mm**
Date Finished:	**15-10-12**	Permit No:	
Relative Level:	**3.76 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256617.73 N** / **317152.64 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
				Concrete 130 mm		0	
				FILL: SAND; fine to medium grained, orange/brown, poorly graded, trace of fine, subangular gravel, loose, moist.	SP		M
	0	SB2_0.5-0.6		FILL: ASBESTOS; fragments of bonded asbestos piping (blue).			D/M
	0	SB2_1.0-1.1 (ASB)		FILL: Gravelly CLAY; orange/brown, low to medium plasticity, trace of fine subangular gravel, some bonded asbestos fragments, loose, moist to wet.	CL	1	M/W
				FILL: ASBESTOS; fragments of bonded asbestos, blue, wet.		2	W
	0 0 0	SB2_2.7-2.8 SB2_2.8-2.9 (ASB) SB2_3.0-3.1 (SPOCAS)		Silty SAND; medium to coarse grained, brown/dark brown, poorly graded, loose, wet.	SM	3	W
				End of hole 3.9 m (target depth).		4	
						5	
						6	
						7	

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

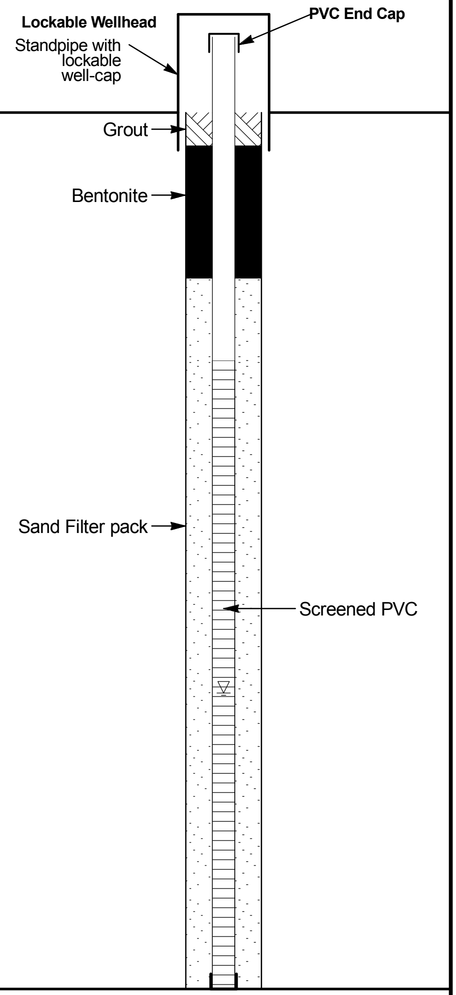
MONITORING WELL SB04-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**5.30 m**
Date Started:	**16-10-12**	Casing Size:	**50 mm PVC mm**
Date Finished:	**16-10-12**	Permit No:	
Relative Level:	**3.81 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256576.09 N 317009.77 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
				Asphalt 40 mm		0	Dry
⧓	0	SB4_0.5-0.6 (ASB)		FILL: Sandy GRAVEL; fine to medium grained, grey/brown, poorly graded, angular to sub-angular, fine to medium sand, some asbestos fragments (blue 2-5 cm) dense, dry.	GP		D
				FILL: SAND; fine to medium grained, orange/brown, some organic material (plant roots), trace of asbestos fragments (blue, less than 2 cm), dense, moist.	SP	1	M
				Clayey SAND; fine to medium grained, mottled orange/brown, poorly graded, dense, moist.	SC		M
⧓	0	SB4_2.0-2.1 (ASB)				2	
⧓	0	SB4_2.2-2.3					
				Sandy CLAY; brown/orange, medium to high plasticity, fine sand, soft, moist to wet.	CH		M/W
⧓	0	SB4_3.0-3.1				3	
⧓	0	SB4_3.2-3.3 (ASB)					
⧓	0	SB4_3.6-3.7 (SPOCAS)					
				Sitly SAND; fine to medium grained, grey, poorly sorted, soft, wet.	SP	4	W
						5	
				End of hole 5.3 m (target depth).			
						6	
						7	

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

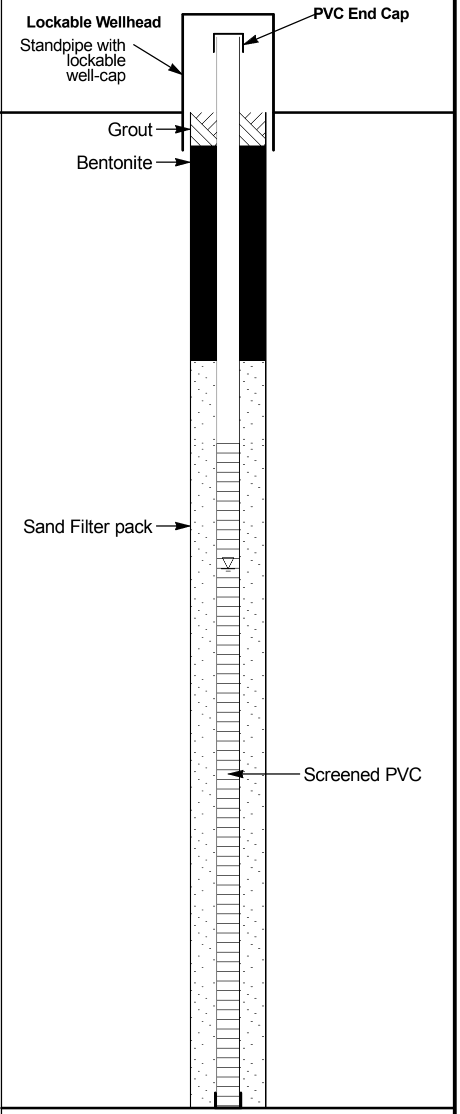
MONITORING WELL SB05-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia West SSI and Delineation Survey	Client:	Statewide Planning Pty Ltd
Project No.:	43218436	Location:	181 James Ruse Drive, Camellia, NSW
Drilling Contractor:	Numac Drilling Services Pty Ltd		
Logged By:	Shahin Falahati	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	6.02 m
Date Started:	16-10-12	Casing Size:	50 mm PVC mm
Date Finished:	16-10-12		
Relative Level:	3.71 mAHD	Drill Type:	Pushtube
Coordinates:	6256552.68 N 317015.71 E	Drill Model:	Geoprobe
Permit No:		Drill Fluid:	Water

Sample Interval	PID (ppm)	Sample ID	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
			GRAVEL (roadbase); coarse, grey, angular to subangular, trace of sand, dense, dry.	GP	0	D
			FILL: SAND; fine to medium grained, orange/brown, poorly graded, trace of fine angular gravel, grey/brown, some asbestos sheet fragments (blue), dense, dry.	SP		D
			Sandy CLAY; medium to high plasticity, fine to medium sand, trace of fine angular gravel, soft, moist.	CH	1	M
⧓	0.3	SB5_1.5-1.6				
⧓	0.3	SB5_1.7-1.8 (ASB)			2	
			Silty CLAY; grey, high plasticity, soft, wet.	CH		W
⧓		SB5_2.8-2.9 (ASB)				
⧓		SB5_3.0-3.1			3	
			Sandy CLAY; orange/brown, medium to high plasticity, fine to medium sand, soft, moist to wet.	CH	4	M/W
⧓	0.4	SB5_4.2-4.3				
					5	
			End of hole 6.02 m (target depth).		6	
					7	

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB06-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **5.68 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **5.10 m**	Coordinates: **6256388.82 N** **317134.00 E**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 170 mm.					
SSA						GP	FILL: GRAVEL; medoim grained, grey, angular to subangular, loose, moist.	M	L			
SSA						GP	FILL: Sandy GRAVEL; fine to medium grained, grey, poorly graded, coarse sand, some broken asbestos pipe fragments, loose, moist.	M	L			
Pushtube				1			FILL: ASBESTOS; blue/grey sheeting fragments and soft pulpy white asbestos material.	D/M	L			
Pushtube				3.5		CH	CLAY; grey/dark brown, high plasticity, trace of fine to medium sand, soft, moist (Natural material).	M	S	⧓		SB6_3.6-3.7
				4						⧓		SB6_3.9-4.0 (SPOCAS)
										⧓		SB6_4.0-4.1 (ASB)
										⧓		SB6_4.6-4.7
										⧓		SB6_4.7-4.8
Pushtube				4.8		CLS	Sandy CLAY; grey/red brown, low to medium plasticity, medium to coarse sand, soft to firm, dry to moist.	D/M	S-F			
				5.1			End of hole 5.1 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB07-12

URS Australia Pty Ltd Level 4, 407 Pacific Highway, Artarmon, NSW	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**
Drilling Contractor: **Numac Drilling Services Pty Ltd**		Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **5.57 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **6.30 m**	Coordinates: **6256414.81 N**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**	**317147.04 E**	Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC / HA				0		GP	FILL: GRAVEL (roadbase); coarse, some asbestos fragments, dry.	D				
SSA				1–3			FILL: ASBESTOS; white/blue, fibrous, pulpy asbestos material, soft.	D/M	S			
Pushtube				4		CH	CLAY; grey/dark grey, high plasticity, soft, moist.	M	S		0.4	SB7_4.0-4.2 SB7_4.3-4.4 (ASB) SB7_4.5-4.6
						CL	Silty CLAY; grey, high plasticity, firm, moist to wet.	M/W	F			
				5		CLS	Sandy CLAY; orange, medium to high plasticity, fine to medium sand, trace of organic material, black, soft to firm, moist.	W	S-F			
				6		CLS	Sandy CLAY; orange/brown, low to medium plasticity, coarse sand, well-rounded, trace of silt, soft, wet.	W	S		0.3 0.3	SB7_5.4-5.5 (ASB) SB7_5.6-5.7
							End of hole 6.3 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

SOIL BOREHOLE SB08-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**	Client:	**Statewide Planning Pty Ltd**
		Project No.:	**43218436**	Location:	**181 James Ruse Drive, Camellia, NSW**
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**	Elevation:	**3.00 mAHD**
Checked By:	**Tanya Stanton**	Total Depth:	**3.90 m**	Coordinates:	**6256474.03 N** **317161.29 E**
Date Started:	**17-10-12**	Casing Size:	**mm**	Drill Type:	**Pushtube**
Date Finished:	**17-10-12**	Permit No:		Drill Model:	**Geoprobe**
				Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA — Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 260 mm.					
HA / SSA / Pushtube						GP	FILL: GRAVEL; coarse grained, dark organic rich soil, asbestos fragments, some clay, medium dense, moist.	D	MD			
Pushtube						SM	Silty SAND; medium grained, dark brown/black, some organic material, dense, wet.	W	D			
Pushtube						CH	CLAY; grey, high plasticity, trace of sand, firm to stiff, moist.	M	F-St			SB8_1.7-1.8 (ASB) SB8_1.8-1.9
Pushtube						SP	SAND; coarse grained, grey, trace of clay, soft, moist to wet.	M/W	VS		0.4	SB8_2.5-2.6 (ASB)
Pushtube						SP	SAND; coarse grained, grey, trace of silt, moist to dry. Some clay lenses with depth, sand grading to medium grained, dry.	D/M	VS		0.3	SB8_2.8-2.9 SB8_2.9-3.0 (SPOCAS)
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB09-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**3.90 m**
Date Started:	**16-10-12**	Casing Size:	**mm**
Date Finished:	**16-10-12**		
Elevation:	**3.78 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256566.74 N 317211.56 E**	Drill Model:	**Geoprobe**
Permit No:		Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 160 mm.					
HA						GP	FILL: Sandy GRAVEL; fine to medium grained, light brown/orange, poorly graded, medium to coarse sand, some asbestos pipe fragments (blue), dense, dry.	D	D			
SSA				1		CH	FILL: CLAY; light brown/orange, medium to high plasticity, trace of fine subangular gravel, dry, stiff.	D	St			
Pushtube							FILL: ASBESTOS; sheets of blue and grey bonded asbestos.	D	MD			
				2		GP	FILL: GRAVEL (roadbase); fine, poorly graded, black, dense, moist.	M	D			
						SM	Silty SAND; medium to coarse grained, brown/dark brown, poorly graded, loose, moist to wet.	M/W	L		8.9	SB9_2.2-2.3 (ASB) SB9_2.3-2.4
				3		SM	Silty SAND; medium to coarse grained, brown/dark brown, poorly graded, loose, wet.	W	L		26	SB9_3.2-3.3 (ASB) SB9_3.3-3.4 SB9_3.4-3.5 (SPOCAS)
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB09A-12

URS Australia Pty Ltd
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Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **3.80 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **6.30 m**	Coordinates: **6256566.62 N** **317210.60 E**	Drill Model: **Geoprobe**
Date Started: **4-12-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **4-12-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 160 mm					
HA						GP	FILL: GRAVEL; coarse grained, red/brown, asbestos fibro sheeting fragments (grey/blue).	M	MD			
SSA				1		SP	FILL: SAND; coarse grained, black, some clay, asbestos fragments.	D/M	MD			
							FILL: ASBESTOS; sheets of fibro asbestos, blue/grey.	D				
				2			FILL: Concrete rubble and black gravel, moist. Strong hydrocarbon odour.	M	L			
						SP	SAND; Medium to coarse grained, brown/black, poorly graded, some peat, high proportion of organic matter (roots), moist to wet. Hydrocarbon odour.	M/W	D		4	SB9A_2.8-2.9
				3							1	SB9A_3.6-3.8 QC103_041212 QC203_041212
				4		SP	SAND: coarse grained, brown/grey, poorly graded, some fine to medium gravel, some organic material (wood fragments).	W	MD		405.1	SB9A_4.3-4.4
											23	SB9A_4.9-5.0
				5		GP	Sandy GRAVEL: fine gravel, grey, coarse sand, some organic material, trace of shale fragments, subrounded, moist to wet.	M/W	MD		12	SB9A_5.3-5.4
Pushtube				6							6.1	SB9A_6.2-6.3
							End of hole 6.3 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

SOIL BOREHOLE SB10-12

URS Australia Pty Ltd
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Drilling Contractor:	Numac Drilling Services Pty Ltd	Project Reference:	Camellia West SSI and Delineation Survey
Project No.:	43218436	Client:	Statewide Planning Pty Ltd
Location:	181 James Ruse Drive, Camellia, NSW		
Logged By:	Shahin Falahati	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	3.90 m
Date Started:	16-10-12	Casing Size:	mm
Date Finished:	16-10-12		
Elevation:	3.83 mAHD	Drill Type:	Pushtube
Coordinates:	6256586.76 N 317214.70 E	Drill Model:	Geoprobe
Permit No:		Drill Fluid:	Water

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 160 mm					
HA / SSA						CLS	FILL: Sandy CLAY; mottled orange-brown, low to medium plasticity, fine to medium sand, some asbestos, broken pipe fragments (blue), stiff, dry.	D	St			
Pushtube				1			FILL: ASBESTOS; bonded fibro sheeting, grey, dry.	D				
						GP	FILL: GRAVEL; coarse grained and some crushed bricks, dense, dry.	D	D			
						SM	Silty SAND; fine, dark brown to black, poorly graded, some asbestos fragments, dense, moist.	M	D			
				2							0	SB10_2.1-2.2 (ASB)
											0	SB10_2.2-2.3
						SM	Silty SAND; medium to coarse grained, poorly graded, trace angular to sub-angular gravel, loose, moist to wet.	M/W	L			
				3							4.2	SB10_3.1-3.2 (ASB)
											1.0	SB10_3.4-3.5
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB11-12

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Drilling Contractor: **Numac Drilling Services Pty Ltd**

Project Reference: **Camellia West SSI and Delineation Survey**

Project No.: **43218436**

Client: **Statewide Planning Pty Ltd**

Location: **181 James Ruse Drive, Camellia, NSW**

Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**	Elevation:	**3.63 mAHD**
Checked By:	**Tanya Stanton**	Total Depth:	**3.90 m**	Coordinates:	**6256620.53 N**
Date Started:	**16-10-12**	Casing Size:	**mm**		**317133.22 E**
Date Finished:	**16-10-12**			Permit No:	

Drill Type:	**Pushtube**
Drill Model:	**Geoprobe**
Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations)	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 160 mm					
HA / SSA						SAND	FILL: SAND; fine to medium grained, poorly graded, some subangular gravel, some broken asbestos pipe fragments, dry.	D	L			
Pushtube				1			FILL: ASBESTOS; fibro sheeting (blue), some asbestos fibres.	D	L			
				2		CH	Silty CLAY; light brown/orange, high plasticity, soft, moist to wet.	M/W	S			SB11_2.5-2.6 (ASB)
				3		SM	Silty SAND; medium to coarse grained, dark brown/black, poorly graded, loose, moist to wet.	M	L		0.2	SB11_3.0-3.1 (ASB)
											0.2	SB11_3.1-3.2
											0.2	SB11_3.8-3.9
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

SOIL BOREHOLE SB12-12

URS Australia Pty Ltd
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Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
		Project No.:	**43218436**
Client:	**Statewide Planning Pty Ltd**	Location:	**181 James Ruse Drive, Camellia, NSW**
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**3.90 m**
Date Started:	**16-10-12**	Casing Size:	**mm**
Date Finished:	**16-10-12**	Permit No:	
Elevation:	**3.69 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**62566624.96 N 317093.93 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Classification	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations)	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0		Concrete 160 mm	Dry				
HA					GP	FILL: Sandy GRAVEL; fine to medium, grey, poorly graded, fine to medium sand, asbestos sheeting (blue), dry.	D	L			
SSA				1		FILL: ASBESTOS sheeting (white and blue).	D				
Pushtube				2	PT	PEAT; trace of fine sand, dense, moist.	M	D		0.6	SB12_2.3-2.4 SB12_2.4-2.5 (ASB)
				3	SM	Silty SAND; medium to coarse grained, poorly graded, trace of organic material, loose, moist to wet.	W	L			SB12_3.3-3.4
										0.3	SB12_3.5-3.6 (ASB) SB12_3.5-3.6
				4		End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB13-12

URS Australia Pty Ltd Level 4, 407 Pacific Highway, Artarmon, NSW	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**
Drilling Contractor: **Numac Drilling Services Pty Ltd**		Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**
Logged By: **Shahin Falahati** Checked By: **Tanya Stanton** Date Started: **16-10-12** Date Finished: **16-10-12**	Bore Size: **125 mm** Total Depth: **5.00 m** Casing Size: **mm**	Elevation: **3.81 mAHD** Coordinates: **6256584.00 N** **317026.00 E** Permit No:	Drill Type: **Pushtube** Drill Model: **Geoprobe** Drill Fluid: **Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 130 mm	Dry				
HA						SP	FILL: SAND; fine to medium grained, orange/brown, poorly graded, some asbestos fragments (blue 5-10 cm), loose, dry.	D	L			
SSA							FILL: ASBESTOS sheeting (white and blue).	D	L	■	0.3	SB13_0.5-0.6 (ASB)
HA						SC	FILL: Clayey SAND; fine to medium grained, mottled orange/brown, poorly graded, trace of fine sub-angular gravel, asbestos pipe fragments (blue 5-10 cm), loose, moist.	M	L	■		SB13_0.8-0.9 (ASB)
				1		SP	SAND; medium to coarse grained, trace of clay, soft, moist.	M	S	■		SB13_1.3-1.4 (ASB)
Pushtube				2		CLS	Sandy CLAY; grey, medium plasticity, red lenses of high plasticity clay, firm, medium sand, firm, moist.	M	F	■	0.4	SB13_2.0-2.1
				4		SP	SAND; Medium to coarse grained, grey, subrounded, wet.	W	VS	■		SB13_4.3-4.4
				5			End of hole 5.1 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB14-12

URS Australia Pty Ltd
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Drilling Contractor: Numac Drilling Services Pty Ltd		Project Reference: Camellia West SSI and Delineation Survey	Client: Statewide Planning Pty Ltd
		Project No.: 43218436	Location: 181 James Ruse Drive, Camellia, NSW
Logged By: Shahin Falahati	Bore Size: 125 mm	Elevation: 4.51 mAHD	Drill Type: Pushtube
Checked By: Tanya Stanton	Total Depth: 5.10 m	Coordinates: 6256523.20 N	Drill Model: Geoprobe
Date Started: 17-10-12	Casing Size: mm	317077.81 E	Drill Fluid: Water
Date Finished: 17-10-12		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Asphalt 50mm					
Hand auger						GP	FILL: GRAVEL (roadbase); fine grained, poorly graded, dense, dry.	D	D			
						SP	FILL: SAND; medium to coarse grained, poorly graded, some fine, angular gravel, loose, dry.	D	L			SB14_0.5-0.6 (ASB)
				1		CL	CLAY; brown/orange, low to medium plasticity, trace of organic material, firm to stiff, moist.	M	F-St		1.0 1.0	SB14_1.8-1.9 (ASB) SB14_1.8-1.9
Pushtube				2		CL	CLAY; brown/orange, medium plasticity, some fine to medium sand, firm to stiff, moist.	M	F-St			
				3		CH	CLAY; grey, high plasticity, soft to firm, moist.	M	S		0.3	SB14_3.5-3.6
				4		SP	SAND; medium to coarse grained, orange/red/brown, poorly graded, medium dense to dense, wet.	W	MD-D		0.4	SB14_4.5-4.6 (SPOCAS)
				5			End of hole 5.1 m (target depth).					
				6								

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB15-12

URS Australia Pty Ltd
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Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **4.85 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **5.10 m**	Coordinates: **6256506.96 N** **317109.06 E**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
Hand auger				0		GP	GRAVEL (roadbase); coarse grained, dark grey/black, angular, dense, dry.	D	D			
						CLS	Sandy CLAY; orange/red, low to medium plasticity, fine sand, soft, slightly sticky. Possible fill or reworked natural material.	M	S			
										⧓	0.2	SB15_0.5-0.6 (ASB)
				1		CH	Sandy CLAY; orange/red, medium to high plasticity, fine sand, some organic material (roots), firm to stiff, moist.	M	F-St			
Pushtube										⧓	0.1	SB15_1.6-1.7 (SPOCAS)
										⧓	0.1	SB15_1.8-1.9 (ASB)
				2		CH	Silty CLAY; grey, medium to high plasticity, firm to stiff, moist.	M	F-St			
										⧓		SB15_2.8-2.9
				3								
				4		SP	SAND; medium to coarse grained, grey/orange, poorly graded, medium dense, moist to wet.	M/W	MD			
										⧓	0.1	SB15_4.3-4.4
				5			End of hole 5.1 m (target depth).					
				6								

Remarks: CC = Concrete core
HA = Hand Auger

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SOIL BOREHOLE SB16-12

URS Australia Pty Ltd
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Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **4.74 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **6.30 m**	Coordinates: **6256463.72 N** **317033.40 E**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0		GP	Concrete 230 mm	D				
HA						GP	FILL: GRAVEL; medium to coarse grained, grey, poorly graded, dry.	D	L			
						CL	Sandy CLAY; red/brown, medium plasticity, fine to medium sand, stiff, moist.	M	St			
				1							0.1	SB16_1.1-1.2 (ASB)
												SB16_1.6-1.7
				2								
Pushtube						CH	Silty CLAY; grey, medium to high plasticity, firm to stiff, moist.	M	F-St		0.3	SB16_2.3-2.4 (ASB)
												SB16_2.7-2.9
				3								
						CH	CLAY; grey, high plasticity, stiff, moist.	M	St			
				4								
				5		CL	Sandy CLAY; orange/grey, medium to high plasticity, fine sand, stiff, moist.	M	St			
				6			Sandy CLAY; orange/grey, medium plasticity, fine to medium sand, stiff.	M	St			
							End of hole 6.3 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB17-12

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Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **4.75 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **3.90 m**	Coordinates: **6256415.82 N** **317027.91 E**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 210 mm					
HA						CL	FILL: Sandy CLAY; grey/orange, high plasticity, fine sand, firm to stiff, dry.	D	F-St			
										⧗	0.8	SB17_0.5-0.6 (ASB)
				1		CH	CLAY; grey/orange, medium to high plasticity, trace of fine sand, stiff to very stiff, moist.	M	St-VSt	⧗		SB17_1.0-1.1
Pushtube						CH	CLAY; grey, high plasticity, stiff to very stiff, moist to dry.	D/M	VSt	⧗		SB17_1.5-1.8
				2						⧗		SB17_2.0-2.1 (ASB)
				3								
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB18-12

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Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Shahin Falahati**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**3.90 m**
Date Started:	**17-10-12**	Casing Size:	**mm**
Date Finished:	**17-10-12**	Permit No:	
Elevation:	**4.72 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256424.99 N** **316983.74 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			CONCRETE 190 mm					
HA						CLS	FILL: Sandy CLAY; grey/orange, low plasticity, fine sand, trace of fine to medium gravel, sub-angular to angular, soft, dry.	M	S			
HA				1		CLS	Sandy CLAY; grey/orange, low to medium plasticity, medium sand, firm to stiff, moist.	M	F-St		0.2	SB18_1.0-1.1 (ASB)
Pushtube						SC	Clayey SAND; medium to coarse grained, orange/red, poorly graded, clay lenses, dense to very dense, moist.	M	D-VD		0.2	SB18_1.7-1.8 (ASB) SB18_1.8-1.9
Pushtube				2		CH	CLAY; grey, high plasticity, trace of fine sand, stiff to very stiff, moist.	M	St-VSt			
Pushtube				3							0.2	SB18_3.2-3.3
				4			End of hole 3.9 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB19-12

URS Australia Pty Ltd Level 4, 407 Pacific Highway, Artarmon, NSW	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **ov.au**	Client: **Statewide Planning Pty Ltd**
Drilling Contractor: **Numac Drilling Services Pty Ltd**		Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**
Logged By: **Shahin Falahati**	Bore Size: **125 mm**	Elevation: **4.71 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **3.90 m**	Coordinates: **6256473.30 N**	Drill Model: **Geoprobe**
Date Started: **17-10-12**	Casing Size: **mm**	**316991.46 E**	Drill Fluid: **Water**
Date Finished: **17-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 200mm					
HA						GP	FILL: GRAVEL; coarse grained, grey, poorly graded, loose, dry.	D	L			
SSA				1		CL	Sandy CLAY: orange-brown, high plasticity, fine to medium sand, stiff. Asbestos fragments, grey 2-4cm.	D/M	St			
Pushtube							CLAY; grey, medium to high plasticity, some fine sand, trace of fine, subangular gravel, stiff to very stiff, dry.	D	St-VSt		0.2	SB19_1.6-1.7
				2							0.3	SB19_2.1-2.2 (ASB) SB19_2.1-2.2 (SPOCAS)
							Sandy CLAY; orange-brown, high plasticity, fine to medium sand, stiff to very stiff, dry.	D	St-VSt			
							CLAY; grey, medium to high plasticity, some fine sand, stiff to very stiff.	M	St-VSt			
				3			SAND; medium to coarse grained, orange/red, poorly graded, trace of silt medium dense to dense.	M/W	MD-D		0.3	SB19_3.0-3.1
							At 3.8 becoming dense-very dense, becoming red.					
				4			End of hole 3.9 m (target depth).					
				5								

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

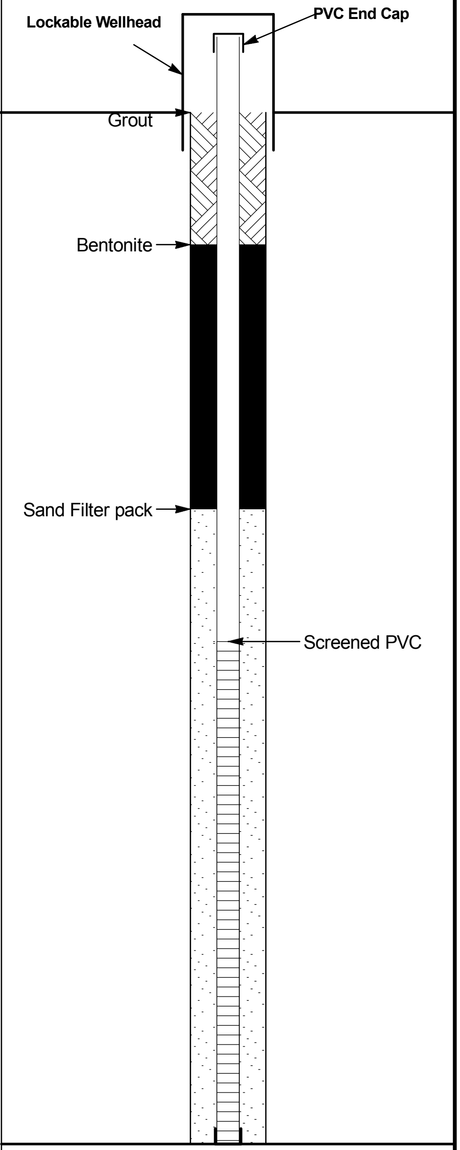
MONITORING WELL SB20(S)-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia West SSI and Delineation Survey	Client:	Statewide Planning Pty Ltd
Project No.:	43218436	Location:	181 James Ruse Drive, Camellia, NSW
Drilling Contractor:	Numac Drilling Services Pty Ltd		
Logged By:	Sarah Bembrick	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	3.90 m
Date Started:	3-12-12	Casing Size:	50 mm PVC mm
Date Finished:	4-12-12		
Relative Level:	3.82 mAHD	Drill Type:	Pushtube
Coordinates:	6256572.28 N 317212.17 E	Drill Model:	Geoprobe
Permit No:		Drill Fluid:	Water

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
				Concrete 150mm		0	
				FILL: GRAVEL (roadbase); coarse grained, dark brown/black, some clay, brick fragments, fragments of fibro asbestos, moist.			M
				FILL: CLAY; red/brown/grey, some angular gravel, fragments of asbestos sheeting, moist.	CH	1	M
				FILL: Gravelly CLAY; asbestos fragments <1cm long, medium gravel, dry to moist. Concrete dust/ asbestos fragments.		2	D/M
				Sandy CLAY; dark brown, low to medium plasticity, fine to medium sand, moist. Hydrocarbon odour and sheen evident.	CL		M
				SAND; medium to coarse grained, dark brown, yellow hue, rounded, some medium gravel, angular, black, soft, moist.	SP	3	M
				End of hole 4.0 m (target depth).		4	

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

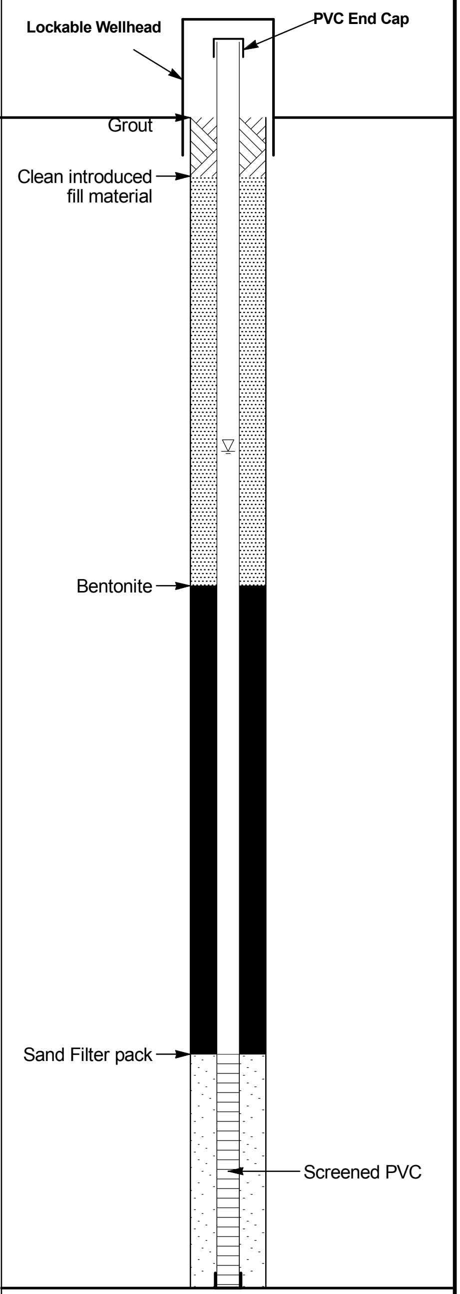
MONITORING WELL SB20(D)-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway, Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia West SSI and Delineation Survey	Client:	Statewide Planning Pty Ltd
Project No.:	43218436	Location:	181 James Ruse Drive, Camellia, NSW
Drilling Contractor:	Numac Drilling Services Pty Ltd		
Logged By:	Sarah Bembrick	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	10.00 m
Date Started:	3-12-12	Casing Size:	50 mm PVC mm
Date Finished:	3-12-12		
Relative Level:	3.80 mAHD	Drill Type:	Pushtube
Coordinates:	6256572.07 N 317213.88 E	Drill Model:	Geoprobe
Permit No:		Drill Fluid:	Water

Sample Interval	PID (ppm)	Sample ID	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
			Concrete 150 mm		0	Dry
			FILL: GRAVEL (roadbase); coarse grained, dark brown/black, some clay, brick fragments, fragments of fibro asbestos, dense, moist.			M
⧓	0.5	SB20(D)_0.5-0.6	FILL: CLAY; red/brown/grey, some angular gravel, fragments of asbestos sheeting, moist.	CH		M
⧓	39.2	SB20(D)_1.0-1.1			1	
			FILL: Gravelly CLAY; asbestos fragments <1cm long, medium gravel, dry to moist. Concrete dust/ asbestos fragments.	CL		D/M
					2	
			Sandy CLAY; dark brown, low to medium plasticity, fine to medium sand, moist.	CL		M
			Hydrocarbon odour and sheen evident.	SP		M
⧓	17.3	SB20(D)_2.7-2.8	Clayey SAND; medium to coarse grained, dark brown, rounded, soft, moist. Hydrocarbon odour and sheen.		3	
⧓	4.0	SB20(D)_4.1-4.2	SAND; medium to coarse grained, dark brown, yellow hue, rounded, some medium gravel, angular, black soft, moist.	SP	4	M/W
			ORGANIC layer; woody fragments, compacted.		5	M
⧓	0.8	SB20(D)_5.3-5.4	Gravelly SAND; coarse grained, yellow/brown, angular, medium gravel, some organic material. Some small, subrounded fragments of shale 1-2 cm long with fine laminations.	SP		M/W
⧓	0.5	SB20(D)_6.5-6.6			6	
			Sand becoming darker in colour, brown/black and medium to coarse.		7	
			Could not log due to saturation and mixing of soil types from different strata within bore hole.			M/W
					8	
					9	
			End of hole 10.0 m (target depth).		10	
					11	

WELL CONSTRUCTION DETAILS



Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB21-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Numac Drilling Services Pty Ltd	Project Reference: Camellia West SSI and Delineation Survey	Client: Statewide Planning Pty Ltd	
	Project No.: 43218436	Location: 181 James Ruse Drive, Camellia, NSW	
Logged By: Sarah Bembrick	Bore Size: 125 mm	Elevation: 3.85 mAHD	Drill Type: Pushtube
Checked By: Tanya Stanton	Total Depth: 5.10 m	Coordinates: 6256586.35 N 317214.18 E	Drill Model: Geoprobe
Date Started: 3-12-12	Casing Size: mm		Drill Fluid: Water
Date Finished: 4-12-12		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval PID (ppm)	Sample ID
CC				0			Concrete 125 mm				
HA						GP	FILL: GRAVEL (roadbase); coarse, black, poorly graded, some asbestos fragments (grey), some brick fragments, trace of medium sand, dark brown. Asbestos increasing with depth to up to 60%.	D			
SSA										3.0	SB21_0.8-0.9
				1		CH	FILL: CLAY; red, high plasticity, some medium gravel, dry.	D			
							FILL: ASBESTOS; grey, fibro sheeting fragments, some clay, black, some medium to coarse sand, dry.	D			
				2		GP	FILL: GRAVEL; coarse grained, red brick fragments.	M			
						SP	SAND: Coarse grained, poorly graded, trace of silt. Hydrocarbon odour	M		224.8	SB21_2.6-2.7
										378.8	SB21_2.8-2.9
				3		SP	Clayey SAND: medium to coarse grained, dark brown-black, clay lenses, low plasticity. Hydrocarbon odour Colour grading to yellow	M/W			
										54.8	SB21_3.6-3.7
				4		SP	SAND; coarse grained, grey, well graded, trace of silt, some organic material (woody fragments), wet.	W		47.8	SB21_4.1-4.2
Pushtube						GP	Gravelly SAND; coarse grained, grey/brown, poorly sorted, fine to medium gravel, some silt, organic material (wood), some shale fragments, subrounded 2-3 cm long.	W			
				5						46	SB21_5.0-5.1
							End of hole 5.1 m (target depth).				
				6							

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB22-12

URS Australia Pty Ltd
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Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Sarah Bembrick**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**5.10 m**
Date Started:	**4-12-12**	Casing Size:	**mm**
Date Finished:	**4-12-12**	Permit No:	
Elevation:	**3.82 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256586.35 N 317219.14 E**	Drill Model:	**Geoprobe**
Drill Fluid:	**Water**		

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA — Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 100 mm					
HA / SSA						GP	FILL: GRAVEL (roadbase); coarse grained, some clay (medium plasticity), some brick fragments, metal reinforced concrete framework, trace of asbestos fragments (blue/grey), dense, dry.	D	D			
				1						⧓	1.1	SB22_0.9-1.0
Pushtube						SP	FILL: SAND; coarse grained, brown/grey, loose, moist.	M	L			
				2			FILL: ASBESTOS; fibro sheets stacked, acicular fibres present, mixed with gravel material, loose, dry.	D	L			
							FILL: ASBESTOS; dark brown/black, coarse, rounded material with resin like appearance (asbestos glue shavings), loose, moist.	M	L	⧓	1.8	SB22_2.6-2.7
				3		SP	SAND; medium to coarse grained, black/brown, yellow hue, some clay lenses, soft, moist. Mild sulforous odour.	M	S			
										⧓	1.7	SB22_3.4-3.6 QC101_041212
				4		SP	SAND; coarse grained, some organic material (wood fragments) (30%), trace of coarse gravel (size 4-5 mm), some cobbles, red/black, soft, wet.	W	S			
										⧓	1.7	SB22_4.2-4.3
				5						⧓	1.8	SB22_5.0-5.1
							End of hole 5.1 m (target depth).					
				6								

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB23-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Numac Drilling Services Pty Ltd**

Project Reference: **Camellia West SSI and Delineation Survey**
Project No.: **43218436**

Client: **Statewide Planning Pty Ltd**
Location: **181 James Ruse Drive, Camellia, NSW**

Logged By:	**Sarah Bembrick**	Bore Size:	**125 mm**	Elevation:	**3.71 mAHD**	Drill Type:	**Pushtube**
Checked By:	**Tanya Stanton**	Total Depth:	**6.30 m**	Coordinates:	**6256604.49 N**	Drill Model:	**Geoprobe**
Date Started:	**4-12-12**	Casing Size:	**mm**		**317218.67 E**	Drill Fluid:	**Water**
Date Finished:	**4-12-12**			Permit No:			

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval PID (ppm)	Sample ID
CC				0			Concrete 160 mm	Dry			
HA / SSA						CL	FILL: CLAY; red brown, low to medium plasticity, some large asbestos fibro sheeting fragments, some coarse, angular gravel, black, dense, dry. Asbestos content increasing to layered sheeting and fragments.	D	D		
Pushtube				1		SC	FILL: Clayey SAND; medium grained, red/brown, some gravel, very dense, moist.	M	VD		
							FILL: Large asbestos fragments, concrete gravel, cobbles, trace of clay, loose, dry.	D	L		
				2		SP	FILL: SAND; coarse grained, dark brown/black, poorly graded, soft, moist.	M	S	158.3	SB23_2.6-2.7
				3		SC	Clayey SAND; medium to coarse grained, dark brown, yellow hue, soft, moist. Mild sulforous odour	M	S	46.7	SB23_3.5-3.6 QC100_141212
				4		SP	Gravelly SAND; coarse grained, some organic material (wood fragments) (30%), medium to coarse gravel, some cobbles, red/black, wet.	W	VS	2.8	SB23_4.5-4.6
				5		GP	GRAVEL: fine to coarse grained, poorly graded, some organic material, wood fragments (blackened), medium to coarse shale fragments. High plasticity clay lenses present.	M/W	S	1.5 1.8	SB23_5.4-5.5 SB23_6.2-6.3
				6			End of hole 6.3 m (target depth).				

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB24-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Numac Drilling Services Pty Ltd**	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**	
	Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**	
Logged By: **Sarah Bembrick**	Bore Size: **125 mm**	Elevation: **3.78 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **5.10 m**	Coordinates: **6256565.91 N**	Drill Model: **Geoprobe**
Date Started: **4-12-12**	Casing Size: **mm**	**317206.05 E**	Drill Fluid: **Water**
Date Finished: **4-12-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA — Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 160 mm	D				
HA						SP	FILL: SAND; medium grained, brown, poorly graded, some asbestos fragments, soft, moist.	M	S			
SSA							FILL: ASBESTOS; fibro sheeting, broken up, some clay, brown,trace of possible ash material, some gravel.	D	L			
				1			FILL: ASBESTOS; large fragments of asbestos sheet fibro, some coarse gravel (roadbase), some concrete pebbles, loose.	D	L	⧓	4.6	SB24_1.0-1.1
				2								
Pushtube							FILL: ASBESTOS; rounded fragments of asbestos glue (5-9 mm long), stained black and very strong hydrocarbon odour, loose, moist to wet.	M/W	L	⧓	166.8	SB24_2.6-2.7
						SC	Clayey SAND; medium grained, brown, well graded, some organic material (roots), dense, moist to wet.	M/W	D			
				3		SP	SAND; medium grained, well sorted, some organic material (roots), brown, loose, moist to wet. Some clay lenses with increasing depth.	M/W	L	⧓	6.0	SB24_3.0-3.2 QC102_041212 QC202_041212
				4			ORGANIC layer; wood fragments (blackened), red when broken, hard, moist.	M	H			
						SP	SAND; coarse grained, grey, clay lenses, some organic material, wood fragments (blackened), soft, moist. Moist peat horizon at 4.8 - 4.9 mbgl. Becoming moist to dry.	M/W	S	⧓	2.3	SB24_4.0-4.1
				5						⧓	0.7	SB24_5.0-5.1
							End of hole 5.1 m (target depth).					
				6								

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB25-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	Numac Drilling Services Pty Ltd	Project Reference:	Camellia West SSI and Delineation Survey
Project No.:	43218436	Client:	Statewide Planning Pty Ltd
Location:	181 James Ruse Drive, Camellia, NSW		
Logged By:	Sarah Bembrick	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	6.30 m
Date Started:	4-12-12	Casing Size:	mm
Date Finished:	5-12-12	Elevation:	3.75 mAHD
Coordinates:	6256565.91 N 317216.73 E	Permit No:	
Drill Type:	Pushtube	Drill Model:	Geoprobe
Drill Fluid:	Water		

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 150 mm					
HA / SSA							FILL: GRAVEL; coarse gravel, dark brown/black, poorly graded, large asbestos fragments 4 -6 cm long, around 5 mm thick, blue/grey.	M	L			
				1							2.3	SB25_1.1-1.2
							FILL: Concrete slab degraded, concrete rubble, asbestos fragments, trace of black gravel, trace of ash.	D/M	D			
				2							215	SB25_2.0
							Silty SAND; fine to medium grained, dark brown, strong hydrocarbon odours, sheen, wet.	W				
				3			Clayey SAND; fine to medium grained, dark brown, sticky, strong hydrocarbon odours, dense, wet.	W	D			
							SAND; coarse grained, grey with yellow mottling, mild hydrocarbon and sulfourous odours, soft, wet.	W	S		115	SB25_3.5
				4			SAND; coarse grained, grey, organic material (50%), wood fragments, 1 cm long, no hydrocarbon odour, wet.	W	S			
Pushtube				5			SAND; coarse grained, well graded, trace of organic material, wet. Sulfurous odour.	M				
				6							11.5	SB25_6.3 ~~QC200~~
							End of hole 6.3 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB26-12

URS Australia Pty Ltd Level 4, 407 Pacific Highway, Artarmon, NSW	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia West SSI and Delineation Survey**	Client: **Statewide Planning Pty Ltd**
Drilling Contractor: **Numac Drilling Services Pty Ltd**		Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**
Logged By: **Sarah Bembrick**	Bore Size: **125 mm**	Elevation: **3.77 mAHD**	Drill Type: **Pushtube**
Checked By: **Tanya Stanton**	Total Depth: **5.10 m**	Coordinates: **6256561.76 N 317210.88 E**	Drill Model: **Geoprobe**
Date Started: **4-12-12**	Casing Size: **mm**		Drill Fluid: **Water**
Date Finished: **5-12-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 150 mm					
HA							FILL: GRAVEL; medium grained, red/brown, angular, some small asbestos fragments 3-8 mm long (blue/ grey), some clay, medium to high plasticity, brown, some fine sand, dense, moist.	M	D			
SSA				1			FILL: CLAY; red/brown, medium plasticity, some asbestos fragments, 4-5 cm long, 3 mm thick, dry.	D				
Pushtube				2			Silty SAND; medium grained, dark brown, strong hydrocarbon odours, sticky, firm, moist to wet.	M/W	F			
										⧓	49.7	SB26_2.7
				3			SAND; coarse grained, black and yellow banding, some organic material, strong hydrocarbon odour, sulfourous odour, soft, wet.	W	S			
				4			SAND; coarse grained, grey, some gravel, some organic material, mild hydrocarbon odour, soft, wet.	W	S	⧓	27.6	SB26_3.9
							Sulforous odour.	W				
				5						⧓	5.9	SB26_5.1
				6			End of hole 5.1 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

URS

SOIL BOREHOLE SB27-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
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Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	Numac Drilling Services Pty Ltd	Project Reference:	Camellia West SSI and Delineation Survey
Project No.:	43218436	Client:	Statewide Planning Pty Ltd
Location:	181 James Ruse Drive, Camellia, NSW		
Logged By:	Sarah Bembrick	Bore Size:	125 mm
Checked By:	Tanya Stanton	Total Depth:	5.10 m
Date Started:	4-12-12	Casing Size:	mm
Date Finished:	5-12-12		
Elevation:	3.80 mAHD	Drill Type:	Pushtube
Coordinates:	6256571.46 N 317181.67 E	Drill Model:	Geoprobe
Permit No:		Drill Fluid:	Water

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 150 mm					
HA							FILL: CLAY; medium plasticity, some coarse gravel, some asbestos fragments, very soft, wet.	M/W	VS			
SSA				1			Buried degraged concrete slab.	D	H			
							Gravelly CLAY; medium plasticity, coarse gravel, trace of ash, hydrocarbon odours, moist.	M				
Pushtube				2			Silty SAND; medium grained, dark brown, very mild odours (not hydrocarbon), moist to wet.	M/W			5.7	SB27_2.7
				3			SAND; coarse grained, grey with yellow mottling, some coarse gravel, some organic material, mild sulforous odours.	W	S		1.1	SB27_5.1
				5			End of hole 5.1 m (target depth).					
				6								

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE SB28-12

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	**Numac Drilling Services Pty Ltd**	Project Reference:	**Camellia West SSI and Delineation Survey**
Project No.:	**43218436**	Client:	**Statewide Planning Pty Ltd**
Location:	**181 James Ruse Drive, Camellia, NSW**		
Logged By:	**Sarah Bembrick**	Bore Size:	**125 mm**
Checked By:	**Tanya Stanton**	Total Depth:	**6.30 m**
Date Started:	**5-12-12**	Casing Size:	**mm**
Date Finished:	**5-12-12**	Permit No:	
Elevation:	**3.80 mAHD**	Drill Type:	**Pushtube**
Coordinates:	**6256616.19 N 317178.32 E**	Drill Model:	**Geoprobe**
		Drill Fluid:	**Water**

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
CC				0			Concrete 20 mm					
HA / SSA							FILL: Gravelly CLAY; light brown, medium plasticity, some asbestos cladding sheet fragments, some black ash, coarse angular gravels, moist.	M	MD			
Pushtube				1.5			FILL: ASBESTOS; fibro sheeting, some clay, dense, dry.	D	D			
				3.3			Silty CLAY; dark brown/ black, medium plasticity, trace of sand, sulfourous odour. Sand content increasing.	M/W		⧓	1.2	SB28_3.3
				4.9			SAND; coarse grained, grey, some organic material (wood fragments), some gravel, sulfurous odour.	M/W		⧓ (6.3)	0.3	SB28_6.3
				6.3			End of hole 6.3 m (target depth).					

Remarks: CC = Concrete core
HA = Hand Auger
SSA = Solid Stem Auger

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SOIL BOREHOLE TP-1

URS Australia Pty Ltd
Level 4, 407 Pacific Highway,
Artarmon, NSW
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: -		Project Reference: ov.au	Client: **Statewide Planning Pty Ltd**
		Project No.: **43218436**	Location: **181 James Ruse Drive, Camellia, NSW**
Logged By: **Sarah Bembrick**	Bore Size: **NA mm**	Elevation: **mAHD**	Drill Type: **-**
Checked By: **Nathan Williams**	Total Depth: **3.30 m**	Coordinates: **N**	Drill Model: **-**
Date Started: **18-10-12**	Casing Size: **mm**	**E**	Drill Fluid: **-**
Date Finished: **18-10-12**		Permit No:	

Method	Casing	Penetration (S M H R)	Geotechnical Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA: Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			Roadbase: GRAVEL, poorly graded, medium grained.					
							CONCRETE: 100 mm.					
							Gravelly SAND: poorly graded, medium to coarse grained, brown to dark brown; gravel fin to medium grained, with some vitrous ash (10 to 30%).					
												TP1_0.5-0.7
				1			Glassy, black layer of ash.					PS1
						FILL	ASBESTOS - Pulp					
							Fibrous asbestos					
							Pipe asbestos					
				2			Some SLAG, 20 to 50 mm pieces.					
						FILL	Sandy CLAY: low plasticity, coarse sand; some fine, angular gravels.					
						FILL	ASH: white, fine grained, low plasticity; some slag, black vitrous ash (10 to 15%).					
				3								TP1_3.0-3.2
							Test pit terminated at 3.3 metres below ground level.					
				4								

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SOIL BOREHOLE WSB01

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Drilling Contractor: **Macquarie Pty Ltd**		Project Reference: **Camellia Western Site**	Client: **Sydney Water**
		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.66 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.90 m**	Coordinates: **6256606.00 N**	Drill Model: **Macquarie Rig**
Date Started: **05-12-05**	Casing Size: **mm**	**317218.60 E**	Drill Fluid: **nil**
Date Finished: **05-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; Brown - yellow clay, loose rock fragments					
							FILL; Grey - brown and black, ashy appearance, trace fragments of white fibro, loose granular ash	M			0	WSB01_0.2_0.3
											0	WSB01_0.5_0.6
				1			FIBRO SHEETING (ASBESTOS); White, minor blue painted				0	WSB01_1.0_1.1
							CLAY; yellow - red and brown, damp, plastic, trace fibro clasts and rock fragments	M				
							FIBRO SHEETING (ASBESTOS);					
				2			EOH @ 1.9m Concrete slab refusal					
				3								
				4								

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SOIL BOREHOLE WSB02

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Macquarie Pty Ltd**	Project Reference: **Camellia Western Site**	Project No.: **43217445**	Client: **Sydney Water** / Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.77 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **3.00 m**	Coordinates: **6256618.70 N**	Drill Model: **Macquarie Rig**
Date Started: **06-12-05**	Casing Size: **mm**	**317177.20 E**	Drill Fluid: **nil**
Date Finished: **06-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; Green - grey, sand and clay, soft, *** plastic	M				
										■	2.3	WSB02_0.2_0.3
										■	0	WSB02_0.5_0.6
							ASH and FIBRO;					
				1			FILL; CLAY, pale brown and white, ash band (10cm) @1.3m					
										■		WSB02_1.3_1.4
							FIBRO SHEETING (ASBESTOS); white,					
							FILL; CLAY, fragments of fibro within clay, brown and black mottled					
				2						■	1.9	WSB02_2.0_2.1
							FIBRO SHEETING (ASBESTOS); white, minor clay					
							CLAY; natural, green - brown mottled					
										■		WSB02_2.8_2.9
				3			EOH @ 3m					
				4								

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SOIL BOREHOLE WSB03

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Phone: 02 8925 5500
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Drilling Contractor:	Macquarie Pty Ltd	Project Reference:	Camellia Western Site
Client:	Sydney Water	Location:	Grand Ave Camellia
Project No.:	43217445		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05	Permit No:	
Relative Level:	3.70 RL	Drill Type:	Push Tube
Coordinates:	6256621.40 N 317152.00 E	Drill Model:	Macquarie Rig
		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; Green - grey, sandy clay, loose	W				
										☒	2.6	WSB03_0.2_0.3
							FILL; CLAY, mottled red, yellow,					
							FIBRO and CLAY; soft clay,					
							CLAY; Fill, red brown, minor black			☒		WSB03_0.5_0.6
										☒		WSB03_0.9_1.0
				1			EOH @ 1m Auger refusal on concrete					
				2								
				3								
				4								

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SOIL BOREHOLE WSB04

URS Australia Pty Ltd
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Phone: 02 8925 5500
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Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site	Client: Sydney Water
		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.58 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 3.00 m	Coordinates: 6256627.90 N 317105.70 E	Drill Model: Macquarie Rig
Date Started: 06-12-05	Casing Size: mm		Drill Fluid: nil
Date Finished: 06-12-05		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SOIL; grass and gravel, dark brown, black					
							CLAY; FILL, rock clasts (slag), mottled white and brown, loose to firm, minor ash,	M				WSB04_0.2_0.3
							FIBRO; 0.1m lense				3.1	WSB04_0.5_0.6
							CLAY; minor fibro pieces, black - grey ash, loose	M				
				1								WSB04_1.0_1.1
							CONCRETE @ 1.8m					
							CLAY; Cream sludge, fibro sludge appearance,		S		2.1	WSB04_1.9_2.0
				2								WSB04_2.3_2.4
							SANDY SILT; mangrove muds, brown, natural		S			
				3			EOH @3m					
				4								

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SOIL BOREHOLE WSB05

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Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		

Logged By:	C Arends	Bore Size:	mm	Relative Level:	3.52 RL	Drill Type:	Push Tube
Checked By:	AReyes	Total Depth:	3.00 m	Coordinates:	6256632.20 N	Drill Model:	Macquarie Rig
Date Started:	06-12-05	Casing Size:	mm		317073.30 E	Drill Fluid:	nil
Date Finished:	06-12-05			Permit No:			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SOIL; gravel and minor ash brown - black, loose, minorrootlets				1.8	WSB05_0.2_0.3
							FIBRO (ASBESTOS); weathered fibro, loose, white, roken	M				
							FIBRO SLUDGE; cream - white, fibrous, clayey texture	W	S			WSB05_0.5_0.6
				1								WSB05_1.0_1.1
							FIBRO (ASBESTOS); weathered, loose, brown and white, minor clay and sand					
							FIBRO SLUDGE; cream - white, fibrous		S			
				2								WSB05_2.0_2.1 QC101_061205 QC201_061205
							MANGROVE MUD; green - grey					
				3			EOH @ 3.0m					~~WSB05_3.0_3.1~~
				4								

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SOIL BOREHOLE WSB06

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Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	2.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05		
Relative Level:	3.74 RL	Drill Type:	Push Tube
Coordinates:	6256636.00 N 317023.40 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SOIL; sandy clay, brown - black, loose, rock fragments			⊠	2.2	WSB06_0.2_0.3
							FIBRO CLASTS					
							CLAY; fill, brown, minor ash and fibro	M	F	⊠	3.6	WSB06_0.5_0.6
				1			FIBRO; loose, broken, white, inter-bands of clay and ash			⊠		WSB06_1.0_1.1
										⊠		WSB06_1.9_2.0
				2			EOH @ 2.0m refusal at concrete					
				3								
				4								

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SOIL BOREHOLE WSB07

URS Australia Pty Ltd
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Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site	Client: Sydney Water
		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.82 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 2.00 m	Coordinates: 6256594.10 N 317011.10 E	Drill Model: Macquarie Rig
Date Started: 06-12-05	Casing Size: mm		Drill Fluid: nil
Date Finished: 06-12-05		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			BITUMEN; FILL; gravel and sand, trace clay, loose, friable, roadbase			⊠	1.5	WSB07_0.2_0.3
							MANGROVE MUDS; silty, muddy, brown			⊠		WSB07_0.5_0.6
				1						⊠		WSB07_1.0_1.1
				2			EOH @ 2.0m			⊠		~~WSB07_2.0_2.1~~
				3								
				4								

Sheet 1 of 1

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SOIL BOREHOLE WSB08

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.81 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256605.40 N**	Drill Model: **Macquarie Rig**
Date Started: **06-12-05**	Casing Size: **mm**	**317066.00 E**	Drill Fluid: **nil**
Date Finished: **06-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			CLAY; fill, brown - yellow, trace rock fragments			⊠	2.3	WSB08
							ASBESTOS; 0.2m band, white			⊠		WSB08
							MANGROVE MUD; green - brown, loose		S			
				1						⊠		WSB08
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB09

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	2.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05		
Relative Level:	3.84 RL	Drill Type:	Push Tube
Coordinates:	6256538.80 N 316996.60 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			ROADBASE; gravel and minor red - brown sand					
										☒	3.6	WSB09
							FIBRO SHEETING (ASBESTOS); sand and rock fragments (slag/shale)			☒		WSB09
							SANDY CLAY; red - brown and black fill, plastic	M	S-F			
				1			CLAY; natural, yellow-brown, high plastic	W	S	☒	1.9	WSB09
							CLAY; mottled yellow, brown and red		F			
										☒		WSB09
				2			EOH @ 2.0m					
				3								
				4								

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SOIL BOREHOLE WSB10

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.35 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256547.10 N**	Drill Model: **Macquarie Rig**
Date Started: **06-12-05**	Casing Size: **mm**	**317098.00 E**	Drill Fluid: **nil**
Date Finished: **06-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL and SAND; rock fragments set in brown sand	M				
											3.4	WSB10
							CLAY; natural dark grey	M	F		3.1	WSB10
				1			MUD; soft dark grey, silty texture		S			
											0.2	WSB10
							CLAY; mottled yellow, brown and white,		F-St			
				2								
							EOH @ 2.2m					
				3								
				4								

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SOIL BOREHOLE WSB11

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05		
Relative Level:	3.77 RL	Drill Type:	Push Tube
Coordinates:	6256598.00 N 317101.30 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FIBRO SHEETING (ASBESTOS); white, loose, semi weathered to weathered brittle			⊠		WSB11_0.2_0.3
							ASBESTOS SLURRY; bonded white-cream, massive texture, fibrous with slurry matrix			⊠		WSB11_0.5_0.6
				1						⊠		WSB11_1.0_1.1
							MANGROVE MUD; silty, sandy, dark brown, massive, smooth texture			⊠		WSB11_1.7_1.8
				2						⊠		WSB11_2.0_2.1
							CLAY; yellow-brown and white mottled	W	S			
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB12

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	Macquarie Pty Ltd	Project Reference:	Camellia Western Site
Client:	Sydney Water	Project No.:	43217445
Location:	Grand Ave Camellia		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05	Relative Level:	3.84 RL
Coordinates:	6256598.10 N 317149.20 E	Permit No:	
Drill Type:	Push Tube	Drill Model:	Macquarie Rig
Drill Fluid:	nil		

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; grey and brown, loose	W				WSB12_0.2_0.3
							CLAY; FILL, trace fragments of fibro sheet, pale brown, semi plastic		F			WSB12_0.5_0.6
				1								WSB12_1.0_1.1 QC102_071205
				2			CLAY and FIBRO SHEETING (ASBESTOS) 50/50; clay is yellow-brown		F			WSB12_2.2_2.3
							SAND; natural, well sorted alluvial sands, brown, loose, consistant	W				WSB12_2.9_3.0
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB13

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site	Client: Sydney Water
		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.76 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 3.00 m	Coordinates: 6256592.00 N	Drill Model: Macquarie Rig
Date Started: 06-12-05	Casing Size: mm	317182.60 E	
Date Finished: 06-12-05		Permit No:	Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND/CLAY minor GRAVEL; loose, minor fibro sheeting fragments	M	S	☒		WSB13_0.2_.3
							CLAY; pink and white, minor clasts of gravel, trace fibro fragments			☒		WSB13_0.5_0.6
				1			FIBRO SHEETING (ASBESTOS); white, loose, brittle					
							CLAY; pink, brown and grey, minor fibro sheeting fragments	M	F	☒		WSB13_1.5_1.6
				2			MANGROVE MUD; sandy, silty, dark grey, massive texture	W		☒		WSB13_2.5_2.6
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB14

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05		
Relative Level:	3.82 RL	Drill Type:	Push Tube
Coordinates:	6256587.30 N 317215.40 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL/ROADBASE					
							CLAY; pink/green	M	F			WSB14_0.2_0.3
							ASH and FIBRO SHEETING (ASBESTOS); black with white fibro					WSB14_0.6_0.7
				1			FIBRO SHEETING (ASBESTOS); white, brittle					
							CLAY; pink and grey, minor fibro sheeting fragmnets		F			WSB14_1.2_1.3
							FIBRO SHEETING (ASBESTOS); weathered, set in clay and gravel matrix, friable, loose, white, grey and green					WSB14_2.1_2.2
				2			MANGROVE MUDS; sandy, silty, massive texture, grey - brown		S			
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB15

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference: **Camellia Western Site**	Client: **Sydney Water**		
Drilling Contractor: **Macquarie Pty Ltd**	Project No.: **43217445**	Location: **Grand Ave Camellia**	
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.77 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.30 m**	Coordinates: **6256567.60 N** **317212.80 E**	Drill Model: **Macquarie Rig**
Date Started: **07-12-05**	Casing Size: **mm**		Drill Fluid: **nil**
Date Finished: **07-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND, ASH and CLAY; grey and brown, loose, granular			☒		WSB15_0.2_0.3
							CLAY; grey and light grey,	M	F	☒		WSB15_0.5_0.6
				1			CLAY and WEATHERED FIBRO; light brown-yellow clay bounded in each by fibro at 0.5m and 1.2m			☒ ☒		WSB15_1.0_1.1 WSB15_1.2_1.3
				2 3 4			EOH @ 1.3m refusal on concrete					

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SOIL BOREHOLE WSB16

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Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	06-12-05	Casing Size:	mm
Date Finished:	06-12-05		
Relative Level:	3.78 RL	Drill Type:	Push Tube
Coordinates:	6256571.70 N 317181.20 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			CLAY and GRAVEL; trace ash, light brown			⊠		WSB16_0.2_0.3
							FIBRO SHEETING (ASBESTOS); platy, grey-brown, loose, brittle					
							SAND; fill, loose, grey, well sorted, medium grained			⊠		WSB!6_0.5_0.6
							CLAY; grey-brown, minor fibro sheeting clasts, small cherty rock fragments					
				1						⊠		WSB!6_1.0_1.1
										⊠		WSB!6_1.3_1.4
				2			MANGROVE MUDS; silty, sandy, grey-brown, firm clay matrix		F			
										⊠		WSB!6_2.3_2.4
							SAND; well sorted, grey, fine-med grained, loose	M				
				3			EOH @ 3.0m					
				4								

Sheet 1 of 1

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SOIL BOREHOLE WSB17

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.80 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.20 m**	Coordinates: **6256576.00 N**	Drill Model: **Macquarie Rig**
Date Started: **06-12-05**	Casing Size: **mm**	**317146.60 E**	
Date Finished: **06-12-05**		Permit No:	Drill Fluid: **nil**

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			CLAY; poor sample return, brown		S			WSB17_0.2_0.3
							CONCRETE					
				1			CLAY; brown and black, trace fibro and ash	M	F			WSB17_1.1_1.2
							EOH @ 1.2m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB18

URS Australia Pty Ltd
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Phone: 02 8925 5500
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Drilling Contractor: **Macquarie Pty Ltd**		Project Reference: **Camellia Western Site**	Client: **Sydney Water**
		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.79 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **3.00 m**	Coordinates: **6256579.90 N**	Drill Model: **Macquarie Rig**
Date Started: **06-12-05**	Casing Size: **mm**	**317099.30 E**	
Date Finished: **06-12-05**		Permit No:	Drill Fluid: **nil**

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			CLAY; fill, yellow-brown,	M	F			
							GRAVEL; grey, loose, fill (rubble), clasts of chert, grey			⧓		WSB18_0.2_0.3
							CLAY; red-brown, massive texture, plastic		F	⧓		WSB18_0.5_0.6
				1						⧓		WSB18_1.2_1.3 QC103_071205 QC202_071205
							YELLOW CHERT; Fill, platy, clasts of yellow rock fragments, grey, chert at base, trace fibro dust					
							MANGROVE MUD; grey, silty sand, soft		S			
				2						⧓		WSB18_2.0_2.1
							CLAY; mottled yellow, brown and grey			⧓		WSB18_2.9_3.0
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB19

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Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Drilling Contractor: Macquarie Pty Ltd	Project Reference: Camellia Western Site	Client: Sydney Water	
	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 3.81 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 1.50 m	Coordinates: 6256585.70 N 317062.60 E	Drill Model: Macquarie Rig
Date Started: 07-12-05	Casing Size: mm	Permit No:	Drill Fluid: nil
Date Finished: 07-12-05			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SHALE CLASTS; platy, grey			☒		WSB19_0.2_0.3
							ASH; grey and white, granular					
							MANGROVE MUDS			☒		WSB19_0.5_0.6
				1						☒		WSB19_1.2_1.3
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB20

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Phone: 02 8925 5500
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Drilling Contractor: **Macquarie Pty Ltd**	Project Reference: **Camellia Western Site**	Client: **Sydney Water**	
	Project No.: **43217445**	Location: **Grand Ave Camellia**	
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **3.80 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **3.00 m**	Coordinates: **6256540.40 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317209.30 E**	
Date Finished: **08-12-05**		Permit No:	Drill Fluid: **nil**

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SANDY GRAVEL; base for bitumen, grey-black, loose	W				WSB20_0.2_0.3
							CLAY; brown, massive texture, trace fragments of rock (blue), plastic	M	F			WSB20_0.9_1.0
				1			CONCRETE					
							CLAY; brown and pale grey, minor fragments of fibro, semi plastic	D/M	F			
				2			FIBRO SHEETING (ASBESTOS); loose, friable, white					WSB20_2.0_2.1
							MANGROVE MUD; grey, brown, sandy silts		S			WSB20_2.2_2.3 WSB20_2.8_2.9
							SAND; well sorted, pale grey, medium grained					
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB21

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Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site	Client: Sydney Water
		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.75 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 0.90 m	Coordinates: 6256506.40 N	Drill Model: Macquarie Rig
Date Started: 08-12-05	Casing Size: mm	317201.90 E	
Date Finished: 08-12-05		Permit No:	Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; grey, black, loose, medium grained, well sorted, fill	W				WSB21_0.2_0.3
				1			EOH @ 0.9m refusal on concrete slab					WSB@!_0.9_1.0
				2								
				3								
				4								

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SOIL BOREHOLE WSB22

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: Camellia Western Site	Client: Sydney Water
Drilling Contractor: Macquarie Pty Ltd		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.72 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 3.00 m	Coordinates: 6256540.60 N	Drill Model: Macquarie Rig
Date Started: 08-12-05	Casing Size: mm	317177.30 E	
Date Finished: 08-12-05		Permit No:	Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; grey, well sorted, loose					
							CLAY; grey-brown, massive texture, trace fibro pieces	M	F	☒		WSB22_0.2_0.3
										☒		WSB22_0.5_0.6
				1								
							ASH; smal band, black granular					
							FIBRO SHEETING (ASBESTOS); blue colour, clay			☒		WSB22_1.3_1.4
							CLAY; yellow and white clay with minor fibro pieces	M	F			
				2			CLAY and SAND; moist with two inter-bands of blue asbestos at (2.2m) and (2.5m), clay is firm, dry and grey-red-brown	D	F	☒		WSB22_2.1_2.2
							SAND; mangrove muds, silty sand becoming medium sand with depth, grey-brown			☒		WSB22_2.8_2.9
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB23

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site	Client: Sydney Water
		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 3.89 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 3.00 m	Coordinates: 6256546.20 N	Drill Model: Macquarie Rig
Date Started: 08-12-05	Casing Size: mm	317142.00 E	
Date Finished: 08-12-05		Permit No:	Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; dark grey, loose	W				
							CLAY; red-brown, semi plastic, massive texture, fill		F	☒		WSB23_0.2_0.3
							FIBRO SHEETING (ASBESTOS), SAND, CLAY and ASH; white- grey and brown speckled. Patches of silty clay within loose, damp, brittle. Large fibro pieces @ 1.3m	M		☒		WSB23_0.6_0.7
				1						☒		WSB23_1.2_1.3
							FIBRO SHEETING (ASBESTOS); blue tinge, sheets of fibro with interbands of weathered fibro	D				
				2						☒		WSB23_2.0_2.1
							MANGROVE MUD; silty sand, smooth and moist, well sorted	M		☒		WSB23_2.5_2.6
							CLAY; mottled yellow and white, semi plastic		F			
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB24

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **2.70 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256514.90 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317173.70 E**	
Date Finished: **08-12-05**		Permit No:	Drill Fluid: **nil**

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; brown, loose, minor ash, fragment of rock (blue metal), trace fragments of fibro sheeting (asbestos)			⊠		WSB24
							MANGROVE MUD; brown, sandy silt increasing to well sorted sand with depth			⊠		WSB24
				1						⊠		WSB24
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB25

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Drilling Contractor: **Macquarie Pty Ltd**		Project Reference: **Camellia Western Site**	Client: **Sydney Water**
		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **2.82 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256476.90 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317183.60 E**	Drill Fluid: **nil**
Date Finished: **08-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; fill, white, brown and grey, loose, minor blue metal fragments			⊠		WSB25_0.2_0.3
							ASH; black-white, loose			⊠		WSB25_0.5_0.6
							MANGROVE MUDS; smooth silty sand becoming coarser with depth, brown-light brown	M				
				1						⊠		WSB25_1.2_1.3
							EOH @1.5m					
				2								
				3								
				4								

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Sheet 1 of 1

SOIL BOREHOLE WSB26

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**

Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **2.89 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256454.80 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317155.70 E**	Drill Fluid: **nil**
Date Finished: **08-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			RUBBLE; rock sand and minor fibro sheetin (asbestos), grey, loose			☒		WSB26_0.2_0.3
							FIBRO SHEETING (ASBESTOS); white, fragmented, loose	W		☒		WSB26_0.7_0.8
				1								
							MANGROVE MUD; grey-brown, wet	W		☒		WSB26_1.3_1.4
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB27

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.50 m
Date Started:	08-12-05	Casing Size:	mm
Date Finished:	08-12-05		
Relative Level:	2.54 RL	Drill Type:	Push Tube
Coordinates:	6256520.80 N 317138.10 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; minor blue metal and fibro sheeting (asbestos), loose, friable,	M				WSB27_0.2_0.3
												WSB27_0.5_0.6
				1			CLAY; grey, semi plastic, poor sample return (compressed)	M	F			WSB27_1.2_1.3
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB28

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		

Logged By:	C Arends	Bore Size:	mm	Relative Level:	3.81 RL	Drill Type:	Push Tube
Checked By:	AReyes	Total Depth:	1.50 m	Coordinates:	6256563.50 N	Drill Model:	Macquarie Rig
Date Started:	08-12-05	Casing Size:	mm		317055.70 E	Drill Fluid:	nil
Date Finished:	08-12-05			Permit No:			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; sand, gravel and clay, minor ash and fibro pieces, loose, conglomertic	M		☒		WSB28_0.2_0.3
							ASH; black and white speckled, fibro pieces			☒		WSB28_0.4_0.5
							CLAY; natural, brown	M	F			
				1						☒		WSB28_1.0_1.1
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB29

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site Project No.: 43217445	Client: Sydney Water Location: Grand Ave Camellia
Logged By: C Arends Checked By: AReyes Date Started: 08-12-05 Date Finished: 08-12-05	Bore Size: mm Total Depth: 1.50 m Casing Size: mm	Relative Level: 4.58 RL Coordinates: 6256528.20 N 317039.20 E Permit No:	Drill Type: Push Tube Drill Model: Macquarie Rig Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FIBRO SHEETING (ASBESTOS); grey with minor sand, gravel			⊠		WSB29_0.2_0.3
							CLAY, GRAVEL and ASH; minor fibro sheeting clasts			⊠		WSB29_0.6_0.7
				1								
							SAND; red-brown, fine grained, loose, well sorted	M		⊠		WSB29_1.4_1.5
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB30

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Macquarie Pty Ltd**		Project Reference: **Camellia Western Site**	Client: **Sydney Water**
		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **4.69 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256510.60 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317037.20 E**	Drill Fluid: **nil**
Date Finished: **08-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL and BITUMEN; loose, minor clay and sand			☒		WSB30_0.2_0.3
							SAND; natural red-brown, well sorted fine-med grained, friable cement matrix of clay, alluvial soils			☒		WSB30_0.5_0.6
				1						☒		WSB30_1.0_1.1
							EOH @ 1.5m					
				2								
				3								
				4								

Sheet 1 of 1

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SOIL BOREHOLE WSB31

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Macquarie Pty Ltd**	Project Reference: **Camellia Western Site**	Client: **Sydney Water**	
	Project No.: **43217445**	Location: **Grand Ave Camellia**	
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **4.65 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256521.90 N**	Drill Model: **Macquarie Rig**
Date Started: **08-12-05**	Casing Size: **mm**	**317022.90 E**	Drill Fluid: **nil**
Date Finished: **08-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			ASH, FIBRO and ROADBASE/GRAVEL; coarse conglomerate texture, loose, friable, black, brown and white	M		☒		WSB31_0.2_0.3
							CLAY; massive texture, trace clasts of fibro and rock, red, brown and yellow			☒		WSB31_0.7_0.8
				1			FIBRO SHEETING (ASBESTOS); band of fibro and clay, brown and white					
							CLAY; natural, mottled red, yellow and brown			☒		WSB31_1.3_1.4
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB32

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	08-12-05	Casing Size:	mm
Date Finished:	08-12-05		
Relative Level:	4.62 RL	Drill Type:	Push Tube
Coordinates:	6256510.30 N 316994.80 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL, SAND and FIBRO					
							CLAY; trace ash, red-brown, minor sand inclinations of medium grained sand		F	X		WSB32_0.2_0.3
										X		WSB32_0.5_0.6
				1			ASH; minor clay and fibro sheeting, black and white-brown, loose	M		X		WSB32_1.3_1.4
							SANDY CLAY; brown, fine grained sand, well sorted clay matrix, perched water @ 1.6m			X		WSB32_1.6_1.7
				2			CLAY; mottled yellow and grey, fine sands					
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB33

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.50 m
Date Started:	08-12-05	Casing Size:	mm
Date Finished:	08-12-05		
Relative Level:	4.82 RL	Drill Type:	Push Tube
Coordinates:	6256502.70 N 317085.10 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL< SAND and BITUMEN; trace blue metal and fibro, loose, friable	D				
							SAND; fine, red-brown, well sorted					
				1			CLAY; red-brown, minor sandy inclinations,	M	F			
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB34

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site** Project No.: **43217445**	Client: **Sydney Water** Location: **Grand Ave Camellia**
Drilling Contractor: **Macquarie Pty Ltd**			
Logged By: **C Arends** Checked By: **AReyes** Date Started: **08-12-05** Date Finished: **08-12-05**	Bore Size: mm Total Depth: **2.50 m** Casing Size: mm	Relative Level: **4.82 RL** Coordinates: **6256498.90 N** **317138.60 E** Permit No:	Drill Type: **Push Tube** Drill Model: **Macquarie Rig** Drill Fluid: **nil**

Method	Casing	Penetration S M H R	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			BITUMEN, GRAVEL, ASH and FIBRO (25%each); friable, loose, black, white and brown			☒		WSB34_0.2_0.3 QC105_081205 QC203_081205
							CLAY; red, brown, firm to stiff, semi plastic, massive texture		F	☒		WSB34_0.5_0.6
				1			RUBBLE; brick, ash, fibro sheeting/ pieces, clay, conglomerate texture			☒		WSB34_1.2_1.3
							CLAY; pale brown, natural, trace Ironstone					
				2						☒		WSB34_2.2_2.3
							EOH @ 2.5m					
				3								
				4								

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SOIL BOREHOLE WSB35

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference: Camellia Western Site	Client: Sydney Water		
Drilling Contractor: Macquarie Pty Ltd	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 4.72 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 1.50 m	Coordinates: 6256479.80 N 316990.30 E	Drill Model: Macquarie Rig
Date Started: 09-12-05	Casing Size: mm	Permit No:	Drill Fluid: nil
Date Finished: 09-12-05			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			ROADBASE; gravel and sand, grey bluestone					
							CLAY; natural, mottled yellow and grey, stiff, low plasticity, Ironstone @ 0.8m, clay turning red and becoming sandy with depth	D/M		☒		WSB35_0.2_0.3
										☒		WSB35_0.5_0.6
				1						☒		WSB35_1.2_1.3
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB36

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		

Logged By:	C Arends	Bore Size:	mm	Relative Level:	4.72 RL	Drill Type:	Push Tube
Checked By:	AReyes	Total Depth:	1.50 m	Coordinates:	6256443.40 N	Drill Model:	Macquarie Rig
Date Started:	09-12-05	Casing Size:	mm		316986.60 E	Drill Fluid:	nil
Date Finished:	09-12-05			Permit No:			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; fill, grey, loose					
							CLAY; minor sand, grey-yellow, firm-stiff, moist becoming dry	D/M				WSB36_0.2_0.3
												WSB36-0.5-0.6
							SAND; red,brown and yellow, loose, friable	D				
				1								WSB36_1.2_1.3
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB37

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **7.74 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **6256402.80 N**	Drill Model: **Macquarie Rig**
Date Started: **09-12-05**	Casing Size: **mm**	**317011.10 E**	Drill Fluid: **nil**
Date Finished: **09-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; roadbase, gravel and sand, dark grey	W				
										☒		WSB37_0.2_0.3
							CLAY; natural, mottled grey and light brown, low plasticity	M				
										☒		WSB37_0.5_0.6
				1								
										☒		WSB37_1.4_1.5
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB38

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Macquarie Pty Ltd**	Project Reference: **Camellia Western Site**	Client: **Sydney Water**	
	Project No.: **43217445**	Location: **Grand Ave Camellia**	
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **4.77 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **2.50 m**	Coordinates: **6256437.60 N**	Drill Model: **Macquarie Rig**
Date Started: **09-12-05**	Casing Size: **mm**	**317053.90 E**	Drill Fluid: **nil**
Date Finished: **09-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SANDY GRAVEL; grey, loose,	M				WSB38_0.2_0.3
							SAND; grey loose then red, fine-med grained					WSB38_0.5_0.6 QC106_091205
							FIBRO SHEETING (ASBESTOS); grey,	W				WSB38_1.0_1.1
				1			CLAY; mottled grey and red-brown, low plasticity, trace Ironstone, perched water @ 1.4m	M	S			
				2								WSB38_2.4_2.5
							EOH @ 2.5m					
				3								
				4								

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SOIL BOREHOLE WSB39

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	3.00 m
Date Started:	09-12-05	Casing Size:	mm
Date Finished:	09-12-05		
Relative Level:	4.97 RL	Drill Type:	Push Tube
Coordinates:	6256482.40 N 317098.80 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND, GRAVEL, ASH, and FIBRO SHEETING (ASBESTOS); grey, black, white and brown, bands of white powdery ash @ 0.4m			⊠		WSB39_0.2_0.3
										⊠		WSB39_0.4_0.5
							SAND; grey-brown stained, medium grained, loose	D				
				1			SAND; loose, red-brown, fine-med grained,	D		⊠		WSB39_1.1_1.2
							CLAY; firm-stiff, mottled red, brown and grey, minor Ironstone	D	F			
				2						⊠		WSB39_2.3_2.4
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB40

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
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Project Reference:	Camellia Western Site	Client:	Sydney Water
Drilling Contractor:	Macquarie Pty Ltd	Location:	Grand Ave Camellia
Project No.:	43217445		

Logged By:	C Arends	Bore Size:	mm	Relative Level:	5.86 RL	Drill Type:	Push Tube
Checked By:	AReyes	Total Depth:	1.50 m	Coordinates:	6256451.20 N	Drill Model:	Macquarie Rig
Date Started:	09-12-05	Casing Size:	mm		317092.90 E	Drill Fluid:	nil
Date Finished:	09-12-05			Permit No:			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL; blue metal, grey sand, loose	D				WSB40_0.2_0.3
							ASH; black, granular, loose	D				WSB40_0.3_0.4
							SAND; light brown, loose					
				1			CLAY; minor sand, mottled yellow, red and brown, trace ironstone material					WSB40_1.4_1.5
							EOH @ 1.5m					
				2								
				3								
				4								

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SOIL BOREHOLE WSB41

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd		Project Reference: Camellia Western Site Project No.: 43217445	Client: Sydney Water Location: Grand Ave Camellia
Logged By: C Arends Checked By: AReyes Date Started: 09-12-05 Date Finished: 09-12-05	Bore Size: mm Total Depth: 3.00 m Casing Size: mm	Relative Level: 5.31 RL Coordinates: 6256477.10 N 317134.50 E Permit No:	Drill Type: Push Tube Drill Model: Macquarie Rig Drill Fluid: nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL, SAND and ROADBASE, grey, loose	D		■		WSB41_0.2_0.3
							ASH; black, loose, granular, (blue asbestos) friable			■		WSB41_0.4_0.5
				1			SANDY CLAY; minor clasts of rocks, clay minor mottled red and grey			■		WSB41_1.0_1.1
				2			GRAVELLY SAND; clasts of brick, fibro, ash and gravel in sand, speckled appearance			■		WSB41_1.6_1.7
							CLAY; natural, red and grey mottled, firm to stiff, low plasticity		F	■		WSB41_2.8_2.9
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB42

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference: **Camellia Western Site**

Project No.: **43217445**

Client: **Sydney Water**

Location: **Grand Ave Camellia**

Drilling Contractor: **Macquarie Pty Ltd**

Logged By:	**C Arends**	Bore Size:	**mm**	Relative Level:	**5.47 RL**	Drill Type:	**Push Tube**
Checked By:	**AReyes**	Total Depth:	**4.50 m**	Coordinates:	**6256448.40 N**	Drill Model:	**Macquarie Rig**
Date Started:	**09-12-05**	Casing Size:	**mm**		**317131.60 E**	Drill Fluid:	**nil**
Date Finished:	**09-12-05**			Permit No:			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND and GRAVEL; loose, friable	D				
							SAND, GRAVEL and FIBRO SHEETING (ASBESTOS)			⊠		WSB42_0.2_0.3
							CLAY; red-brown			⊠		WSB42_0.5_0.6
							FIBRO SHEETING (ASBESTOS)					
							CLAY					
							FIBRO SHEETING (ASBESTOS)			⊠		WSB42_0.9_1.0
							ASH					
				1			FIBRO SHEETING (ASBESTOS)					
							CLAY; red-brown, firm to stiff, minor clasts of fibro sheeting (asbestos) 20-30cm intervals					
										⊠		WSB42_1.9_2.0
				2								
							SANDY CLAY; brown, natural	M	S			
				3						⊠		WSB42_3.0_3.1
				4						⊠		WSB424.0_4.1
							EOH @ 4.5m					

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SOIL BOREHOLE WSB43

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd	Project Reference: Camellia Western Site	Client: Sydney Water	
	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 5.45 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 4.50 m	Coordinates: 6256424.90 N	Drill Model: Macquarie Rig
Date Started: 09-12-05	Casing Size: mm	317165.50 E	Drill Fluid: nil
Date Finished: 09-12-05		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL and SAND; minor ash, loose, friable		D			WSB43_0.2_0.3
							FIBRO SHEETING (ASBESTOS); blue grey sheets, minor pulp					WSB43_0.5_0.6 QC107_091205 QC204_091205
				1			ASBESTOS PULP; smooth, massive texture, unconsolidated,	W				WSB43_1.0_1.1
							FIBRO SHEETING (ASBESTOS); grey, aligned					
				2			ASBESTOS PULP; as above, white pulp					WSB43_2.0_2.1
							FIBRO SHEETING (ASBESTOS);					
				3			ASH and PULP; black and white ash, yellow pulp					WSB43_3.0_3.1
				4			CLAY; plastic, yellow and grey mottled		S			WSB43_4.0_4.1
							EOH @ 4.5m					

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SOIL BOREHOLE WSB44

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd	Project Reference: Camellia Western Site	Client: Sydney Water	
	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 5.58 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 4.50 m	Coordinates: 6256386.60 N 317162.60 E	Drill Model: Macquarie Rig
Date Started: 09-12-05	Casing Size: mm		Drill Fluid: nil
Date Finished: 09-12-05		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND, SILT, CLAY and ASH; brown and black, minor rock fragments			⊠		WSB44_0.2_0.3
							ASBESTOS PULP; white, minor sheeting			⊠		WSB44_0.5_0.6
							Interbands of clay and fibro sheeting, trace ash			⊠		WSB44_0.9_1.0
				1								
							ASBESTOS PULP; minor red-brown clay bands @ 1.7m and 2.0m					
				2						⊠		WSB44_2.1_2.2
							CLAY SAND; red-brown, plastic, massive texture		S	⊠		WSB44_3.0_3.1
				3			ASBESTOS SHEETING; blue grey					
							SAND; natural, mottled grey-brown, firm to stiff, minor sand intrusions		F			
				4						⊠		WSB44_4.0_4.1
							EOH @ 4.5m					

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SOIL BOREHOLE WSB45

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: Camellia Western Site	Client: Sydney Water
Drilling Contractor: Macquarie Pty Ltd		Project No.: 43217445	Location: Grand Ave Camellia
Logged By: C Arends	Bore Size: mm	Relative Level: 5.49 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 4.50 m	Coordinates: 6256374.00 N 317125.30 E	Drill Model: Macquarie Rig
Date Started: 09-12-05	Casing Size: mm		Drill Fluid: nil
Date Finished: 09-12-05		Permit No:	

Method	Casing	Penetration S M H R	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			ROCK (SHALE) FRAGMENTS AND RED BROWN CLAY; poor sample return, ash and weathered fibro sheeting, loose, brittle, white and black speckled,			⊠		WSB45_0.2_0.3
										⊠		WSB45_0.5_0.6
				1			FIBRO SHEETING and FIBRO PULP; loose, white,			⊠		WSB45_1.4_1.5
							ASH; (slag?), vitreous ash, shiny black, granular and *** fracture					
				2			ASBESTOS PULP; light cream/grey, sand band @ 2.9m, some patches of pink painted pulp			⊠		WSB45_2.5_2.6
				3						⊠		WSB45_3.0_3.1
							FIBRO SHEETING (ASBESTOS); ash/slag, loose, black and white, minor light brown clay, perched water					
							BASAL SAND; soft sandy clay, light brown	W	S			
				4						⊠		WSB45_4.0_4.1
							EOH @ 4.5m					

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Sheet 1 of 1

SOIL BOREHOLE WSB46

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**
Logged By: **C Arends** Checked By: **AReyes** Date Started: **09-12-05** Date Finished: **09-12-05**	Bore Size: **mm** Total Depth: **4.50 m** Casing Size: **mm**	Relative Level: **5.66 RL** Coordinates: **6256414.50 N** **317127.40 E** Permit No:	Drill Type: **Push Tube** Drill Model: **Macquarie Rig** Drill Fluid: **nil**

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL and SAND; grey roadbase material			⊠		WSB46_0.2_0.3
							ASH, CLAY and FIBRO SHEETING (ASBESTOS); red, brown, grey and white, loose sand to gravel size components					
							ASBESTOS PULP; white, fibrous, unconsolidated, soft massive smooth texture, ash band (0.1m) @ 2.1m			⊠		WSB46_0.5_0.6
				1						⊠		WSB46_1.2_1.3
				2								
							SANDY CLAY; light brown, uncohesive (loose)		S			
							COAL ASH; black, vitreous lustre			⊠		WSB46_2.7_2.8
				3			FIBRO SHEETING (ASBESTOS); weathered broken, loose, grey					
				4						⊠		WSB46_3.8_3.9
							EOH 4.5m					

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SOIL BOREHOLE WSB47

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.50 m
Date Started:	09-12-05	Casing Size:	mm
Date Finished:	09-12-05		
Relative Level:	5.70 RL	Drill Type:	Push Tube
Coordinates:	6256404.80 N 317092.70 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			CLAY and GRAVEL; trace fibro pieces, loose clay fill, friable			☒		WSB47_0.2_0.3
							BASAL SANDY CLAY; red-brown, yellow, minor ironstone, friable, well sorted, fine grained			☒		WSB47_0.5_0.6
				1			CLAY; firm-stiff, yellow-grey, low plasticity			☒		WSB47_1.3_1.4
							EOH @ 1.5m					

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SOIL BOREHOLE WSB48

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: **Macquarie Pty Ltd**	Project Reference: **Camellia Western Site**	Client: **Sydney Water**	
	Project No.: **43217445**	Location: **Grand Ave Camellia**	
Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **2.80 RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **3.00 m**	Coordinates: **6256357.10 N**	Drill Model: **Macquarie Rig**
Date Started: **12-12-05**	Casing Size: **mm**	**317156.70 E**	Drill Fluid: **nil**
Date Finished: **12-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND; minor gravel, dark grey, loose		D			WSB48_0.2_0.3
							SHALE; filll, loose, pink/grey, platy	D				WSB48_0.4_0.5
							ASBESTOS SHEETING; blue-green, set with dark grey sandy clay		S			
				1								WSB48_1.0_1.1
							SANDY CLAY; basal sand clay mottled red and yellow green					
				2								WSB48_2.0_2.1
							SAND; white-grey, coarse, well sorted	W				
				3			EOH @ 3.0m					
				4								

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SOIL BOREHOLE WSB49

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.50 m
Date Started:	12-12-05	Casing Size:	mm
Date Finished:	12-12-05		
Relative Level:	5.24 RL	Drill Type:	Push Tube
Coordinates:	6256365.70 N 317079.30 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			SAND/GRAVEL; brown sand, minor clasts of concrete and blue metal, loose clay					WSB49_0.2_0.3
												WSB49_0.6_0.7
							ASH and FIBRO; fibro sheeting, grey, set into black ash					WSB49_0.9_1.0
				1			ASBESTOS PULP; pink, clay loose					
							CLAY; natural, brown, stiff		St			WSB49_1.4_1.5
							EOH @ 1.5m push tube stuck in stiff clay					
				2								
				3								
				4								

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SOIL BOREHOLE WSB50

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor: Macquarie Pty Ltd	Project Reference: Camellia Western Site	Client: Sydney Water	
	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 5.65 RL	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 1.50 m	Coordinates: 6256367.70 N 317054.40 E	Drill Model: Macquarie Rig
Date Started: 12-12-05	Casing Size: mm	Permit No:	Drill Fluid: nil
Date Finished: 12-12-05			

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			GRAVEL, ASH, SAND and MINOR FIBRO PIECES; loose, dry and friable	D				WSB50_0.2_0.3
							SANDY CLAY; red-brown,		F			WSB50_0.5_0.6
				1			CLAY; firm to stiff, minor ironstones	D				WSB50_1.2_1.3
							EOH @ 1.5m					
				2								
				3								
				4								

Sheet 1 of 1

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SOIL BOREHOLE WSB51

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone: 02 8925 5500
Fax: 02 8925 5555

Drilling Contractor:	Macquarie Pty Ltd	Project Reference:	Camellia Western Site
Project No.:	43217445	Client:	Sydney Water
Location:	Grand Ave Camellia		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	1.50 m
Date Started:	12-12-05	Casing Size:	mm
Date Finished:	12-12-05	Relative Level:	6.07 RL
Coordinates:	6256369.50 N 317018.60 E	Permit No:	
Drill Type:	Push Tube	Drill Model:	Macquarie Rig
Drill Fluid:	nil		

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			FILL; sand clay and gravel, trace fibro pieces, loose, friable	D		☒		WSB51_0.2_0.3
							CLAY; yellow/brown, minor sand	M	F	☒		WSB51_0.7_0.8
				1						☒		WSB51_1.1_1.2
							EOH @1.5m					
				2								
				3								
				4								

URS

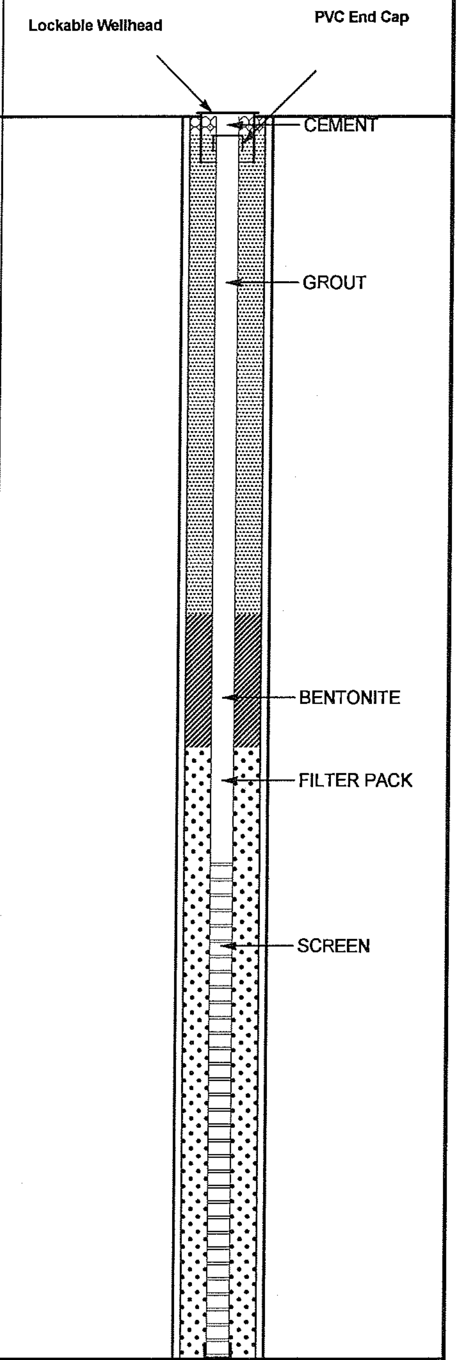
MONITORING WELL WSB52/MW01

URS Australia Pty. Ltd.
Level 3, 116 Miller Street, North Sydney
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference: Camellia Western Site		Client: Sydney Water	
Drilling Contractor: Macquarie Pty Ltd	Project No.: 43217445	Location: Grand Ave Camellia	
Logged By: C Arends	Bore Size: mm	Relative Level: 5.57 mAHD	Drill Type: Push Tube
Checked By: AReyes	Total Depth: 7.50 m	Coordinates: 6256372.60 N 316981.70 E	Drill Model: Macquarie Rig
Date Started: 12-12-05	Casing Size: 50 mm		Drill Fluid: nil
Date Finished: 12-12-05		Permit No:	

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA (Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations)	Classification	Depth (m)	Moisture Condition
		WSB52/MW01_0.1_0.2		FILL; pink, brick, gravel and sand, loose, friable,		0	D
		WSB52/MW01_0.5_0.6		CLAY; natural, yellow, brown, sandy clay, loose, friable			
		WSB52/MW01_1.0_1.1				1	
				SAND; yellow-grey, well sorted, loose, friable, medium grained			
		WSB52/MW01_2.0_2.1				2	
		WSB52/MW01_3.0_3.1				3	
				CLAY; minor sand, firm to stiff, slightly moist			D/M
		WSB52/MW01_4.0_4.1				4	
		WSB52/MW01_5.0_5.1		CLAY; mottled with grey-white, fine-medium sand, water intercepted @ 5.2m		5	W
		WSB52/MW01_6.0_6.1				6	
				SAND; well sorted, grey, med-coarse grained			W
		WSB52/MW01_7.0_7.1				7	
				EOH @ 7.5m			

WELL CONSTRUCTION DETAILS



URS

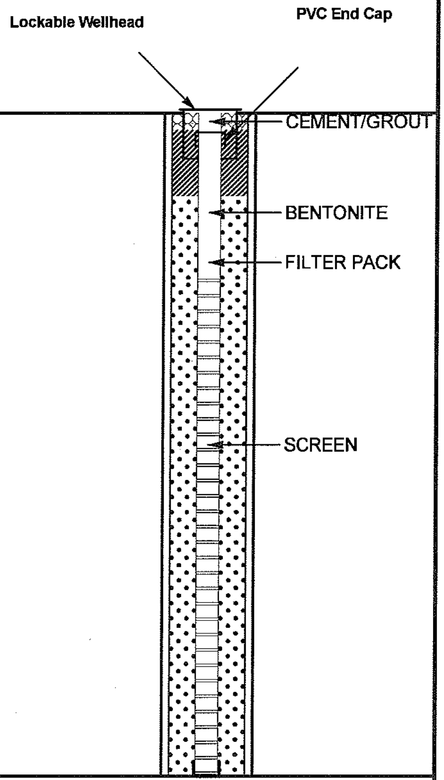
MONITORING WELL WSB53/MW02

URS Australia Pty. Ltd.
Level 3, 116 Miller Street, North Sydney
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	4.00 m
Date Started:	12-12-05	Casing Size:	50 mm
Date Finished:	12-12-05		
Relative Level:	3.37 mAHD	Drill Type:	Push Tube
Coordinates:	6256362.70 N 317115.60 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations	Classification	Depth (m)	Moisture Condition
		WSB53/MW02_0.1_0.2		FILL; ash, sand and gravel, loose,dry, minor brick, dark grey,		0	D
		WSB53/MW02_0.5_0.6		ASBESTOS PULP; white, incohesive			M
						1	
		WSB53/MW02_1.6_1.7		MANGROVE MUDS; dark brown, water @ 1.3m, silty sandy			W
						2	
				SAND; grey-brown, medium-grained, saturated, well sorted		3	W
		WSB53/MW02_4.0_4.1		EOH @ 4.0m		4	
						5	
						6	
						7	

WELL CONSTRUCTION DETAILS



WELL_WITH_MOIST_CONDITION J:\JOBS\43217445\WESTER~1\DRILL LOGS.GPJ WCC_AUS.GDT 11/04/06

URS

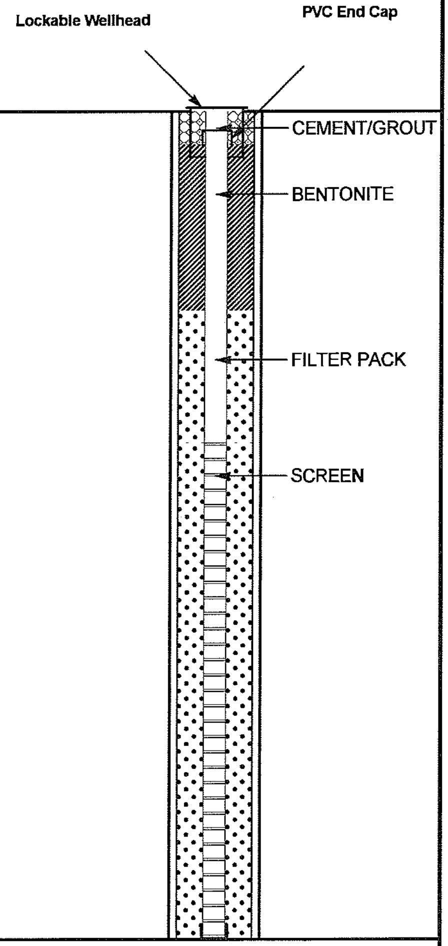
MONITORING WELL WSB54/MW03

URS Australia Pty. Ltd.
Level 3, 116 Miller Street, North Sydney
Phone: 02 8925 5500
Fax: 02 8925 5555

Project Reference:	Camellia Western Site	Client:	Sydney Water
Project No.:	43217445	Location:	Grand Ave Camellia
Drilling Contractor:	Macquarie Pty Ltd		
Logged By:	C Arends	Bore Size:	mm
Checked By:	AReyes	Total Depth:	5.00 m
Date Started:	13-12-05	Casing Size:	50 mm
Date Finished:	12-12-05		
Relative Level:	3.59 mAHD	Drill Type:	Push Tube
Coordinates:	6256564.40 N 317007.40 E	Drill Model:	Macquarie Rig
Permit No:		Drill Fluid:	nil

Sample Interval	PID (ppm)	Sample ID	Legend	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), moisture content, consistency / density, and additional observations	Classification	Depth (m)	Moisture Condition
⊠		WSB54/MW03_0.1 QC109_131205 QC205_131205		GRAVEL; roadbase, sand, dry, friable, loose, dark grey.		0	D
				SAND; red-brown, low plasticity			D/M
⊠		WSB54/MW03_0.5_0.6					
⊠		WSB54/MW03_1.0_1.1				1	
				SANDY CLAY; yellow-orange, cohesive,			D/M
⊠		WSB54/MW03_2.0_2.1				2	
				SANDY CLAY; water intercepted			W
⊠		WSB54/MW03_3.0_3.1				3	
						4	
⊠		WSB54/MW03_4.5_4.6					
				EOH @ 5.0m		5	
						6	
						7	

WELL CONSTRUCTION DETAILS



URS

SOIL BOREHOLE WSB55

URS Australia Pty Ltd Level 3, 116 Miller St North Sydney NSW 2060	Phone: 02 8925 5500 Fax: 02 8925 5555	Project Reference: **Camellia Western Site**	Client: **Sydney Water**
Drilling Contractor: **Macquarie Pty Ltd**		Project No.: **43217445**	Location: **Grand Ave Camellia**

Logged By: **C Arends**	Bore Size: **mm**	Relative Level: **RL**	Drill Type: **Push Tube**
Checked By: **AReyes**	Total Depth: **1.50 m**	Coordinates: **N**	Drill Model: **Macquarie Rig**
Date Started: **13-12-05**	Casing Size: **mm**	**E**	Drill Fluid: **nil**
Date Finished: **12-12-05**		Permit No:	

Method	Casing	Penetration (S M H R)	Ground Water Data and Comments	Depth (m)	Graphic Log	Classification	USC DESCRIPTION OF STRATA Type, plasticity / particle size, colour, secondary / minor components (e.g., "trace"), additional observations	Moisture Condition	Consistency Relative Density	Sample Interval	PID (ppm)	Sample ID
				0			ROADBASE; gravel and sand, dark grey, loose,	D		☒		WSB55_0.1_0.2
							SANDY CLAY; mottled orange and red-brown, plastic, soft-firm		S-F	☒		WSB55_0.5_0.6
				1						☒		WSB55_1.0_1.1
							EOH @ 1.5m			☒		~~WSB55_1.5_1.6~~
				2								
				3								
				4								

Appendix E Plates

Plate Log

Client Name:	Site Location:	URS Project No.:
Statewide Planning	Camellia West	43218346

Date:	Plate No:
18/10/2012	1.

Description:

Sample location TP1 – Observed clinker material – thin layer of black fill.

Direction Photo Taken:
Facing east

F

Appendix F Asbestos SWMS

ASBESTOS SAFE WORK METHOD STATEMENT FOR STATEWIDE PLANNING PTY LTD 181 JAMES RUSE DRIVE CAMELLIA *CAMELLIA REMEDIATION PROJECT*

Prepared for: Statewide Planning Pty Ltd

Prepared by: R T Benbow, Principal Consultant
BENBOW ENVIRONMENTAL
North Parramatta, New South Wales

Report No: 131039_AWMS_FINAL
September 2013
(Released: 4 September 2013)

Benbow
ENVIRONMENTAL

Engineering a Sustainable Future for Our Environment

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DOCUMENT CONTROL

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Reviewed by:	Position:	Signature:	Date:
Duke Ismael	Senior Environmental Engineer		4 September 2013

Approved by:	Position:	Signature:	Date:
Duke Ismael	Senior Environmental Engineer		4 September 2013

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2	20-June-2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
3	27-June 2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
4	2 July 2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
5	3 July 2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
6	24 July 2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
7	22 August 2013	DRAFT	R T Benbow	Duke Ismael	Duke Ismael
FINAL	4 September 2013	FINAL	R T Benbow	Duke Ismael	Duke Ismael

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4	2 July 2013	Statewide Planning Pty Ltd	RT Benbow
5	3 July 2013	Statewide Planning Pty Ltd	RT Benbow
6	24 July 2013	Statewide Planning Pty Ltd	RT Benbow
7	22 August 2013	Statewide Planning Pty Ltd	R T Benbow
FINAL	4 September 2013	Statewide Planning Pty Ltd	R T Benbow

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EXECUTIVE SUMMARY

The work methods to be applied to undertake the remedial action plan for the Camellia Project are discussed in this document.

The management of the health and safety risks to the workforce who will undertake the remediation requires the following approach.

- A Safety Management System

  The safety management system provides the overriding control of the remediation works and brings the accountability back to the senior management and owners of Statewide Planning and any other entities that may have control or ownership of the site. The safety management system would therefore equally apply to CEJ Constructions Pty Limited who would be the project manager for the Remediation Works.

  A document titled Safety Management System has been prepared following the guidelines of the Department of Planning & Infrastructure's HIPAP (Hazardous Industry Planning Advisory Papers).

  The Safety Management System sets the standards that need to be adhered to by contractors engaged to undertake the remediation works.

- The Asbestos Safe Work Method Statement provides the details on how the work is to be undertaken to satisfy the regulatory requirements and achieve a zero risk approach to the potential environmental exposure to airborne asbestos fibres generated at the work areas.

  The Asbestos Safe Work Method Statement provides an introduction to the nature of the risks associated with the remediation works to put into context the importance of the asbestos fibre emission controls – referred to as asbestos dust controls in this document.

  The remediation works have not previously been undertaken in Australia and a worldwide search for similar projects is continuing and if details are obtained will be added to a revision of the Asbestos Safe Work Method Statement.

  Since release of Revision 6 of the Asbestos Safe Work Method Statement, information applicable to the US EPA has been processed and 20 documents were received. A summary of the findings is presented in the Attachments to this Revision 6 of the Asbestos Safe Work Method Statement. The US EPA, through contractors, undertook two projects at a Johns Manville site at Waukegan Illinois. This site is within US EPA Region 5 and is a Superfund site. This site, spread over 300 acres has approximately 600,000 ton (US) of asbestos containing materials and what the documents refer to as raw asbestos (equivalent to friable asbestos) present.

The first project undertaken during 1988-1989 involved earthworks to level areas where asbestos wastes had been used on banks and sides of slopes and to cover any exposed asbestos containing materials. No asbestos containing materials were trucked on site. Extensive air sampling at work areas and perimeter boundaries were undertaken. This was a relatively simple exercise compared to the proposed Camellia Project. The US EPA criteria at the work area of 0.1 fibres/millilitre was readily satisfied for the vast majority of the air samples.

Another area of this overall site was the subject of a further remediation project carried out in 2002. This later project is of more relevance as it involved the excavation of 49,689.92 ton (US) of asbestos containing materials and soil. This material was excavated and placed into trucks for disposal to landfill.

Personal communication was made with the US EPA Remedial Project manager responsible for the project and he advised that the project satisfied the OSHAPEL of 0.1 fibre/millilitre work area criteria using water saturation and low stream velocity water from water trucks and sprinklers. The report titled "Removal Action Summary" dated December 12, 2002, is provided in full in the Attachments. It includes photographs of the works. Details of daily air monitoring results were not accessible at the time of preparation of the Asbestos Safe Work Method Statement. The report stated that the maximum air monitoring results was 0.0105 fibres/millilitre.

Two additional investigations have been undertaken to support the use of the alternative to negative pressure enclosures as Benbow Environmental does not support the use of these enclosures for the Camellia Project. Benbow Environmental advises against the use of negative pressure enclosures for a remediation project of this nature and considers their use will result in human health issues if adopted.

Very detailed explanations are provided in two reports prepared by Benbow Environmental.

- Alternative Asbestos Dust Controls for Large Scale Projects. Report No. 131039_Alternative Asbestos Dust Controls_ Rev2.
- Environmental Assessment of Using Foams for Asbestos Fibre Control. Report No. 131039_Environmental Assessment_Rev2.

The asbestos dust controls placed on the Camellia Project are far more extensive and have the additional safeguards of saturating the subsoil beneath the concrete and asphalt before removing these surfaces and continuing with saturation as new surfaces are exposed.

- The use of wind protection devices to protect the work area and on site haul roads from wind effects.

- The use of a dust suppressant foam on the surfaces that are disturbed by the excavator buckets.

The documents reviewed from the 1989 and 2002 projects used very similar asbestos management processes that have been designed into the Camellia Project.

The Camellia Project has clear objectives set in the Safety Management System to ensure protection of the health and safety of any person while on site. Just as critical is the prevention of an environmental exposure to airborne asbestos fibres that may be generated on site. Prevention of an environmental exposure has driven the adoption of a zero risk approach.

To establish that the work methods will achieve these objectives a pilot trial stage including excavation is recommended at the commencement of the remediation programme.

The pilot trial including excavation would be thoroughly evaluated to refine the methods of asbestos dust controls before excavation across several areas proceed.

A contingency plan has been developed and is discussed in this document.

The author's history of professional experience with hazardous materials and specifically asbestos is provided as an Attachment for the reader's benefit.

A project Safety Management Plan (SSMP) has been prepared by the project Manager for the Remediation Works – CEJ Construction Pty Ltd.

The SSMP is presented as Attachment 2.

Risk Hazard analysis will need to be prepared using a 6x6 matrix and with a team made up of the Site Operation Manager, Risk Consultant, Hygienist, Chief Leader, and Environmental Engineer/ Scientist.

The Safe Work Method Statement does not set the limit for validation of uncontaminated areas of the site. These details are provided in the Remediation Action Plan and would also be set in the validation Plan.

The latest revision of the Remediation Action Plan relied upon for information is document Final Report–revision A Remediation Action Plan 181 James Ruse Drive, Camellia NSW 23 June 2013 URS Proj #43218346.

A separate document titled Environmental Management Plan would be prepared for the site prior to any commencement of works on the site.

The Asbestos Safe Work Method Statement recommends off site human health monitoring of the air for environmental concentrations of respirable size asbestos fibres using a Transmission Electron Microscopy Method developed by the ISO. Real time fibre and dust monitoring instruments would also be used on the site perimeter to provide an indicator of the air quality. Calibration of the two instruments will need to be undertaken.

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1. INTRODUCTION

The Camellia Remediation Project will require removal and containment of 68,190 cubic metres of asbestos containing materials (ACM) that are of the bonded and friable types of asbestos containing materials from across the site and includes the river bank.

Approximately 40 cubic metres of mud containing fragments of asbestos cement has been allowed for in the containment cells. A further 130 cubic metres has been allowed to be removed from the nature strip on James Ruse Drive.

Hydrocarbon contaminated soils to be excavated and treated on site amount to 10, 020 cubic metres.
There are health risks associated with the removal of both these contaminated materials.

Total quantity of asbestos containing material from across the site is 68,190 cubic metres, including 683 cubic metres of clinker based on the RAP. Then there is an additional 170 cubic metres that could be removed from the mud adjacent to the river bank and the nature strip.

The containment cells consist of three reinforced concrete structures constructed within excavated and uncontaminated areas. Total containment volume available is in excess of 90,000 cubic metres.

The process of disturbing the asbestos containing materials (ACM) will generate asbestos dust and debris (ADD).

The unsealed perimeter of the site along the foreshore (bank) of Parramatta River and the land bordering James Ruse Drive have significant presence of asbestos containing materials (ACM) and asbestos dust and debris (ADD).

Any debris would not be permitted on trafficked areas and a preliminary inspection and clearance statement for trafficked areas would be obtained prior to the Remediation Works commencing.

The remediation programme will be a difficult Project requiring adherence to the methods detailed.

To achieve the level of diligence needed, training and an awareness induction programme specific to this Project will be required. Constant vigilance by the occupational hygienists will be required and they will need to have a representative permanently in attendance on site. Third party auditing of the use of the asbestos dust controls and of the occupational hygienists' air sampling will be required and has been built into the Safe Work Method Statement.

An Environmental Management Plan would be prepared for the site and would be separate to the safety plan.

2. BACKGROUND TO ASBESTOS FIBRES AS A HEALTH HAZARD

Exposure to respirable asbestos fibres has caused significant fatalities amongst workers employed in occupations involved with materials containing asbestos. There is also a strong association of the fatal mesothelioma tumour being incurred from an environmental exposure to respirable sized asbestos fibres.

There has been widespread communication of these health risks and the history of the use of asbestos and the disease that resulted is well known. The continued production and use of asbestos containing materials after the link to asbestos fibres causing lung cancer and mesothelioma were found is an indictment of how our society has functioned in the past and how it has unwittingly accepted risks for workers and their families without forewarning of the hazards they were being exposed to.

Asbestos is classified by the International Agency for Research on Cancer (IARC) as a Type 1 Carcinogen i.e. definitely causes cancer in man.

The extent of the exposure to asbestos fibres that can result in lung cancer or a mesothelioma tumour is unknown and is unable to be proven with sufficient certainty to allay fears commonly experienced by our community with any works associated with asbestos.

The "one fibre kills" scenario is not supported by the presence of environmental and manmade sources of asbestos fibres, most cities in developed countries have asbestos fibres present in the urban environment.

Asbestos fibres are present in the lungs of most city dwellers, the numbers of fibres present are in the hundreds of thousands.

The incidence of mesothelioma is very low to rare. However there are sufficient incidences occurring to warrant a zero risk policy when asbestos containing materials are encountered and need to be disturbed or removed.

Development of a risk model that is able to establish a safe level of exposure is not scientifically possible as there are members of our community who develop the fatal mesothelioma tumour from random exposures that are not related to an occupational history. An argument for a dose response approach that limits the number of fibre exposures a year is not acceptable and therefore for the Camellia Remediation Project a zero risk approach is adopted.

This Asbestos Safe Work Method Statement therefore places the highest standard of asbestos dust controls that are feasible and adopts as minimum the ALARP methodology i.e. As Low As Reasonably Practical.

This was the basis of the objectives developed in the Safety Management System.

- Work Zone

Work zones are the areas on site and around the perimeter of the concreted areas, along the bank of Parramatta River, adjacent to James Ruse Drive where the surfaces are not sealed and ACM (asbestos containing materials) are present.

The Work zones are therefore areas where the ACM will be disturbed, excavated, transported, placed and compacted on site.

Each work zone will have a number of unit operations undertaken and each operation will have the potential to generate asbestos dust unless the controls and work methods are adopted.

Within the work zone use of PPE as detailed in this document will be required.

The occupational exposure within the defined work zones will be limited to 0.1 fibre/ millilitre over an 8 hour period as measured using the membrane filter method. Each of the work zones will be broken up into smaller work cells and within the work cells this limit would need to be achieved.

Around the work zone and within the work cell where the work is being undertaken will be the exclusion zones. The exclusion zone is separated from the work cell by barriers, signage and the person nominated in charge of the work zone will have authority to exclude any person from entering the work zone. Procedures establish the protocol to be adopted and zero acceptance of non-conformances.

Plans showing the work zone and which areas of the site would first be remediation are included in this document.

At the exclusion zone, the occupation exposure limit will be <0.01 fibres / millilitre as measured using the membrane filter method (also referred to as phase contrast microscopy or PCM).

The objective during the pilot trial work programme at the exclusion zones will be to achieve zero countable fibres/100 fields on the membrane filter. This objective once achieved would then be maintained throughout the life of the Project.

At environmental monitoring reference points the membrane filter method is not the appropriate measurement method to use. These reference points would also be referred to as the off site human health monitoring points.

Phase contrast microscopy is deficient in being able to report below 0.01 fibres / millilitre. An alternative method could be developed by counting larger numbers of fields and sampling larger volumes of air, however the method would not have credibility with the community, the regulatory authorities or the author of this document.

Environmental reference points are of critical importance to the community and are established in this document.

The relevance of the environmental measurements is that these will be used to provide surety to the community that the zero risk objective set for the Remediation Programme is being achieved throughout the life of the Project.

The use of continuous recording fibre counting instruments has been identified as a useful tool however it has a serious limitation of being able to accurately distinguish between a dust particle and a respirable sized fibre - whether of asbestos or non-asbestos origin.

As a consequence calibration of the instrument will be needed and it would provide a reaction trigger by the occupational hygienist to document the adherence to the methodology in place rather than cause a noncompliance.

The availability of an environmental air monitoring method in Australia is limited. The US EPA has extensive experience with the application of transmission electron microscopy (TEM). The use of TEM has been researched further and a laboratory that would be used to undertake the analysis has been identified and preliminary arrangements have been made to facilitate obtaining results of the environmental monitoring within 3 days of the sampling.

Environmental monitoring would be conducted on a periodic basis either weekly or monthly as discussed in a later section of this document.

Continuous fibre counting using direct reading instruments would be undertaken at two site perimeter locations placed in line with the work zones and one at each of the East and West perimeters. The instrument is provided by ECOTECH. It is sourced from the USA where it was specifically developed for real time fibre monitoring. The instrument is a MSP 7400AD Fibre Monitor. The limits of accuracy from the manufacturer are expressed with reference to fibre length and diameter:

- Detectable fibre length 2 to 300 microns;
- Detectable fibre diameter 0.2 to 20 microns
- Detectable fibre concentration –
  Minimum – 95% confidence and 12.5% precision depends on sampling time.
  – 8 hour sampling time 0.1 fibres/Litre (i.e. 0.001 fibres/millilitre).
  – 1 minute sampling time 50 fibres/Litre (i.e. 0.05 fibres/millilitre).

The use of the instrument and reaction to the monitoring results will depend on calibration against the phase contrast microscopy and transmission electron microscopy that will be undertaken. Initially this would be during the pilot trial programme and then at commencement of the full extent of the remediation programme.

3. LEGISLATIVE REQUIREMENTS

The following clauses are from the Work Health and Safety Regulation 2011 that are most relevant to asbestos and the Remediation Works.

The user of this document is required to fully understand and accept these regulatory requirements.

The reader is also directed to two Codes of Practice released by WorkCover.

- How to Manage and Control Asbestos in the Work Place December 2011
- How to Safely Remove Asbestos December 2011

Clause 464 Asbestos control plan requires that the licensed asbestos removalist prepare an asbestos control plan.

The Asbestos Safe Work Method Statement (this document and attachments serves as the asbestos control plan.

Clause 477 Removing friable asbestos requires amongst other things that the asbestos removal area expressed using the words work zone and work cell in this document, is enclosed to prevent the release of respirable asbestos fibre. This requirement is the basis of the asbestos dust control in this document coupled with several other control strategies Clause 477(b) refers to the use of negative pressure.

Due to the work being undertaken in the open not in a building and findings from work undertaken on a similar project undertaken for the USA EPA where enclosures were not used, and findings from a detail study of alternate removal methods at a refinery in the USA, negative air pressure is not considered to be warranted as suitable alternative involving the use of a dust suppressant foam on specific surfaces and water fogging within the wind mitigating device over the wetted surfaces are considered sufficient. Due to an enclosure having to be a large structure, achieving a negative air pressure that would work adequately is not considered to be practical and prevention of release of asbestos fibres at source is considered to be more reliable and effective.

Considerable research of the proven success of remediation using wet dust suppression as the main means of dust control was undertaken.

There were three projects of a similar nature identified. One in Israel and the two US EPA Superfund projects at Waukegan Illinois. Technical data on the first project could not be accessed. Information was able to be obtained on the US EPA projects and these supported the conclusion that saturation of the asbestos containing materials would be sufficient to satisfy the Work Health and Safety permissible limits. This was confirmed by personal communication with the projects' remediation manager.

Further safeguards are considered warranted to achieve the zero risk policy that has been adopted. Therefore means of preventing the work area or on site haulage routes to be exposed to wind currents of >1 metre/second were considered to be crucial. Hence the use of a technique similar to a wind break but with other design features, was devised.

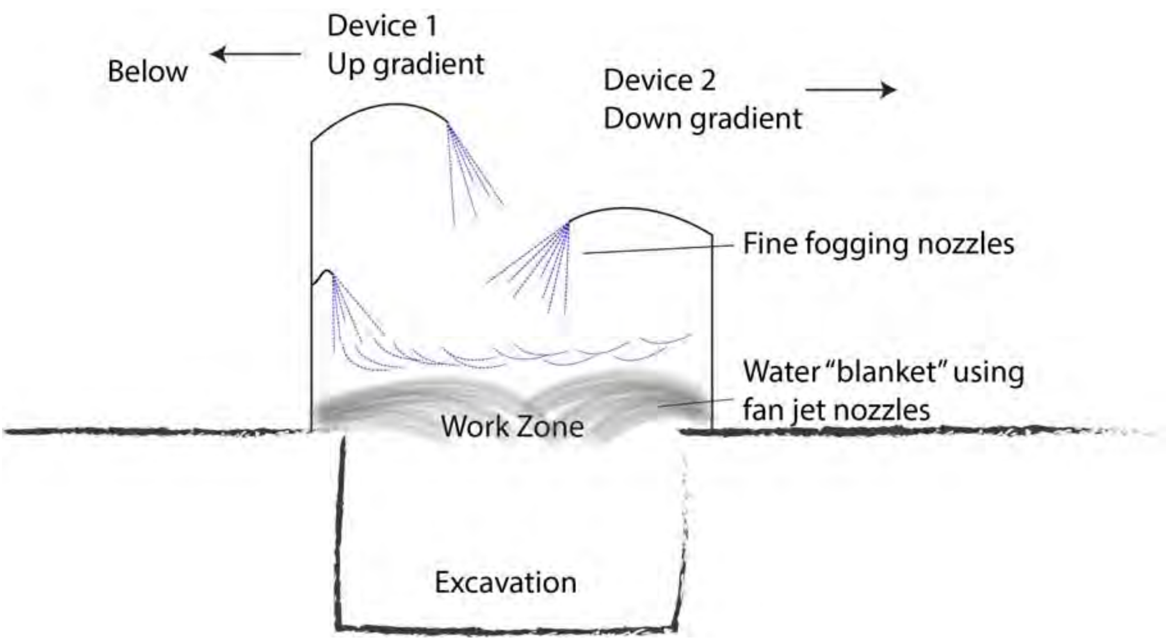
A wind mitigation device combines the following design features:

- Windproof to height of 6–9 metres depending on results of smoke tests during the pilot trial programme;
- Top edge is curved to prevent positive upwards air movement across the face of the work cell;
- Along the underside of the curved surface a row of foggers 1 m apart and able to release a fine mist of water that will flow to ground and provide a means of wetting dust particles and using the density of the wetted dust and absence of wind currents preventing vertical or horizontal dispersion.

During the pilot trial programme the need for a second wind mitigating device on the opposite side of the work cell would be studied. This would be the contingency used if the objectives of the zero risk methods do not achieve the 0.1 fibre/millilitre and 0.01 fibre/millilitre work zone air monitoring objectives.

The controls are designed to prevent the release of asbestos fibres and dust at source and to control dispersion and contain asbestos fibres and dust to within the work zone.

The appearance of a wind mitigating device is shown below:



Based on the findings of the US EPA experience and our control methodology, an application would be made to exempt the project from clauses 420 and 477 on the basis of the alternative method. The alternative method is discussed in detail in two reports prepared by Benbow Environmental.

- Alternative Asbestos Dust Controls for Large Scale Projects. Report No 131039_Alternative Asbestos Dust Controls_Rev2.
- Environmental Assessment of Using Foams for Asbestos Fibre Control Report No. 131039_Environmental Assessment_Rev2.

A review of the exemptions would be made on the basis of the findings from the pilot trial programme.

The MANN Group would be the preferred licensed asbestos contractor as they have undertaken works on site during preparation of the RAP and have a high standard of acceptance. Their licence number is AD 211059.

Clause 420 Exposure to Airborne Asbestos at Workplace

(1) A person conducting a business or undertaking at a workplace must ensure that:

(a) exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable, and

(b) if it not reasonably practicable to eliminate exposure to airborne asbestos—exposure is minimised so far as is reasonably practicable.

Note. WHS Act—section 19 (see clause 9).

(2) A person conducting a business or undertaking at a workplace must ensure that the exposure standard for asbestos is not exceeded at the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) Subclauses (1) (a) and (2) do not apply in relation to an asbestos removal area:

(a) that is enclosed to prevent the release of respirable asbestos fibres in accordance with clause 477,

(b) in which negative pressure is used in accordance with that clause.

Clause 429 Asbestos Management Plan

(1) This clause applies if asbestos or ACM is:

(a) identified at a workplace under clause 422, or

(b) likely to be present at a workplace from time to time.

(2) A person with management or control of the workplace must ensure that a written plan (an asbestos management plan) for the workplace is prepared.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) A person with management or control of the workplace must ensure that the asbestos management plan is maintained to ensure the information in the plan is up to date.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(4) An asbestos management plan must include information about the following:

(a) the identification of asbestos or ACM,

Example. A reference or link to the asbestos register for the workplace and signage and labelling.

(b) decisions, and reasons for decisions, about the management of asbestos at the workplace,

Example. Safe work procedures and control measures.

(c) procedures for detailing incidents or emergencies involving asbestos or ACM at the workplace,

(d) workers carrying out work involving asbestos.

Example. Consultation, responsibilities, information and training.

(5) A person with management or control of a workplace must ensure that a copy of the asbestos management plan for the workplace is readily accessible to:

(a) a worker who has carried out, carries out or intends to carry out,
work at the workplace, and

(b) a health and safety representative who represents a worker referred to in paragraph (a), and

(c) a person conducting a business or undertaking who has carried out, carries out or intends to carry out, work at the workplace, and

(d) a person conducting a business or undertaking who has required, requires, or intends to require work to be carried out at the workplace.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

Clause 435 Duty to Provide Health Monitoring

(1) A person conducting a business or undertaking must ensure that health monitoring is provided, in accordance with clause 436, to a worker carrying out work for the business or undertaking if the worker is:

(a) carrying out licensed asbestos removal work at a workplace and is at risk of exposure to asbestos when carrying out the work, or

(b) is carrying out other ongoing asbestos removal work or asbestos-related work and is at risk of exposure to asbestos when carrying out the work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) For the purposes of subclause (1) (a), the person must ensure that the health monitoring of the worker commences before the worker carries out licensed asbestos removal work.

(3) The person must ensure that the worker is informed of any health monitoring requirements before the worker carries out any work that may expose the worker to asbestos.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 445 Duty to Train Workers about Asbestos

(1) In addition to the training required by Division 1 of Part 3.2, a person conducting a business or undertaking must ensure that workers engaged by the person, whom the person reasonably believes may be involved in asbestos removal work or in the carrying out of asbestos-related work, are trained in the identification and safe handling of, and suitable control measures for, asbestos and ACM.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) This clause does not apply in relation to a worker referred to in clause 460.

(3) The person must ensure that a record is kept of the training undertaken by the worker:

(a) while the worker is carrying out the work, and

(b) for 5 years after the day the worker ceases working for the person.

Maximum penalty:

(a) in the case of an individual—$1,250, or

(b) in the case of a body corporate—$6,000.

(4) The person must keep the record available for inspection under the Act.

Maximum penalty:

(a) in the case of an individual—$1,250, or

(b) in the case of a body corporate—$6,000.

Clause 446 Duty to limit use of Equipment

(1) A person conducting a business or undertaking must not use, or direct or allow a worker to use, either of the following on asbestos or ACM:

(a) high-pressure water spray,

(b) compressed air.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

(2) Subclause (1) (a) does not apply to the use of a high pressure water spray for fire fighting or fire protection purposes.

(3) A person conducting a business or undertaking must not use, or direct or allow a worker to use, any of the following equipment on asbestos or ACM unless the use of the equipment is controlled:

(a) power tools,
(b) brooms,
(c) any other implements that cause the release of airborne asbestos into the atmosphere.

Maximum penalty:

(a) in the case of an individual—$3,600, or
(b) in the case of a body corporate—$18,000.

(4) In subclause (3), the use of equipment is **controlled** if:

(a) the equipment is enclosed during its use, or
(b) the equipment is designed to capture or suppress airborne asbestos and is used in accordance with its design, or
(c) the equipment is used in a way that is designed to capture or suppress airborne asbestos safely, or
(d) any combination of paragraphs (a), (b) and (c) applies.

Clause 458 Duty to ensure Asbestos Removalist is licensed

(1) A person conducting a business or undertaking that commissions the removal of asbestos must ensure that the asbestos removal work is carried out by a licensed asbestos removalist who is licensed to carry out the work.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

(2) Subclause (1) does not apply if the asbestos to be removed is:

(a) 10 square metres or less of non-friable asbestos or ACD associated with the removal of that amount of non-friable asbestos, or
(b) ACD that is not associated with the removal of friable or non-friable asbestos and is only a minor contamination.

(3) If subclause (2) applies, the person conducting the business or undertaking that commissions the asbestos removal work must ensure that the work is carried out by a competent person who has been trained in accordance with clause 445.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 459 Asbestos Removal Supervisor must be present or readily available

A licensed asbestos removalist must ensure that the nominated asbestos removal supervisor for asbestos removal work is:

(a) if the asbestos removal work requires a Class A licence—present at the asbestos removal area whenever the asbestos removal work is being carried out, and
(b) if the asbestos removal work requires a Class B licence—readily available to a worker carrying out asbestos removal work whenever the work is being carried out.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 460 Asbestos removal worker must be trained

(1) A licensed asbestos removalist must not direct or allow a worker to carry out licensed asbestos removal work unless the removalist is satisfied that the worker holds a certification in relation to the specified VET course for asbestos removal relevant to the class of licensed asbestos removal work to be carried out by the worker.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) A licensed asbestos removalist must provide appropriate training to a worker carrying out licensed asbestos removal work at a workplace to ensure that the work is carried out in accordance with the asbestos removal control plan for the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) In this clause, **appropriate training** means training designed specifically for the workplace where the licensed asbestos removal work is carried out and the work to be carried out at the workplace.

Note. Unless this clause applies, the obligation to provide training to workers

Clause 461 Licensed asbestos removalist must keep training records

(1) A licensed asbestos removalist must keep a record of the training undertaken by a worker carrying out licensed asbestos removal work:

(a) while the worker is carrying out licensed asbestos removal work; and

(b) for 5 years after the day the worker stopped carrying out licensed asbestos removal work for the removalist.

Maximum penalty:

(a) in the case of an individual—$1,250, or

(b) in the case of a body corporate—$6,000.

(2) The licensed asbestos removalist must ensure that the training record is readily accessible at the asbestos removal area and available for inspection under the Act.

Maximum penalty:

(a) in the case of an individual—$1,250, or

(b) in the case of a body corporate—$6,000.

Clause 462 Duty to give information about health risks of licensed asbestos removal Work

A licensed asbestos removalist must give the following information to a person likely to be engaged to carry out licensed asbestos removal work before the person is engaged to carry out the work:

(a) the health risks and health effects associated with exposure to asbestos,

(b) the need for, and details of, health monitoring of a worker carrying out licensed asbestos removal work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 463 Asbestos removalist must obtain register

A licensed asbestos removalist must obtain a copy of the asbestos register for a workplace before the removalist carries out asbestos removal work at the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) Subclause (1) does not apply if the asbestos removal work is to be carried out at residential premises.

Clause 464 Asbestos removal control plan

(1) A licensed asbestos removalist must prepare an asbestos removal control plan for any licensed asbestos removal work the removalist is commissioned to undertake.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) An asbestos removal control plan must include:

(a) details of how the asbestos removal will be carried out, including the method to be used and the tools, equipment and personal protective equipment to be used, and

(b) details of the asbestos to be removed, including the location, type and condition of the asbestos.

(3) The licensed asbestos removalist must give a copy of the asbestos removal control plan to the person who commissioned the licensed asbestos removal work.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

Clause 465 Asbestos removal control plan to be kept and available

(1) Subject to subclause (2), a licensed asbestos removalist must ensure that a copy of the asbestos removal control plan prepared under clause 464 is kept until the asbestos removal work to which it relates is completed.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

(2) If a notifiable incident occurs in connection with the asbestos removal work to which the asbestos removal control plan relates, the licensed asbestos removalist must keep the asbestos removal control plan for at least 2 years after the incident occurs.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

(3) The licensed asbestos removalist must ensure that, for the period for which the asbestos removal control plan must be kept under this clause, a copy is:

(a) readily accessible to:

(i) a person conducting a business or undertaking at the workplace, and

(ii) the person's workers at the workplace, or a health and safety representative who represents the workers, and

(iii) if the asbestos removal work is to be carried out in residential premises—the occupants of the premises, and

(b) available for inspection under the Act.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

Clause 466 Regulator must be notified of asbestos removal

(1) A licensed asbestos removalist must give written notice to the regulator at least 5 days before the removalist commences licensed asbestos removal work.

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

(2) Despite subclause (1), licensed asbestos removal work may be commenced immediately if there is:

(a) a sudden and unexpected event, including a failure of equipment, that may cause persons to be exposed to respirable asbestos fibres, or

(b) an unexpected breakdown of an essential service that requires immediate rectification to enable the service to continue.

(3) If the asbestos must be removed immediately, the licensed asbestos removalist must give notice to the regulator:

(a) immediately by telephone, and

(b) in writing within 24 hours after notice is given under paragraph (a).

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

(4) A notice under subclause (1) or (3) must include the following:

(a) the following in relation to the licensed asbestos removalist:

(i) name,

(ii) registered business name,

(iii) Australian Business Number,

(iv) licence number,

(v) business contact details,

(b) the name and business contact details of the supervisor of the licensed asbestos removal work,

(c) the name of the competent person or licensed asbestos assessor engaged to carry out a clearance inspection and issue a clearance certificate for the work,

(d) the name and contact details of the person for whom the work is to be carried out,

(e) the following in relation to the workplace where the asbestos is to be removed:

(i) the name, including the registered business or company name, of the person with management or control of the workplace,

(ii) the address and, if the workplace is large, the specific location of the asbestos removal,

(iii) the kind of workplace,

(f) the date of the notice,

(g) the date when the asbestos removal work is to commence and the estimated duration of the work,

(h) whether the asbestos to be removed is friable or non-friable,

(i) if the asbestos to be removed is friable—the way the area of removal will be enclosed,

(j) the estimated quantity of asbestos to be removed,

(k) the number of workers who are to carry out the asbestos removal work,

(l) for each worker who is to carry out asbestos removal work—details of the worker's competency to carry out asbestos removal work.

Clause 468 Person with management or control of workplace must inform persons about asbestos removal work

(1) This clause applies if the person with management or control of a workplace is informed that asbestos removal work is to be carried out at the workplace.

(2) The person must ensure that the following persons are informed that asbestos removal work is to be carried out at the workplace and when the work is to commence, before the work commences:

(a) the person's workers and any other persons at the workplace,

(b) the person who commissioned the asbestos removal work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) The person must take all reasonable steps to ensure that the following persons are informed that asbestos removal work is to be carried out at the workplace and when the work is to commence, before the work commences:

(a) anyone conducting a business or undertaking at, or in the immediate vicinity of, the workplace,

(b) anyone occupying premises in the immediate vicinity of the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 469 Signage and barricades for asbestos removal work

An asbestos removalist must ensure that:

(a) signs alerting persons to the presence of asbestos are placed to indicate where the asbestos removal work is being carried out, and

(b) barricades are erected to delineate the asbestos removal area.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 470 Limiting access to asbestos removal area

(1) This clause applies to:

(a) a person conducting a business or undertaking at a workplace who commissions a person to carry out licensed asbestos removal work at the workplace, and

(b) a person with management or control of a workplace who is aware that licensed asbestos removal work is being carried out at the workplace.

(2) Subject to subclause (4), the person must ensure, so far as is reasonably practicable, that no one other than the following has access to an asbestos removal area:

(a) workers engaged in the asbestos removal work,

(b) other persons associated with the asbestos removal work,

(c) anyone allowed under this Regulation or another law to be in the asbestos removal area.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) The person may refuse to allow access to an asbestos removal area at the workplace to anyone who does not comply with:

(a) a control measure implemented for the workplace in relation to asbestos, or

(b) a direction of the licensed asbestos removalist.

(4) A person referred to in subclause (2) (a), (b) or (c) has access to an asbestos removal area subject to any direction of the licensed asbestos removalist.
(5) If a person referred to in subclause (2) (a), (b) or (c) has access to an asbestos removal area, the person must comply with any direction of the licensed asbestos removalist.
Maximum penalty:
(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 471 Decontamination facilities

(1) An asbestos removalist must ensure that facilities are available to decontaminate the following:
(a) the asbestos removal area,
(b) any plant used in the asbestos removal area,
(c) workers carrying out asbestos removal work,
(d) other persons who have access to the asbestos removal area under clause 470 (2) (b).
Maximum penalty:
(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.
(2) An asbestos removalist must ensure that nothing that is likely to be contaminated with asbestos is removed from the asbestos removal area unless the thing:
(a) is decontaminated before being removed, or
(b) is sealed in a container, and the exterior of the container is, before being removed:
(i) decontaminated, and
(ii) labelled in accordance with the GHS to indicate the presence of asbestos.
Maximum penalty:
(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 472 Disposing of asbestos waste and contaminated personal protective equipment

(1) Subject to subclauses (2) and (3), an asbestos removalist must ensure that asbestos waste:
(a) is contained and labelled in accordance with the GHS before the waste is removed from an asbestos removal area, and
(b) is disposed of as soon as practicable at a site authorised to accept asbestos waste.
Maximum penalty:
(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.
(2) An asbestos removalist must ensure that personal protective equipment used in asbestos removal work and contaminated with asbestos:
(a) is sealed in a container before being removed from an asbestos waste area, and
(b) so far as is reasonably practicable, is disposed of on the completion of the asbestos removal work at a site authorised to accept asbestos waste, and
(c) if it is not reasonably practicable to dispose of the personal protective equipment that is clothing:
(i) is laundered at a laundry equipped to launder asbestos-contaminated clothing, or
(ii) if it is not practicable to launder the clothing—is kept in the sealed container until it is re-used for asbestos removal purposes, and

(d) if it is not reasonably practicable to dispose of the personal protective equipment that is not clothing:

(i) is decontaminated before it is removed from the asbestos removal area, or

(ii) if it is not practicable to decontaminate the equipment in the asbestos removal area—is kept in the sealed container until it is re-used for asbestos removal purposes.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Example. Work boots.

(3) An asbestos removalist must ensure that a sealed container referred to in subclause (2) is decontaminated and labelled in accordance with the GHS to indicate the presence of asbestos before being removed from the asbestos removal area.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Part 8.8 Asbestos removal requiring Class A licence

Clause 475 Air monitoring—asbestos removal requiring Class A licence

(1) A person conducting a business or undertaking who commissions asbestos removal work requiring a Class A asbestos removal licence at a workplace must ensure that an independent licensed asbestos assessor undertakes air monitoring of the asbestos removal area at the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) If the workplace is residential premises, the licensed removalist carrying out asbestos removal work requiring a Class A asbestos removal licence at the premises must ensure that an independent licensed asbestos assessor undertakes air monitoring of the asbestos removal area at the premises.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) The air monitoring must be carried out:

(a) immediately before the licensed asbestos removal work commences, unless glove bags are to be used for the removal, and

(b) while the licensed asbestos removal work is carried out.

(4) The person who commissions the licensed asbestos removal work must ensure that the results of the air monitoring are given to the following:

(a) workers at the workplace,

(b) health and safety representatives for workers at the workplace,

(c) a person conducting a business or undertaking at the workplace,

(d) other persons at the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(5) If the workplace is residential premises, the licensed asbestos removalist carrying out the licensed asbestos removal work at the premises must ensure that the results of the air monitoring are given to the following:

(a) the person who commissioned the asbestos removal work,

(b) workers at the workplace,

(c) health and safety representatives for workers at the workplace,

(d) a person conducting a business or undertaking at the workplace,

(e) the occupier of the residential premises,

(f) the owner of the residential premises,

(g) other persons at the workplace.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(6) An independent licensed asbestos assessor, who undertakes air monitoring for the purposes of this clause, must use the membrane filter method for the air monitoring.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 476 Action if respirable asbestos fibre level too high

(1) The licensed removalist carrying out asbestos removal work requiring a Class A asbestos removal licence at a workplace must:

(a) if respirable asbestos fibre levels are recorded at the asbestos removal area at 0.01 fibres/ml or more, but not more than 0.02 fibres/ml—immediately:

(i) investigate the cause of the respirable asbestos fibre level, and

(ii) implement controls to prevent exposure of anyone to asbestos, and

(iii) prevent the further release of respirable asbestos fibres, and

(b) if respirable asbestos fibre levels are recorded at the asbestos removal area at more than 0.02 fibres/ml—immediately:

(i) order the asbestos removal work to stop, and

(ii) notify the regulator, and

(iii) investigate the cause of the respirable asbestos fibre level, and

(iv) implement controls to prevent exposure of anyone to asbestos, and

(v) prevent the further release of respirable asbestos fibre.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) If the licensed removalist stops asbestos removal work requiring a Class A asbestos removal licence because the recorded respirable asbestos fibre level exceeds 0.02 fibres/ml, the removalist must ensure that the asbestos removal work does not resume until air monitoring shows that the recorded respirable asbestos fibre level is below 0.01 fibres/ml.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 477 Removing friable asbestos

(1) A licensed asbestos removalist removing friable asbestos must ensure, so far as is reasonably practicable, the following:

(a) the asbestos removal area is enclosed to prevent the release of respirable asbestos fibres,

(b) subject to subclause (3), negative pressure is used,

(c) the wet method of asbestos removal is used,

(d) subject to subclause (3), the asbestos removal work does not commence until the air monitoring is commenced by a licensed asbestos assessor,

(e) air monitoring is undertaken during the asbestos removal work, at times decided by the independent licensed asbestos assessor undertaking the monitoring,

(f) any glove bag used to enclose the asbestos removal area is dismantled and disposed of safely.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) A licensed asbestos removalist must ensure that any enclosure used in removing friable asbestos is tested for leaks.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(3) Subclauses (1) (b) and (1) (d) do not apply if glove bags are used in the Class A asbestos removal work.

(4) The licensed removalist must not dismantle an enclosure for a friable asbestos removal area until the removalist receives results of air monitoring, showing that the recorded respirable asbestos fibre level within the enclosure is below 0.01 fibres/ml, from:

(a) if the friable asbestos is removed from residential premises—the licensed asbestos assessor who undertook the air monitoring, or

(b) in any other case—the person who commissioned the Class A asbestos removal work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(5) The licensed removalist must ensure that an enclosure for a friable asbestos removal area is dismantled in a way that, so far as is reasonably practicable, eliminates the release of respirable asbestos fibre.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(6) The person who commissioned the removal of the friable asbestos must obtain a clearance certificate from a licensed asbestos assessor after the enclosure for the friable asbestos removal area has been dismantled.
Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 480 Duty to give information about health risks of asbestos-related work

A person conducting a business or undertaking must give the following information to a person likely to be engaged to carry out asbestos-related work for the business or undertaking before the person is engaged to carry out the work:

(a) the health risks and health effects associated with exposure to asbestos,
(b) the need for, and details of, health monitoring of a worker carrying out asbestos-related work.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 481 Asbestos-related work to be in separate area

A person conducting a business or undertaking that involves the carrying out of asbestos-related work must ensure that:

(a) the asbestos-related work area is separated from other work areas at the workplace, and
(b) signs alerting persons to the presence of asbestos are placed to indicate where the asbestos-related work is being carried out, and
(c) barricades are erected to delineate the asbestos-related work area.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

Clause 482 Air monitoring

(1) A person conducting a business or undertaking at a workplace must ensure that a competent person carries out air monitoring of the work area where asbestos-related work is being carried out if there is uncertainty as to whether the exposure standard is likely to be exceeded.
Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

(2) If the competent person determines that the exposure standard has been exceeded at any time in a work area, the person conducting the business or undertaking must, so far as is reasonably practicable:

(a) determine the workers and other persons who were in the work area during that time: and
(b) warn those workers about possible exposure to respirable asbestos fibres, and
(c) so far as is reasonably practicable, warn the other persons about possible exposure to respirable asbestos fibres.

Maximum penalty:

(a) in the case of an individual—$6,000, or
(b) in the case of a body corporate—$30,000.

(3) The person conducting the business or undertaking must ensure that information about exposure to respirable asbestos fibres, including the determination made by the competent person and the results of the air monitoring, is readily accessible to the workers and other persons referred to in subclause (2).

Maximum penalty:

(a) in the case of an individual—$3,600, or

(b) in the case of a body corporate—$18,000.

Clause 483 Decontamination facilities

(1) A person conducting a business or undertaking for which asbestos-related work is carried out must ensure that facilities are available to decontaminate the following:

(a) the asbestos-related work area,

(b) any plant used in the asbestos-related work area,

(c) workers carrying out the asbestos-related work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) The person must ensure that nothing that is likely to be contaminated with asbestos is removed from the asbestos-related work area unless the thing:

(a) is decontaminated before being removed, or

(b) is sealed in a container, and the exterior of the container is:

(i) decontaminated, and

(ii) labelled in accordance with the GHS to indicate the presence of asbestos, before being removed.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Clause 484 Disposing of asbestos waste and contaminated personal protective equipment

(1) Subject to subclause (2), a person conducting a business or undertaking for which asbestos-related work is carried out must ensure that asbestos waste:

(a) is contained and labelled in accordance with the GHS before the waste is removed from an asbestos-related work area, and

(b) is disposed of as soon as practicable at a site authorised to accept asbestos waste.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

(2) The person must ensure that personal protective equipment used in asbestos-related work and contaminated with asbestos:

(a) is sealed in a container, and that the exterior of the container is decontaminated and labelled in accordance with the GHS to indicate the presence of asbestos before being removed, and

(b) so far as is reasonably practicable, is disposed of on the completion of the asbestos-related work at a site authorised to accept asbestos waste, and

(c) if it is not reasonably practicable to dispose of the personal protective equipment that is clothing:

(i) is laundered at a laundry equipped to launder asbestos-contaminated clothing, or

(ii) if it is not practicable to launder the clothing, is kept in the sealed container until it is re-used for the purposes of asbestos-related work, and

(d) if it is not reasonably practicable to dispose of the personal protective equipment that is not clothing:

(i) is decontaminated before it is removed from the asbestos removal area, or

(ii) if it is not practicable to decontaminate the equipment in the asbestos removal area, is kept in the sealed container until it is re-used for the purposes of asbestos-related work.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

Example. Work boots.

(3) The person must ensure that a sealed container referred to in subclause (2) is decontaminated and labelled in accordance with the GHS to indicate the presence of asbestos before being removed from the asbestos-related work area.

Maximum penalty:

(a) in the case of an individual—$6,000, or

(b) in the case of a body corporate—$30,000.

4. SUMMARY OF THE REMEDIATION PROGRAMME (WORKS)

A Remediation Action Plan was prepared by URS and titled:

Final Report – Revision C
Remediation Action Plan
181 James Ruse Drive Camellia NSW

The remediation programme (or works) that results from this document are summarised in this section of the Asbestos Safe Work Method Statement.

Pertinent facts to the Asbestos Safe Work Method Statement are the focus of this discussion. Reference is made to the following drawings from the Remediation Action Plan prepared by URS.

The reader who requires further details is directed to the full report prepared by URS.

4.1 SITE FACILITY MAP AND DISCUSSION

This is presented as Figure 4-1 and shows the location of the site. The site can be seen to be bordered by James Ruse Drive to the west, the Clyde Carlingford rail line to the east.

Parramatta River to the north separates the site from the University of Western Sydney Campus.

To the north west are nearest residential receivers in the urban area of Rosehill. Closest residential streets are Thomas, Broughton and Tennyson.

To the immediate south of the site are commercial premises and one of these fronts James Ruse Drive and is an After School Child Care Centre.

Adjacent to Camellia Station are further commercial premises, there being a Supermarket outlet with a day care centre located on the first floor, in an elevated position.

Further to the east along Grand Avenue are numerous large commercial/industrial premises with several hundred employees on their site.

One of these premises, API, has requested environmental air sampling at their north west boundary.

On the western side of James Ruse Drive are many commercial premises and other commercial/industrial premises extend further to the west.

On the eastern side of Parramatta River are large industrial premises and to the north east are many commercial premises of a small business nature.

Railway stations within the vicinity of the site are Camellia to the immediate south of the site and Rydalmere more distant and north of the site.

From this overview of the site locality the following are sensitive receptors to be considered in the environmental asbestos fibre sampling programme.

Air monitoring at reference locations is undertaken to provide assurance to the residential community, to the Campus of the University of Western Sydney and to premises involving children.

Equally important as the above are occupants of commercial/industrial premises and persons who travel along James Ruse Drive, the Parramatta River and the Clyde-Carlingford Rail Line.

Two methods of air monitoring would be undertaken at these reference locations for the purpose of human health:

- The transmission electron microscopy method used extensively by the US EPA. This method is able to identify fibres that are collected on the filters used for the air sampling as being organic, asbestiform or another material. The phase contrast microscopy method used on site is unable to perform this need. The TEM method enables environmental exposure levels of respirable asbestos fibres to be measured accurately.

- Direct reading instruments that record when a fibre that fits the dimensions of respirable sized asbestos fibre is present.

A set of nine reference locations have been chosen for the start of the Remediation Programme. Their location can be varied based on need, findings and community consultation.

Four reference locations have been chosen for the perimeter of the site. These are designated as Reference locations 1, 2, 3 and 9.

The other five reference locations would be at nearest residential and community receivers. A review of the reference locations would be undertaken after further consultation occurs.

Two locations where children may be located in the commercial area have been specially chosen. These are at locations 3 and 4. Reference location 3 is near the south-west corner of the site and is an after school day care centre. Reference location 4 is a child care centre located above a supermarket south-east of the site.

These are given reference numbers.

Reference Location 1: Perimeter of the site alongside the Clyde – Carlingford Rail Line

Reference Location 2: Perimeter of the site alongside James Ruse Drive

Reference Location 3: Outside the southern end of the site near the south west corner and in front of an after school day care centre

Reference Location 4: First floor of Supermarket south east of the site off Grand Avenue at a child care centre

Reference Location 5: University of Western Sydney, southern boundary and therefore adjacent to the northern bank of Parramatta River

Reference Location 6: Residences at the eastern end of Thomas Street

Reference Location 7: North West corner of API site

Reference Location 8: Residences along the eastern half of Broughton Street

Reference Location 9: Northern bank of the Parramatta River during remediation of the foreshore

A programme of monitoring is presented in Section 11 of this Asbestos Safe Work Method Statement.

The two direct reading fibre counting instruments would be located along the 1 - 1 and 2 - 2 Reference locations. These two instruments may be located at other locations during the cause of the Remediation Programme.

Figure 4-1: Site Location & Environmental Reference Locations

4.2 SITE FEATURES MAP AND DISCUSSION

The site features map is presented as Figure 4-2. This figure is an aerial photograph of the site and provides a description of the various surfaces of the site. Although shown on the figure these are discussed below.

A comparison of this figure with the following two figures, Figure 4-3 and Figure 4-4, will show the association between these surfaces, where the contaminated materials, i.e. asbestos containing materials and hydrocarbon contaminated soils, are located.

The location of the asbestos containing materials is the prime focus of the discussion. The site features map shows five surfaces that are flat (or level) areas of the site. The figure draws attention to two steep embankments, a foreshore embankment and two retaining walls.

The discussion is relevant as the presence of asbestos containing materials alters across the site and varies at the various embankments.

The treed area along the western boundary of the site is another area with the presence of asbestos containing materials.

A photographic section, Section 4.3 provides views of these various areas.

The discussion commences in the lower south west corner proceeding clockwise around the drawing.

A later sub section shows the proposed work zones and how the remediation works would be proceed.

Figure 4-2: Site Features Map

4.2.1 Lower South West Corner

This area is a level surface, concreted and extends north generally from the access road into the site to the former River Road and to the east to the Central Access Road. Along this eastern boundary of this area, the land rises to the Central Access Road.

The asbestos containing materials are buried relatively shallow across most of this area. The Figure 4-3, using colours shows that the north west part of this area has buried asbestos containing materials to 0.7-1.4 metres and three small pockets (shown as yellow) to depths of 2.1 metre.

The Environmental Cell would be placed where the Central Access Road is shown and this road has a depth to contaminate of asbestos containing materials of 0-0.7m. Hence excavation of this Cell will involve the minimum depth of excavation involving disturbing asbestos containing materials.

The Environmental Cell 2 would be placed along the western boundary of this area and where again the asbestos containing materials are also shallow. Half of the Cell, the northern half, will require excavation to 1.4m and as already noted three small pockets to 2.1m

The approach recommended is to first carry out the excavation of the southern half of Cell 2 to the depth required, and as shown in Figure 4-5, Figure 4-6 and Figure 4-7 show the structural details of the three Cells. These figures show the structural detail of the 3 Cells. Figure 4-10 shows the exact location of the three Environmental Cells. The Environmental Cells will be excavated to approximately 7m below the existing natural ground level. Therefore the majority of the excavation will be in asbestos uncontaminated material.

Therefore the excavations would be able to proceed so that sufficient depth of excavation is undertaken at the southern ends of the Cells 1 and 2 and avoid the need to stockpile all of the asbestos containing materials that need to be removed from these Cells.

This is seen as a major advantage as stockpiling and then loading the stockpiled asbestos contaminated materials back into a dump truck adds to processes that have significant potential to release airborne asbestos fibres. ALARP thinking dictates these steps need to be avoided where possible and therefore avoid additional material handling.

This would mean that the southern halves of the Cells 1 and 2 would need structures of the Cells constructed so that the asbestos containing materials can be trucked directly to the final storage location.

This approach would also enable the Cells to be used as the north south haul road with designated interconnecting east west haul roads that also have the concrete removed, the asbestos containing materials removed and enable control of the spread of asbestos dust and debris to be contained during the life of the remediation programme.

This approach would also mean that fixed water sprays could be placed above the designated haul roads and the roadway surfaces could be kept damp. This would also mean that undisturbed areas of the site would not have asbestos dust and debris spread from the 'mud' that accumulates in the treads of tyres.

Figure 4-3: Extent of Asbestos Waste and Proposed Containment Cell Locations

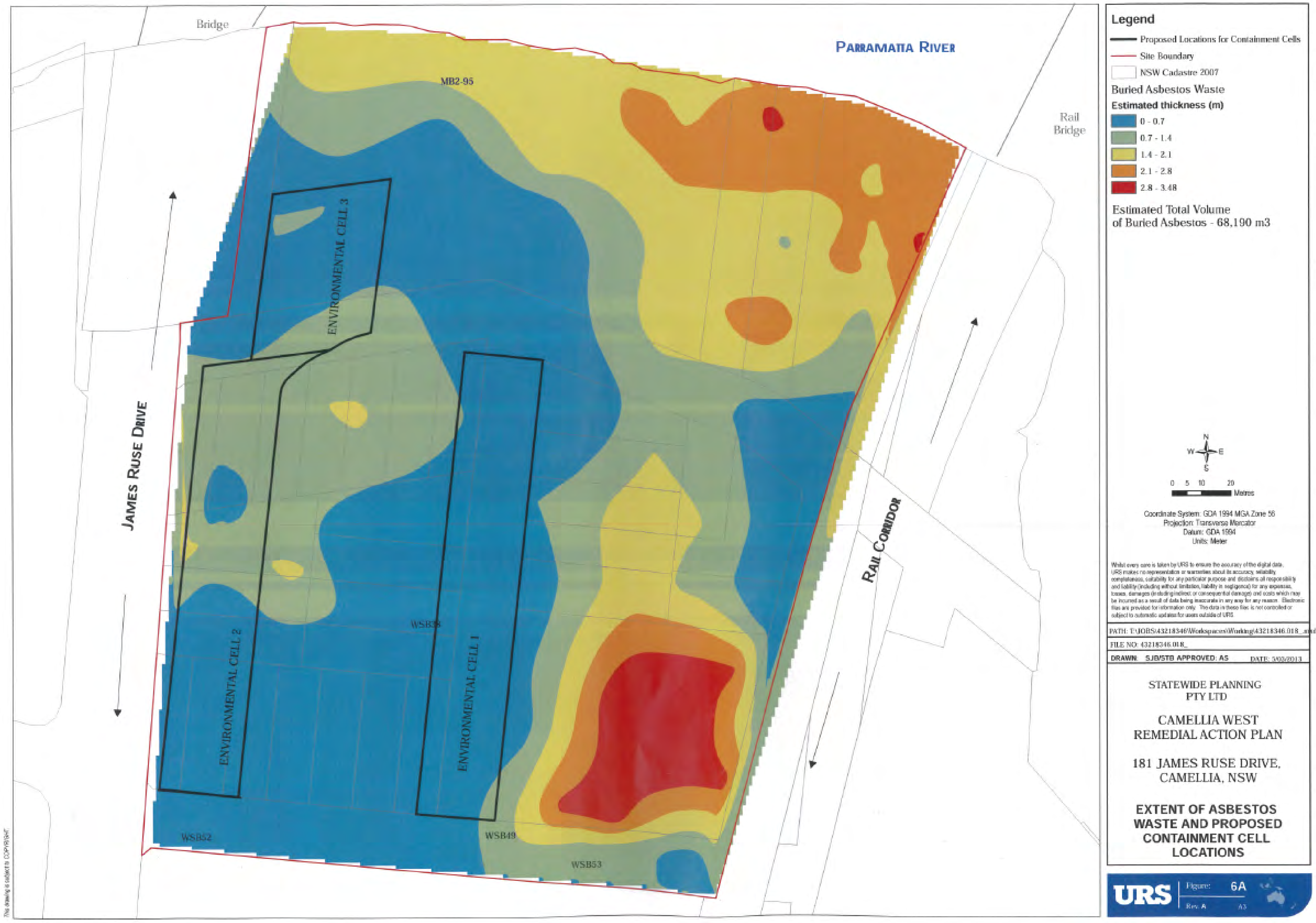


Figure 4-4: Extent of Total Fill Materials and Proposed Containment Cell Locations

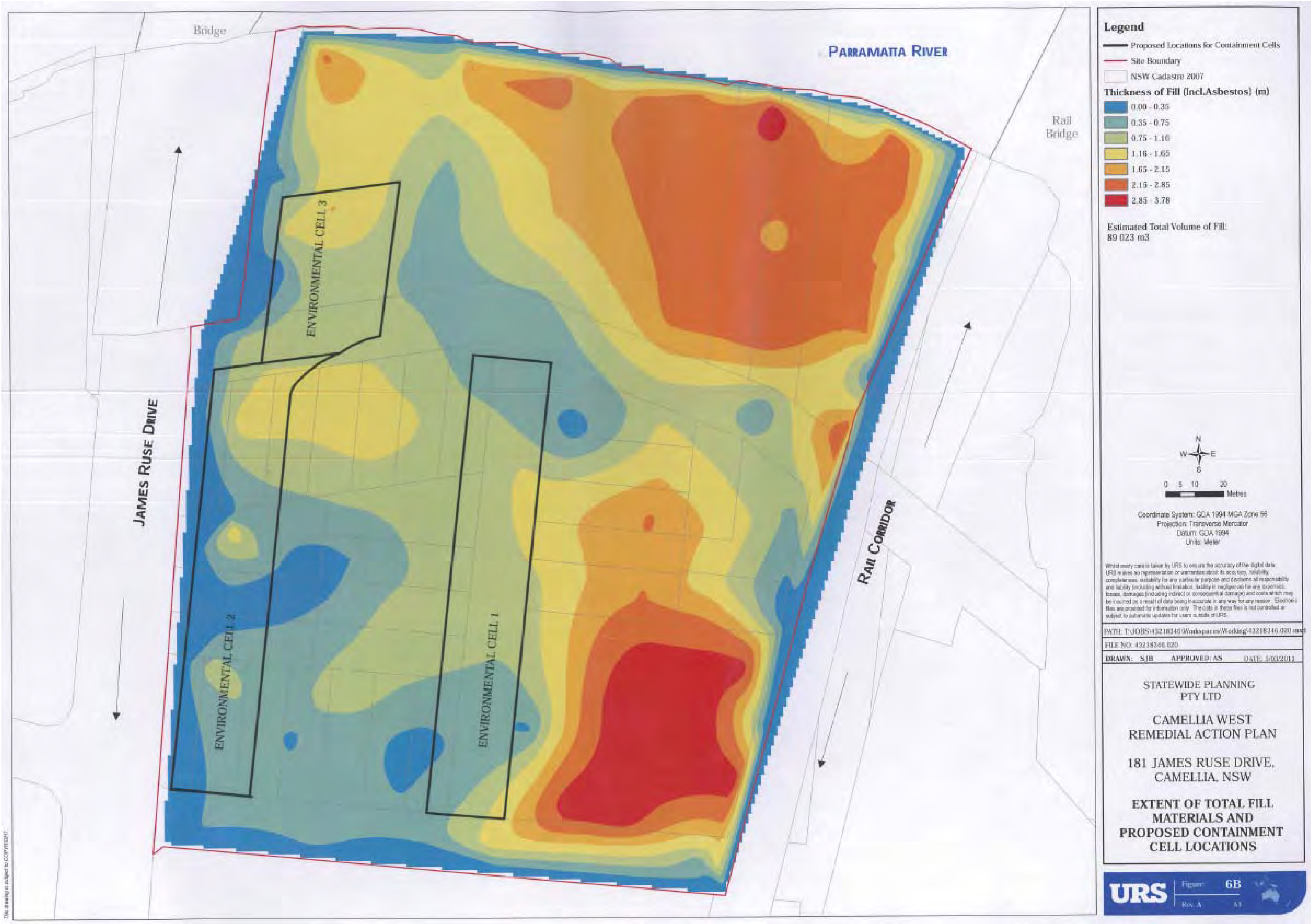


Figure 4-5: Camellia West, James Ruse Drive Camellia – Shoring Plan S101

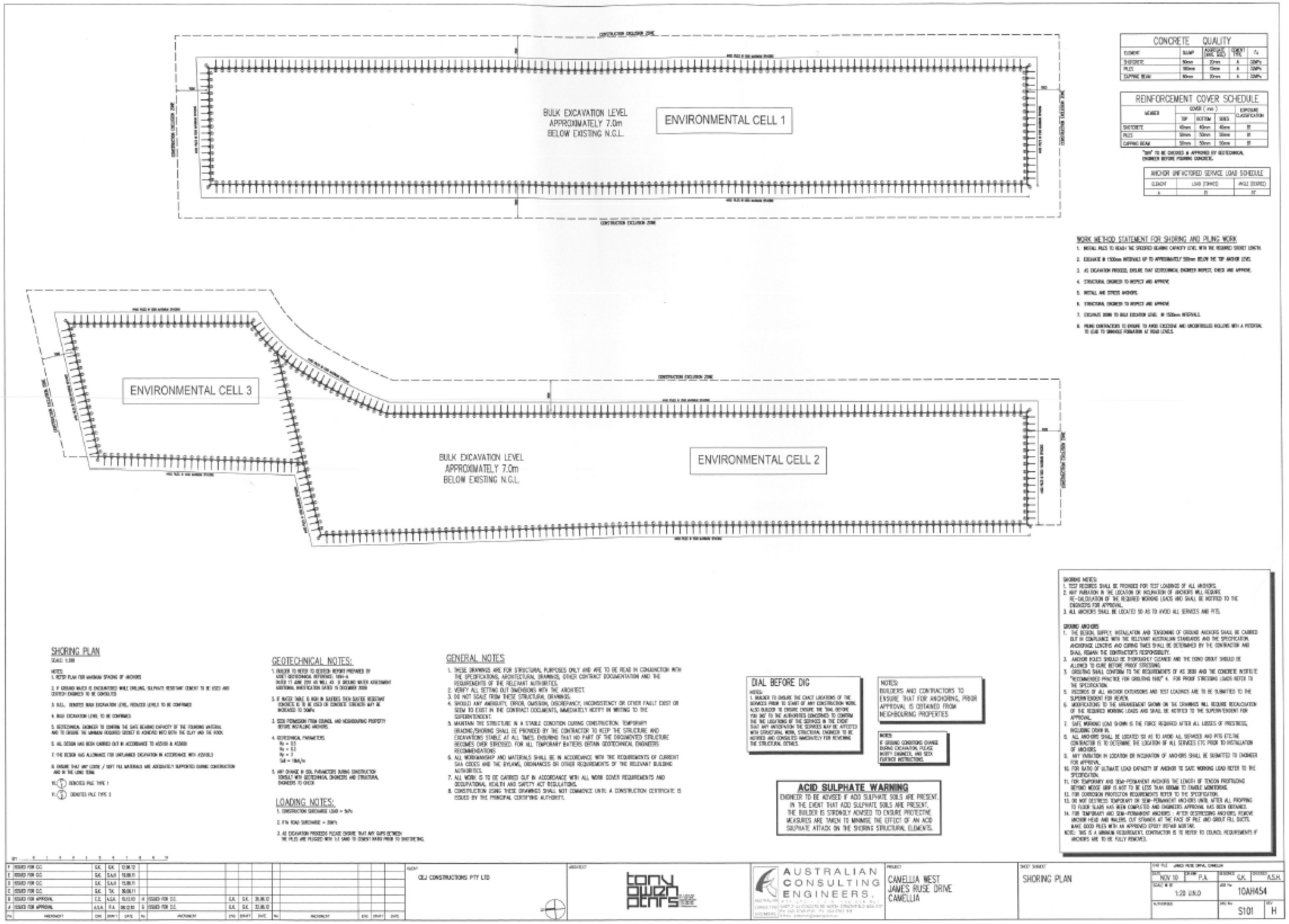


Figure 4-6: Camellia West, James Ruse Drive Camellia – Shoring Plan S102

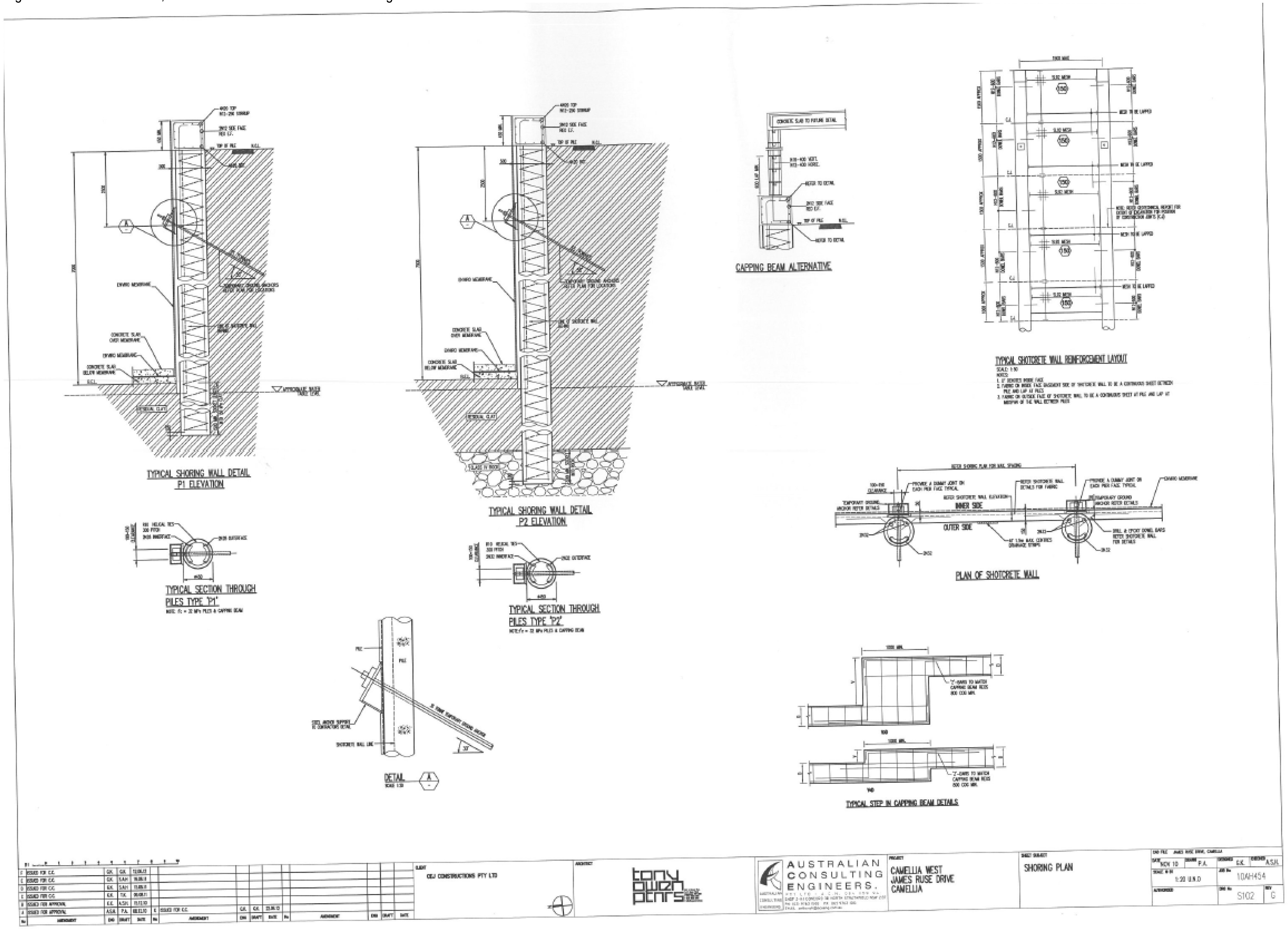
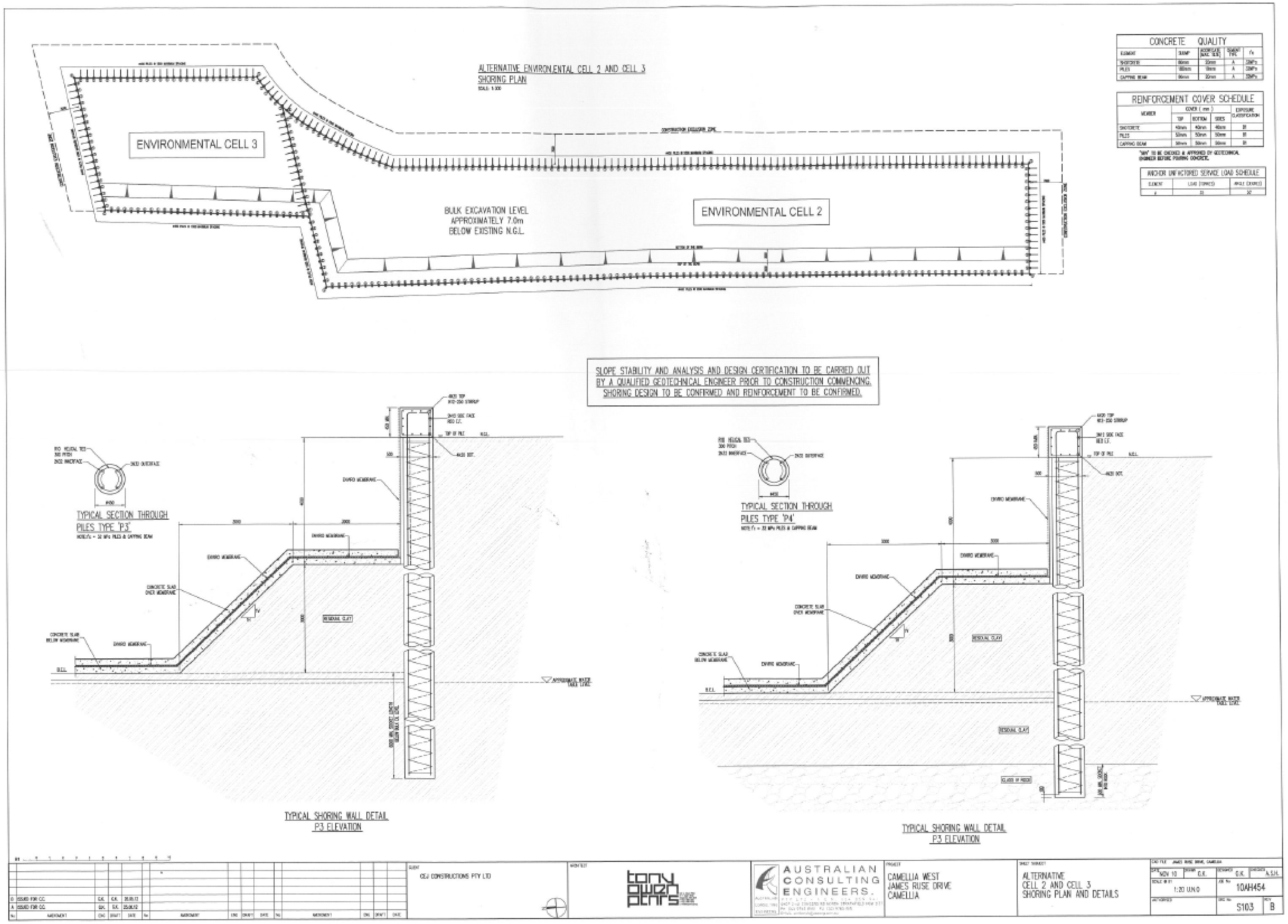


Figure 4-7: Alternative Cell 2 and Cell 3 Shoring Plan and Details



4.2.2 Level Surface

As shown on Figure 3-2 the Level Surface is in the northern 'half' of the site and extends across the full width of the site.

Figure 3-3 shows that the depth of the buried asbestos containing materials is extensive to depth of 2-1m and to 2.8m with small pockets to 3.48m.

A soil to depth sampling programme is based on NSW EPA guidelines as discussed in detail in the Remedial Action Plan and the number of drill holes provides surety for a diameter of ~30m. Therefore it can be expected that there will be other areas where the contamination from asbestos containing materials could also reach 3.48m. This is not seen as an issue and the volume of containment of the three Environmental Cells has very adequate free space available.

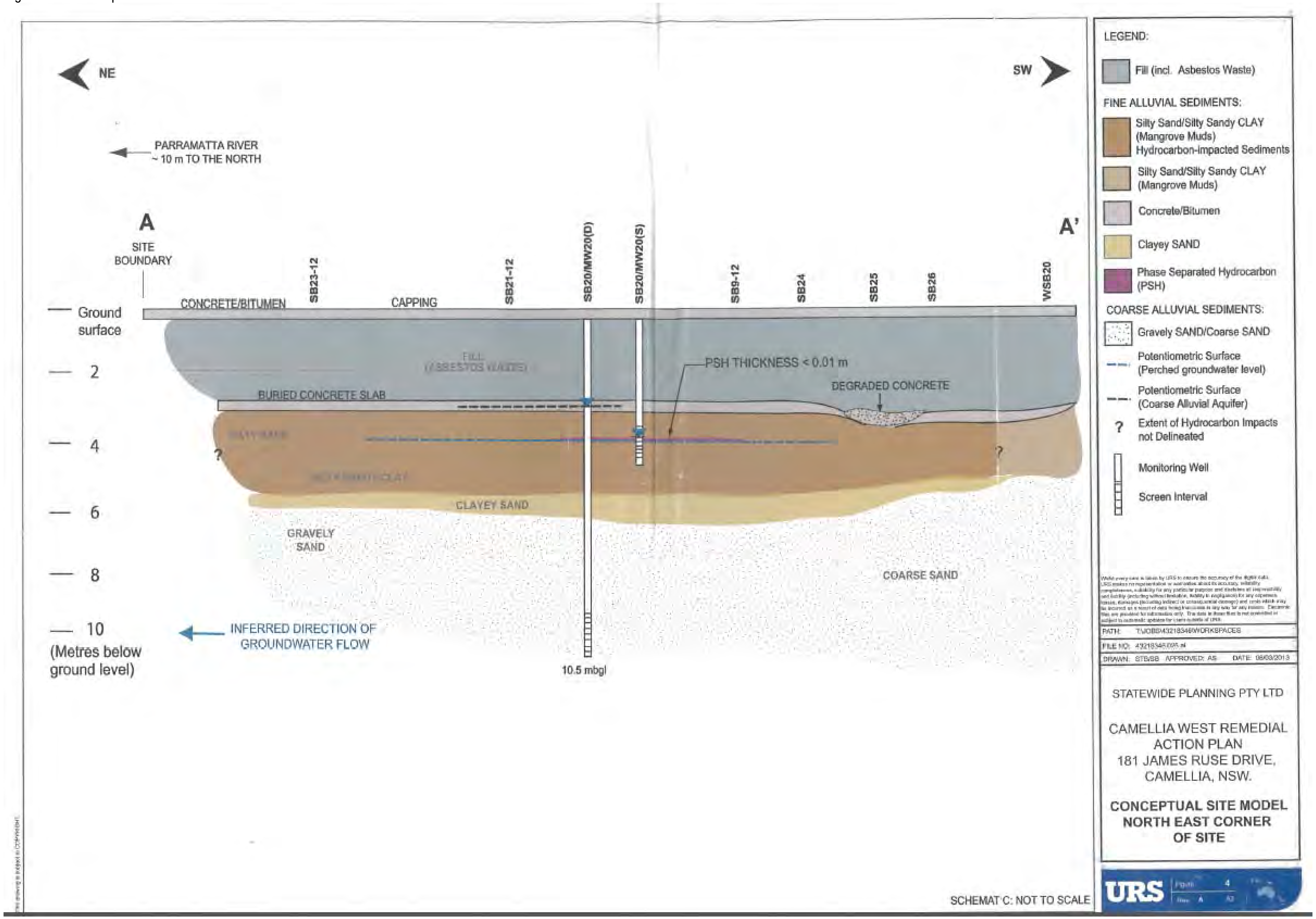
The construction of the Cells 1 and 2 to the depth required means that the asbestos containing materials from this area, i.e. the Level Surface, would be able to be transferred directly into the Cells without requiring stockpiling.

Figure 3-8 provides a Conceptual Site Model of the north east corner of the site.

It is considered that there is adequate detail to enable the Remediation Works to proceed. This figure shows that there is an area of hydrocarbons present in the silty sand.

This is shown on this figure as phase separated hydrocarbons. This material would be removed and stockpiled separate to any other stockpiled material to allow the hydrocarbons to be removed using the URS recommended treatment system of vacuum removal and air cleaning using beds of activated carbon contained in tanks.

Figure 4-8: Conceptual Site Model North East Corner of the Site



4.2.3 Raised South East Corner

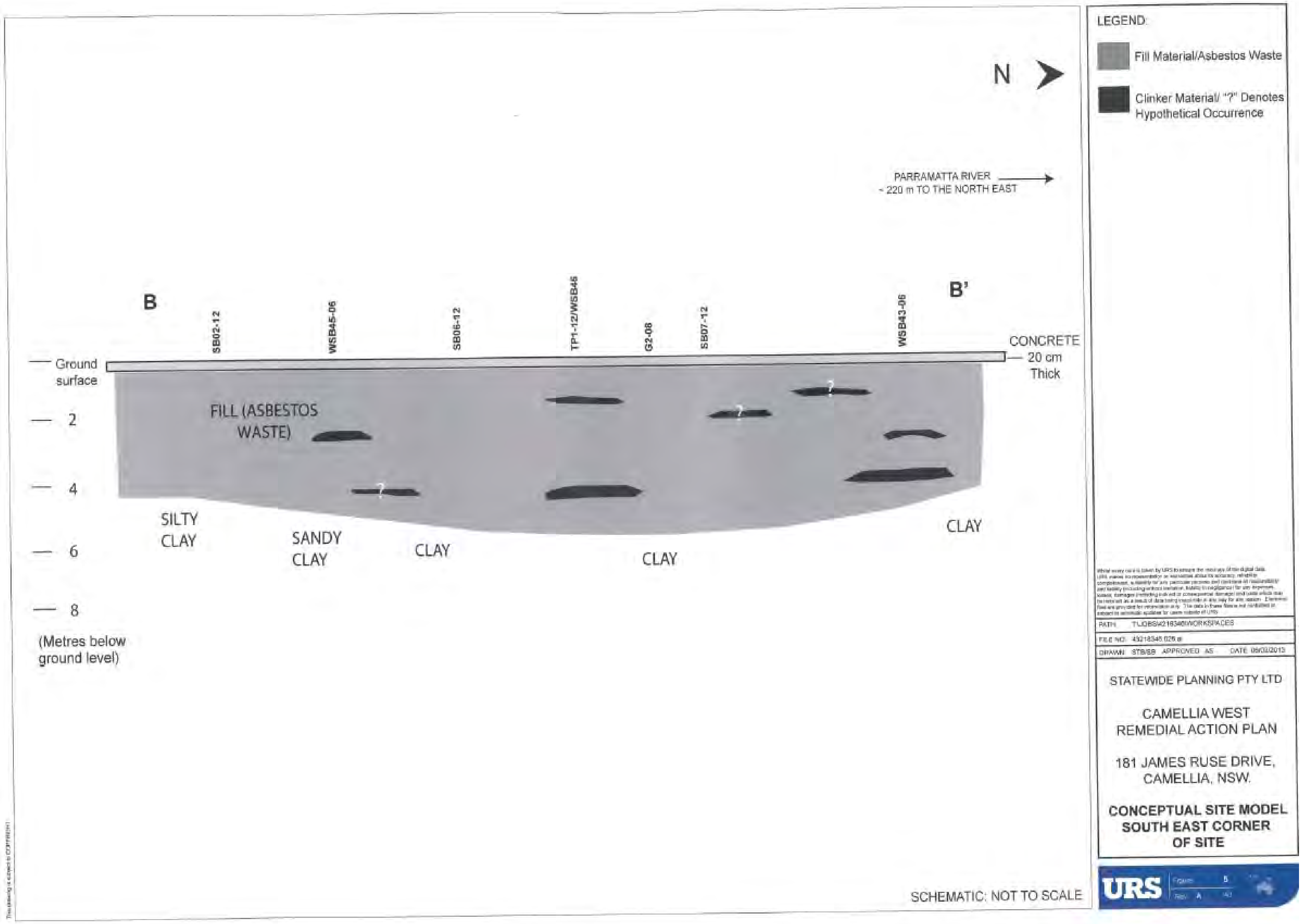
The raised south east corner, by first referring to Figure 3-3 shows depth to asbestos waste (i.e. asbestos containing materials or asbestos contaminated materials) of up to 3.48m.

The depth of this material is typically 1.4 to 3.48 m across this area of the site and will require the major excavation programme of asbestos containing materials.

Figure 3-9 shows the conceptual model for this corner of the site.

There is the opportunity therefore to directly transfer the excavated material directly across and into Cell 1 using designated east to west routes and avoid unnecessary dust generations and reduce the risks from the release of asbestos dust and debris onto paved surfaces and allowing this material to become airborne during emptying of the haul truck at stockpiles by avoiding stockpiling wherever possible.

Figure 4-9: Conceptual Site Model South East Corner of the Site



4.2.4 Embankments

The embankment at the foreshore has asbestos cement sheet and pieces of asbestos cement sheeting and piping present. Stormwater drainage pipes would also be expected to be of asbestos cement. This material would be removed and placed into the Cells.

Similarly along the treed western boundary of the site asbestos cement fragments are present and these extend down this side of the site and to the treed area outside the site perimeter and in the vegetated area adjacent to the road bridge of James Ruse Drive across Parramatta River. These areas would also be subject to the Remediation Works.

4.3 PHOTOGRAPHS

The following set of Photographs were recorded during May 2013 and provides support for the discussion.

Photograph 1A: The northern half of the site viewed to the west. The James Ruse Drive bridge over Parramatta River is in the background and the bank of the River commences to the right of the photograph.

Photograph 1B: A further view of the northern half of the site viewed to the east.

Photograph 1C: The Clyde Carlingford Rail line bridge across the Parramatta River is in the background of the photograph. There are numerous fragments of asbestos cement on the concreted areas. This is asbestos dust and debris and needs to be removed using safe work practices so that this material is not pulverised and able to become an uncontrolled source of airborne asbestos fibres and dust.

Photograph 2A: The edge of the River bank has the asbestos cement partially covered. Fragments of asbestos cement have been scattered through the mangroves and will require a depth of soil to be removed and the cleaned surfaces validated to the standards discussed in the URS Remedial Action Plan.

Photograph 2B: Fragments of asbestos cement on the foreshore.

Photograph 2C: A view to the east along the foreshore.

Photograph 2D: A further view along the foreshore.

Photograph 2E: The sheets of asbestos cement are visible through portions of this fabric.

Photograph 2F: A further view.

Photograph 3: A view from the North West corner of the site in a southerly direction. The photograph is taken from where Cell 3 would be located.

Photograph 4: A view along the western edge of the site where asbestos cement fragments are also on the surface. The remediation of the site would remove the potential for these fragments to be disturbed and release asbestos fibres.

Photograph 5A: Contamination of stormwater pits and pipelines has occurred from past uses of the site. This pit is in the northern area of the site.

Photograph 5B: Fragments are in the floor of the pit.

Photograph 6: A view to the north along the eastern boundary of the site. The retaining wall along the eastern half of the site, shown on Figure 4-1, can be seen.

Photograph 7: A view to the south from near the eastern boundary of the site showing the intersection of the former River Road and the Central Access Road.

Photograph 8A: The embankment from the level surface shown in Figure 4-1 down to the former River Road. This roadway would have been the original ground surface of the site if as expected the power pole shown is original.

5. SUMMARY OF ASBESTOS DUST CONTROL

The purpose of the summary is to discuss the asbestos dust controls that are available and to develop the approach that is adopted.

As noted earlier in the Statement two additional reports have been compiled which provide further technical details that support the basis of the asbestos dust controls.

Nature of the Asbestos Containing Materials Present at Site

The RAP prepared by URS has defined in sufficient detail the locations of the asbestos containing materials. The forms of the ACM and the types of asbestiform minerals i.e. serpentine and amphibole that are present.

The forms of asbestos containing materials are principally asbestos cement in the form of sheeting. It is understood sheeting is not compacted together within the site but is along the river bank.

There are areas beneath the site where friable asbestos in the form of fibre containing sludge will be present.

Disturbance of either of these forms of asbestos containing material would be defined as working with friable asbestos and the relevant Clauses of the Work, Health and Safety Regulations 2011 would apply.

The types of asbestos fibres present are chrysotile (white), amosite (brown) and crocidolite (blue).

All types are treated within the same level of health risk.

The regulatory requirements when removing friable asbestos are in summary the following:

- Saturate the entire body of the friable asbestos using water injection.
- Removal of the wetted friable asbestos using an enclosure placed under negative pressure and exhausting the air through a HEPA filter.
- Use of approved PPE.

There are many other requirements but for the purpose of this summary discussion these are the principal requirements.

The excavation of the asbestos containing material will cause the disturbed surfaces to be broken and asbestos fibres will be exposed and would become airborne unless effective controls are in place.

Wetting of the asbestos containing material throughout the body of compacted asbestos cement sheets will therefore not be possible, it is unable to be done unless holes are placed through the body of the asbestos wastes and water is used to flood the wastes.

In addition, saturation of the exposed surfaces of the asbestos cement would be done before the surfaces of this material are disturbed. This means having water layers over the exposed surfaces. The water will contain a wetting agent as required by the regulations and in accordance with the following Codes of Practice:

- How to Manage and Control Asbestos in the Work Place December 2011
- How to Safely Remove Asbestos December 2011

The following table discusses the advantages and disadvantages of the methods available to control the generation of airborne asbestos fibre and contain their dispersion to confined areas within the work areas.

Table 5-1: Methods of Asbestos Dust Control

Method	Advantages	Disadvantages
1. Place entire site within an enclosure subjected to negative air pressure.	Complete isolation of site from the surrounding environment.	Impractical to provide negative air pressure that would achieve the 12 Pa (water gauge) negative pressure over such a large air volume. The air capture velocities at work areas would be non-existent due to the large volume of air that exists. On completion of the remediation the whole of the inside surfaces of the enclosure would need to be cleaned before being dismantled. This would be a massive undertaking requiring scaffolding and covering of the whole of the site ground surface in 200 micron plastic as any asbestos fibre resting on the enclosure would be dislodged.

Table 5-1: Methods of Asbestos Dust Control

Method	Advantages	Disadvantages
2. Use wind mitigating devices erected over the work areas and subject these to negative air pressure. Thoroughly wet the asbestos containing materials before disturbing. Use water foggers during disturbance, wetting agent and binder added to the water stream. Wash down sides of dump truck. Cover the load. At the dumping point apply foggers as above. Dumping point also to be within a negative air pressure enclosure. Wind mitigating devices that consist of high 6–9m wind breaks with returns over the top to prevent wind eddies entering the work area need to be movable so that set up time is limited. Negative air pressure will require large number of fans and HEPA filters. Diesel generator required at each set of wind mitigating devices. Dump trucks enter the wind mitigating device from openable ends. No disturbance occurs while any side or end is opened. Exclusion zone established with signage and barrier tape. Supervisor has control of who accesses the wind mitigating device.	Isolation of the release of airborne asbestos fibres from the work area. Prevention of generation of airborne asbestos fibres exceeding 0.1 f/ml using wet methods. Prevention of dispersion of airborne asbestos fibres. Readily able to achieve <0.1 f/ml outside the wind mitigating device.	Impractical to achieve the required 12 Pa (water gauge) negative pressure in the wind mitigating device as these will be of considerable size – ~ 9m high, ~40m long and 8-10m wide. This is a large volume of air to displace to maintain the negative pressure. Difficulty in maintaining the negative air pressure as an enclosure would be buffeted by breezes and leakages around the ground surfaces. Analyses of various methods at oil refinery in the US showed that absence of negative air pressure did not reduce the effectiveness of the control of respirable sized asbestos fibres immediately outside the wind mitigating device. The wind mitigating device needs to fully envelop the work area to be effective.
3. Use Method 2 but no negative air pressure. Apply a foam dust suppressant to the surface of the asbestos containing materials as these are being disturbed. Saturate the asbestos wastes by drilling holes through the concrete and saturate the subsoil beneath the concrete. Water fogger sprays would be placed across the top of the wind mitigating devices. Double wind mitigating devices may be needed, one on either side of the excavation. Along the long sides of the environmental cells wind shields 3–4m high would be erected with water sprays located across the top of the wind shields to provide further dust control if it is needed.	Isolation of the release of airborne asbestos fibres from the work area. Prevention of generation of airborne asbestos fibres exceeding 0.1 f/ml using wet methods. Prevention of dispersion of airborne asbestos fibres. Readily able to achieve <0.1 f/ml outside the wind mitigating device.	None

Table 5-1: Methods of Asbestos Dust Control		
Method	Advantages	Disadvantages
4. Use wet methods only.	Simpler to set up and use. US EPA studies, not yet fully researched, extensively indicate that the limit of 0.1 f/ml is achievable at the work area and 0.01 at exclusion zone.	No control of wind effects. No additional safeguard. Risks inadequately controlled. Wind erosion becomes a serious short coming.

The methodology would be adopted to achieve an equivalent level of control and this would be the following, again in summary as more detailed discussion is provided through the set of procedures that will be attached to this document.

The works are not being conducted within a building but in an external environment and therefore direct application of the controls as used within a building are not adopted and are not supported.

Evidence from studies conducted in removing friable asbestos from oil refineries has been researched. Operation of a similar remediation programme at a Johns Manville (JM) site in the US has provided support for the use of wet methods and wind mitigating devices that do not rely on negative air to control the potential release of asbestos fibres.

Wind control panels will act to prevent wind or breezes coming into contact with the work zones. These will be equivalent to partial enclosures and be more effective as, in addition to having a vertical panel forming a wall, there will be an angled section along the top. These are described in this document as a wind mitigating device.

The basis of the asbestos dust controls will be the following:

- Use of portable wind mitigating devices that surround the work areas on at least one side that is the work Cells within the larger work zones. The wind mitigating devices prevent wind from impacting on the work Cell. The wind mitigating devices would provide an environment free of air currents so that water fogging would maintain a saturated condition of the asbestos containing material.

  Prior to excavation holes would be drilled into the concrete using drill rigs filled with dust capture and HEPA air filtration. The holes would be flooded with water to saturate the subsoil. The volumes of water expected would typically be 10 L/square metre or equivalent to a 10 mm depth on the surface. Holes would initially be spaced 1 m apart in the first work cell. Re-appraisal of the water volumes would be undertaken during the pilot trial and excavation and during the start of the project.

  Prior to excavation concrete slabs would be numbered, then cut into manoeuvrable pieces within the wind mitigating device, lifted and washed down.

The Occupational Hygienist would examine the surface of the slab and require more washing down until the surface is clean of any asbestos fibres. Surface dust samples from each slab would be collected and analysed on site in a laboratory to be permanently manned on site.

The concrete slab would be removed once given the clearance. It would be removed to a designated clean area to await recycling on or off site.

The excavation would be made available for the operation of the excavator. Prior to the first removal of the sub surface, it would be saturated until a layer of water with wetting agent rests on the upper surface.

As the bucket of the excavator breaks the surface of the ACM, a dust foam suppressant would be applied to envelope the disturbed surface in foam.

The application of foam would continue under the surface of ACM that is exposed.

There are several biodegradable foams available:

- Foamshield; and
- SDC 1200 from Midwest Industries.

The exact product that would be used would be determined prior to the pilot trial programme. More than one type may be trialled. Biodegradability has been considered in the design of foam dust suppressants. These products are designed to be non-hazardous.

The excavator once full would then be covered with the foam.

The bucket would then be emptied into the dump truck. Water fogging would occur over the body of the dump truck during this step.

These steps would be completed until the dump truck is full. The wheels of the dump truck and the sides of the body would be washed down before the truck leaves the end of the wind mitigating device through an opening that would be immediately closed after the dump truck has passed out of the wind mitigating device. While the travel of the dump truck is occurring or until a second truck is ready to enter through the same end of the wind mitigating device, the excavated surface would again be saturated.

This process would continue until the asbestos containing materials have been excavated.

The wind mitigating device could be mounted on wheels and would have sufficient rigidity that it is able to be moved to the next Cell of the work zone to be excavated.

Typically two or more wind mitigating devices would be used in unison. The first one removing the concrete and then being shifted to the adjacent surface to permit the excavator and dump truck to extract the asbestos containing materials.

The excavator would remain behind the wind mitigating device and not be relocated as this would avoid the tracks becoming a source of asbestos dust and debris (ADD).

The dump truck would follow a designated roadway to shift the material to either a stockpile in the first instance and once one of this Environmental Cells is formed directly into a Cell to avoid stockpiling.

The wind mitigating device would have a long side with returns that would prevent eddies entering the work cell. The need for the excavator and filling of the Cells to be undertaken behind a windbreak is paramount. Several sets of wind mitigating devices and wind breaks would be able to be used around the site.

The wind mitigating devices would have a polythene layer inside and be constructed from an impermeable canvas/polymer material that provide the necessary strength against wind erosion.

Dimensions of the wind mitigating devices would suit the width of the excavation and the height of the excavator.

The wind mitigating devices would have a structural steel frame around the closed long side and would be able to have ends formed from separate wind mitigating devices if ends are found to be needed from the pilot trial programme. The design of the base of these devices would be based on being able to be braced to withstand wind loads. During winds that would cause air currents within the work zone that would prevent the dust controls working then work would stop. The excavation would be covered by a tarpaulin if the hygienist considers that dust and fibres may be released.

Along the river bank a different type of wind mitigating device to accommodate the wet river bank and the steep slope would be designed.

The method relies on the following factors:

1. A defined work zone and Cells within the work zones;

2. A work area protected from wind;

3. A work area with one open side that can also be closed;

4. A defined roadways to use for traffic on site;

5. Prevention of the spread of asbestos generation of asbestos dust or possible release of asbestos fibres;

6. High level of effectiveness of preventing generation of asbestos dust or possible release of asbestos fibres;

7. Use of a foam dust suppressant to envelope the disturbed or damaged surfaces of the ACM with foam as a blanket to prevent airborne release of asbestos fibres;

8. Use of water fogging nozzles; and

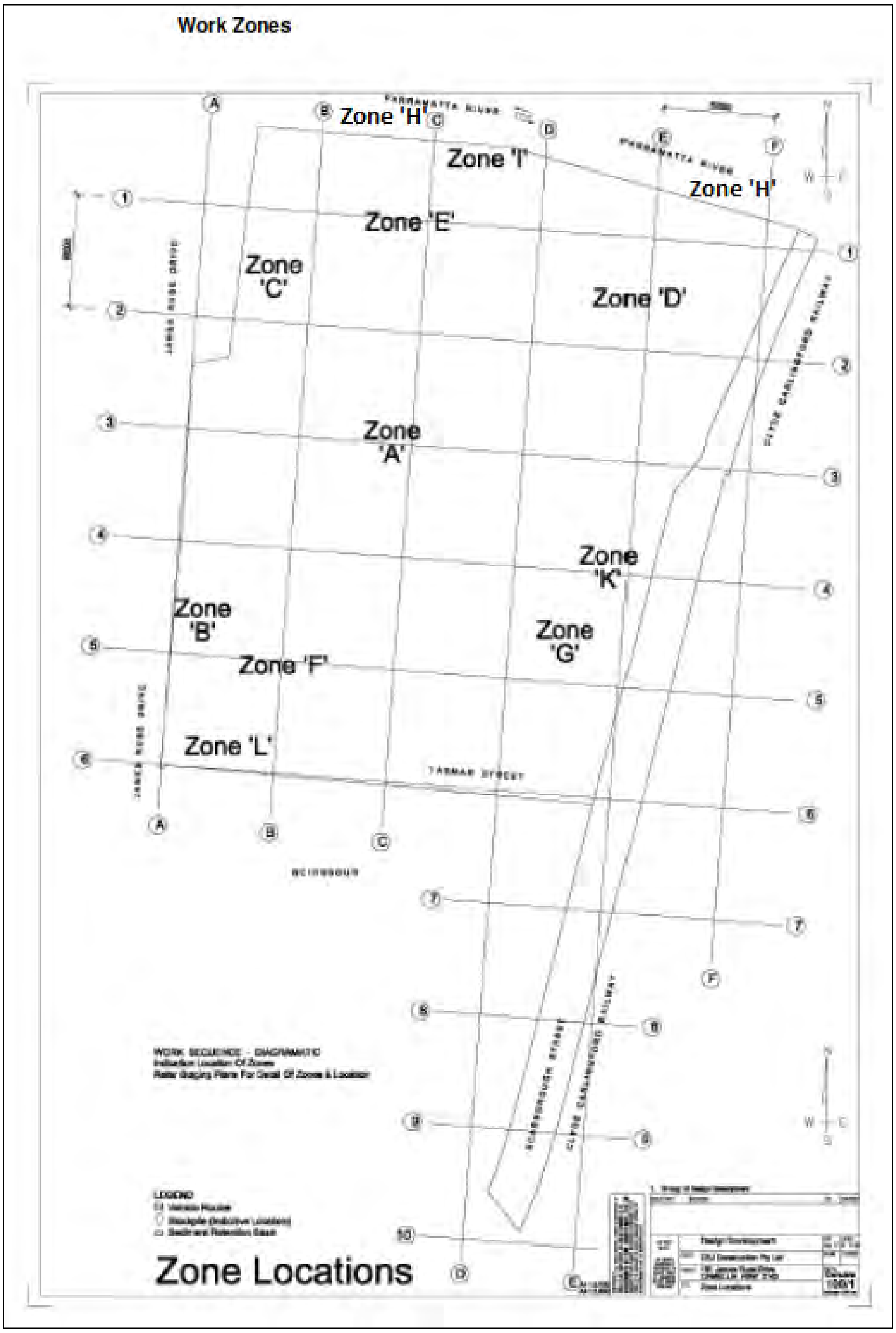
9. Constant vigilance of trained operators occupational hygienists.

Further details of the preliminary steps to be taken and discussion of work areas was provided in the Section 3 of the document and the Photographs presented in Section 4.3.

5.1 THE WORKS PROGRAMME

The works programme is explained using the following diagrams provided by the Document SP270 – Safe Work Plan – CJ – 2012.20.20 – ver01.doc. The site has been separated into a number of zones.

Figure 5-1: Work Zones



The Zones are designated by letters A – I. Zone H is the river bank.

Each Zone would commence with an excavation 6-8m wide and a length generally up to 80m in length. No exposed surfaces of asbestos containing materials beneath the concrete can be exposed to outside air without being protected by wind mitigation devices or covered by an impermeable polymer cover.

Therefore each work cell would be constrained in size.

Figure 5-2 shows Stage 1 of the Work Programme which involves excavating Environmental Cell 1.

The bolded lines show the trafficable routes to be used and within Zone A there are ramps shown leading to the north and south within the zone.

Figure 5-3 shows the Stage 2 and shows the Zone D would next be excavated so that the asbestos containing material is trucked directly across to Environmental Cell 1.

Figure 5-4 shows Stage 3 and shows the Works area in filling Environmental Cell 1 has extended to include, besides Zone 'B', Zone 'C' and Zone 'D'. Zone 'B' involves excavating the asbestos containing material and to avoid stockpiling the dump truck will transport its loads directly across to Environmental Cell 1.

Figure 5-5 shows Stage 4 and the extension of the works programme to include Zone 'E' and 'F'.

Figure 5-6 shows Stage 5. The Zones shown in Figure 5-5 continue to be excavated. Environmental Cell 1 is not full. Environmental Cell 2 is being filled.

Figure 5-7 shows Stage 6 and filling of Environmental Cell 2 continuous.

Figure 5-8 shows Stage 7 and the ongoing filling of the Environmental Cell 2. Figure 5-9 shows Stage 8 and Figure 5-10 shows completion of Stage 2.

The programme of decontaminating Zone 'H' i.e. the bank of Parramatta River has to be decided.

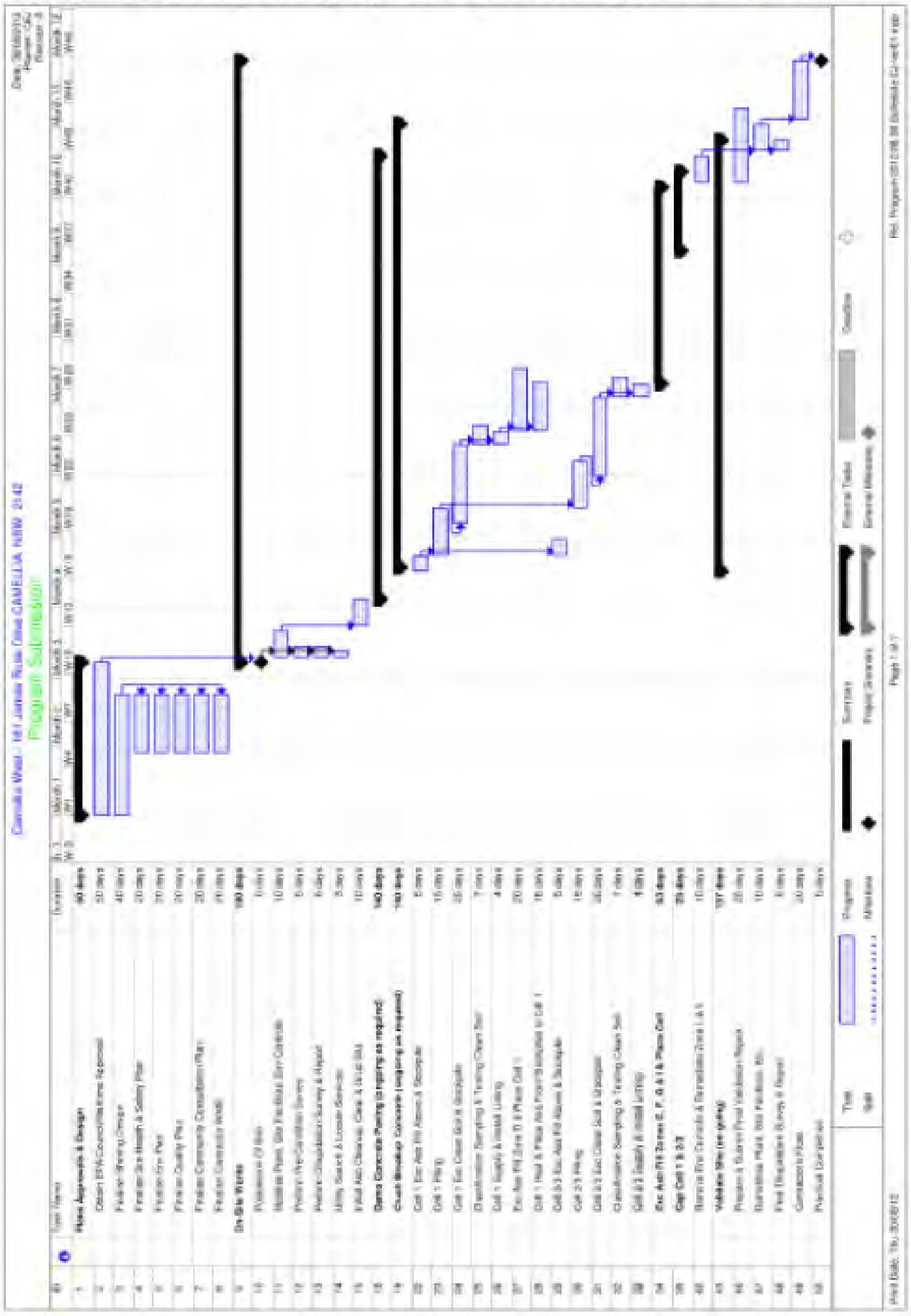
The work programme will be continually monitored and upgraded in the Asbestos Safe Work Method Statement as the Camellia Remediation Project progresses. It is expected that the geotextile cover over the northern surface of the asbestos containing material would be maintained and additional tarpaulins of a 200 micron or thicker plastic material added. The asbestos containing materials would be removed from the southern side of the bank working from under the cover material.

As the work under the Asbestos Safe Work Method Statement develops documented methods of removing the asbestos containing materials from the nature strip will be detailed. These would be expected to be similar to those recommended and with a high dependence on the application of foam.

A timetable for the program is included.

Program

Program dated 29/08/2012 (revision A) subject to change time to time (e.g. inclement weather, etc.)



SP720-Safe Work Plan-CJ-2012.12.20-ver01.doc
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Figure 5-2: Stage 1 of the Work Programme

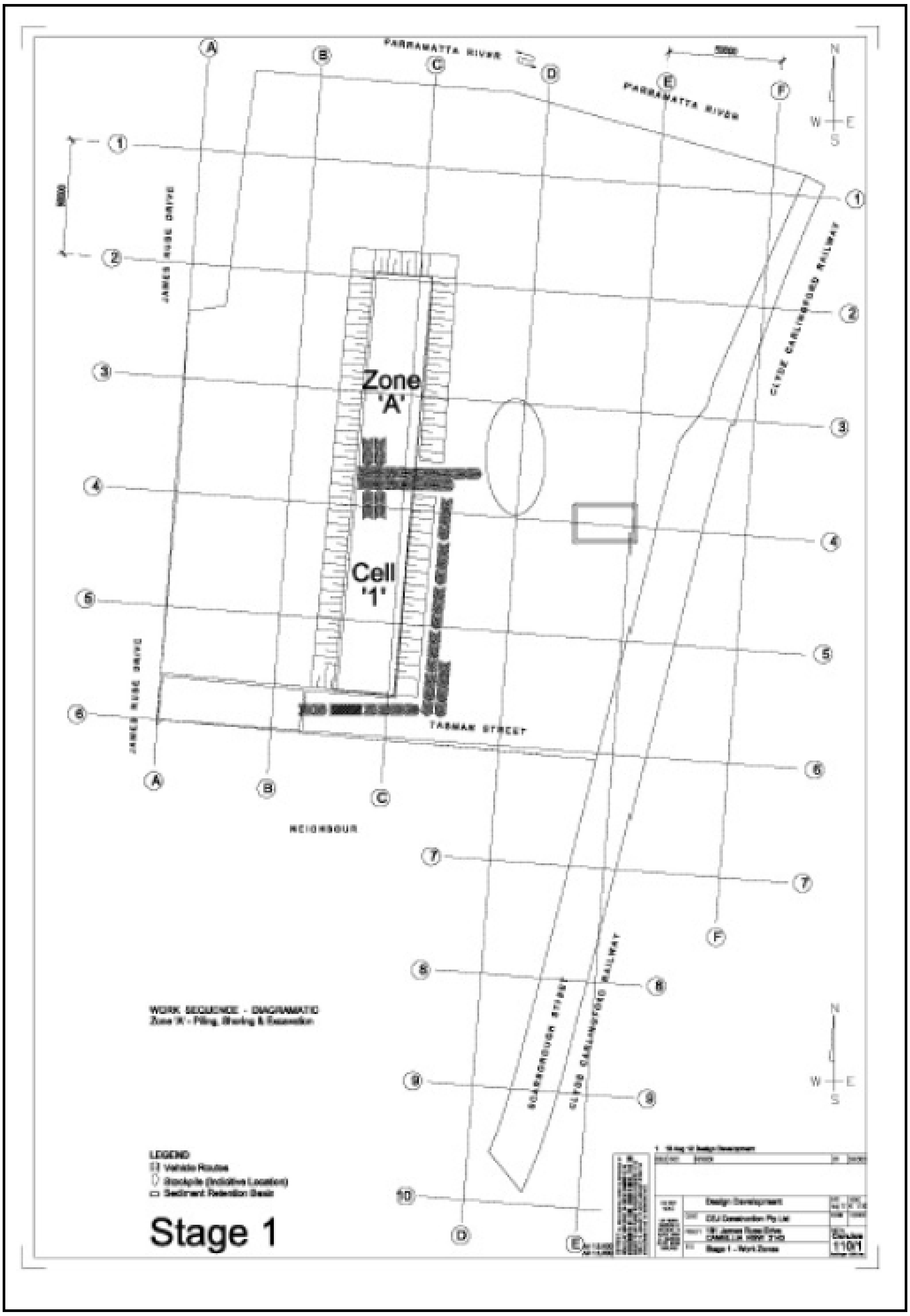


Figure 5-3: Stage 2 and shows the Zone 'D'

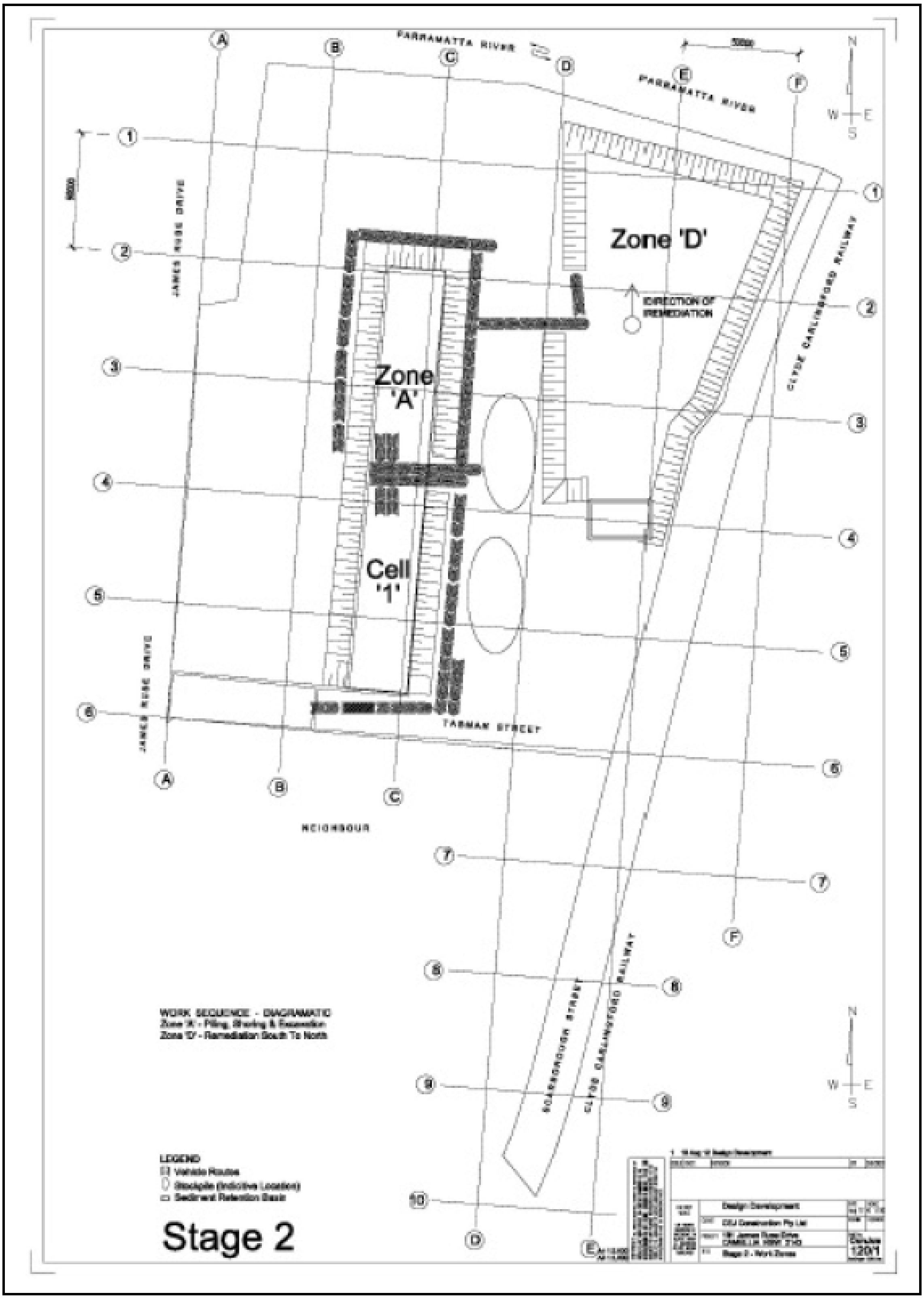


Figure 5-4: Stage 3 and shows the works area in filling Environmental Cell 1

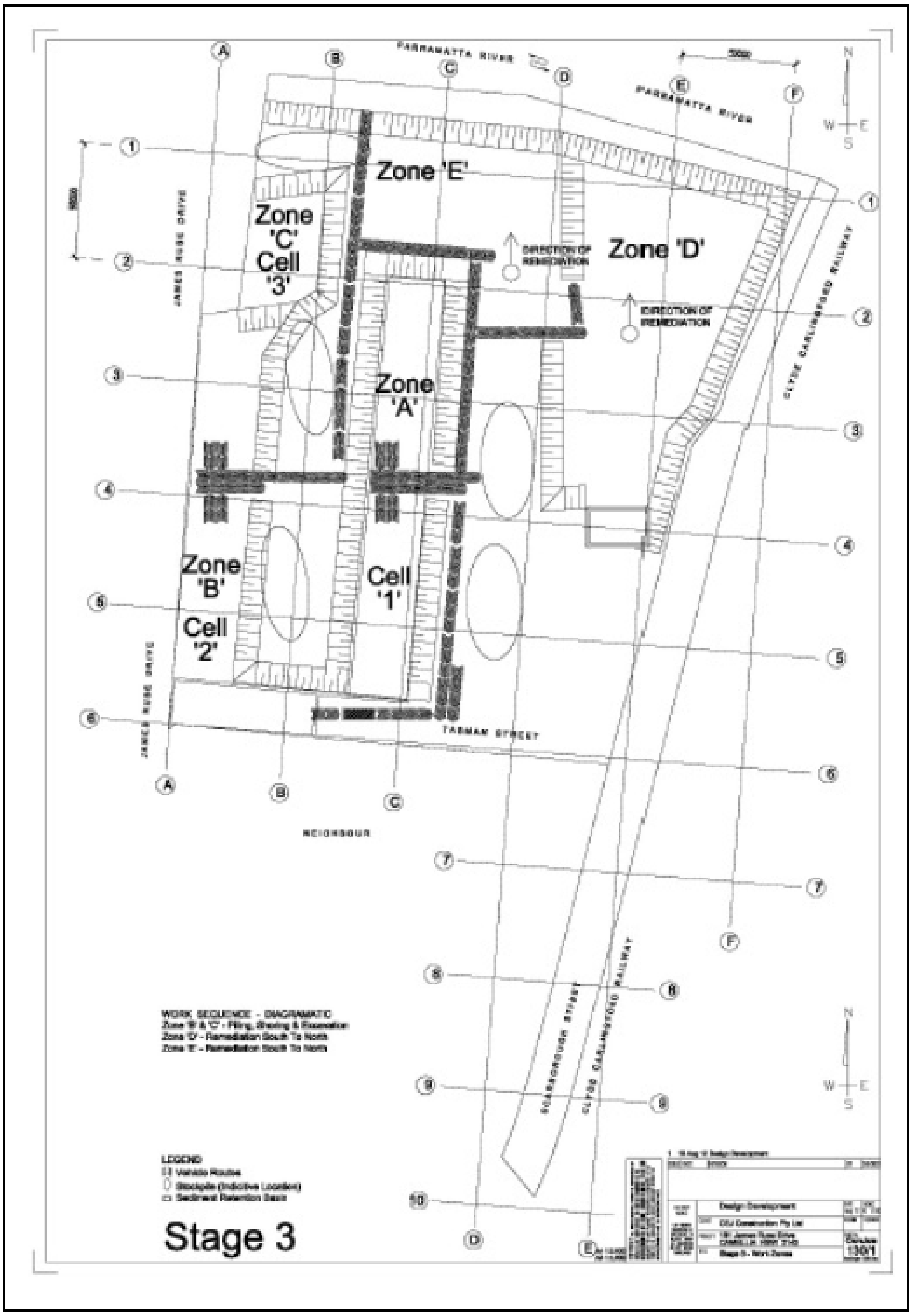


Figure 5-5: Stage 4 and the extension of the works programme to include Zone 'E' and 'F'

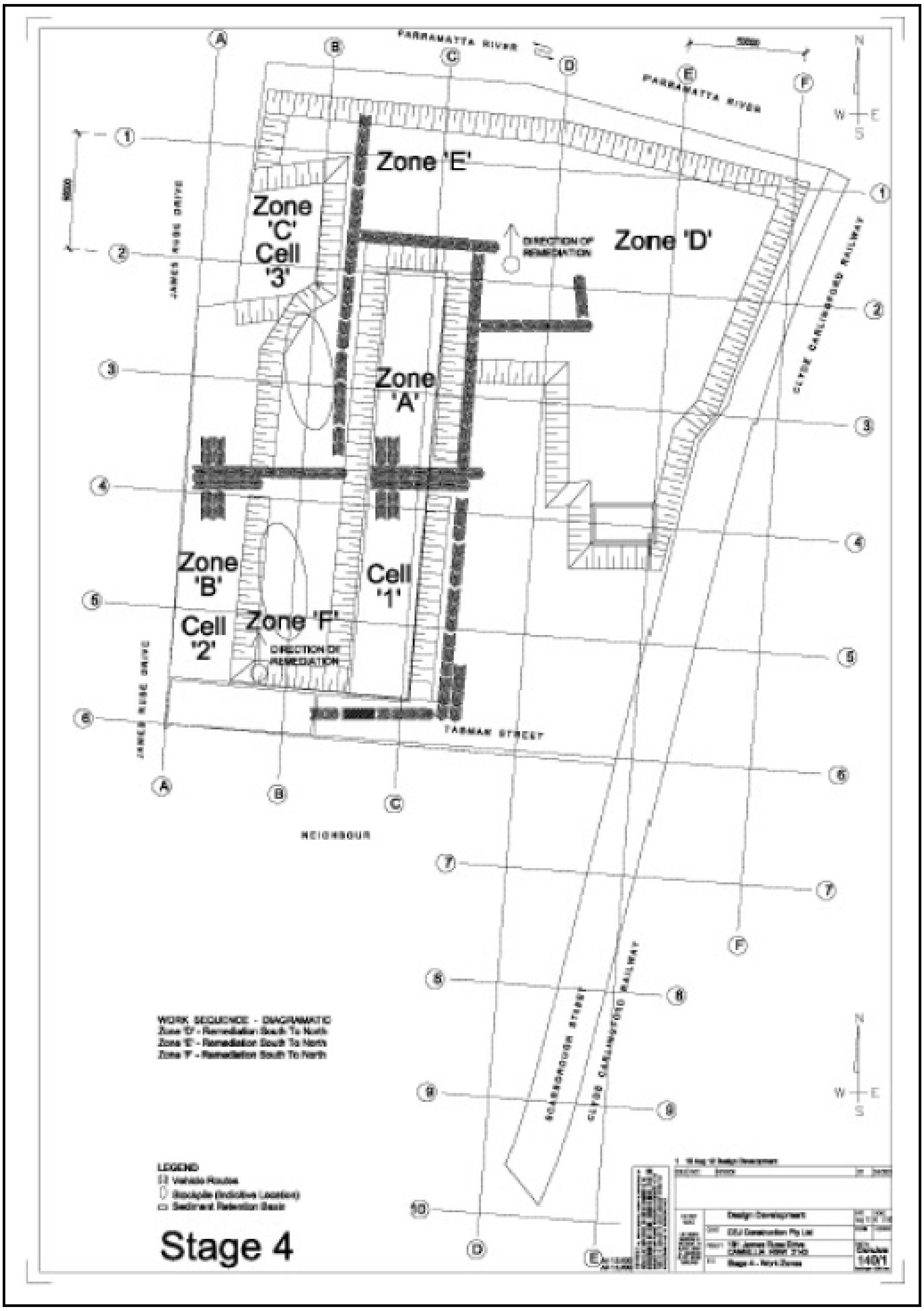


Figure 5-6: Stage 5

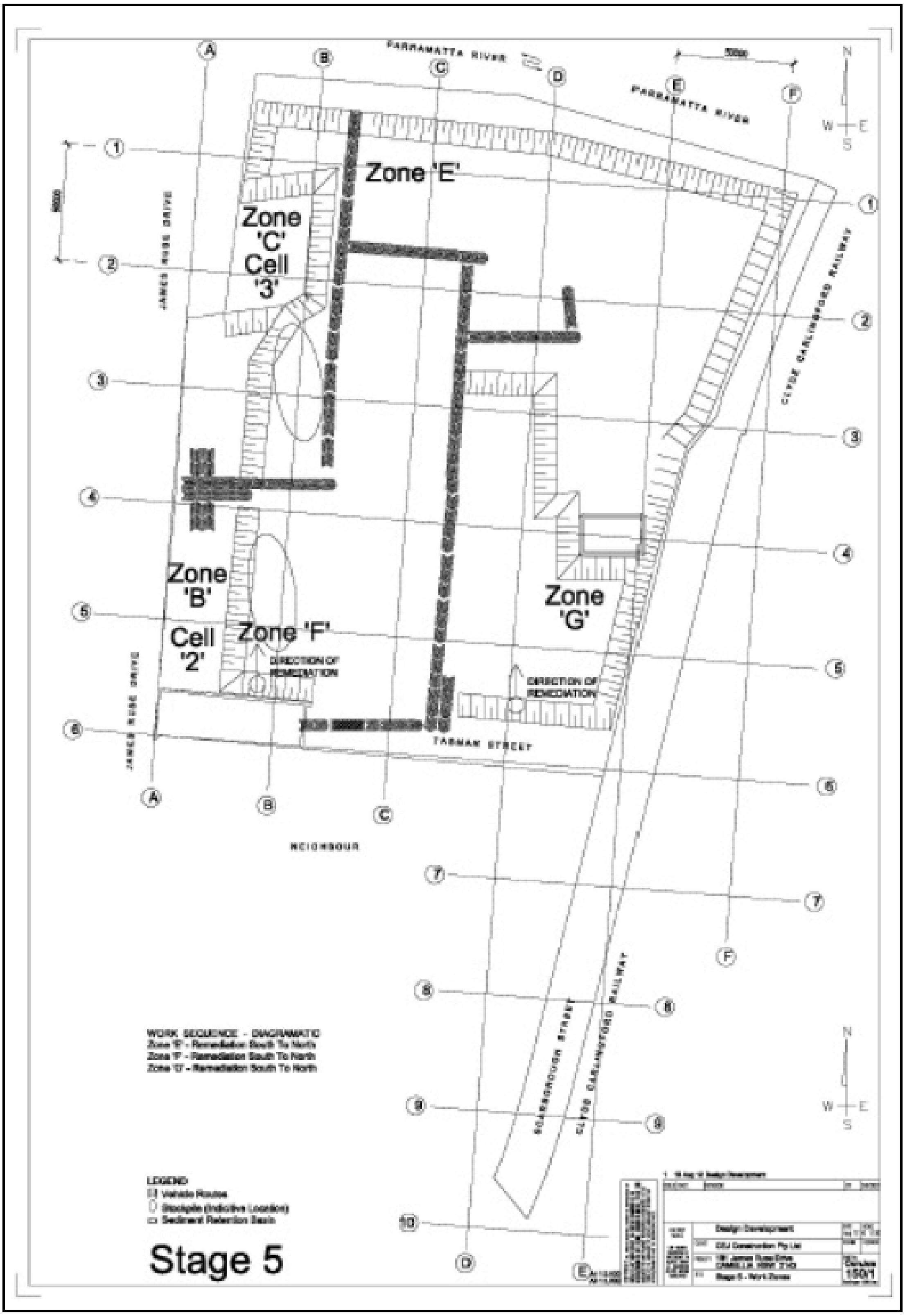


Figure 5-7: Stage 6 and filling of Environmental Cell 2 continuous

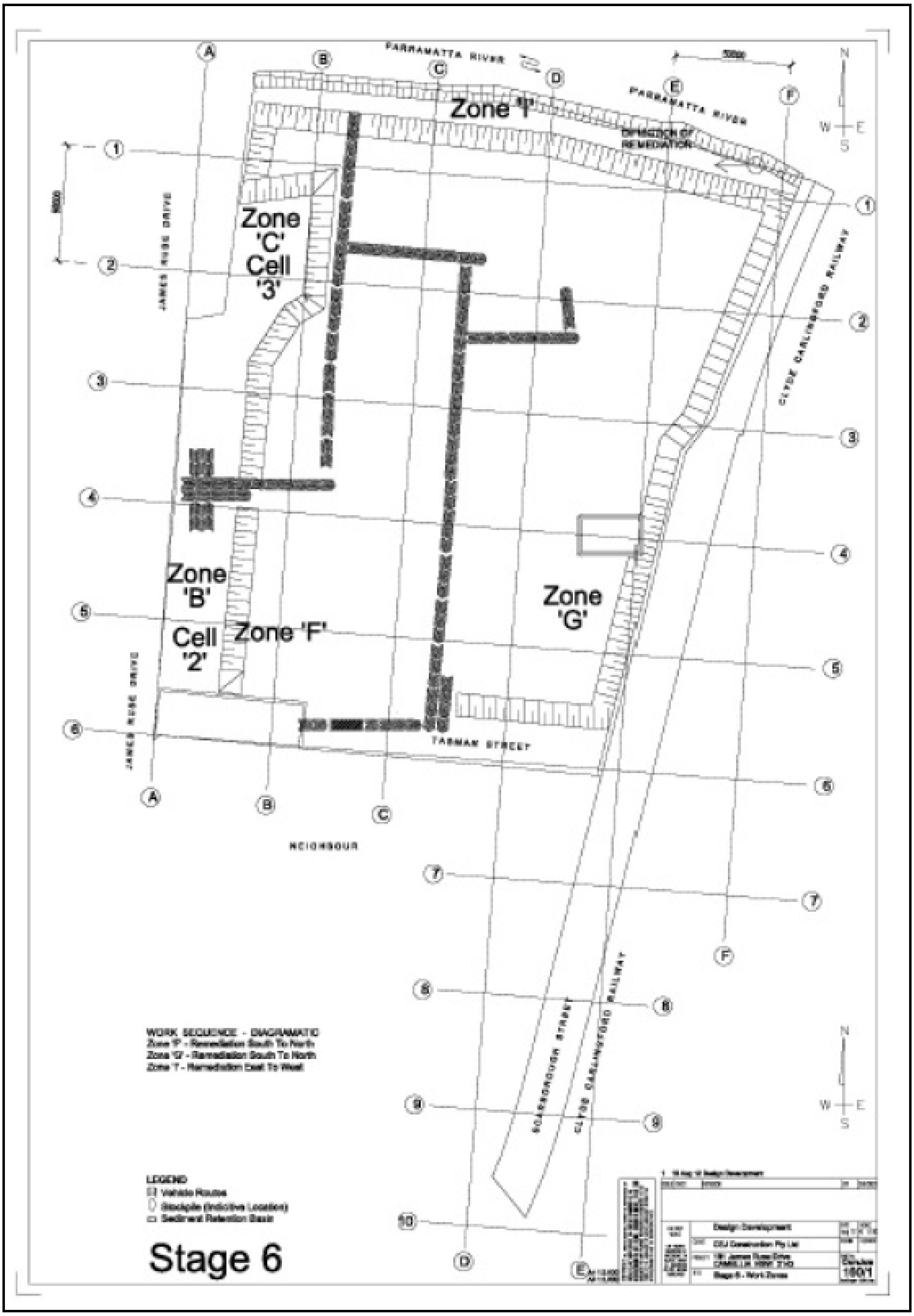


Figure 5-8: Stage 7 and the ongoing filling of the Environmental Cell 2

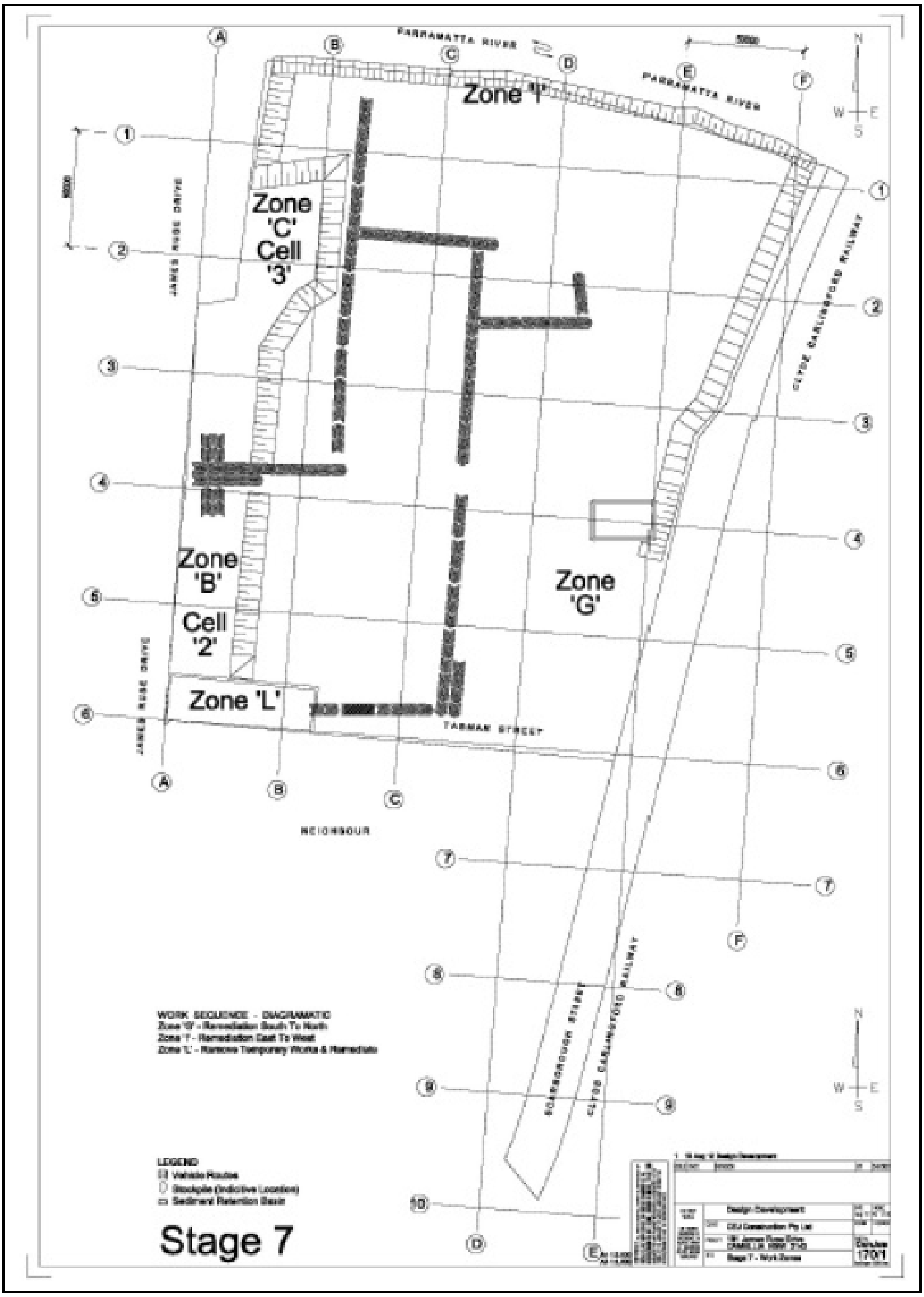


Figure 5-9: Stage 8

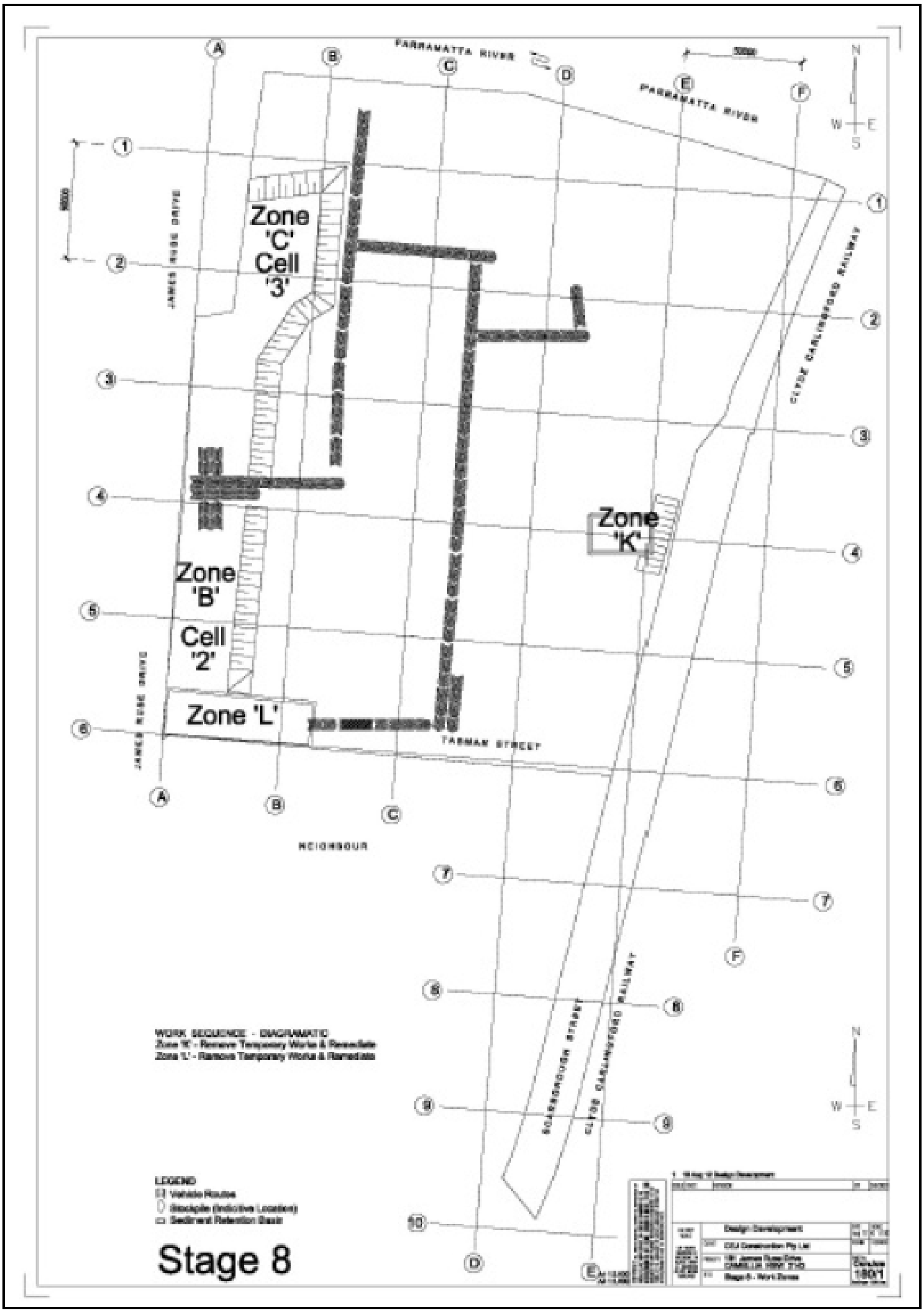
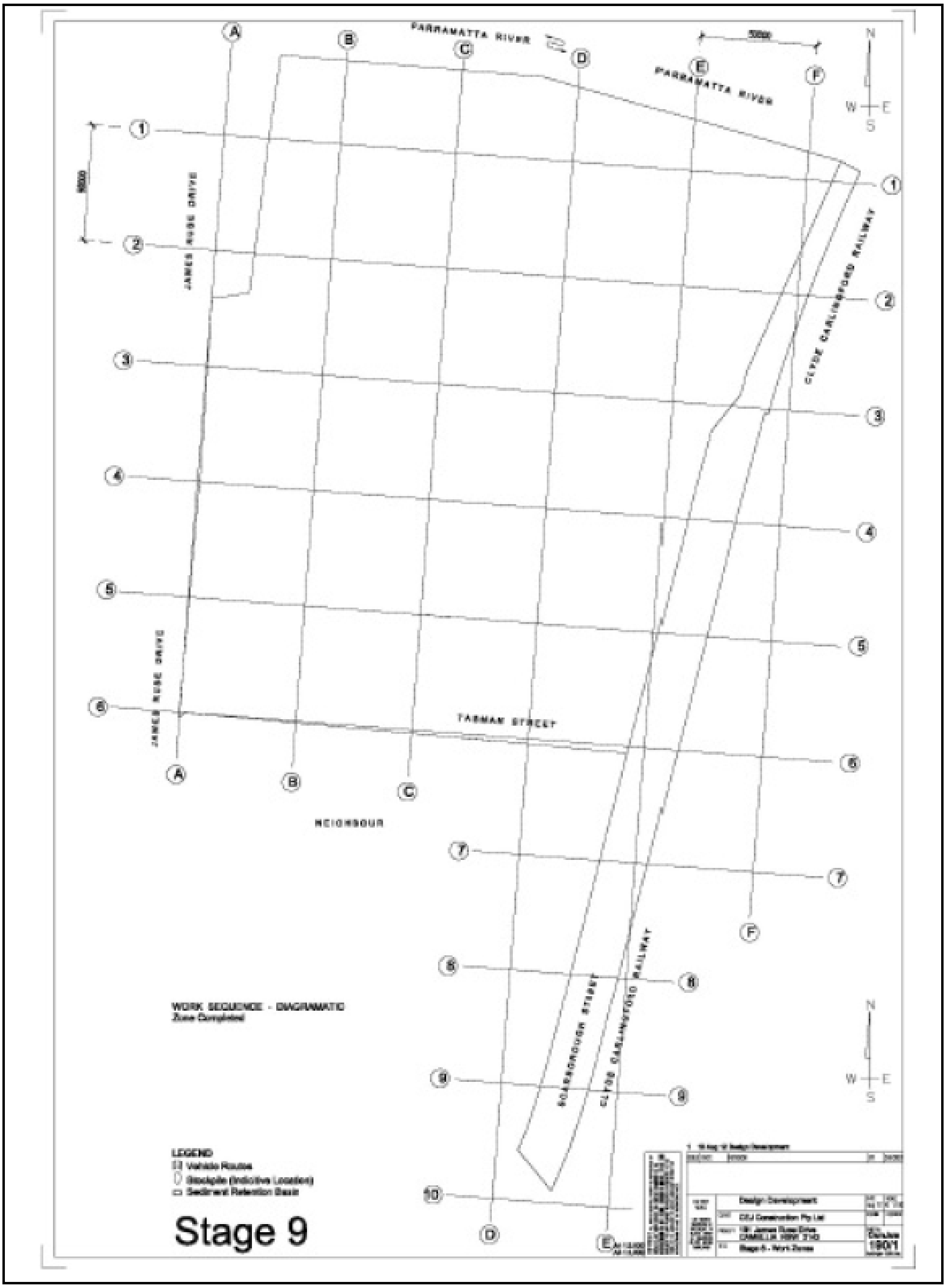


Figure 5-10: Completion of Stage 2.



6. AIRBORNE ASBESTOS AIR MONITORING PROGRAM

The following section was provided in its entirety by Safe Work and Environments Pty Ltd and is reproduced with the permission of Rune Knoph, Principal OHS & E Consultant.

Due to the nature of the work process and the potential risk of friable asbestos fibres being present within the soil and in dust generated during works, it is recommended that an asbestos air monitoring program is implemented for the period of the works. The air monitoring is carried out to ascertain that no detectable levels of airborne asbestos fibres escape the designated work area(s)/zone(s) through the course of the planned work. In addition, the air monitoring results works as a hold point for daily review of risk and potential cease work.

6.1 Scope of Work

The scope of the asbestos air monitoring program will be to:

- Carry out asbestos exposure air monitoring of asbestos removal personnel to confirm the correct selection of respiratory protective equipment.
- Carry out control monitoring at the boundaries of the asbestos work area/site as well as the site boundary to ensure that there are no detectable levels of airborne asbestos escaping the work area and site.
- Carry out clearance air monitoring within the work areas at completion of remediation activities to ascertain that there are no residual airborne asbestos fibres post remediation and to allow for safe access to the work areas without the use of PPE.

6.2 Sampling Methodology

The sample collection and analysis should be conducted in accordance with the National Occupational Health and Safety Commission (NOHSC) "Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust [NOHSC: 3003 (2005)].

The sampling is carried out by the use of portable asbestos air monitoring pumps fitted with a sampling cartridge housing the asbestos sampling filter, which collects the atmospheric dust to its surface. The flow rates of the monitoring pumps are calibrated with a field calibrator (rotameter) which in turn is calibrated against a primary calibration source. The sampling filters are then analysed in a NATA accredited laboratory for asbestos fibre concentration on the filters over the known volume of air sampled, expressed as fibres/mL (of air).

6.2.1 Laboratory Analysis

All exposure, control and clearance samples will be analysed by SWE's NATA accredited asbestos laboratory by way of phase contrast microscopy (PCM). The detection limit for this laboratory analysis procedure is <0.01 fibres/mL of air collected.

6.3 ASSESSMENT CRITERIA

6.3.1 Exposure sampling

The Safe Work Australia occupational exposure standard for all forms of asbestos is 0.1 fibres/mL in accordance with the "Workplace Exposure Standards for Airborne Contaminants", 2011.

All exposure sampling will be compared to the above 0.1 fibres per millilitre exposure standards, however all personnel that are sampled will be wearing appropriate respirators. The exposure sampling is carried out mainly to confirm the correct selection of the respirators of the removal personnel.
It is anticipated that the minimum respiratory protection required to protect against asbestos fibres for this project is a negative pressure, half mask, air purifying respirator, equipped with HEPA filters for airborne contaminants as follows,

- Asbestos fibres not in excess of 1 fibres/ml (10 X TWA); or

  In the event air monitoring results exceed the protection factor for negative pressure, half mask, air purifying respirators the following protection will be required:

- Full face piece air purifying respirator, with HEPA filters for airborne concentrations not in excess 5 fibres/ml of asbestos, or.

- Pressure demand, full face piece, supplied air respirators for concentrations expected to meet or exceed 100 fibres/ ml asbestos.

All workers inside the asbestos removal work area will wear the proper respirator for the asbestos concentration generated.

6.3.2 Control and Clearance Monitoring

Control air monitoring should be carried out outside the asbestos removal area at the boundary to the remediation site/zones and/or the overall site boundary as well as at other strategic sampling locations as required. The concentration of fibres at these sampling site locations should not exceed <0.01fibres/mL of air which also is the detection limit for airborne asbestos. The following table outlines the action respond levels and associated actions for any recorded asbestos concentrations:

Control Level (airborne asbestos concentration) fibres/mL	Control/Action
<0.01	Continue work with current control measures
0.01 – 0.02	Review control measures
≥0.02	Cease work and investigate cause

6.4 SAMPLING LOCATIONS AND INTERIM SAMPLING PLAN

The below principal sampling locations will make part of the sampling program once work commences on site. The below frequencies and timing of sampling is at this stage indicative and will be required readdressed once the remediation program and methodology is more specifically defined by the remediation contractor.

Sampling Locations	Type of Sampling	Frequency/Timing of Sampling
Asbestos Removalist in Removal area	Exposure	At commencement of work in each zone for at least the two first days of work. Then once weekly
Machine Operator	Exposure	At commencement of work in each zone for at least the two first days of work. Then once weekly
Supervisor/Consultant	Exposure	At commencement of work in each zone for at least the two first days of work. Then once weekly
Asbestos Removal Site Boundary	Control	Daily
Site boundaries (up and down wind)	Control	Daily
Lunch shed	Control	Daily
Decontamination area	Control	Daily
Laundry area (if any site clothes laundered at site)	Control	Weekly
Clean end of wet decontamination unit/area/room	Control	Daily
Removal area	Clearance	At completion of remediation work and visual/soil validation clearance. 1 sample per 100m2.

No community recipient locations is recommended for any of the above suggested sampling types is recommended included, as such data is better sampled closure to source for asbestos fibres.

6.5 OPERATIONAL MONITORING

SWE further suggest that real time dust or fibre sampling may be carried out at the work face or boundaries to provide an operational control option that allows for immediate results. The results can be used as an action respond trigger to cease work on the suspicion of asbestos fibre release rather than awaiting the ad hoc sampling results of the NATA sampling using the membrane filter method.

To utilize this control option the results of initial dust and asbestos fibres must be available and from this an appropriate operational sampling procedure and shut down action plan can be developed and implemented as an administrative control.

The above is to be considered a recommendation and is not a mandatory requirement for the asbestos remediation work but rather an operational control measure that will enable a proactive way of managing dust release potentially containing detectable levels of asbestos.

6.6 EMERGENCY PROCEDURES

In the event that an activity involves elevated asbestos fibre monitoring concentrations (>0.01 fibres/ml) during decontamination works and clearance monitoring, the following steps should be followed:

1. The Asbestos Removal Contractor is to be notified to clean the affected area(s) by following the Asbestos Safe Work Method Statements and advise the Occupational Hygiene Consultant;

2. The work area is to be inspected and the cause of the elevated result investigated by the Occupational Hygiene Consultant;

3. Occupational Hygiene Consultant to advise on appropriate control strategies, where necessary;

4. After clean up works have been completed, a further visual inspection will be undertaken by the Occupational Hygiene Consultant. Further clearance air monitoring shall be conducted to ensure that asbestos exposure levels are at an acceptable level (i.e. <0.01 fibre/mL); and

5. Subsequent to completion of successful investigation of the cause of the elevated readings, a successful visual inspection and monitoring results must be <0.01 fibres/ml before an ‘all clear’ can be given.

7. DECONTAMINATION AND PPE

As the asbestos material being handled is potentially of a friable nature and the known level of asbestos cement contamination in the subject soils may be relatively high in density, the potential for clothing, etc. (on personnel conducting the works) to become significantly contaminated with free asbestos fibres is considered medium to high. Decontamination procedures and wet decontamination facilities will be required for this site and these would be provided by the Class A licensed asbestos contractor.

All personnel in working within the Work Zones with or in any other way being affected by asbestos contaminated material will be required to decontaminate at the end of each work shift (i.e. before morning tea, lunch and afternoon tea) and at the end of the work day.

A decontamination area would be established on site for the use of the personnel conducting the asbestos related works. The decontamination area will comprise a segregated area where the contaminated work clothing and respirators are removed and discarded. This area is to be connected to the wet decontamination unit and all access to and from work area should be done via this ‘change room’ area.

Prior to any work commencing on any of the Work Zones, suitable barricades are to be erected around the boundary of the work site. Asbestos Warning Signage will be provided at suitable intervals and at all entrances detailing the restriction of access to the site.

The Change Area is the area in which potentially contaminated PPE must be removed prior to leaving the Designated Work Area. It is to be located at the entry to the work Designated Work Area. It must not be used for purposes other than decontamination. It must not be used as a materials storage area. All personnel leaving the asbestos work area must use the Change Area prior to leaving the site. Personnel will remove disposable protective clothing prior and will be required to ensure that no asbestos soiled clothes or PPE leave the decontamination area to the ‘clean end’ of the area.

Personal protective equipment (PPE) is to be provided to all personnel working in the Designated Work Areas and must be available within the decontamination area. The PPE which is required will be to the standards required for the asbestos removal work detailed in this AMP.

Access to site will be determined by the PM for the work site. The asbestos work site shall be deemed not accessible to non-employees or personnel not inducted for work within the contaminated areas until a final clearance has been given by the occupational hygienist company.

7.1 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Where personnel are working on the ground within the designated asbestos areas and are required to handle, or are likely to come into direct contact with asbestos material:

- High visibility vests;
- Disposable coveralls with booties;
- Safety boots with rubber soles;
- Safety glasses;
- Gloves;
- Hard Hats; and
- Respirators - half or full face P3 including organic vapour filter (where other contamination is identified in the soil).

The protective clothing will be provided daily to employees at the commencement of their work shift at the Change Area. Protective clothing is only for use in the Designated Work Area and will not be used outside of this area.

Once workers are inside the Work Zones, they are not permitted outside of that area without proceeding through the appropriate decontamination procedures.

No employee is permitted to remove any disposable protective clothing from the site. Contaminated overalls and PPE is to be disposed of with the asbestos contaminated waste materials in appropriately labelled waste bins or bags.

These requirements are specified as a minimum standard and may be modified at the discretion of the PM or his designee during the course of the remediation works.

7.2 DISPOSAL OF ASBESTOS MATERIALS & CONTAMINATION

After asbestos contaminated soils have been removed, all asbestos waste including soiled PPE, shall be placed into 0.2mm polyethylene plastic bags marked with “Asbestos Waste” which, are to be sealed by wire ties or tape and then suitably washed. The bags shall then be placed in bins lined with 0.2mm polyethylene sheeting and transported in leak-proof vehicles for disposal at an approved regional asbestos waste disposal depot.

Should it be necessary to temporarily store asbestos waste prior to transport to the waste facility then all plastic bags containing the waste shall be held in leak-proof metal containers or bins suitably marked and held in a secured area displaying appropriate warning signs.

Solid asbestos waste shall be collected and double bagged in heavy duty, low density polyethylene 0.2 mm thick bags. A maximum bag size of 1200 mm (length) x 900 mm (width) shall be observed and bags shall be filled to no more than 50 per cent capacity.

The loaded weight of the bag shall not exceed 20 kg. Each bag or other container shall be labelled on its outermost surface with warning statements.

Bags or primary containers which have held asbestos material shall not be re-used, and containers marked as above shall not be used for any other purpose.

Transport of asbestos waste material shall be done so in plastic lined leak-proof vehicles or in air leak proof vehicles that are covered so that no spillage or dispersal of the waste to the atmosphere occurs.

Care must be taken to ensure that the integrity of the plastic bags is not damaged during handling or transportation. In particular, bags of asbestos waste shall not be thrown or dropped from a height, (which may rupture the bag). Vehicles may be checked for cleanliness prior to leaving the demolition site.

Controlled wetting of waste shall be employed, where practicable, to reduce dust emission during bag sealing and in cases of accidental bag rupture, during transportation. Excessive water logging shall be avoided as the excess of contaminated water may leak out of the bags, thereby creating a future source of airborne dust.

The asbestos waste shall be disposed of at a site and in a manner as approved by the Local and State authorities. Documentary evidence of the disposal shall be collected and provided. This will include name of the authorised tip, weighbridge docket and registration number of vehicle for every disposal.

7.3 Outdoor Work

The works will involve outdoor works in a hot climate. The contractor will need to make allowance for heat stress, with special consideration to PPE requirements, when developing the work schedules. Consideration must also be given to the adequate supply of cool water, monitoring personnel for signs of heat stress and protection from the sun.

7.4 Personal Hygiene Requirements

During the site induction programme, the project personnel will be briefed on the requirements for personal site hygiene. All personnel entering the site, including workers, supervisors and visitors, will observe the following personal hygiene regulations:

- No eating, drinking or smoking will be permitted in the working area. Eating, drinking and smoking will only be permitted in designated areas after decontamination has been completed;
- The required personal protective equipment is to be worn prior to entry to the work site. Disposal of personal protective equipment and disposable overalls will be the responsibility of the contractor. No soiled protective clothing is to be disposed of as general waste or be allowed to leave the site;
- Fresh protective clothing will be available at all times for anyone who requires it. Clothing that has come into any contact with contaminated material shall not be re-worn;
- Hand to mouth and hand to face contact should be avoided on site; and
- All site personnel working with asbestos impacted soils are to decontaminate at the end of the day prior to leaving the site.

7.5 EMERGENCY PROCEDURES

In the event that an emergency arises, a potentially dangerous situation is encountered or of any suspect/unknown material is identified, site work is to cease immediately and the matter is to be reported to the PM for immediate assessment and action.

An emergency will include, but not be limited to:

- Any site personnel is involved in an accident or experiences adverse symptoms of exposure while onsite;
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated and that the appropriate safety equipment is not available; or
- A breach of the exclusion zone (Designated Work Area) by non-approved personnel.

The following procedures will be employed by contractor/consultant personnel in potentially hazardous areas:

- In the event that any site personnel experiences any adverse symptoms of exposure whilst onsite, work will be halted and instruction or assistance sought from the PM or SM.
- In the event of an accident, the Site Supervisor and the injured person will compile an incident report, which will be submitted to the PM within 24 hours of the incident. Follow-up actions will be carried out to correct situation.
- In the event that an emergency situation arises, the Site Supervisor must address the problem and notify the ambulance, fire brigade and police if necessary. In addition, the PM must be notified immediately.
- To minimise the impact of an emergency situation, at least one of the contractor's site personnel working onsite will be trained in basic First Aid procedures and all field personnel will have immediate access to a First Aid kit.
- Emergency phone numbers will be made available at the commencement of the Project and displayed throughout the project in the site office including ambulance, fire brigade, police and the nearest hospital. All these services can be called on 000 in a life-threatening emergency. In addition, the mobile phone numbers of the Site Manager and the PM will be made available.

In the event of an emergency it is ideal that the decontamination procedures are adhered to. However, depending on the emergency and the concentration of asbestos in the work area, these decontamination procedures may be altered by the PM (in consultation with the asbestos consultant).

8. COMMUNICATIONS

8.1 4.1 SITE INDUCTIONS

Prior to starting any site works that will affect the identified asbestos contamination; all site workers involved in the project (including subcontractors and others) shall attend:

- a site-specific Safety Induction conducted by State Wide Planning or delegated principal contractor or subcontractors controlling the relevant sites are to be made aware of the specific risks present on-site; and
- a site-specific Safety Induction conducted by State Wide Planning or SWE to be made aware of the Plan and its requirements.

For any the asbestos removal work, the remediation contractor or the Class A licensed contractor will carry out a safety induction (tool box) pertaining to that part of the work.

Documented evidence of the safety induction/s must be readily available on site and will be recorded.

8.2 PRE-START MEETINGS

Daily pre-start meetings shall be held prior to any work commencing. The purpose of the pre-start meeting is to discuss the day's work activities (inc. SWMSs), any safety issues or requirements and any corrective actions. The form also serves as a record of daily attendance in the event of a site evacuation. The Record of Toolbox Safety Meeting will record the subjects discussed and the personnel in attendance during the daily pre-start meetings. Any special requirements from State Wide Planning in regards to the procedures, scope or timing of the works will be discussed at the daily pre-start meeting.

9. CONCRETE CRUSHING AND SCREENING PLANT

If a concrete crushing and screening plant is brought to site then its activities will need to undergo a risk hazard assessment prior to any use of the plant occurring.

As the concrete slabs will have been numbered and given a clearance certificate the risk of asbestos fibres being released will be extremely low.

Dust controls will be needed and these are usually limited to applying water.

PPE that includes the following would be needed:

- High visibility clothing with long sleaves;
- Safety boots;
- Safety helmet;
- Hearing protection;
- P2 protection disposal dust masks; and
- Safety glasses.

Training identified from the risk hazard assessment would be undertaken and documented.

There area where the concrete crushing and screening plant is located needs to be in a work zone free of any exposure to asbestos fibres.

The traffic route to the location of this plant needs to be on a roadway surface not used by the dump trucks hauling the asbestos containing materials.

10. HANDLING OF HYDROCARBON CONTAMINATED SOIL

Hydrocarbon contaminated soils will be removed for treatment. As this may also contain asbestos contaminated materials, the Work Zone involving these soils will be required to apply the asbestos dust controls.

Air monitoring using passive samplers or thermal description tubes (charcoal tubes) and constant flow air sampling pumps will be needed during the removal of the first loads of these soils.

P3 level of protection half or full face respirators that can provide asbestos fibre and hydrocarbon protection will be needed until the hygienists establish the level of protection required.

The air monitoring for hydrocarbons will also include locations in the exclusion zone to establish if PPE with hydrocarbon removal is required to be worn at the exclusion zone.

The hydrocarbon contaminated soils would be removed to a designated area. The stockpiles are to be covered by an impermeable cover that would be sealed with sand bags or equivalent method to prevent the stockpiles being exposed during wind.

A risk hazard assessment of the hydrocarbon soil handling, storage, treatment activities would be undertaken prior to commencing these activities.

The risk assessment team would include an hygienist, an environmental engineer or scientist as well as the contractors and CEJ P/L project staff.

The validation of the treated hydrocarbon soils is the subject of the Remedial Action Plan.

11. ENVIRONMENTAL MONITORING PROGRAMME

Environmental air monitoring for respirable sized asbestos fibres uses transmission electron microscopy (TEM). The method that would be used is from the International Standards Organisation – Method ISO 10312 (1995).

The method uses a 45 mm filter holder with a minimum of 1,800 L of air drawn through the filter holder. The sampling time would be 7-8 hours. The minimum concentration that can be detected is 0.002 fibres/millilitre.

The analyses would be undertaken by an overseas laboratory located at Los Angeles so that reasonable turn around times can be achieved.

The purpose of the environmental air monitoring is to provide evidence for the community and regulatory authorities that there is no increase in environmental concentrations of asbestos fibres as a result of the remediation work. The on site air monitoring and auditing of the use of the asbestos dust controls is the monitoring method relied upon to ensure there would not be any release of respirable sized asbestos fibres into the environment.

Air monitoring at reference locations is undertaken to provide assurance to the residential community, to the Campus of the University of Western Sydney and to premises involving children.

Equally important as the above are occupants of commercial/industrial premises and persons who travel along James Ruse Drive, the Parramatta River and the Clyde-Carlingford Rail Line.

Two methods of air monitoring would be undertaken at these reference locations for the purpose of human health:

- The transmission electron microscopy method used extensively by the US EPA. This method is able to identify fibres that are collected on the filters used for the air sampling as being organic, asbestiform or another material. The phase contrast microscopy method used on site is unable to perform this need. The TEM method enables environmental exposure levels of respirable asbestos fibres to be measured accurately.

- Direct reading instruments that record when a fibre that fits the dimensions of respirable sized asbestos fibre is present.

A set of nine reference locations have been chosen for the start of the Remediation Programme. Their location can be varied based on need, findings and community consultation.

Four reference locations have been chosen for the perimeter of the site. These are designated as Reference locations 1, 2, 3 and 9.

The other five reference locations would be at nearest residential and community receivers. A review of the reference locations would be undertaken after further consultation occurs.

Two locations where children may be located in the commercial area have been specially chosen. These are at locations 3 and 4. Reference location 3 is near the south-west corner of the site and is an after school day care centre. Reference location 4 is a child care centre located above a supermarket south-east of the site.

These are given reference numbers.

Reference Location 1: Perimeter of the site alongside the Clyde – Carlingford Rail Line

Reference Location 2: Perimeter of the site alongside James Ruse Drive

Reference Location 3: Outside the southern end of the site near the south west corner and in front of an after school day care centre

Reference Location 4: First floor of Supermarket south east of the site off Grand Avenue at a child care centre

Reference Location 5: University of Western Sydney, southern boundary and therefore adjacent to the northern bank of Parramatta River

Reference Location 6: Residences at the eastern end of Thomas Street

Reference Location 7: North West corner of API site

Reference Location 8: Residences along the eastern half of Broughton Street

Reference Location 9: Northern bank of the Parramatta River during remediation of the foreshore

A programme of monitoring is presented in Section 11 of this Asbestos Safe Work Method Statement.

The two direct reading fibre counting instruments would be located along the ① -① and ②-② Reference locations. These two instruments may be located at other locations during the cause of the Remediation Programme.

The TEM method would be used during the pilot trial including excavation at the work area exclusion zone and also on site and at the reference locations shown on Figure 11-1.

The environmental background concentrations of asbestos fibres (i.e. respirable sized) would be measured every quarter of the year prior to the commencement of the project.

During commencement of the project the environmental air concentrations of asbestos fibres would be measured weekly for the first 6 months.

Based on the expected findings of no detectable increase in the concentration of asbestos fibres, the sampling period could be reduced to fortnightly for the following quarter and then monthly for the remainder of the project.

The sampling would be undertaken during calm wind conditions and during conditions when the breeze/wind is toward the monitoring location. There would be monitoring during conditions downwind of the site. This would mean that the air monitoring would not be conducted on the same day at every reference location chosen for that week's monitoring.

The TEM method would also be used on site and at the two direct reading instruments to assist with calibrating these instruments as well as learning from the effectiveness of the asbestos dust controls at the work cells.

Figure 11-1: Environmental Reference Locations

12. CONCLUDING REMARKS

The preparation of the Asbestos Safe Work Method statement has developed from lessons learnt by the US EPA and from the knowledge of the Principal Consultant of Benbow Environmental.

A zero harm approach is the basis of the engineering controls detailed in this statement and supportive reports.

R T Benbow
Principal Consultant

13. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Statewide Planning Pty Ltd, as per our agreement for providing environmental services. Only Statewide Planning Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Statewide Planning Pty Ltdfor the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Glossary

GLOSSARY

TERM/ABRIVIATION	DEFINITION
AC	Asbestos Cement
Access/Work Permit	An authorised document that allows access to a Restricted Area for a defined duration and purpose
ACM	Asbestos Containing Material
Air lock	An area that separates the asbestos work area from other areas. Normally an airlock would consist of spring loaded doors or two or more overlapping sheets of plastic sheet positioned so as to define the boundary between each segment of the decontamination facility, whilst allowing personnel access and airflow towards the removal area. To ensure a good airflow through the unit where doors are used to segment the decontamination unit, large openings with a hinged flap to operate as a one-way valve should be provided.
AMR	Asbestos Material Register
Approved respirator	A respirator, which complies with Australian Standard 1716-Respiratory Devices.
Approved vacuum cleaner	Vacuum cleaning equipment that passes all extracted air through a High Efficiency Particulate Air (HEPA) filter before the air is discharged into the atmosphere and conforms to the relevant requirements of the Australian Standard 3544 - Industrial Vacuum Cleaners for Particulates.
Asbestos	Is defined as the fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals, including actinolite, amosite (brown asbestos), crocidolite (blue asbestos), chrysotile (white), tremolite, or any mixture containing one or more of these.
Construction work	Shall include all work performed in or in connection with the installation, erection, repair, cleaning, painting, renewal, renovation, dismantling, maintenance, ornamentation or demolition of buildings, ships, structures, pipes, plant, machinery, parts, artefacts, appliances, or tools or parts thereof.
Control Actions	In the process of implementing asbestos materials management, it is fundamental that any identified asbestos situations have control actions determined to prevent personnel from being placed at risk. These controls include, but are not necessarily be limited to: elimination of hazard/risk, substitute, isolate, engineering, administrative, Personal Protective Equipment
Employee	Means any person who has entered into or works under a contract of service or apprenticeship with an employer, whether or any other place of employment.

TERM/ABRIVIATION	DEFINITION
Employer	Includes any person or body, whether incorporated or unincorporated, including self-employed, who employ one or more persons in industrial or commercial premises, office, ship, construction site or any other place of employment.
Friable asbestos	Asbestos which, when dry, is easily crumbled or reduced to powder by hand. Broken or damaged bonded asbestos by weathering or mechanical damage.
Glove bags	Single use bags constructed from transparent, heavy-duty polyethylene, with built-in arms and access ports. Generally glove bags are approximately 1 metre wide by 1.5 metres deep and are designed to completely isolate small removal jobs from the general work area.
Hazard	Anything with the potential to cause harm.
Hazardous material	Includes: asbestos containing material, synthetic mineral fibre, polychlorinated biphenyls, ozone depleting substances and lead containing paint.
Pb	Lead
Membrane Filter Method	Is the technique outlined in the NOHSC Guidance Note on the Membrane Filter Method for Estimating Method Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].
NATA	National Association of Testing Authorities.
NOHSC	National Occupational Health and Safety Commission.
PPE/RPE	Personal / Respiratory Protective Equipment
Property owner	Shall include the owner of buildings or other structures in which asbestos products may exist.
Registered removalist	Is a removalist registered or licensed under the relevant state legislation to perform asbestos removal and maintenance work.
Regulations	Include all provisions given force of law by the competent authority or authorities.
Relevant authority	Refers to the appropriate local, territorial, state or commonwealth government agency.
Removal area	Region immediately surrounding the site of asbestos removal and is defined by either barriers or the plastic sheeting of the containment. For the purposes of this document, the removal area is assumed to be potentially contaminated with asbestos dust.
Removal site	Region surrounding, and adjacent to, the asbestos removal area. In a building this may be an entire floor surrounding the removal area.
Respirable Fibre	Fibre which is small enough to lodge in the lungs
Restricted Area	A location requiring an Access/Work Permit because unprotected activity to undertake the intended purpose may expose a person asbestos respirable (airborne) asbestos fibre. For example: Drilling a switch board containing asbestos. Entry to a ceiling space containing asbestos.

TERM/ABRIVIATION	DEFINITION
	Entry to a riser shaft containing asbestos. Access onto a fragile asbestos cement roof. A cupboard containing asbestos pipe lagging.
Risk	The probability that harm from a hazard will occur.
State authority	For the purposes of this document, all references to state legislation or authorities shall include those of Australian territories.
Structure	Includes any industrial plant, erection, edifice, wall, chimney, fence, bridge, dam, reservoir, wharf, jetty, earth works, reclamation, ship, floating structure and tunnelling.

Attachment 2: Safety Management Plan (SSMP)

Project Safety Management Plan (SSMP)

Project Name:	**Camellia West**
Address:	181 James Ruse Drive
	CAMELLIA NSW 2142
Job No.:	CAMJAM
Commencement Date:	25 May 2012

By

CEJ Constructions Pty Ltd

ABN 17 125 903 817

Controlled ☐

Uncontrolled ☒

Authorised By: ____________________
Project Manager

Date: 25/05/2012

Note: Project Safety Management Plan:

- Site-specific Safety Management Plan (SSMP)

Controlled Document Register

The following is used to record any Controlled Document issued. It is optional and not necessary to record Uncontrolled documents issued.

Issue	Section	Page	Document/Description	Issued To	Date
1	n/a	n/a	n/a	Head Contractor	25 May 2012

Document Revision Status

The following is used to record any changes.

Section	Revision	Date	Amendment Description

Contents

Identified Hazards

Site-specific hazards (e.g. peculiarities of access and egress, protecting the public from the site, etc.):

1. Contamination (refer 'Safe Work Plan' for remediation); and
2. Substantial services and associated infrastructure are present near and on limited areas of the site (refer 'Safe Work Plan'). In particular Eastern Corridor Zone 3 and south/west corner of site including Zone 4.

Section 1.00

Management

Responsibilities

CMS Ref: 1.00

Site Environmental, Health and Safety Policy (*to be displayed on site noticeboards*)

We are committed to the ongoing improvement of the Environment, Health and Safety standards at our workplace.

Our main objectives are to identify and eliminate all accidents which might result in death or serious disability, and comply with environmental legislation.

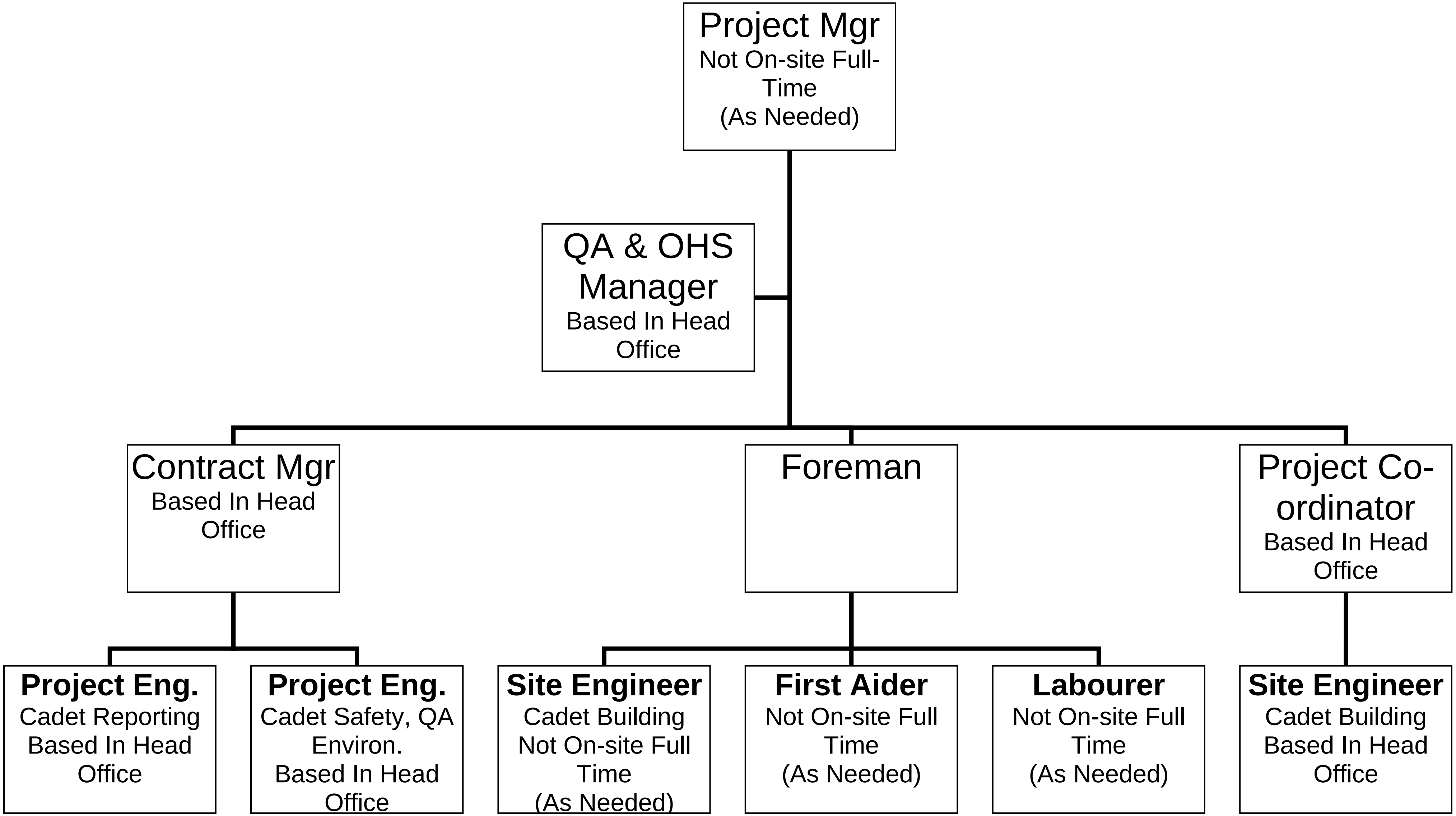
We are committed to achieving this by:

1. Daily example and accountability of the Site Team.
2. Careful planning and preparation and monitoring of written procedures and method statements involving supervisory staff, designers, workers and subcontractors to ensure OHS and Environmental work practices.
3. Ensuring the OHS and Environmental induction of all personnel prior to their commencement on site.
4. Regular inspections of the workforce and procedures.
5. Promoting and increasing the OHS and Environmental awareness of our designers, supervisory staff, workers, subcontractors, suppliers and our client.
6. Close liaison with client's staff, safety and environmental supervisory personnel.
7. Call on all personnel involved with the project to bring to the attention of the supervisory staff any matters requiring correction.

As a team, we will work together to implement the Management System to ensure the health, safety and well being of our employees, subcontractors, client's employees and general public.

....	....	....
Signature	Position	Date
....	....	....
Signature	Position	Date
....	....	....
Signature	Position	Date

Site Management Structure (*to be displayed on site noticeboards*)



Project Manager

Ensure the Contractor's OHS, Environmental, Rehabilitation, QA and IR Systems are developed and implemented in their area of accountability.

Identification of system verification requirements and allocation of human, technical and financial resources adequate to meet those needs. Implement a Site Safety Committee when more than 20 persons are on site.

Develop a Project Safety Plan and/or Site-Specific Safety Management Plan, Work Method Statements, Environmental Plan, Quality Plan and IR Plan that are consistent with the Contractor's CMS.

Assessment of Service Providers' abilities to comply with OHS, Environmental, Rehabilitation, QA and IR requirements.

Issuing and agreeing roles and responsibilities with all the Contractor's employees, on site.

Investigating incidents, accidents, non-conformance and initiating corrective (preventative) actions.

The development and implementation of emergency procedures.

To support and assist with the rehabilitation of employees, who have been injured at work, by encouraging their early return to normality through work based rehabilitation programs.

Responsible to ensure attendance (including own) at specified OHS, Environmental, Rehabilitation, QA and IR skill programmes.

Project/Site Engineer, Contract Manager, Project Administrator & Project Co-ordinator

Ensure overall Project Safety Plan or Site-Specific Safety Management Plan is being implemented in their area of work.

Ensure Work Method Statements are obtained off each subcontractor prior to starting on site.

Review all work methods prior to submitting to Site Manager or General/Area Foreman for review.

Review selected subcontractors' performance with Site Manager or General/Area Foreman.

Assist in the review of any incidents, which might result in death or serious disability and recommend remedial action.

Review subcontractor work methods as required with General/Area Foreman.

Responsible to ensure subcontractors have been issued all relevant information so that they are selected with a clear understanding of their OHS, Environmental, Rehabilitation, QA and IR obligations.

Responsible to carry out an audit of their area of management with the Site Manager or General/Area Foreman.

Responsible to be involved in the review of any high risk work method procedures for their area.

Monitoring purchasing and material delivery with General/Area Foreman.

Ensuring attendance (including own) at scheduled OHS, Environmental, Rehabilitation, QA and IR skill programmes.

Site Manager

Ensuring compliance with the Project Safety Plan and/or Site-Specific Safety Management Plan, Work Method Statements, Environmental Plan, Quality Plan and IR Plan for the project.

Ensuring appropriate standard and procedures for OHS, Environmental, Rehabilitation, QA and IR legislation, regulations, standards, codes, safe working rules and enterprise, workplace, project or other enforceable agreements (if applicable).

Review Site-Specific Safety Plan, Environmental Plan, QA Plan, IR Plan/Strategy, Work Method Statement and Material Safety Data Sheets issued by subcontractors. Attend selected subcontractor OHS, Environmental, Rehabilitation, QA and IR audits with General/Area Foreman.

Be the Senior Management representative on the Site Safety Committee.

Acquiring and communicating OHS, Environmental, Rehabilitation, QA and IR information to personnel.

Planning OHS, Environmental, Rehabilitation, QA and IR training including Site Safety Rules (which may be displayed on site noticeboards), task and induction on site.

To ensure that all persons on site receive induction training and arrange other health, safety, rehabilitation, environmental, quality assurance and on the job training when required.

To encourage reporting of all incidents, non-conformances and mishaps, as well as accidents and injuries.

To monitor subcontractors compliance with the Project Safety Plan or Site-Specific Safety Management Plan, QA Plan, IR Plan, Site-Specific Plans, Work Method Statements and ability to comply with the Corporate Management System requirements.

Be the point of contact for all authority representatives, e.g. WorkCover, EPA.

Ensuring attendance (including own) at scheduled OHS, Environmental, Rehabilitation, QA and IR skill programmes

Foreman/General Foreman/Area Foreman

To encourage the involvement of all personnel in achieving a safe and healthy environment, compliance with standards by personally being involved with the Site Safety Committee, arranging work activity and refresher safety training and inviting input from people on matters relating to work processes as well as OHS, Environmental, Rehabilitation, QA and IR.

Communicating OHS, Environmental, Rehabilitation, QA and IR information including Site Safety Rules, which may be displayed on site noticeboards. Ensure all personnel attend a general OHS&R training course and site induction. Keep appropriate records of training.

Monitor subcontractors' Site-Specific Safety Plans, Environmental Plans, QA Plans, IR Plan/Strategy, Work Method Statements, Material Safety Data Sheets and training. Attend selected subcontractor OHS, Environmental, Rehabilitation, QA and IR audits.

To ensure that appropriate standards, safe working practices, procedures and use of personnel protective equipment are implemented and adhered to in their area of accountability.

To ensure that plant and equipment is maintained in a safe condition, with guards and safety devices in place and a regular programme of maintenance occurs.

Through regular inspections identify potential problems and hazards. When necessary, arrange assessment of possible hazards and institute control measures.

Ensure procedures for receiving, safely storing and using materials and hazardous substances.

Quarantining unsafe or non-conforming work areas, materials, plant and equipment.

Ensure first aid is available to all persons on site when required.

Ensure a register of persons receiving first aid treatment.

Maintaining accident and emergency procedures and first aid equipment. Ensure appropriate forms are completed and collate accident and injury statistics. Keep other records as directed by the Contractor's Project Manager.

Ensuring attendance (including own) at scheduled OHS, Environmental, Rehabilitation, QA and IR skill programmes

Leading Hand

Ensure work in their area of accountability is carried out safely and in an environmentally responsible manner.

Review all work methods for your area.

Ensure all subcontract workers understand and are working to their Work Method Statements.

Attend Site Safety Committee as scheduled.

Attend subcontractor OHS, Environmental, Rehabilitation, QA and IR audits.

Ensuring attendance (including own) at scheduled OHS, Environmental, Rehabilitation, QA and IR skill programmes.

Site Labour/Personnel

The Labour Chart is based on the Construction Programme.

This Labour Chart indicates the number of workers envisaged to be on site at various stages of the works and this information has been used to calculate and plan for the amenity and facilities required.

This plan is monitored and reviewed on a regular basis to accommodate the needs of the project as the work progresses and changes.

Description	Year: …………												Year: …………											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
300 men																								
280 men																								
260 men																								
240 men																								
220 men																								
200 men																								
180 men																								
160 men																								
140 men																								
120 men																								
100 men																								
80 men																								
60 men																								
40 men																								
20 men																								
10 men																								
5 men																								
Lifts																								
Crane out																								
Hoist out																								

Section 2.00

Subcontractors

and

Purchasing

CMS Ref: 6.00

Subcontractors and Purchasing

Successful OHS, Environmental, Rehabilitation, QA and IR management relies on control of Service Providers (e.g. consultants, subcontractors and suppliers) on the site and is clearly the responsibility of the Site Team.

This process can be broken-up into the following stages.

Selection and Monitoring of Subcontractors

Where service providers' are required for a job they are selected on price, experience and capability to carry out the work and how they will satisfy the OHS, Environmental, Rehabilitation, QA and IR requirements of the job.

The Contractor maintains a register of preferred service providers that have been successfully assessed. Any further service providers will be assessed on EHS&R criteria.

The Site Team may use the Tenderer/Subcontractor Compliance Review (ITF 190) during the tender stage and/or to monitor the subcontractor during the works for compliance with their Site-Specific Safety Plans.

Purchasing

Quotes are requested from service providers. The Project Engineer states the work to be performed including the OHS, Environmental, Rehabilitation, QA and IR requirements and highlights any health & safety hazards present on site, job title & number in the tender and subcontract documents.

The following is to be complied with prior to delivery of materials:

- Provide a Material Safety Data Sheet for all hazardous substances
- All hazardous substances containers must be labelled
- The type of goods and hazards
- Time of delivery
- Unloading location
- Method of unloading

Reference

- ITF 190 Tender/Subcontractor's Safety Compliance Review
- SP 645 Hazardous Substances

Section 3.00

Process Control

CMS Ref: 9.00

Site Specific Information (*to be displayed on site noticeboards*)

1. General Site Information

Contractor's Site Office is located on site

Main site entry is via 181 James Ruse Drive CAMELLIA NSW 2142 (opposite River Road West)

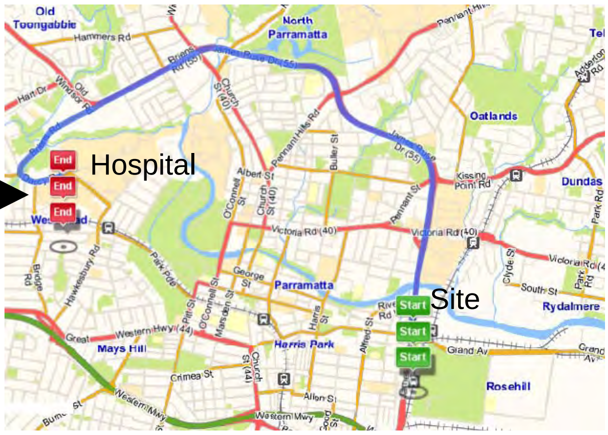
Site Ph: .... Fax: ....

Contractor's emergency contact: Mr. .... Mob: ....

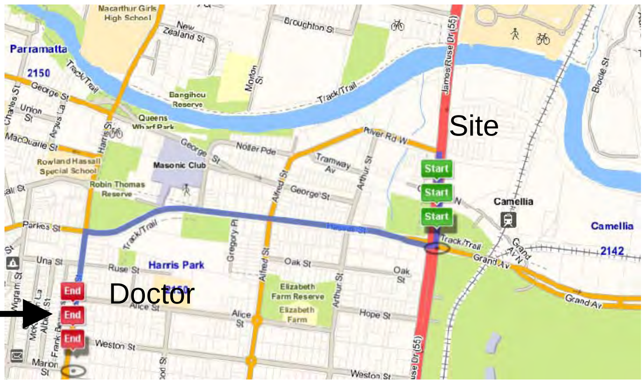
Mr. .... Mob: ....

2. Emergency Telephone Numbers

Ambulance and Fire Brigade	000	
Police	000	95 Marsden Street PARRAMATTA NSW 2150 Ph: 9633 0799
Police Assistance (e.g. theft, break-in, etc)	131 444	
Hospital	9845 5555	Darcy Road (Cnr Darcy & Hawkesbury Rds) WESTMEAD NSW 2145



Eye Hospital	9332 8400	Corner Sir John Young Crescent and Crown St Woolloomooloo
Doctor	9633 4435	79 Harris Street Harris Park NSW 2150 Dr: Bonovas C



Poisons Information Centre 131 126 or 9519 0466

State Emergency Service	9673 1277	
Pollution Incidents	131 555	DECCW Department Environment, Climate Change & Water (previously known as EPA)
Workplace Incidents	9370 5000	WorkCover 400 Kent St Sydney
Local Council	....	....
Dept Immigration & Multicultural Affairs	1800 040 070	Facsimile 1800 505 550
Sydney Water	132 090	Cnr Pitt & Bathurst St Sydney
Telstra	1100 or 132 203	
Optus	1800 505 777	
Energy Australia	131 388	
AGL Gas Networks Limited	131 909	
Roads & Traffic Authority (RTA)	9221 3000	

3. First Aid Representatives

Mr. .... Mr. ....

4. Site Induction Officers (person/s carrying site induction briefing)

Mr. .... Mr. ....

5. Site Safety Committee Members

Mr. .... Mr. ....

6. Parking (refer plan)

No parking on the site.

Map – Site Location

Project: Camellia West – 181 James Ruse Drive CAMELLIA Job No: CAMJAM

Site Evacuation Plan (*to be displayed on site noticeboards*)

1. Move to Assembly Area on Evacuation Tone sounding.
2. Do not use hoists.
3. Do not run.
4. Do not return to the site until the Contractor's Manager gives an 'all clear'.

Note: Assembly area is shown on plan below.

Fire and Evacuation Procedure (*to be displayed on site noticeboards*)

Every morning the Contractor’s Site Manager (or person nominated by him) is to receive the Subcontractors’ list (this list may be either verbal or in writing) of personnel who are working on site for the day.

If a fire is discovered on the site, try and contain it with a fire extinguisher. Do not place yourself at risk.

If the fire is uncontrollable, notify the Contractor’s Site Office.

Then proceed to give details of locations of fire (e.g. the type, extent of risk or size of fire).

Site Office will sound horn/siren and inform all staff of evacuation procedures.

If site office is unattended:

a) Telephone “*000*” state authority required, e.g. fire brigade.

b) Name of building/site.

c) Address of the above.

d) Specific location of entry.

e) Site telephone number.

Assembly Point is indicated in the Site Evacuation Plan.

Do not return to the site until the Contractor’s Manager gives an ‘all clear’.

First Aid Emergency Procedures

If an accident/emergency happens, notify the First Aider or Site Supervisor forthwith or telephone the Contractor's Site Office on the number indicated in the Site Specific Information (Safety Procedure form reference number SP205).

Details required:

a) Location of accident/emergency.

b) Type of injury/emergency.

c) Severity of injury/emergency.

d) Will the authorities (e.g. ambulance) be required?

All injuries must be reported to the Contractor's First Aider or Site Supervisor for a record to be made in the register of injuries.

If the Site Office is unattended or First Aider is unable to be located:

a) Telephone "*000*" state authority required, e.g. ambulance.

b) Name of building/site.

c) Address of the above.

d) Specific location of entry.

e) Site telephone number.

Whilst waiting for the authorities, make sure the employee is not moved unless there is a higher a risk of being injured. Send an employee to the front gate to alert the authorities of access to location.

Emergency Response to Spills

If a spill occurs that threatens or harms the environment, notify the First Aider or Site Supervisor forthwith or telephone the Contractor's Site Office on the number indicated in the Site Specific Information (Safety Procedure form reference number SP205).

All spills must be reported to the Contractor's First Aider or Site Supervisor and the EPA or local council as soon as practical after becoming aware of it.

For large-scale hazardous spills call the Fire Brigade immediately:

a) Telephone "*000*" state authority required, e.g. fire brigade.

b) Name of building/site.

c) Address of the above.

d) Specific location of entry.

e) Site telephone number.

Whilst waiting for the authorities, make sure that people are not placed at risk and secure plant and clear area so the risk of personal property damage is minimised. Send an employee to the front gate to alert the authorities of access to location.

For small-scale spills, follow the MSDS for the spilled substance.

General spill procedures:

a) Stop the source of the spill immediately if it is safe to do so.

b) Contain the spill and control it's flow (refer to the MSDS). Stop the spill from entering any stormwater drains by blocking the drain outlets.

c) Clean up the spill promptly by following the relevant MSDS. It is important to clean up all spills quickly, even small ones, as they can easily flow into stormwater drains or be washed there by rain.

Emergency Procedures

The emergency team is made up of the Contractor’s and all subcontractors’ Foremen to check numbers of employees on site (under their control) and accounting for them.

In case of an emergency the evacuation shall take place as detailed in the Site-Specific Induction.

Prior to returning to site the all clear is to be given by the Contractor’s Site Management.

Emergency phone numbers are to be maintained and updated on a regular basis and communicated to all persons, on site. Contact phone numbers and procedures should be displayed in site offices, First Aid Station, Bulletin Boards and high traffic areas.

Traffic Management Plan

1. Objective

The objective of this plan is to ensure that any potential disruption to traffic, inclusive of all vehicles, pedestrian, cyclists, etc. (within the vicinity or the area immediately surrounding the site) is minimised at all times during the construction of the project.

2. Scope and Implementation

The control and management of traffic involves the co-ordination of all delivery trucks, loading and unloading of these delivery trucks, concrete pumping from the street if necessary and the control of vehicular and pedestrian traffic to ensure their safety and minimal disruption to the general public and work on site.

All workers, employees, subcontractors, employers and the management team, involved in the construction of the project will adhere to this Traffic Management Plan.

3. Execution of Plan

a) All deliveries will be planned, where possible, to avoid peak hour traffic in the mornings and afternoons.

b) Delivery vans and trucks entering and exiting the site will be using the driveway on James Ruse Drive CAMELLIA NSW 2142.

c) Warning signs will be placed to notify all vehicles and pedestrians that a crane is working overhead, as necessary.

d) During the excavation phase, the following precautions will be taken:

- ➢ A trained attendant wearing suitably attired clothing (fluorescent coloured vest) will direct traffic and excavation trucks. This attendant will also be using a “STOP/SLOW” sign to assist in the direction of traffic; and
- ➢ The trucks will follow a set traffic route to minimise disruption to traffic.

e) During concrete pours, the following precautions will be taken:

- ➢ The WorkCover Code of Practice for pumping concrete will be strictly adhered to;
- ➢ If a ‘pump-line’ is set up from the street, then the safe and unobstructed access for the general public will be ensured;
- ➢ Potential trip and slip hazards will be eliminated and an attendant will be on hand at all times to ensure that unauthorised persons are kept away from immediate area of pump machine;
- ➢ An access ramp will be provided where required where the pump line passes over the footpath; and
- ➢ The attendants will be wearing appropriate PPE (fluorescent vests, helmets, safety boots, etc.) at all times during concreting to control traffic and concrete deliveries.

f) Any necessary applications for council permits or notification to the relevant authorities (e.g. police, RTA, etc.) will be carried out prior to any concrete pours.

g) Any work that will affect pedestrians and traffic (e.g. awning work, work to footpath and driveway, work above footpath, etc.), will be supervised such that pedestrian and traffic safety is maintained at all times. All necessary applications for permits, approvals and notification of relevant authorities will be carried out prior to these works taking place.

Section 4.00

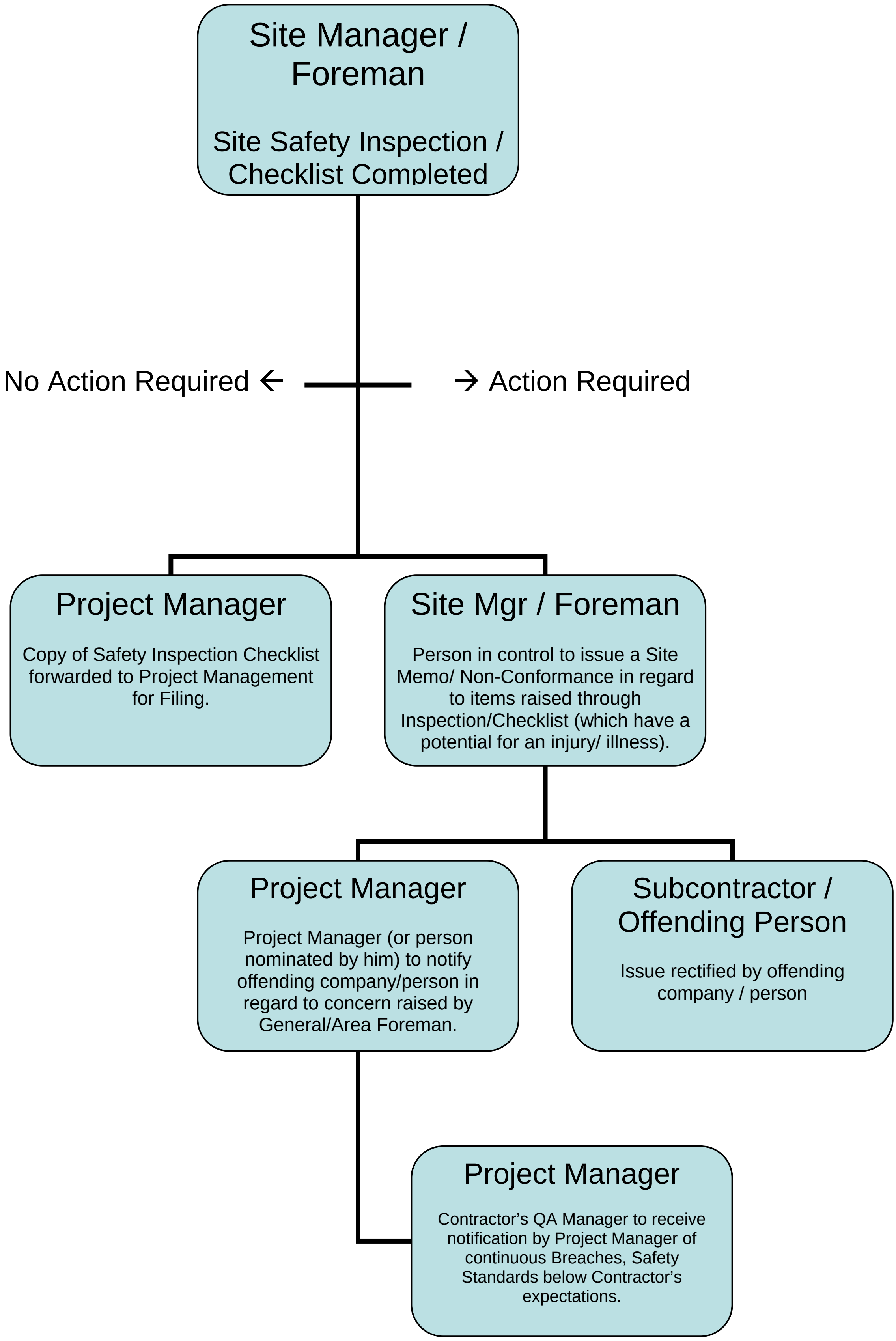
Inspections

and

Testing

CMS Ref: 10.00

Flowchart for Site Safety Inspection/Checklist



Section 5.00

Control

of

EHS&R Issues

CMS Ref: 13.00

Hazard Quarantining Procedure and Responsibility

Employee identifies hazard.

Can the hazard be controlled immediately?

Yes – Do It.

Hazard Controlled

→ Action Required

No – Could the Risk Cause Death or a Serious Disability?

Controls Required?
Area closed for immediate rectification? Temporary control measure needed?

Employee notifies foreman and completes hazard report (Non-Conformance Advice) for foreman

Foreman establishes corrective action & deadline.

Foreman implements corrective action.

Foreman's Manager confirms corrective action in place.
Hazard Controlled

Foreman signs off & files Non-Conformance Advice.

Site Safety Rules (*to be displayed on site noticeboards*)

1. Condition of Entry

It is a condition of entry to this site that Site Safety Rules are complied with.

Prior to commencing work personnel must attend general construction work health and safety induction, site-specific induction and site-specific work activity safety training.

Authorised entry and movement of personnel, vehicles and equipment will be coordinated by the Contractor. Warning signs will be adhered to and notification of deliveries will be made to the Contractor's Foreman.

2. Control of the Site

Every person on site has a responsibility to ensure the health and safety of themselves and others. Each person has the obligation to ensure the health and safety of their activities is managed in accordance with the Occupational Health and Safety Act 1983 and the Occupational Health and Safety Act 2000.

3. Tidiness

Ensure work progresses in a tidy manner, work areas are kept clear of excessive rubbish and work areas are left in a clean and tidy condition

4. Material Handling and Storage

Indicate where materials are to be delivered and stored (signs may be erected if appropriate), taking into account where materials will be used and the order in which they will be used. Ensure materials and equipment are stored on site in a manner that will not cause injury or illness to persons.

5. Protective Equipment

Must comply with appropriate Australian Standard. Shall be worn where necessary.

6. Safety Helmets

Shall be worn by all supervisors, employees and associated visitors in the designated areas. These areas will be signposted and barricaded.

7. Footwear

Steel capped boots shall be worn by all supervisors, employees and workers in the designated areas. These areas will be signposted and barricaded.

Suitable footwear must be worn at all times. Bare feet, thongs, flimsy or unsuitable footwear is prohibited.

8. Scaffold and Height Works

Ensure the scaffolds in use are erected to manufacturer's specifications. In particular, ensuring that the scaffolds comply with relevant parts of the Australian Standard for Scaffolding AS 1576.

Any person having to perform works above 1.8 metres must be supplied with and operate from a fully completed scaffold. A 'ticketed' scaffolder must erect scaffold over 4 metres.

Access scaffolding shall be erected with handrails, kickboards and scaffold planks, all securely fixed. When erecting or dismantling scaffolding at the end of each day, it shall be secured and left in a safe state and access to the scaffold blocked with temporary handrails

9. Handrails and Walkways

Handrails shall be erected in any location where there is a likelihood of falling, a step decent or a drop of more than one-metre (1m).

Where handrails are removed by an Employee for access, the Employee shall ensure that another employee or supervisor shall during all working hours be present to ensure that no other worker or person on site is endangered by the removal of the handrails and that the handrails are replaced that day or when the job requiring their removal is complete whichever is the sooner.

Walkways, stairs and other access ways shall be kept clear of materials and debris.

10. Ladders

Ladders shall not be used for access over more than one floor level and shall be secured at the top and bottom and access to the top and bottom of the ladder shall be kept clear.

11. Electrical Safety

All plant and equipment must be checked monthly (e.g. distribution boards, etc.) as per Code of Practice. Amenities, site office, must be checked every three months by a licensed electrician, with a register kept on site.

Ensure electricity supply for use on site is protected by a residual current device (trip tested monthly) installed into the power source, e.g. portable generators.

All fittings to extension cords to be either non-rewirable (moulded) or transparent.

All leads and power cables to be supported above any work area and passageway to provide clear access for personnel and vehicles.

Only approved portable multi-boards are to be used. No double adaptors/piggy back plugs to be used.

Ensure electrical supply complies with the relevant safety standards.

12. Stability of Structure during Construction

Ensure that the structure remains stable during the construction process. *Destabilisation may be caused by weather, wind, subsidence, construction loads, live loads and the premature removal of temporary bracing or temporary propping.*

13. Protrusions

Ensure any protrusions created are removed, bent over or guarded to eliminate or reduce risk of injury where they present a hazard. *Protrusions include* *protruding nails, tie-down bolts, reinforcing rods and mesh, bars, steel, copper and plastic tubing, metal flashing, post tensioning cables etc.*

14. Trenching and Excavation

Ensure any trenching and excavation is supervised by a person who is competent and capable of assessing the risks associated with trenching work. *This person should be knowledgeable on trenching, soil stability, appropriate shoring systems and where possible should have experience working with the local soil conditions.*

For trenches less than 1.5 metres deep – ensure a competent person checks the stability of trenches. If soil is unstable or prone to collapse, trenches should be shored before people enter them.

For trenches more than 1.5 metres deep – ensure a competent person carries out a risk assessment before people enter them.

Ensure any unattended trenching and excavation is barricaded or covered where they present a hazard, and are filled as soon as possible.

15. Plant, Cranes, Hoists and Machines

Operation of cranes and hoists shall be by licensed operators only and the operation of this equipment shall be in accordance with the manufactures' and authorities' recommendations.

Only licensed personnel operate or use specified plant and equipment. Other plant and equipment can only be used or operated by a competent person. In all cases ensure safety instructions provided by the manufacturer are followed.

No person other than a licensed 'dogman' shall give signals to the crane. Signal controls or gates shall not be removed from the hoist or crane.

16. Hazardous Substances

When using hazardous substances or chemicals, follow the precautions outlined by the manufacturer. *This information can be found on material safety data sheets (MSDS's), which must be provided by the supplier or manufacturer of a hazardous substance on the purchaser's request.*

17. Warning signs

Warning signs must be erected and maintained to indicate hazardous areas. *Warning signs may be required for some hazardous situations.*

18. Ultra Violet Light

People working on the site should wear adequate clothing, or use other protection, to protect them from the effects of working in the sun.

19. Toilets

Toilet facilities where available are in designated areas for workers and subcontractors.

20. Drinking Water

Where reticulated water is available near the project, it will be made accessible for workers and subcontractors to use. Otherwise potable water should be taken to site.

21. First Aid

All subcontractors should have a first aid kit available for themselves and their employees.

All people requiring first aid treatment are to contact the First Aid Officer who will administer the treatment and record the accident in the report record book, the person’s name and nature of accident.

22. Public and Construction Work

Consider the health and safety of the public by taking necessary steps to ensure activity on site does not cause members of the public any illness or injury.

23. Work Method Statements

Persons must complete and follow safe work method statements for the work they are to carry out.

24. Fire Prevention

Appropriate fire extinguishers must be on hand for each welding set bought on site, and also placed in strategic locations on site.

Fire hazards such as garbage, oily rags and flammable materials shall be eliminated by prompt removal or other corrective action.

25. Small Tools

Small tools shall be used in accordance with manufacturers’ recommendations and any malfunction shall be immediately repaired. Tools shall not have their guards removed and eye protection shall be used when using angle grinders, hammer drills, breakers and oxy gear. Free flight explosive powered tools are not permitted on this site.

26. Accidents and Emergencies

Shall be reported immediately to the Contractor’s Foreman along with any dangerous occurrence. Any employee who is off for more than seven (7) days along with any dangerous occurrence will warrant a report to be lodged with WorkCover Authority of NSW.

27. Accident Procedure

Should an accident occur that involves personal injury, the following steps shall be taken:

- Do not remove the victim, call an ambulance.
- Disconnect power, air or gas at the scene - but do not remove.
- Apply first aid, clear airways, resuscitation or compression to bleeding.
- Keep victim warm.
- Clear site for ambulance access.

- Write report immediately with witness/es reports, take photographs and notify The Builder's representative.
- Call the WorkCover Authority Inspector.

Where the accident involves plant, the following actions should be taken:-

- Secure the plant and clear area so the risk of personal property damage is minimised.
- If movement or removal involves any risk, call in an expert.
- Write report immediately with witness/es reports, take photographs and notify The Builder's representative.
- Call the WorkCover Authority Inspector.

28. Minimisation of Wastes

Workers can:

- Build carefully to avoid waste.
- Look after materials to minimise damage.
- Support & follow the reduce, reuse and recycle programs.
- Stack off-cuts safely for reuse.
- Minimise waste – put it in the recycle bins.
- Separate all wastes at source and not cross-contaminate.
- Keep wastes clean and dry.
- Not contaminate stormwater & waterways.
- Inform the Builder of any spillage.

29. General Health and Safety

The collective cooperation of each individual worker is required to maintain healthy and safe working environment for all workers on this site.

When decisions must be made which relate to safe operation, safety will always take precedence over expediency.

Any synthetic mineral fibres are to be installed in accordance with Worksafe Australia Codes of practice.

No animals and or pets are to be permitted to enter upon the site without the prior written approval from The Builder.

Glass containers are not allowed on the site other than in the lunchroom.

The site is a Smoke Free Zone. Smoking is prohibited in all areas of the site, inclusive of enclosed areas, site offices and amenity areas.

The site is an Alcohol and Drug Free Zone. Alcohol and drugs are prohibited in all areas of the site, inclusive of enclosed areas, site offices and amenity areas

30. Policing of Safety on Site

In respect of any breaches of safety The Builder may decide to send the offender off site without any warning.

At the discretion of The Builder a warning may be given, then the offender may be sent off the site. This shall be decided by The Builder or his representative.

31. Contractor's and Sub-Contractors' Employees

These site safety rules have identified general health and safety issues relevant to the Contractor's sites. In addition to this you are expected to know and comply with the regulatory requirements relating to the work you carry out.

WorkCover's Codes of Practice are relevant to the building industry and you should also be familiar with the Codes relating to your work.

You must familiarise yourself, your employees and any other person with the information provided herein in the interests of health and safety. Check the order/subcontract for every new site for additional health and safety hazards.

All employers are to ensure the entitlement of all employees to work legally in Australia. If the Subcontractor (or his Subsubcontractors) shall make default of this requirement then the Contractor may by notice in writing determine the Contract between the Contractor and Subcontractor.

Rehabilitation Program

The rehabilitation program is of extreme importance within our operations. The program includes:

- Prevent injury and illness by providing a safe and healthy working environment.
- Ensure that the occupational rehabilitation process is commenced as soon as possible after an injury in a manner consistent with medical judgement.
- Ensure that a return to work as soon as possible after an injury is a normal practice and expectation.
- Provide appropriate duties, where practicable, for an injured worker, as an integral part of the rehabilitation process.
- Consult with workers and where applicable, any industrial union of employees representing them to ensure that our rehabilitation programs operate effectively.
- Ensure that participation in a rehabilitation program will not, in itself, prejudice an injured worker.

CEJ Constructions Pty Ltd
7 Charles Street
Parramatta NSW 2150
Ph: (02) 8830 0400
Fax: (02) 8830 0499
A.C.N. 125 903 817

To:

Attn:

Non-conformance Advice

Project: Camellia West

Address: 181 James Ruse Drive
CAMELLIA NSW 2142

Site Tel.: Fax:

From:

☐ OHS (e.g. safety, enviro., etc)
☐ QA (i.e. quality assurance)
☐ IR (i.e. industrial relations)
☐ OW&D (outstanding work & defects)
☐ Other:

Advice No:
Date:
Job No: CAMJAM
Contract No:

☒ Mark as applicable

Sent By: ☐ Mail ☐ Facsimile ☐ Email ☐ Courier ☐ Hand Del. ☐ Other:

Description:

Date to be Completed:	Contractor Authorised Signature:

Reply - Action to be Taken by Person Responsible:

Date Received by (Print Name):	Signature:

Note: Acknowledgment of receipt is not mandatory for this form to take effect.

Completion of Action Taken and/or Comment:

Date Completed:	Contractor Authorised Signature:

List of Non-conformances

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM
Trade/Subject: Date:

NCR	Non-conformance Advice				Follow-up (if applicable)		
No.	Date	Type	Service Provider	Brief Description	Response/ Rework	Inspect By	Date
00001							
00002							
00003							
00004							
00005							
00006							
00007							

Section 6.00

Corrective Action

CMS Ref: 14.00

Accident or Injury Investigation

1. General

Where a lost time injury or an incident with the potential to cause a serious injury/illness occurs, then an Incident/Accident Investigation Report (ITF 080) is to be completed by the Project Manager (as deemed necessary) or person nominated by him.

2. Procedure

a) Obtain and document the situation and facts associated with the accident and/or injury.

   Utilise:

   i. Witnesses.
   ii. Sketches.
   iii. Photos.

b) Trace and record the sequence of events leading up to the accident and/or injury:

   i. Identify and record all contributing behavioural factors.
   ii. Identify and record all contributing physical and environmental factors.

c) Identify and record the reasons and/or failings.

d) Evaluate behavioural and physical factors, and for each:

   i. Consider alternative action.
   ii. Select best solution.
   iii. Effectiveness.
   iv. Cost.
   v. Acceptability.

e) Ascertain and implement the most appropriate corrective action.

f) File all documentation and notify the WorkCover Authority if appropriate.

g) Follow up and evaluate the effectiveness and acceptability of the corrective action.

3. References

- PF 710 Non-conformance Advice
- PF 750 List of Non-conformances
- ITF 215 Incident/Accident Investigation Report
- SP 630 Accident Reporting

Section 7.00

Handling, Storage,

Packaging and Delivery

CMS Ref: 15.00

Manual Handling

1. Individual Handling

a) Position your feet apart, with one forward and one back to gain balance. Stand close to or astride the load where possible.

b) Bend your knees when lowering your hands in lifting and lowering. When moving or placing loads, allow your leg muscles to lift or take the weight.

c) Keep your arms close to your body in all handling procedures. Do not reach out to lift or place loads, but position your hands close to the object to be handled.

Where it is impossible to stand close to the load, draw it to your body in a sliding movement before handling.

d) Ensure you have a secure grasp. Use your forearm, wrist, hand and whole of fingers where necessary.

e) Raise your head as you commence to lift.

f) Use your leg muscles and bodyweight when pulling or pushing loads.

2. Group Lifting

If the item to be handled is too heavy or awkward for you to lift on your own, seek assistance. Do not put your body under stress or strain:

a) When group lifting the movement of all people involved must be co-ordinated by simple directions given by one member of the team.

b) People of similar height and build should be employed to lift and carry long heavy loads if mechanical means are unavailable.

c) Position your body adjacent to the load to be moved.

d) If it is necessary to fully bend your knees to grasp the load, it is important that an adequate number of people be employed to safely manage the load.

e) Use a secure grip to grasp the load, with your arms between your knees and close to your body.

3. References

- ITF 150 Risk Identification – Safe Handling Checklist
- WorkCover Authority Code of Practice BackWatch Catalogue
- WorkCover Authority Guide Manual Handling Resources

Hazardous Substances

1. General

Legislation to control the handling of hazardous chemicals used in the workplace has been implemented in NSW by the WorkCover Authority (WorkCover). The following section outlines the procedures and systems that will be adopted for this project.

Hazardous and industrial waste arising from demolition/operational activities shall be removed (generated) and/or transported in accordance with the requirements of the Environment Protection Authority (EPA) and WorkCover.

2. Definition of Hazardous Substances

A substance which has the potential through being used at work to harm the health or safety of persons in the workplace.

3. Objectives

The objectives of legislation to control the use of hazardous substances are to:

a) minimise the risk of adverse health and safety effects due to exposure to hazardous substances in the workplace.

b) ensure that hazardous substances used at work are provided with labels and Material Safety Data Sheets (MSDS) are obtained. In Australia these should conform to National OHS Commission guidelines.

c) provide for the assessment and control of risks arising from exposure to hazardous substances.

d) ensure that employees with potential to exposure to hazardous substances used in the work activity are provided with information and training on the nature of hazards and means of assessing and controlling exposure to workplace hazardous substances and that, where applicable, employee workplace representatives have access to this information.

e) ensure that emergency services and other relevant public authorities have access to relevant information on workplace hazardous substances.

4. Material Safety Data Sheets (MSDS)

a) A MSDS provides the information needed to allow the safe handling of hazardous substances used at work. In Australia is should be set out in accordance with Worksafe’s Guidance Note for Completion of MSDS.

b) MSDS’s in the recommended format should be developed for all chemicals and substances supplied to site.

c) Employers/Subcontractors must obtain a MSDS from the supplier for all hazardous substances used in the workplace. A suppliers’ MSDS must never be altered.

d) MSDSs must be kept up to date and kept together in a convenient location at the workplace (could be contained in a database.)

e) Employees must have access to the MSDSs relating to the hazardous substances used at the workplace.

f) Employers must make sure employees understand the significance of the information contained in the MSDS.

5. Registers and Inventories

A register or inventory provides a central listing of all hazardous substances, which are used in the workplace.

Registers or inventories will be kept in the same place as MSDSs at the workplace and be accessible to employees.

6. Labels

All containers of substances supplied to, used or handled in the workplace will be labelled to allow people to use the substance safely. This includes containers into which chemicals are decanted unless all the decanted chemical is to be used immediately.

In Australia further guidance on the labelling of hazardous substances is to be found in the Worksafe Draft "*Guidance Note for the Labelling of Hazardous Substances Used at …*".

7. Assessment

An assessment is to be undertaken to evaluate the health and safety risks to employees arising from the use of hazardous substances in the workplace and to determine the measures necessary to control these risks.

The assessment will record and include:

a) identification of hazardous substances in the workplace.

b) nature of the hazard to health and safety.

c) degree of risk to health and safety.

d) measures required to control the exposure.

e) whether health surveillance is necessary.

f) induction and training required.

Not all hazardous substances at a workplace are chemicals; therefore the assessment will take into account substances that are produced as a by-product of a process (e.g. dust, fumes and gases).

8. Control

The purpose of control is to minimise employee exposure to hazardous substances thereby preventing adverse health effects, which could occur from such exposure.

Control of hazardous substances will be achieved through progressive application of the following hierarchy of control measures:

a) Elimination of hazardous substances from the workplace.

b) Substitution by less hazardous substances.

c) Isolation of the process to control the emission of hazardous substances.

d) Engineering control, including local exhaust ventilation for vapour, gases, or particulate, to contain or minimise hazardous substances or processes.

e) Adoption of safe work practices, including changes to work methods, which minimise exposure to hazardous substances.

f) Where other effective means of controlling the hazard are not workable, suitable approved PPE will be provided which conforms to the relevant standard.

9. Disposal of Wastes

All waste products are to be disposed of in accordance with:

a) OHS requirements

b) Consideration of minimising impact to the Environment.

c) Compliance with Standards and Codes.

d) Approvals.

10. Monitoring

The purpose of monitoring is to derive a qualitative estimate of the exposure of employees to hazardous substances. Monitoring is relevant to both assessment and control.

Monitoring involves the periodic and/or continuous sampling of workplace atmospheres of personnel, to determine the risk of exposure to hazardous substances. Monitoring is relevant to assessment and control.

11. Health Surveillance

The purpose of health surveillance is to ensure the health of employees is maintained while working with hazardous substances (e.g. lead, silica dust, manganese and isocyanides).

Early adverse health effects from exposure to hazardous substances may be detected through health surveillance.

12. Record Keeping

Employee records are maintained for a period of 30 years. The retention of records for this period of time is necessary because some adverse health effects, such as cancers, may take a long time to develop.

Records will include inventories of hazardous substances, results of workplace monitoring and employee health surveillance.

13. Employee Duties

All employees working with or near hazardous substances will maintain safe work practices so that their health and safety and the health and safety of those around them, is maintained.

a) Employees will use the control measures provided to minimise the risk of exposure to hazardous substances.

b) PPE will be used when provided. It should be kept clean and maintained in an appropriate manner.

c) Employees will practice a high standard of personal hygiene by washing thoroughly and removing all protective clothing before eating, drinking and smoking.

d) Defects discovered in any control measures including PPE will be reported promptly to a supervisor.

14. References

- ITF 085 Register of Hazardous Substances
- ITF 095 Workers Register
- WorkCover Authority, Code of Practice, A Guide to the Hazardous Substances Regulation and Control
- WorkCover Authority, Code of Practice, Reading Labels and Material Safety Data Sheets
- WorkCover Authority, Code of Practice, Working Safely with Chemicals
- WorkCover Authority, Code of Practice, Managing Chemical Hazards in the Workplace
- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Waste) Regulation 1996
- Waste Avoidance and Recovery Act 2001
- NSW Occupational Health & Safety Act 2000
- NSW Construction Safety Act 1912 (Regulation 84A-J Construction Work Involving Asbestos or Asbestos Cement 1983)
- Occupational Health & Safety Regulation 2001
- Occupational Health & Safety (Asbestos Removal Work) Regulation 1996

Section 8.00

Training

CMS Ref: 18.00

Training

1. General Industry, Trade, OHS, Environmental, Rehabilitation, QA and IR Training

All of our personnel are briefed on their specific roles and responsibilities with regard to our OHS, Environmental, Rehabilitation, QA and IR systems, inspection and testing. During their first week on the job new personnel are given a brief outline and a specific understanding of their responsibilities (e.g. SP 120, SP 125, SP 130, SP 135 & SP 140).

Training needs are identified and training is provided when necessary, to ensure that all personnel have the specific skills and qualifications to perform their work. Records of employee training and qualifications are kept, e.g. Workers Register (ITF 095).

2. Site Workers OHS, Environmental, Rehabilitation, QA and IR Training

For site workers completion of the following courses are compulsory:

.01 WorkCover accredited ‘OHS Induction Training Course for Construction Work – General’ (old ‘green card’ now commonly called ‘white card’). A ‘site worker’ who has not attended the course will be given reasonable time to attend

.02 Site Specific Induction, e.g. Site Induction Register (ITF 100) and Site Specific Induction (SP 655)

.02 Work Method Statement (SWMS), Job Safety Analysis (JSA) and Risk Assessment training

The Project Safety Plan/Site-Specific Safety Management Plan (PSP/SSMP) may specify further training needs, e.g. ‘tool box talks’ Training and OHS Talks – Supervisor’s Record (ITF 115).

3. References

- ITF 095 Workers Register
- ITF 100 Site Induction Register
- ITF 115 Training and OHS Talks – Supervisor’s Record
- ITF 235 Personnel & Training Record
- SP 655 Site Specific Induction
- WorkCover Authority OH&S Training – WorkCover occupational health and safety courses for industry

Site Specific Induction (*to be displayed on site noticeboards*)

Project: Camellia West – 181 James Ruse Drive CAMELLIA Job No: CAMJAM

1. A Brief Introduction to the Project

1.1 It's History:

The property has been used for industrial and commercial activities and then owned by Sydney Water for a while prior to its sale for redevelopment.

1.2 It's Future:

The development includes rezoning for industrial, commercial, retail & residential use.

1.3 The nature of the project at this point in time – Describe what's happening on the job at the moment. You should emphasise that whilst on the project you may encounter:

- Demolition
- Excavation
- Piling
- General Construction
- Finishing
- Environmental & Heritage
- Infrastructure

2. Parking and Hours of Work

2.1 **Site Parking** – No general parking is provided for on site.

Public transport via buses (from James Ruse Drive) and train (from Camellia Railway Station at the end of Grand Avenue).

2.2 **Noise Restrictions and Specific Hours of Work** – The project is governed by:

- The project is open for work Monday to Friday 7:00 AM to 5:00 PM
  Saturday 7:00 AM to 4:00 PM
- No heavy vehicles are allowed to enter the site outside these hours without the prior written approval of the Contractor.

3. Personal Protective Equipment (PPE)

3.1 **PPE To Be Worn At All Times** – PPE is to be worn in all areas designated. No exceptions:

- Hard Hat
- Steel Cap Boots
- Vest
- All PPE as per your Work Method Statement (WMS) and risk assessments
- **PPE must be supplied by your Employer**

3.2 **Observe What Is Happening Around You** – Be observant and take care when:

- Walking to and from your amenities and place of work
- Walking/working near trucks, forklifts, cranes or heavy machinery
- Observe and obey all warning signage

3.3 **Environmentally Responsible Project** – Each inductee can make an improvement to the environment and care is required with:

- Not contaminating stormwater and waterways
- Recycle an reduce waste wherever possible
- Informing the Contractor of any spillage

4. First Aid & Emergency Accident Procedure

4.1 **Location First Aid Facilities** – Refer to the drawing on the notice board and emphasise the location of the facilities.

4.2 **Emergency Accident/First Aid Procedure** – Refer to the written procedure on the notice board and describe the first aid call/notification system being used.

4.3 **Report all Injuries** – Report all injuries to the First Aid Officer.

4.4 **Report all Incidents** – Report all incidents including 'near hit'/'near miss' incidents. The report is to be to your Employer's Supervisor or the Contractor's Foreman.

5. Emergency Evacuation Procedure

Refer to the drawing and written procedure on the notice board and be sure that inductees understand location and the procedure.

6. Breaches of Safety

6.1 **Warning System** – At the discretion of the Contractor a warning system may apply for removal of offenders from site:

Step 1	First Warning	=	Verbal
Step 2	Second Warming	=	Written and verbal
Step 3	Third Breach	=	Written, verbal and in the presence safety committee member, delegate or management representative and removal from site

6.2 **Instant Dismissal/Removal from Site** – The Contractor may have an offender dismissed/removed from site immediately (without warning) for behaviour such as:

- Fighting
- Stealing
- Urinating

- Absenteeism
- Wilfully damaging amenities
- Deliberate damage to any plant and equipment
- Person being under the influence of drugs or alcohol
- Tampering with or vandalising of safety related equipment

7. Safe Systems of Work

7.1 **Work Method Statements** (WMS) – Have you been inducted into your safe WMS and your company Safety Plan.

- You must have safe WMSs developed for all task carried out on site
- You must be able to carry out all tasks without risk to yourself or others
- All inductees must acknowledge and sign the Site Induction Register that the *employee has read, understood & accepts his company's Work Method Statement* and *Site Safety Rules* prior to starting work on site

7.2 **Tool Box Meetings** – All subcontractors must conduct tool box meetings, as necessary (e.g. on the last Friday of the month (in accordance with the conditions of contract)). Signed attendance must be submitted to the Contractor.

7.3 **Working at Height** – All tasks that involve working outside a hand railed area or where workers could be exposed to a fall (e.g. a fall greater than 1.8m), must submit a specifically developed WMS to the Contractor for review. This must occur BEFORE work begins.

This safe work method must incorporate a thorough Risk Assessment and the proposed controls. Following review by the Contractor, all workers involved in the task must be inducted and a signed attendance record submitted to the Contractor BEFORE work begins.

7.4 **Scaffold** – Any changes or alterations required to scaffold must be communicated to the Contractor's Foreman who will coordinate with the scaffolders on site:

- Scaffolding must not be altered or removed except by certified scaffolders employed by the Site Scaffold Subcontractor. Workers found altering or removing scaffold could face instant dismissal
- Scaffold that is not completed will be indicated by signage (e.g. "Scaffold Incomplete", "No Access", etc.)
- Scaffold must be cleaned following all tasks by the relevant subcontractor

7.5 **Mobile Scaffold** – Must be built to regulation.

8. Housekeeping

8.1 **Access** – Maintain a clear and safe access free of obstruction at all times, particularly:

- First aid areas and call systems
- To fire extinguishers
- Temporary power board
- Stairs
- Scaffold
- Access to hoist

8.1 **Clean-Up!** – It is the subcontractors' responsibility to clean up:

- Clean up progressively
- Do not let rubbish accumulate
- Use the bin provided. If there is no bin, see the Contractor's foreman to organise
- Subcontractor who do not clean up progressively will be directed to stop production

9. Plant and Machinery

Plant and machinery are to be operated by certified/ticketed operators. Trainees may operate machinery under the supervision of a certified operator. A logbook of training must be maintained.

10. Electrical

10.1 **Tagging** – All power tools and leads must be checked and tagged monthly by a certified electrician:

- Tagging must be completed by the 7th of the month
- Tagging must be done prior to starting on site

10.2 **Electrical equipment is dangerous**

- **Elevate all leads!**
- Use insulated lead hooks or stands
- Earth Leakage Circuit Breakage (ELCBs) must be reset by an electrician
- The lid on the temporary power boards must be kept down

11. Drugs and Alcohol

The Use of Drugs or Consumption of Alcohol is Strictly Prohibited

- Drugs and alcohol is prohibited in all areas of the site including the site amenities
- Workers found to be under the influence of drugs or alcohol will be removed from site
- If you wish to receive help for a drug or alcohol problem, see your employer or delegate about a drug and alcohol rehabilitation program

12. Smoking

Smoking is Prohibited – Smoking is prohibited in all areas of the site (e.g. hoist, amenities, offices, first aid facilities).

13. Radios and Walkmans

13.1 Radios are permitted on site but must be used responsibly and with consideration for others.

13.2 Volume must be kept at a reasonable level.

13.3 Walkmans are prohibited on site.

14. Code of Conduct

All workers are expected to behave in a courteous and polite manner to one another and to visitors to the project. Emphasise that swearing over channels is prohibited.

15. A Last Word on Safety

15.1 **Site Safety** – Each inductee is to read and acknowledge that he understands the Site Safety Rules, this Site Specific Induction and his company's Work Method Statements (SWMS), Job Safety Analysis (JSA), Risk Assessments and by signing the Site Induction Register.

15.2 **Hazards** – If you notice a problem or hazard on site:

- Try to fix it yourself
- Inform your supervisor or the Contractor's Foreman or safety committee member (if we do not know, how can we solve the problem)
- **Do it safely …… or not at all**

Training & OHS Tool Box Talk – Supervisor's Record

Project: Camellia West – 181 James Ruse Drive CAMELLIA Job No: CAMJAM

Workplace: .... Date: ....

Employer/Subcontractor: ....

Supervisor: .... Signature: ....

Subject: .... Duration: ....

Type: ☐ - OHS (e.g. safety, env., etc.) ☐ - QA (i.e. quality) ☐ - IR (i.e. industrial relations) ☐ - Other: ________		
Employees Present (Print Names)		

Comments Or Points Raised By Attendees

Personnel & Training Record

Surname	
First name & others	
Address	
Telephone	
Date of Birth	
Nationality	
Languages spoken	
Emergency Contact	
Relationship	
Address of Emergency Contact	
Phone No. of Emergency Contact	
Years of Experience in the Construction Industry	
Date commenced with Contractor	
Building Industry long Service Leave Number (if applicable)	
Describe your Occupation	

Complete the following information to ascertain training history

Course	***Copies Attached (Y/N)***	***Date Completed***	***Expiry Date***	*Registration/ Identification Number*	***Comments***
General Induction for Construction Work in NSW 'White Card' Previously called 'Green Card' which needs to be upgraded to 'White Card'					
Drivers Licence Class					
Dogman					
Rigging					
Scaffold					
Tower Crane Driver					
Mobile Crane Driver					
Senior First Aid					

Course	Copies Attached (Y/N)	Date Completed	Expiry Date	Registration/ Identification Number	Comments
Occupational First Aid					
Advanced Resuscitation					
Man & Materials Hoist					
Materials Hoist					
Explosive Power Tool (EPT) Operator					
Forklift					
Elevated Work Platform					
11m Boom					
Formwork & Falsework					
Traffic Control – Worksite Planning 'Red Card'					
Traffic Control – Stop Slow Bat 'Blue Card'					
Traffic Control					
Backhoe					
Industry Induction					
OHS Committee Member					
OHS Supervisor					
Drugs & Alcohol					
Manual handling/Backwatch					
Clerk of Works					
TAFE Certificate					
(Detail Qualifications)					
Software/Sure Trak/MS Project Training					
Software/MS Office (Word, Excel, etc.) Training					
Software/Accounting					
Software/Project Management					
Other Employer Training					
Other:					

Section 9.00

EHS&R Records

CMS Ref: 16.00

Internal Audit Report

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Scope of Audit:........ Audit No:........ Date:........

Item	Activity Audited	Observations/Comments	Conforms		Action Taken/Follow Up	Initials /Date
			Yes	No		

Auditor:........ .... Audite:........ ....

Signature of Auditor Print Name Date Signature of Audite Print Name Date

Incident/Accident Investigation Report

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

1. *To be completed by Site Management immediately after:*
   - *a lost time injury occurs; or*
   - *an incident with the potential to cause serious injury/illness occurs.*
2. *A copy of the completed form is to be faxed to the Contractor's Project Manager and QA Manager.*
3. *Immediate notification verbally is required in case of a serious injury, illness or incident occurring.*

Time/Date of Accident/Incident:

Name of Injured Person/s: Age:

Location of Accident/Incident (be specific):

Nature of Injury/Illness:

Occupation of Injured Person:

Referred/Transferred to:

Damage to Equipment/Property:

Description of Accident/Incident (describe in detail):

Recommended Preventative Action:

Form Completed by:

Print Name	Position	Date

Note: If insufficient space provided above, please provide additional information on the back of this Form.

Weekly Site Safety Walk

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Date: .... day of ...., 20......

Participants: ....

No	Description of Works	Action	By Date	Initials /Date

Hazardous Substances Register

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Analysed by: Site Staff		**Reviewed:**					**Date:**	
Product	**MSDS Supplied**	**First Aid Requirements**				**PPE**	**Flammability**	**SWMS Developed**
		Swallow	Eyes	Skin	Inhaled			

First Aid
A Rinse Mouth
B Rinse with water
C Wash with soap and water
D Induce vomiting
E Do NOT Induce Vomiting
F Remove contaminated clothing
G Apply artificial respiration (if breathing has stopped)
H Remove from exposed area
I Seek medical assistance
J Bandage with dressing

PPE
I Overalls
II Safety Shoes
III Gloves
IV Safety Glasses
V Respirator
VI Wash hands after use
VII Well ventilated area

Flammability
1 Flammable
2 Nearby equipment must be earth
3 Highly flammable
4 Heating may cause separation
5 Non-Combustible
6 Combusts with other products
7 Remove all possible ignition sources
8 Do not smoke

Site Induction Register

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Date	Employee's Name	Employed by Company Name	Employee has Read, Understood & Accepts Conditions & Site Safety Rules Yes / No	Employee has Read, Understood & Accepts His Company's Work Method Statement Yes / No	Employee confirms entitlement to work legally in Australia Yes / No	OHS General Induction for Construction Work in NSW Commonly called Old 'Green Card' New 'White Card'	Other Qualifications, tickets and cards (e.g. traffic control, dogman, rigger, etc.)	Signature
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			
			Yes	Yes	Yes			

Site Induction Form

Project: Camellia West – 181 James Ruse Drive CAMELLIA Job No: CAMJAM

Site Induction Number And/Or Date: ....

Name: ....

Address: ....

Telephone No.: ....

Medical Conditions Or Allergies: ....

Next Of Kin: .... Emergency No.: ....

Union Membership: .... Membership No.: ....

Long Service Leave No.: ....

Industry Induction (Old 'Green Card' New 'White Card') No.: ....

Superannuation Membership: .... No.: ....

Redundancy Membership: .... No.: ....

Employer: .... Address: ....

Position Employed As: ....

Has Safety Equipment Been Issued By The Employer:

Boots	Yes ☐	No ☐
Hard Hat	Yes ☐	No ☐
Life Jacket	Yes ☐	No ☐
Other	Yes ☐	No ☐

Have You Read, Understood & Accept Your Company's Safe Work Method Statement Yes ☐ No ☐

You confirm Your Entitlement To Work In Australia Yes ☐ No ☐

Will You Be Operating Equipment Requiring Certification Yes ☐ No ☐

Type Of Equipment: ....

Certificate Held: ....

Copy Supplied To Site Foreman Yes ☐ No ☐

(Ticket Must Be Presented Prior To Using Equipment On Site)

Site Safety Procedures

I am obligated to follow these procedures and work in a safe manner:

- To ensure that all electrical equipment I use is correctly tagged
- To wear the correct personal protective equipment (safety gear)
- To ensure that handrails and signage is placed around penetrations
- To keep all access ways clear and tidy
- To make sure all scaffolds I work on have handrails and kickboards
- To check power tools every morning before use
- To report all faulty equipment to the foreman
- To be aware of and active in general housekeeping
- To report all safety issues to my foreman or safety officers
- To be aware of the safety and health of my fellow employees

The site foreman has made me aware of the following safety policies

Site layout	Explain location of amenities, lunch sheds, access to site, transportation(hoists etc)
Parking	Explain designated parking areas or No Parking on site
Tools and equipment check lead tagging etc.	Leads and electrical equipment to be tagged by .... prior use on site
Site traffic	Explain site traffic procedure. Refer site rules
Location of First Aid and Safety Officer	First aid office is located First aid officers are Emergency contact method is Site Foreman's phone
Location of work areas	Answer queries regarding access to specific work areas
Safety Committee	Safety Chairman is Safety committee members are
Reporting	All accidents and incidents are to be reported to first aid officer
Certification and licensing	certificates and licences must be presented to safety officer prior to commencement of activities requiring certification or licensing
Safety requirements	Site safety rules are located on bulletin board at lunch shed
Non-English speaking persons	Refer to employer to insure site rules are understood
Lifting techniques	
NO alcohol/drugs allowed at any time	This means NO
Housekeeping	All trade waste is to be placed in bins provided and located … … … … … … … … … … … … … … … … … …
Hazardous substances	Notification required prior delivery as per site rules
Deliveries	Explain site notification requirements
Unloading	Explain site unloading facilities, S/C unloading requirements
Emergency evacuation	Explain emergency evacuation procedure
Internal works	

By signing this form the employee has read and understood & accepts conditions and site safety rules

Signature:.. Date:..................................

Witness:.. Date:..................................

Training & OHS Talks Register

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Workplace:

Employer/Sub-Contractor:

Trainer	Subject Matter	Type of Training					Number Attending	Date
		OHS	Environ	IR	QA	Other		

Job Development Action

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

The following is to be completed, as applicable, for each project. It is desirable to monitor development/actions at regular intervals during project.		**Initials /Date**
1.	**Review Conditions of Contract and Client Brief:**	
2.	**Notification to Brokers of Insurance Requirements:**	
2.1	For residential buildings has written notification been given to Broker with regard to HWI (Residential Contractors Annual Home Warranty Insurance)?	
2.2	For projects with a Head Contract value of one million dollars ($1m) or more has notification been given to our Broker of contract value for ‘Contract Works’ insurance (old name ‘all-risk’)?	
3.	**OHS – Site-Specific Induction:**	
4.	**OHS – Project Safety Plan (PSP) or Site-Specific Safety Management Plan (SSMP):**	
5.	**Environmental & Waste Management Plan (EMP):**	
6.	**IR Plan:**	
7.	**QA Plan:**	
8.	**Training Actions:**	
	OHS and EMP Site-Specific Induction procedures included in PSP/SSMP/EMP.	
	Work Method Statement (SWMS) verification included in Site-Specific Induction.	
9.	**Design – Safety, Environmental, IR, QA and ‘Build-Ability’ Issues:**	
	Reviewed and considered Australian Standards (“AS”), Building Code of Australia (“BCA”) and WorkCover Codes of Practice.	
	Identify, investigated, assessed and control of risks associated with the site or inherent in design.	
	Considered and documented issues relating to the eventual removal or demolition of the facility.	
10.	**Design Plan Ongoing:**	
	Start - Reviewed Client Brief and associated documents.	
	20% - Design Complies Client Brief, AS, BCA, legislation, awards, etc.	
	80% - Design Complies Client Brief, AS, BCA, legislation, awards, etc.	
	100% - For Construction Drawings comply Client Brief, AS, BCA, legislation, awards, etc.	

Section 10.00

Design

CMS Ref: 4.00

Design

The Site Team is responsible for undertaking the design review in conjunction with OHS, Environmental, Rehabilitation, QA, IR and ‘build-ability’ issues. This process can be broken-up into the following stages.

Design Input

The client’s brief, head contract, OHS, Environmental, Rehabilitation, QA, IR, ‘build-ability’ issues, legislation, awards and statutory requirements will be taken into consideration in the design input and documented for adequacy.

We are to update and co-ordinate the design input with those responsible for imposing requirements and resolve any incomplete, ambiguous or conflicting requirements. This process will also take into consideration the results of any trade or contract review activities.

The Job Development Action (PF 010) will also take into consideration the design risks to workers undertaking the construction, safety issues relating to the eventual removal or demolition of the facility.

Design Review

The Site Team are responsible for undertaking and recording design reviews. Formal design review meetings are held at regular stages of the design. At these meetings the design output will be measured against the design input.

Representatives of disciplines and other specialists, as required, will attend design meetings. The minutes of meetings are recorded and maintained.

Design Verification

At the design review meetings the design output is measured against the design input to ensure design verification. Minutes of meetings are recorded.

Design Changes

Design changes are controlled by the Contractor to ensure that the responsible person only does changes.

We make sure that changes are clearly identified on the documents. Changes are thoroughly reviewed and authorised for issue. All design change documents are issued with a covering Document Transmittal (PF 610). The document lists (PF 305 & PF 405) are updated to reflect current revision status.

References

- PF 010 Job Development Action
- PF 305 List of Documents
- PF 405 Document Register

- PF 610 Correspondence

Section 11.00

Internal OHS&R

Review

CMS Ref: 17.00

Internal EHS&R Review

The Site Team will conduct internal audits with regard to OHS, Environmental, Rehabilitation, QA and IR issues. Refer to Project OHS, Environmental and IR Audit (ITF 195), Internal Audit Report (ITF 205) and Project Audit Schedule (ITF 210).

The audit results are recorded with Non-conformance Advice (PF 720) and entered on the List of Non-conformances (PF 750), if necessary. These are discussed with the people concerned and timely action is taken to ensure that the system procedures are operating effectively.

Follow up verification audits are taken if required for each non-conformance.

Incident/Accident Investigation Reports (ITF 215) and Project Safety Performance (ITF 220) are tabled at the Corporate Project Meetings to ensure the system is operating effectively.

References:

- PF 720 Non-conformance Advice
- PF 750 List of Non-conformances
- ITF 195 Project OHS, Environmental and IR Audit
- ITF 205 Internal Audit Report
- ITF 215 Incident/Accident Investigation Reports
- ITF 220 Project Safety Performance

Section 12.00

Documentation

CMS Ref: 5.00

Job Filing System

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

The following Filing System is used for this project with OHS, Environmental, IR and QA records filed accordingly (cross out anything that is not applicable; add any new items).

Description	***Location***	***Maintained By***
Project Filing System (Refer AF 002)		
• Electronic Filing	Contractor's HO	PM
• Paper Filing	Contractor's HO & Site	PM & Contractor's HO
Drawings:		
• List of Drawings, Amendments and Transmittals	Site	PM
• Current	Site	PM
• Superseded	Site	PM
• Other		
Specifications:		
• All	Site	PM
•		
Contracts:		
• Contract Documents and Correspondence	Contractor's HO & Site	PM & Contractor's HO
• Variations	Contractor's HO & Site	PM & Contractor's HO
Specific Standards, Regulations Legislation and Awards Used:		
•		
Safety Records:		
• Project Safety Plan (PSP)/Site-Specific Safety Management Plan (SSMP)	Site	PM
• Environmental & Waste Management Plan (EMP)	Site	PM
• Soil & Water Management Plan (SWMP)		
• IR Plan/Strategy	Site	PM
• Site Specific Induction Course (e.g. records, timing)	Site	PM
• Electrical Plant and Equipment Log Book	Site	PM
• Engineers' Certificates for formwork	Site	PM
• Subcontractors' Site-Specific Safety Plans	Site	PM
• Subcontractors' Work Method Statements (SWMS)	Site	PM
Quality Records:		
• QA Plan	Site	PM
• Quotes and Tenders	Site	PM
• List of Non-Conformance	Site	PM
• Inspection and Test Plans (ITP)	Site	PM
• Delivery Dockets	Site	PM
• Certificates and Authorities	Site	PM
Procedure Forms:		
• PF 005 Review of Contract (by Contractor)	Site	PM
• PF 010 Job Development Actions	Site	PM
• PF 105 Job Filing System	Site	PM
• PF 205 Project Filing System		
• PF 305 List of Documents (documents & data Contractor control)	Site	PM
• PF 310 Register of Relevant Forms		
• PF 320 Controlled Document Register		
• PF 330 Document Revision Status		
• PF 340 Resources		
• PF 345 Handover Documents/Approvals	Site	PM
• PF 405 Drawing Register (may also be used as transmittal)	Site	PM
• PF 470 List of Drawing Registers		
• PF 505 Site Diary	Site	PM
• PF 550 Site Safety Diary	Site	PM
• PF 610 Correspondence (multi-purpose transmittal, instruction, etc.)	Site	PM
• PF 650 List of Correspondence		
• PF 710 Non-conformance Advice	Site	PM
• PF 750 List Non-Conformance	Site	PM
• PF 805 Quote Request		
• PF 825 Order		
• PF 840 List of Orders		

List of Documents

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

The following list is to be completed and kept up to date by the Contractor. List the Clients specifications and contracts for each job/project and also any necessary office forms, Codes of Practice, Australian Standards, Rules, Legislation, Awards, Regulations, Permits, etc. (but not drawings).

The listed documents and data are available in our office or on site as required.

Item	Name of Document or Data	Author/ Client	Date Issued	Library Ref. No.	Reviewed & Auth. For	
					Use (Contractor)	Disposal (Initials & Date)

Notes:
1. Where any changes to these documents affect the Contractor's work the Contractor notifies and issues revisions to those concerned, any training (if required) and a diary note kept accordingly.
2. Strike out if superseded, changed or out of date and withdraw and dispose of all copies properly.
3. Items shown with an asterisk "*" are to be kept for legal or historical purposes.

CEJ Constructions Pty Ltd
7 Charles Street
Parramatta NSW 2150
Ph: (02) 8830 0400
Fax: (02) 8830 0499
A.C.N. 125 903 817

To:

Attn:

Project: Camellia West

Address: 181 James Ruse Drive
CAMELLIA NSW 2142

Site Tel.: Fax:

From:

Document Register

☐ Document Transmittal Doc. No:

☐ Site Instruction Date: 23/09/06

☐ Request for Information Job No: CAMJAM

☐ Memorandum Contract No:

☐ Other: ☒ Mark as applicable

Sent By: ☐ Mail ☐ Facsimile ☐ Email ☐ Courier ☐ Hand Del. ☐ Other:

COMMENT:

Please find pdf/cad/paper drawings attached

Date Of Issue:	**Day**														
	Month														
	Year														
Distribution:		No. Of Copies													
As above															
Reason for Issue	A-App C-Const G-General I-Info P-Prelim T-Tender														
Dwg Medium	P-Paper F-Film T-Tracing E-Email D-Disk														
Ref No.	***Document/Dwg Title***	***Revision***													

Note: Please dispose properly any previously issued copies.

Section 13.00

Statistical Techniques

CMS Ref: 20.00

Project Safety Performance

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Month No	Month & Year	Employee Exposure			Number of Injuries				Injury Effects				LTI Indicators			
		Ave Empl. Per	Total Man-Hours Worked		First Aid Treatment		Medical Treatment		Lost Time Injuries		Days Lost		LTI Frequency Rate		Average Time Lost Rate	
		Mth.	Mth. A	YTD B	Mth.	YTD	Mth.	YTD	Mth. C	YTD D	Mth. E	YTD F	Mth. G	YTD H	Mth. I	YTD J

Lost Time Injuries = Occurrences that have resulted in a fatality, permanent disability or time lost from one day/shift or more.

LTI Frequency Rate Mth (G) = $\dfrac{\text{No. of Lost Time Injuries in period C} \times 1{,}000{,}000}{\text{No. of man-hours worked in period (A)}}$

LTI Frequency Rate YTD (H) = $\dfrac{\text{No. of Lost Time Injuries YTD (D)} \times 1{,}000{,}000}{\text{No. of man-hours worked YTD (B)}}$

Average Time Lost Rate Mth (I) = $\dfrac{\text{No. of working days lost in period (E)}}{\text{No. Lost Time Injuries in period (C)}}$

Average Time Lost Rate YTD (J) = $\dfrac{\text{No. of working days lost YTD (F)}}{\text{No. Lost Time Injuries YTD (D)}}$

Note: **A copy of the completed form is to be distributed to the Contractor's Project Manager and QA Manager.**

Section 14.00

Client-Supplied

Products

CMS Ref: 7.00

Client-supplied Product

Where the client provides items (e.g. products, materials, equipment, software, data or services) they want incorporated into the permanent works we inspect them for the OHS, Environmental, QA and IR suitability (e.g. are the items safe to use or whether any special precautions are necessary).

The same procedures for receiving materials from other suppliers will be used.

Section 15.00

Inspection

and

Test Status

CMS Ref: 12.00

Inspection & Test Status

All work inspected is ‘signed-off’ on the checklists (ITFs) as the work progresses. The Site Team monitors that no work is carried out until the previous inspection points have been satisfactorily achieved.

The status requirements for inspection and tests are detailed in the form.

Section 16.00

Measuring Equipment

for

Inspections and Tests

CMS Ref: 11.00

Measuring Equipment

Inspection, Measuring and Test Equipment is selected to suit the accuracy of its intended application and usage is restricted to its range of accuracy.

Before we use equipment, they are checked as necessary to ensure they are operating satisfactorily for the purpose of the work. The check is made against a known valid relationship (e.g. existing surveyor's 'set-out').

Any equipment found out of calibration is repaired by an authorised laboratory/repairer or replaced. The laboratory/repairer is to show suitable calibration status, maintain calibration records for inspection, measuring and test equipment. Indicators and approved identification records are to be provided if requested by the Contractor.

Validity of previous laboratory/repairer's records is assessed if equipment is found to be out of calibration. The laboratory/repairer is to safeguard test facilities.

We are to ensure that environmental conditions are suitable for equipment to be used. Trained people are to handle, preserve and store equipment such that accuracy and fitness for use is maintained.

Section 17.00

Product Identification

and

Traceability

CMS Ref: 8.00

Product Identification & Traceability

The Site Team is to record the job number on all applicable OHS, environmental, rehabilitation, QA and IR records associated with the job.

We may also mark-up drawings showing the location of items with the item reference number.

Section 18.00

Servicing

CMS Ref: 19.00

Servicing

The scope of our work does not include servicing.

Annexure 1

Register of Relevant Forms

Register of Relevant Forms

Project: Camellia West – 181 James Ruse Drive CAMELLIA NSW 2142 Job No: CAMJAM

Document Type: Project Safety Management Plan (SSMP)

For use by Project Manager or the person responsible for EHS&R (Environmental, Occupational, Health, Safety & Rehabilitation) on site.

Doc. No.	***Document Name***	***Use & Comments***
	QA Procedure Forms	
PF 005	Review of Contract	Review of contract prior to Contractor's acceptance
PF 010	Job Development Action	Take into consideration the design risks to workers undertaking the construction, safety and environmental issues
PF 105	Job Filing System – Record Location	So the Contractor details location of all records
PF 205	Project Filing System – Building	So that the Contractor always carries out filing the same way
PF 305	List of Documents	Document lists are updated to reflect current revision status
PF 310	Register of Relevant Forms	Forms and procedures so that Contractor always do these activities the same way
PF 320	Controlled Document Register	Record holders of Controlled Documents
PF 330	Document Revision Status	Record any changes
PF 340	Resources	Record expected resources
PF 345	Handover Docs & Approvals	Design validation requirements are documented to the defined user needs and requirements
PF 405	Document Register	All documents are issued with a covering document transmittal. Document lists are updated to reflect current revision status (e.g. drawings)
PF 470	List of Document Registers	All document registers are listed
PF 505	Site Diary	Record site activities, any problems or issues that arise
PF 550	Site Safety Diary	Record safety site activities, any problems or issues that arise
PF 610	Correspondence	All documents (e.g. variation documents, site instructions, request for information, etc.) are issued with a covering Document Transmittal
PF 650	List of Correspondences	All site books are listed
PF 720	Non-conformance Advice	Resolve and record any problems or issues that arise
PF 750	List Non-conformances	Any work that does not conform is listed
PF 805	Quote Request	We state the work to be performed
PF 825	Order	Type and extent of control is mainly confirmed using Order. We state the work to be performed including the OHS, Environmental, Rehabilitation, QA and IR requirements needed
PF 840	List of Orders	All orders are listed
PF 905	List of Projects	A job number is established for each project and a register maintained

Doc. No.	***Document Name***	***Use & Comments***
	EHS&R Inspection & Test Forms	
ITF 005	Products, Materials, Plant and Equipment Checklist	To inspect on site plant and equipment
ITF 010	Crane (Mobile) Inspection Report	To inspect on site mobile cranes
ITF 015	Lifting Gear Checklist	To inspect on site lifting gear
ITF 020	Overhead Protective Structures	To inspect on site overhead protective structures
ITF 025	Hoist Checklist	To inspect on site hoist
ITF 030	Compressor/Pump Checklist	To inspect on site compressors
ITF 035	Forklift Truck Checklist	To inspect on site forklift
ITF 040	Oxy Acetylene Checklist	To inspect on site oxy acetylene
ITF 045	Scaffolding Checklist	To inspect on site scaffold
ITF 050	Loader/Excavator Inspection Report	To inspect on site loader excavator
ITF 055	Concrete Pump Line Checklist	To inspect on site concrete pump line
ITF 060	Traffic Control Checklist	To inspect traffic control measures (eg stop/slow bat)
ITF 065	Truck Logbook	To record truck deliveries and removal of material (e.g. excavation spoil)
ITF 070	Electrical Equipment Logbook	Logbook of inspections of site electrical equipment
ITF 075	Fire Protection Extinguishers	To inspect on site fire protection sprinklers
ITF 080	Mobile Plant Logbook	Logbook of inspections of site mobile plant
ITF 085	Hazardous Sub Register MSDS	Records required by hazardous substance regulation
ITF 095	Workers Register	Records of employee training & qualifications are kept
ITF 100	Site Induction Register	Employee site EHS&R records & OHS General Induction for construction work
ITF 110	Work Injury Illness Register	Employee injury management records
ITF 115	Training & OHS Talks Register	Employee site EHS&R records
ITF 120	Air Conditioner Filter Cleaning Register	Status requirements are detailed in the form
ITF 130	Excavation, Coring, Jackhammering or Chasing Permit	To be completed prior to coring
ITF 135	Crane Climbing Permit	To be completed prior to climbing a crane
ITF 140	Crane Schedule Daily	Record of crane activities
ITF 145	Plant Risk Assessment	To conduct and record results of plant risk assessment
ITF 150	Risk Identification Safe Handling	To conduct and record results of safe handling risk assessment
ITF 155	Risk Assessment Sheet	To conduct and record results of risk assessment
ITF 160	Training & OHS Talks – Supervisor's Record	Tool-box-talks, training and OHS talks recorded
ITF 165	PPE Issue Record	Employee personal protective equipment record
ITF 170	Daily Site Safety Inspection	Generic daily site safety inspection
ITF 175	Weekly Site Safety Inspection	Generic weekly site safety inspection
ITF 180	Weekly Site Safety Walk	Generic weekly site safety walk

Doc. No.	Document Name	Use & Comments
ITF 185	Site Inspection OHS Committee	Minutes of OHS Committee meeting
ITF 190	Tenderer Subbies OHS Compliance Review	Preferred service providers are assessed
ITF 195	Project OHS, Environmental & IR Audit	Audit program requires at least one audit per project
ITF 200	Project Amenities Audit	Audit program requires at least one audit per project
ITF 205	Internal Audit Report	Audit results are recorded
ITF 210	Project Audit Schedule	To review the set up of basic safety system requirements
ITF 215	Incident Accident Investigation	To record accident investigation
ITF 220	Project Safety Performance	Site safety performance records & accident statistics
ITF 225	SWMP Checklist Water Quality	To inspect on site environmental water quality
ITF 230	SWMP Checklist Soil Conservation	To inspect on site environmental soil conservation
ITF 235	Personnel Training Record	Personnel training records are recorded
ITF 305	Statement of Responsibilities	Waste Management – To list documents and persons (in management position) responsibilities
ITF 310	Action Plan	Waste Management – To plan and nominate person responsible
ITF 315	Land Use or Activity Proposal	Waste Management – Intention for managing waste
ITF 320	Details of Waste Management – Demolition Phase	Waste Management – Plan reuse, recycling & disposal
ITF 325	Details of Waste Management – Construction Phase	Waste Management – Plan reuse, recycling & disposal
ITF 330	Use of Premises	Waste Management – Plan waste requirements
ITF 335	Ongoing Management of Waste	Waste Management – Plan waste management
ITF 340	Soil and Water Management Plan (SWMP)	Waste Management – May be included in SP 84 SWMP
ITF 345	Environmental Report	Waste Management – Generic checklist
ITF 350	Subcontractor SWMS/JSA Review Verification Checklist	To conduct Service Provider safety work method statement checklist
ITF 400	Safe Work Method Statement SWMS	To conduct and record results of safe work method statement
ITF 605	Risk Analysis	To conduct and record results of risk analysis
ITF 650	Job Safety Analysis JSA	To conduct and record results of job safety analysis
	EHS&R Safety Procedures	
SP 105	Site EHS&R Policy	Site EHS&R policy
SP 115	Site Management	Organisation chart of site management structure
SP 120	Project Manager	EHS&R roles and responsibilities of project manager
SP 125	Site Engineer & Project Admin	EHS&R roles and responsibilities of site and project engineers
SP 130	Site Manager	EHS&R roles and responsibilities of site manager
SP 135	Foreman	EHS&R roles and responsibilities of foreman

Doc. No.	*Document Name*	*Use & Comments*
SP 140	Leading Hand	EHS&R roles and responsibilities of leading hand
SP 145	Site Labour Personnel	Schedule of site labour plot
SP 205	Site Specific Information	Details of site specific information
SP 210	Site Safety Rules	Generic site safety rules
SP 215	Site Evacuation Plan	Generic site evacuation plan
SP 220	Fire & Evacuation Procedure	Generic fire & evacuation plan
SP 225	First Aid & Emergency Procedure	Generic first aid & emergency procedure
SP 230	Emergency Response to Spills	Generic emergency response to spills
SP 235	Emergency Procedures	Generic emergency procedures
SP 240	First Aid Establishment	Generic first aid establishment
SP 245	Site Accommodation & Sanitary Facilities	Generic site accommodation & sanitary facilities
SP 250	Site Plan ~ Accommodation & Facilities	Generic site plan ~ accommodation & facilities
SP 255	Overhead Protection	To ensure that overhead protection is properly controlled and maintained
SP 260	Locality of Accesses	Generic locality of accesses
SP 265	Traffic Management Plan	Generic traffic management plan
SP 270	Pedestrian Access	Generic pedestrian access
SP 275	Subcontractors & Purchasing	
SP 280	Rehabilitation Program	To ensure that employees who become incapacitated at work are rehabilitated as effectively as possible
SP 285	Design	To review the set up of design system
SP 290	Internal EHS&R Review	Generic EHS&R review
SP 295	Client-Supplied Product	Generic procedures for client-supplied product
SP 300	Inspection & Test Status	Procedures for Inspection and test inspections and checklists
SP 305	Measuring Equipment	Measuring and test equipment control procedure
SP 310	Product Identification & Traceability	Procedures for identification and traceability
SP 315	Servicing	Generic procedures for servicing
SP 320	Visitors to the Site	Procedures for visitors to the site
SP 325	Security	Generic procedures for security
SP 405	Audible Reverse Warning Vehicles	Generic procedures for audible reverse warning vehicles
SP 410	Concrete Pump & Lines	Generic procedures for concrete pump & lines
SP 415	Core Drilling	Generic procedures for core drilling
SP 420	Cranes	To ensure that cranes used by the Contractor are properly controlled and maintained
SP 425	Crane Lifting Radius	Generic procedures for carne lifting
SP 430	Climbing Procedure for Tower Crane	Generic procedures for ‘climbing’ a tower crane
SP 440	Elevated Work Platforms	To ensure that elevated work platforms used by the

Doc. No.	Document Name	Use & Comments
		Contractor is properly controlled and maintained
SP 445	Excavation	Generic procedures for excavation
SP 450	Fire Precautions During Construction	Generic procedures for fire precautions during construction
SP 455	Formwork	To ensure that formwork used by the Contractor is properly controlled and maintained
SP 460	Gas Cylinder Storage	To ensure that gas cylinders used by the Contractor is properly controlled and maintained
SP 465	Hoarding – Overhead Protective Structures	To ensure that hoardings used by the Contractor is properly controlled and maintained
SP 470	Hoarding Location Plan	Generic procedures for hoarding location
SP 475	Hoarding Structural Certification	Generic hoarding structural certification
SP 480	Hoists	To ensure that hoists used by the Contractor is properly controlled and maintained
SP 485	Hot Work Procedures	Generic procedures for hot work
SP 490	Jump-Form System	To ensure that jump-form used by the Contractor is properly controlled and maintained
SP 495	Light Swinging Stage	To ensure that light swinging stage used by the Contractor is properly controlled and maintained
SP 500	Loading Platforms	To ensure that loading platforms used by the Contractor is properly controlled and maintained
SP 505	Manual Handling	Generic procedures for manual handling
SP 510	Penetrations	Generic procedures for penetrations
SP 515	Perimeter Screens	To ensure that perimeter screens used by the Contractor is properly controlled and maintained
SP 520	Rubbish Chute	To ensure that rubbish chute used by the Contractor is properly controlled and maintained
SP 525	Scaffold	To ensure that scaffold used by the Contractor is properly controlled and maintained
SP 530	Scaffold Location Plan	Generic procedures for scaffold location
SP 535	Pier Holes & Confined Spaces	Generic procedures for pier hole & confined space
SP 540	Facade Panel Installation	To ensure that facade panel installation is properly controlled and maintained
SP 545	Plant and Equipment	To ensure that plant and equipment used by the Contractor is properly controlled and maintained
SP 605	Site Safety Committee	Generic procedures for site safety committee
SP 610	Safety Committee Constitution	Generic safety committee constitution
SP 615	Flowchart OHS Inspection Checklist	Documents the OHS processes, highlighting hold and witness points
SP 620	Hazard Quarantining Procedure & Responsibility	Generic procedures for hazard quarantining & responsibility
SP 625	Accident or Injury Investigation	To provide guidelines on investigating and reporting accidents and injuries
SP 630	Accident Reporting	Reporting procedures have been documented
SP 635	Risk Assessment	To enable Contractor's personnel to identify risks,

Doc. No.	***Document Name***	***Use & Comments***
		assess their impact and control them to an acceptable level
SP 640	Guidelines for Producing WMS	Major hazard and risk has been identified
SP 645	Hazardous Substances	Generic procedures for hazardous substances
SP 650	Waste Management Plan	To ensure Contractor manages waste management issues
SP 655	Site Specific Induction	Generic procedures for site specific induction
SP 660	Warning Procedure for Site Personnel	Generic procedures for warning site personnel
SP 665	Legal Other Requirements	Guide on specific legal and other requirements
SP 670	Soil Water Management Plan	To ensure Contractor manages soil and water environmental issues
SP 675	Training	Guide on specific training requirements
SP 680	Subby Pack	Generic procedures for subcontractors' safety
SP 685	Complaints Handling & Community	To provide guidelines on complaints handling & community
SP 690	Project OHS&E Plan	Generic site specific safety management plan

Annexure 2

Subby Pack

WorkCover
NEW SOUTH WALES

SUBBY PACK

OHS CONTRACTOR MANAGEMENT TOOL

TOOL 2001
WorkCover NSW OHS Contractor Management Tool

CONSTRUCTION SAFETY KIT

WorkCover. **Watching out for you.**

Preamble

Subby Pack is a tool to help small business in the construction industry systematically manage occupational health and safety (OHS). It is designed to assist a company that has no safety management system by providing pro-forma documents that can be adapted to meet the company's needs.

Subby Pack was developed by the University of New South Wales School of Safety Science and Building Research Centre with the assistance of principal contractors in the construction industry. It was developed in support of the Construction Memorandum of Understanding (MOU). The MOU was signed in 1998 between the NSW Government and the Chief Executive Officers of the principal contractors and major industry associations in the NSW construction industry.

The signatories to the MOU have worked in partnership to implement measures to improve the construction industry's OHS and injury management performance.

The MOU signatory contractors are:

- ABB Engineering Construction;
- Abigroup Contractors Pty Ltd;
- A.W. Edwards Pty Limited;
- Barclay Mowlem Construction Ltd;
- Baulderstone Hornibrook Pty Ltd NSW/ACT;
- BHP Engineering Group;
- Concrete Constructions Group Ltd;
- Cordukes Ltd;
- Grocon Pty Limited;
- John Holland Construction and Engineering Pty Ltd;
- Leighton Contractors Pty Ltd;
- Bovis Lend Lease;
- Multiplex Constructions NSW Pty Ltd;
- Thiess Contractors Pty Ltd;
- Transfield Pty Ltd;
- Walker Corporation Pty Ltd; and
- Westfield Design & Construction.

Subby Pack was first published by the above contractors and the Construction Safety Alliance.

Subby Pack is a tool that will assist subcontractors in planning for safety. It is intended to provide practical guidance only to subcontractors in the preparation of documentation and procedures to assist them in systematically managing occupational health and safety and injury management.

Contractors should refer to their responsibilities as set out under the Occupational Health and Safety Act 2000, the Occupational Health and Safety Regulations 2001 and the Workers Compensation Act 1987.

While Subby Pack was developed for the construction industry, the Pack has been applied to a number of different industries with great success.

Other products developed under the auspices of the Construction MOU include:

1. Hazard Profile: Identification Tool for Metal Roofing
   Identification Tool for Electrical Hazards on-site
   Identification Tool for Bricklaying
   Identification Tool for Formwork
   Identification Tool for Aluminium Mobile Scaffolds
   Identification Tool for Steel Reinforcement Fixing
   Identification Tool for Concrete Placement
   Identification Tool for Demolition
2. Supervisor Manual: OHS Training Tool
3. Safety Meter: Positive Performance Measurement Tool
4. CHAIR: Safety in Design Tool

Another valuable tool to assist small and medium-sized businesses to systematically manage safety is WorkCover's *Workplace Safety Kit*.

More information about each of these products can be obtained by contacting WorkCover NSW on 131050 or www.workcover.nsw.gov.au.

Table of Contents

1.0 Introduction

This document sets out the safety management strategy to be adopted by ..……………………
Insert company name

during the course of the ………………………… contract on the …………………………………
Insert trade · Insert site name

project managed by ……………………………………………………..
Insert Principal Contractor name

The document is not designed to replace the Schedule of Health Safety & Environmental requirements as stated in the Special Conditions of Contract, but will be used to provide verification of the actions of ………………………………. in relation to these requirements.
Insert company name

This document and subsequent additions will be made available to ..…………………………..
Insert Principal Contractor name

for the purpose of auditing.

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1. Name of Company:

………………………………………………………………………………………………………

Address: ……………………………………………………………………………………..………..

………………………………………………………………………………………………………

Phone:…………………………………………Fax:…………………………………………………..

2. ……………………………..…… will provide …………..…………….. as the person on site
Insert company name
responsible for supervision of the Scope of Works and its safety.

3. Our peak number of employees on the site will be: ………..….

4. ……………………..……… does/does not intend to subcontract all or part of the works.
Insert company name

Trade Name:…………………………………………………………………………………………..

Contract Job Number: ……………………………………………………………..………………

Managing Director/General Manager: ……………………………………………………………...

Address: ……………………………………………………………………………………………

Phone: ……………………..……… Fax: ..………………………… Mobile: …………..…………..

Scope of Works: ____

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2.0 Safety Policy

At ……………………………….. our Occupational Health, Safety and Rehabilitation
Insert company name
Policy is based on a belief that the well-being of people employed at work, or people affected by our work, is a major priority and must be considered during all work performed on our behalf.

People are our most important asset and their health and safety is our greatest responsibility. The public shall be given equal priority to that of our employees.

The objectives of our Safety Policy are:

- To achieve an accident free workplace.
- To make health and safety an integral part of every managerial and supervisory position.
- To ensure health and safety is considered in all planning and work activities.
- To involve our employees in the decision making processes through regular communication, consultation and training.
- To provide a continuous program of education and learning to ensure that our employees work in the safest possible manner.
- To identify and control all potential hazards in the workplace through hazard identification and risk analysis.
- To ensure all potential accident/incidents are controlled and prevented.
- To provide effective injury management and rehabilitation for all employees.

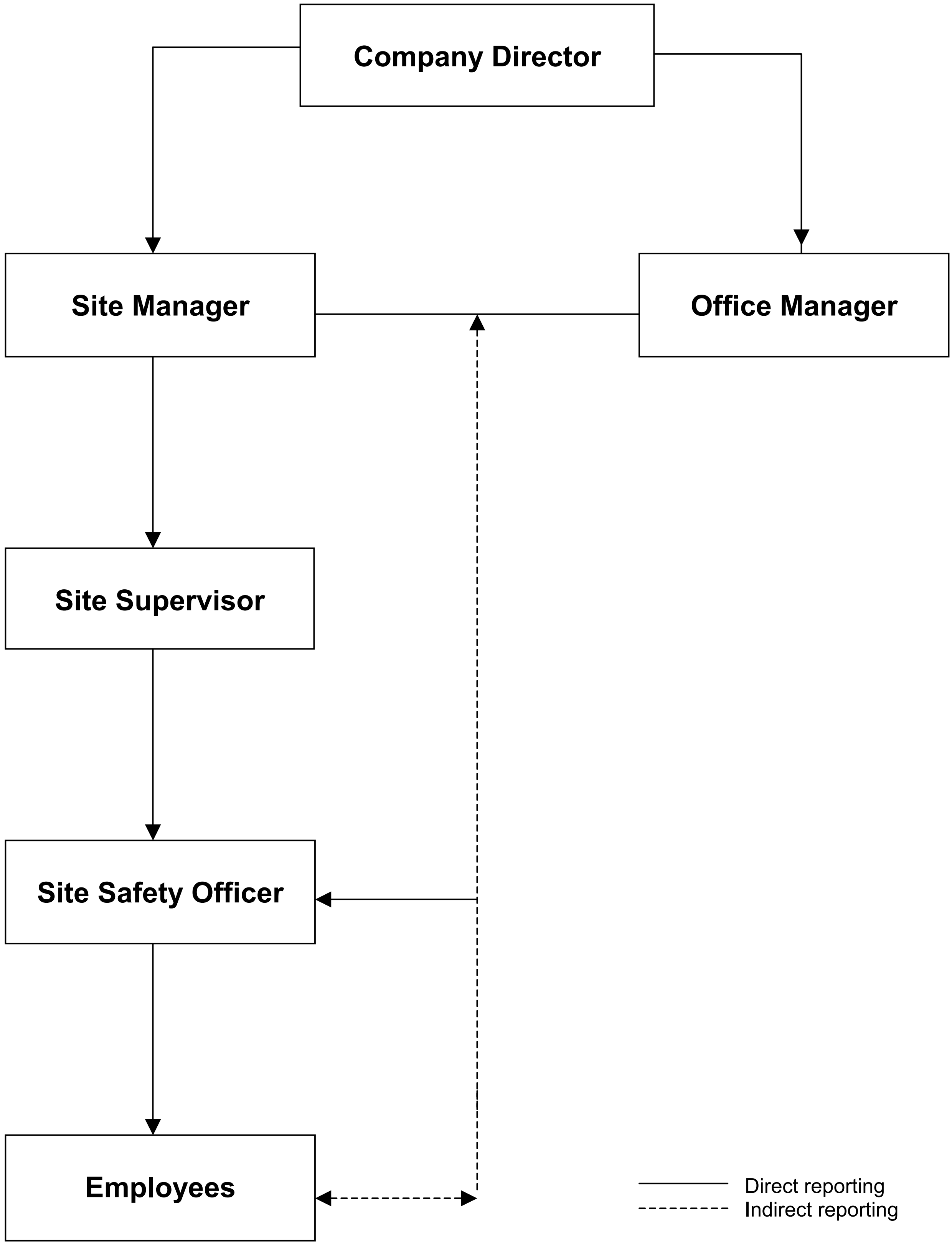
The success of our health and safety management is dependent on:

1. Pro-active planning of all work activities with due consideration given to implementing occupational health and safety (OHS) controls that are suitable to each given situation.
2. Understanding the total work process and associated OHS risks.
3. Ensuring the work team is totally committed to achieving our objectives.
4. Ensuring that open and honest communication exists between management and all employees.

………………………………………	………………………………………………	….. / …… / …..
Director's name	**Signature**	**Date**

3.0 Roles and Responsibilities

The following flow chart shows the lines of occupational health and safety reporting througout the organisation.



3.1 Roles and Responsibilities Defined

…………………………………... will provide the following key personnel on site. Their roles
Insert company name
and responsibilities regarding safety on site are outlined below.

SITE MANAGER

……………………………………….. is responsible for safety on the project. Duties include:
Insert name

- implementing the company Occupational Health Safety and Rehabilitation procedures;
- using the principles of the Hierarchy of Controls (Best to Worst guide in this Pack) in all design, fabrication and construct activities to minimise the risk to all personnel in the workplace;
- carrying out a design review with the Principal Contractor's project team to assist in the identification of further risk reduction controls measures;
- participating in the planning and design stages of trade activities;
- stimulating a high level of safety awareness at all times;
- identifying safety training needs;
- leading by example;
- ensuring safe equipment and plant is provided and maintained;
- insisting on correct and safe work practices at all times;
- assisting in the identification and preparation of safe work procedures;
- reviewing safety reports and inspections and initiating rectification where necessary;
- participating in accident/incident investigations;
- participating in safety meetings and programs; and
- monitoring compliance with safe work methods (controls).

SITE SUPERVISOR

…………………………………….. is responsible for safety on the project. Duties include:
Insert name

- implementing the company Occupational Health Safety and Rehabilitation procedures;
- observing all OHS requirements and statutory rules and regulations;
- ensuring that all works are conducted in a manner that is safe and without risk to employees health and safety;
- planning to do all work safely;
- providing advise and assistance on OHS to all employees;
- participating in the planning and design stages of trade activities;
- ensuring current OHS and other relevant legislative requirements are met in the workplace;
- identifying OHS training programs in advance and allowing for employee/s identified as requiring training to attend the training;
- actioning safety reports and carrying out workplace inspections;
- preparing and participating in safety meetings and safety programs;

- facilitating the preparation of Work Method Statements and Safe Work Method Statement for the trade;
- insisting and ensuring on safe work practices at all times;
- investigating hazard reports and ensuring that corrective actions are undertaken;
- conducting project inductions, toolbox talks and daily team briefings;
- participating in accident/incident investigations;
- leading by example and promoting OHS at every opportunity;
- supervising and ensuring compliance with safe work procedures;
- providing suitable employment to assist rehabilitation initiatives; and
- stimulating a high level of safety awareness at all times.

SITE SAFETY OFFICER

……………………………………….. is responsible for safety on the project. Duties include:
Insert name

- assisting the Site Supervisor to develop and implement the Occupational Health Safety and Rehabilitation (OHS&R) procedures;
- communicating safety performance to the Site Manager;
- providing advice and assistance on OHS to all employees;
- participating in the planning and design stages of trade activities;
- monitoring OHS legislative requirements for the trade package;
- monitoring compliance with safe work procedures;
- co-ordinating rehabilitation for injured employees;
- reviewing safety reports and inspections;
- preparing and participating in safety meetings and programs;
- facilitating Tool Box Talks on a regular basis;
- insisting on correct and safe practices at all times;
- preparing and conducting project safety inductions;
- investigating and developing new OHS initiatives for the trade;
- conducting accident/incident investigations;
- leading by example and promoting OHS at every opportunity;
- stimulating a high level of safety awareness at all times;
- communicating with the OHS&R Site Manager on matters relating to health and safety;
- facilitating the maintenance of all records as required under this Pack; and
- participating in regular workplace inspections and ensuring that any improvements resulting from such inspections are actioned in the required time frame.

***IMPORTANT: Principal Contractors and Sub Contractors need to also be aware of their responsibilities under Chapter 8 of the OHS Regulation 2001.**

4.0 Document Control

4.1 Issue, Revision and Review

……………………………………………….. is responsible for:
Insert company name

- **Completing the Subby Pack** and providing a copy to the Principal Contractor before work commences on site.
- **Maintaining an up to date version of the Subby Pack**. A record of revisions that occur will be kept in the Record of Revision table below. All obsolete pages will be destroyed.
- **Providing an updated copy to the Principal Contractor** whenever changes occur.
- **Maintaining a register of people to whom the Subby Pack is issued** using the Distribution List table below.
- **Issuing** a completed Subby Pack to all those registered.
- **Ensuring revisions are distributed** to all registered people.
- **Reviewing the Subby Pack at intervals of not more than one month** to ensure it is up to date.

4.2 Record of Revision

Edition/ Revision	Date	Section	Page	Revision Details
Issue A/ Revision 0				Original

4.3 Distribution List

Controlled copies of this Subby Pack have been issued to the holders nominated hereunder.

No.	User	Position	Issue Date
01			
02			
03			
04			

5.0 Hazard Identification and Risk Assessment

5.1 Procedure

Occupational Health and Safety Legislation requires anyone in control of the workplace to identify the potential hazards of the proposed work, assess the risks involved and develop controls to eliminate, or minimise, the risk.

5.2 Identify Hazards

To help find all potential hazards, the job will be broken down into activities that follow the sequence of construction. These activities are provided in a ***Work Method Statement (WMS)***, which is a list of job procedures, and other work-related practices provided to the Principal Contractor. The WMS details how the Scope of Work will be carried out.

For each of the work activities and associated job steps identified in the Work Method Statement provided ………………………………………….. will identify potential hazards.
Insert company name

To assist this process, resources such as the following will be used:

- WorkCover and trade based Codes of Practice and other publications, e.g. safety alerts;
- Hazard Profiles for specific trade groups;
- Workplace experience; and
- Consultation (e.g. Tool Box Talks) with workers experienced in the task to be undertaken.

5.3 Assess Risks

For each potential workplace hazard identified a Risk Class will be determined by referring to the categories below. The attached Risk Management chart (FORM 001) will be used to determine the requirement for management of the risks identified.

Class 1: (High Risk): Does the hazard have the potential to kill or permanently disable you?

Class 2: (Medium Risk): Does the hazard have the potential to cause a serious injury, or illness, which will temporarily disable you?

Class 3: (Low Risk): Does the hazard have the potential to cause a minor injury which would not disable you?

5.4 Selection and Use

- Where identified, all class 1 and 2 risks will be recorded on a detailed Safe Work Method Statement (SWMS) (also referred to as a Job Safety Analysis or JSA). Class 3 risks will be minimised as far as possible but will not be recorded on a SWMS.
- A Risk Class will be used to determine the level of Controls required to eliminate or minimise a potential hazard.
- The higher the Risk Class the more extensive the controls to be provided.

Risk Management

……..……………………… **Project:**________________________ **Date:**________
Insert company name

Major Work Activity	Potential Hazards	Activity Risk Score	SWMS Required	SWMS No. & Date Produced
Example: Installation of metal roofing on portal frame 3 storey high factory.	Falls from the edge of the roof. Falls through the roof framing, service penetrations or other openings.	Class 1 risk Class 1 risk	Yes: [X] No: [ ]	1. Generic (not specific to any site) SWMS required for the major work activity at tender for evaluation purposes. 2. Site specific SWMS provided for the major work activity before work commences.
			Yes: [ ] No: [ ]	
			Yes: [ ] No: [ ]	
			Yes: [ ] No: [ ]	
			Yes: [ ] No: [ ]	
			Yes: [ ] No: [ ]	

6.0 Safe Work Method Statement*

*** also referred to as a Job Safety Analysis or JSA**

6.1 Procedure

Preparation of a ***Safe Work Method Statement*** (SWMS) involves identifying potential hazards, assessing their risk and recording how to eliminate, or minimize, the risk to worker safety (controls). Where potential hazards are identified as Class 1 or Class 2 risks the Safe Work Method Statement will be completed using the step by step guide on the next page.

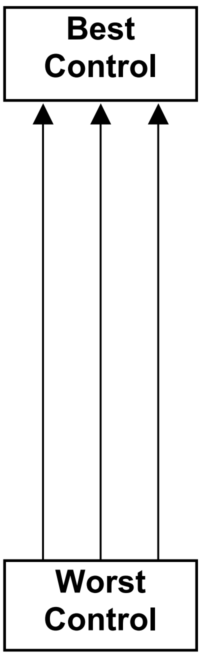
A generic (not specific to any site) SWMS will be submitted at tender. Broadly defined job steps will be used and general hazards identified. The SWMS will demonstrate ………………………………..'s understanding of the risks (particularly Class 1 & 2
Insert company name
risks) involved in the work and typical controls used. This SWMS will be provided for the purpose of tender evaluation.

Prior to commencement of work on site the generic Safe Work Method Statement submitted at tender will be reviewed. Where job steps or site conditions will change from those planned the SWMS will be updated to reflect the way the job will actually be done on the specific site and how safety will be controlled ***– a site specific SWMS.***

The SWMS form – FORM 002/a and FORM 002/b, provides a record to demonstrate compliance to Occupational Health and Safety Legislation. The person responsible for implementing a particular action to eliminate, or minimise, the risk of the potential hazard on site is nominated on the SWMS. This will ensure responsibility for risk control is allocated and can be followed up.

6.2 Evaluation of the SWMS

The Safe Work Method Statement will be evaluated on how well Class 1 & Class 2 hazards have been identified for the work activity to be undertaken and whether the suggested controls, wherever possible, eliminate the potential hazard or minimise the risk of injury. **Controls should be as high as practical in the "Best to Worst" guide shown below.**



1. Remove the hazard completely:
- e.g. remove risk of electrocution by using compressed air driven tools.

2. Separate people from the hazard:
- e.g. guards on power tools,
- e.g. use effective barriers and edge protection,
- e.g. enclose noisy machinery.

3. Use an engineered control:
- e.g. use Earth leakage device (safety switch) on electrical power source.
- e.g. use a machine to lift heavy objects.
- e.g. use scaffolding rather than ladders to reduce risk of falls.

4. Change work practices:
- e.g.training in lifting techniques.
- e.g. tagging procedures.

5. Provide personal protection (PPE):
- e.g. hearing protection, eye protection etc.

NOTE: PPE should be the last barrier to protect people when all else fails.

6.3 Safe Work Method Statement Step by Step

Does the SWMS provde:

1. The name of the company?
2. A description of the work activity or task to be undertaken?
3. The date the SWMS was developed?
4. The name and signature of the person who developed the SWMS?
5. The project name/number and the name of the Principal Contractor?
6. The job steps involved in doing the work?
7. Potential Class 1 and Class 2 hazards associated with the job task to be undertaken?
8. The controls that will be put in place to eliminate or minimise the potential hazards identified?
9. Controls as high as practicable on the "best" to "worst" control guide?
10. The name of the person/s responsible for ensuring that the control/s is in place?

6.4 Selection and Use

- The Safe Work Method Statement will be completed and signed by an appropriately qualified person/s representing …………………………………….. who is competent in the
  Insert company name
  work activity to be undertaken.

- The Safe Work Method Statement will be reviewed and signed by the appropriate Principal Contractor representative on the project.

- Employees will review the SWMS and sign (ToolBox Talk FORM 018) that they understand and are willing to implement the controls required to carry out the work safely.

- Work will not proceed until the above three criteria are achieved.

FORM 002/a

Safe Work Method Statement

Company Name:	Project Name/No:
Work Activity/Task:	Principal Contractor:
Date:	**Note: Sign off to be provided at Tool Box talk**
Prepared by:	
Signature:	

Item	**Job Step** Break the job down into steps	**Potential Hazard** What can harm you?	**Controls** What you are going to do to make the job as safe as possible	**Person** Who Will Ensure this Happens

Reviewed by:

______________________________ Principal Contractor Representative

______________________________ Position

______________________________ Signature

___/___/______ Date

Safe Work Method Statement (cont.)

Item	**Job Step** Break the job down into steps	**Potential Hazard** What can harm you?	**Controls** What you are going to do to make the job as safe as possible	**Person** Who Will Ensure this Happens

Reviewed by:

______________________________ ____________________________
Principal Contractor Representative Position

______________________________ ___/___/______
Signature Date

7.0 Skills and Competencies

7.1 Procedure

……………………………….. will ensure that its employees are adequately trained to a level
Insert company name
of competency sufficient to ensure their health and safety when at work.

7.2 Assessment

………..……………………………….. will undertake a training/competency assessment of all
Insert company name
employees prior to the commencement of work on the nominated site. The assessment will be recorded on FORM 003. Where skill deficiencies are detected appropriate training will be provided *before* work commences so that employees can perform their designated duties safely.

7.3 Selection and Use

- The FORM 003 register will be provided to the appropriate Principal Contractor's representative on site for review.

- Workers will be selected for specific tasks based on their level of skill and competency to undertake the work safely.

- Where workers are unskilled in the required task appropriate training will be provided prior to commencement of the work and recorded on FORM 004.

- **Day Labour** will be used only when the nominated worker/s satisfy the level of competency required to undertake the required task or when appropriate training can be provided prior to commencement of the work. Proof of the competency of Day Labour must be detailed in the Skills/Competency Assessment Register FORM 003 provided.

Skills/Competency Assessment Register

…………………..……………… Project:________________________ Date:________
Insert company name

Employee name	Skills, Competencies and experience (e.g. tickets/ qualifications)	Work to be undertaken on this project	Deficiencies in skills & competencies	Additional training required before work can commence
	[ ]Years Experience			Completed: Yes/No Date completed:../../..
	[ ]Years Experience			Completed: Yes/No Date completed:../../..
	[ ]Years Experience			Completed: Yes/No Date completed:../../..
	[ ]Years Experience			Completed: Yes/No Date completed:../../..
	[ ]Years Experience			Completed: Yes/No Date completed:../../..
	[ ]Years Experience			Completed: Yes/No Date completed:../../..

Training Attendance Register					
……………………………………………… Insert company name					
Course Name:					
Course Location:				Date:	
Name of Participants		Position	Training Type	Hours Attended	Signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Training Company	Names of Trainers		Length of Course (Hours)
	1		
	2		
	3		
	4		

8.0 OHS Induction

8.1 Procedure

……………………………….. will ensure that persons carrying out the nominated work have
Insert company name
relevant training including Occupational Health and Safety (OHS) Induction Training. Workers will not carry out construction work until they have received the minimum requirements for OHS induction training:

1. Industry (general) induction;

2. Work Activity OHS induction; and

3. Site Specific OHS Induction.

8.2 Selection and Use

- All workers will receive the above three minimum OHS induction training requirements before work on site commences and a record of the training provided on FORM 005.

Induction Register

…………………………………… Project:___________________________ Date:_________
Insert company name

Name	Course Description 1,2 or 3	Card No./ Reg. No.	Date of Course	Duration	Conducted by

Key:
1 **-** Industry (general) Induction
2 - Work Activity Induction
3 - Site Specific Induction

9.0 Workers Compensation & Rehabilitation

9.1 Procedure

………………………… will provide Workers Compensation Insurance for all employees
Insert company name
and other persons deemed to be employees under the Workers Compensation Act 1987. The trade and occupation of each employee on site and their salaries will be recorded. A record of the insurance will be provided on FORM 006 together with an attached *current* copy of the policy details issued by the insurer.

Where the basic tariff premium is greater than $50,000, a return to work co-ordinator will be appointed and for those that are $50,000 and under, they need to have someone appointed as a workplace contact.

9.2 Assessment

Where contractors are engaged to carry out work their ability to be considered an “employee/s” under the Workers Compensation Act 1987 will be assessed.

Workers Compensation	
Company:	______________________
Person Responsible for Processing Claims:	______________________ ______________________ Phone No.: __________ Mobile No.: __________
Name of Insurer:	______________________ Address:______________________ ______________________ ______________________ Phone No.: ______________ Policy No.: ______________ Expiry Date:../…./….
NOTE: A copy of *current* Workers Compensation policy must be attached.	

Return to Work	
Name of Return to Work Co-ordinator:	______________________ ______________________ ______________________ Phone No.: __________ Mobile No.: __________
Name of Rehabilitation Provider:	Company: ______________________ Contact: ______________________ Phone No.: ______________

10.0 Hazard Reporting

10.1 Procedure

…………………………………… will encourage all employees to report hazards immediately.
Insert company name

Our supervisor on site will investigate all reported hazards and document corrective actions. Corrective actions will be signed off when completed. The procedure and responsibilities for reporting hazards are outlined on form FORM 007 on the next page. The supervisor will complete a Hazard Report – FORM 008 where hazards cannot be corrected immediately.

…………………………………… will issue our Hazard Report form to all supervisory
Insert company name

personnel and safety committee representatives. A number of forms for employee use will be placed in the appropriate crib shed.

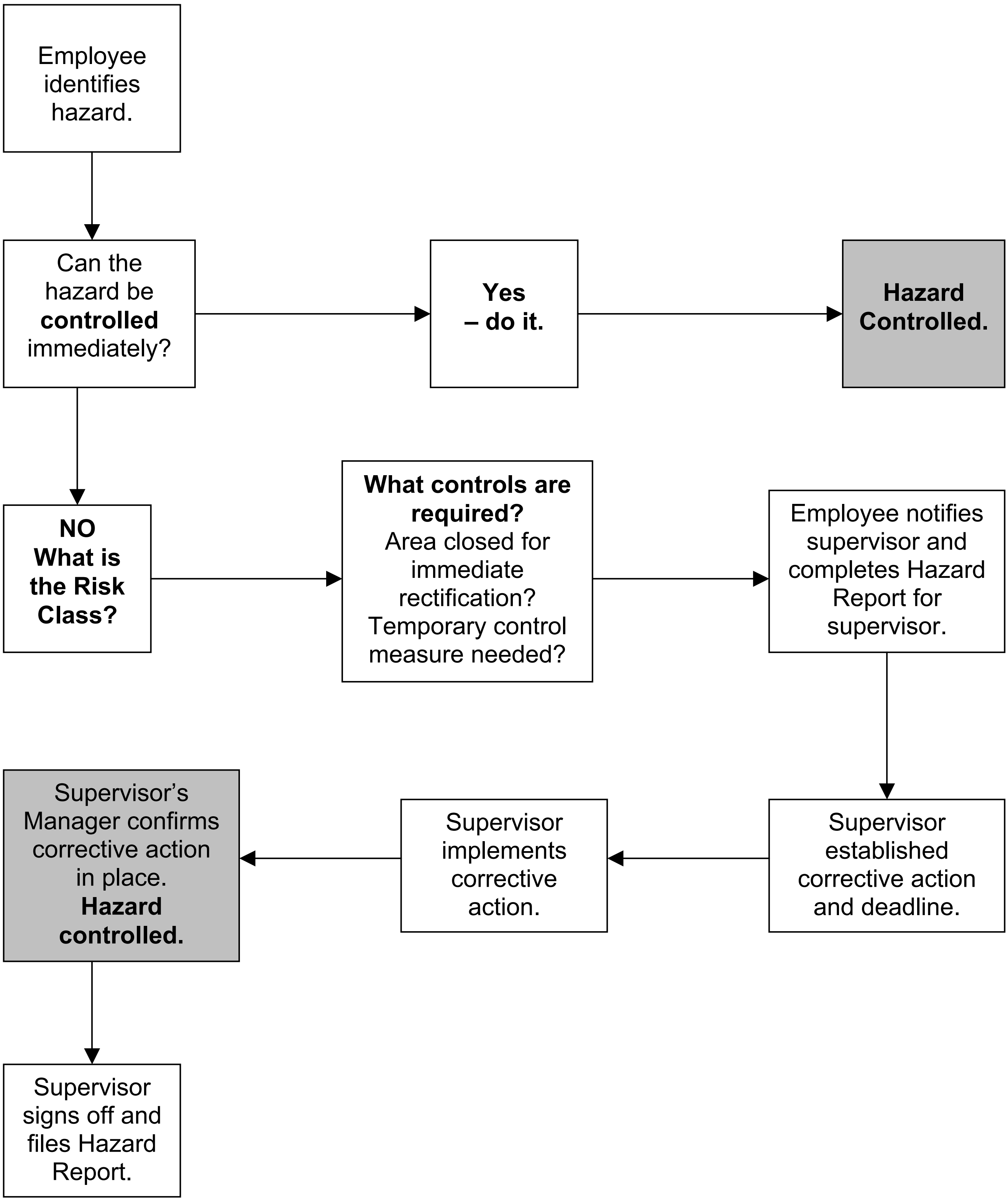
10.2 Assessment

When a hazard is identified in the workplace a Risk Class will be assessed immediately using the categories outlined in the hazard identification and risk assessment section of this Pack. The Risk Class will determine the appropriate level of response required to protect the health and safety of workers – i.e. immediate, within 24 hours, within 48 hours and so on.

10.3 Corrective Actions

- The Hazard Report will be signed by the inspection team leader and presented to the site supervisor if he/she is not part of the team.
- The above mentioned supervisor shall sign off the report when satisfied that all items on the report have been satisfactorily actioned. Copies of the signed off reports will be kept in this Pack.

Hazard Reporting Procedure & Responsibility



Hazard Report

Company: ……………………………….……….…………….

Project: ……………………………………………..…………… **Date:** …/……/……….

Submitted by: …………………………………………..…………

Signature: ………………………………………**Submitted to:** …..…………………………..…….

The following hazard has been identified in relation to your work:

____

Risk Level: Class 1 (High) [ ] **Class 2 (Medium) [ ]** **Class 3 (Low) [ ]**

Location:

To be Completed by Supervisor

Action Required: ____

By Whom: ………………………………….………………………….

By When: ☐ Immediate ☐ Within 24 hrs ☐ Within 7 days

Corrective Action Completed by: ……………………………………………………………..

Time:……………. **Date:** …../…./….. **Signature:** …………………..……………………………..

Confirmed by: ………………..…………………… **Signature:** …………………………………

11.0 Electrical

11.1 Procedure

……………………………………… will ensure that the use of electrical wiring, portable tools
Insert company name
and extension leads will be in accordance with the Code of Practice Electrical Practices for Construction Work. Where a more specific provision is not made in the Code of Practice conformance will be to the provisions of Australian Standard AS-3000, Wiring Rules.
All electrical equipment to be brought on site will be listed in the Electrical Equipment Register FORM 009. The register will be completed prior to commencement of the works and maintained for the duration of the works on site.

11.2 Inspection & Tagging

All electrical leads, portable power tools, junction boxes and earth leakage devices will be tested, inspected by a suitably qualified person and labeled with a tag of current date before being brought on site. Where this is not possible the Principal Contractor will be advised immediately and assistance requested in order to comply with the requirements of the Code of Practice Electrical Practices for Construction Work. A record of the currency of all electrical equipment will be recorded on FORM 009.

11.3 Selection and Use

- Whilst on site any electrical equipment found without a tag of current date issued by a suitably qualified person will not be used.
- Where an electrical item is located without a current inspection and test tag proof of the electrical items currency of inspection and test will be provided or the item removed from site immediately.
- When used on a construction site all electrical equipment will be connected to an Earth Leakage protection device at all times.
- Where practicable all electrical leads will be kept off the ground on insulated hangers or on insulated lead stands.
- Extension leads will not be joined together.
- All plugs and sockets will be non-wirable (moulded) or transparent.
- Electrical equipment will not be placed on, or near, wet areas unless the equipment is designed for the specific purpose, e.g. pump.
- **Where electrical equipment is hired,** e.g. portable generators, work lights and extension leads, ……………………………………… will ensure that the same
  Insert company name
  requirements for Occupational Health and Safety as those required on site are specified to the Hire Company as a condition of the Hire Agreement.

Electrical Equipment Register

Project:____ **Date:**____________

Ref: Code of Practice Electrical Practices for Construction Work

Equipment Description	Plant or Serial No.	Date of Insp/test	Results and/or trip current (less 30mA) for Earth Leakage Device	Date of next Insp/test	Electrician's Signature	License No.

Electrical item	Frequency of inspection/test
Tools & leads	Monthly
Sub-board earth leakage device	Trip tested monthly; calibrated 3 monthly

Monthly/Tag colour

J – Red	F – Blue	M- Orange	A – Green	M – White	J - Yellow	Jul – Blue	A – Green	S - Red	O – Yellow	N – Orange	D- White

12.0 Hazardous Substances

12.1 Procedure

Prior to hazardous substances being used on a project ……………………………. will submit
Insert company name
a Material Safety Data Sheet (MSDS) to the Principal Contractor for approval. No substances will be brought on site without approval of the current MSDS by the Principal Contractor. All substances to be brought on site will be listed in FORM 010.

12.2 Selection

………………………… will consider the following when selecting hazardous substances:
Insert company name

- Flammability and explosivity;
- Carcinogenic classification if relevant;
- Corrosive properties;
- Environmental hazards;
- Toxicity (short and long term);
- Chemical action and instability;
- Extent of PPE required;
- Storage requirements.

12.3 Storage

- All storage and use of hazardous substances will be in accordance with the MSDS.
- All hazardous substances will be stored in their original containers with the label intact at all times.
- Hazardous substances of any quantity will not be stored in crib rooms, container sheds or offices.

12.4 Use

- Where practicable the material with the lowest possible hazard capability that meets the technical requirements for the job will be used.
- Refer to WorkCover and National Occupational Health and Safety Commission (NOHSC) Publications for advice. See in particular: *List of Designated Hazardous Substances (NOHSC: 10005/1999)*.
- Advice on a substance may be obtained from a chemical database, e.g Chemwatch.
- Prior to using the hazardous substance all workers involved in its use will be provided with adequate information and training to allow safe completion of the required task. Confirmation of this training will be provided by a "sign off" on the appropriate Tool Box Talk FORM 018 or the training recorded on FORM 004 .

Hazardous Substances Register & Risk Assessment

Project:____ Date:___________

The following hazardous substances exist on site. A copy of the MSDS has been forwarded to the person responsible for First Aid and is listed under the relevant subcontractor using the substance to increase first aid response time.

Product Name	Application	Product labeled Yes/No	MSDS Yes/ No	Risk Assessment (Class 1, 2 or 3)	Control/s based on the risk class (eg. mask, ventilation required)

Class 1: (High Risk) Does the substance and its associated hazards have the potential to kill, or cause permanently disability, **e.g. lung disease**?
Class 2: (Medium Risk) Does the substance and its associated hazards have the potential to cause a serious injury, or illness, which will temporarily disable, **e.g. Dermatitis**?
Class 3: (Low Risk) Does the substance and its associated hazards have the potential to cause a minor injury which would not disable, **e.g. mild skin rash**?

13.0 Lifting Gear

13.1 Procedure

…………………………….. will ensure that all lifting gear (chains, slings, wire rope, shackles,
Insert company name
hooks) to be brought on site have a *current* certificate of test and are listed in the register FORM 011. The register will be maintained during the course of the contract.

13.2 Assessment

All lifting slings and accessories will be marked with the manufacturers identification, maximum rated capacity and the grade of the steel or alloy. ……………………………… will provide
Insert company name
each item with a marked identification number and a current test certificate for each will be held on site and made available on request.

13.3 Selection & Use

- Prior to use all lifting gear will be inspected by a competent person to check for defects.
- Lifting gear that does not have a current test certificate will not be brought on site under any circumstances.

Lifting Gear Register

Description	Plant No.	Date of Last Inspection	Condition	Inspected by	Date for Next Inspection
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	
				Qualification:	

14.0 Plant

14.1 Procedure

Equipment including static (stationery) and mobile plant can be hazardous to workplace safety.

In order to comply with Occupational Health and Safety Legislation ………………………………. will carry out regular inspection and maintenance of plant and
Insert company name
Equipment. The inspection and maintenance history of each item will be documented on the appropriate FORM 012 to FORM 015 (or their equivalent) and provided prior to commencement on site.

Where a relevant Australian Standard is appropriate, e.g. AS-2550 for cranes, the inspection, use and maintenance of the plant will comply as a minimum with the Standard. Where no Australian Standard is provided, the inspection, use and maintenance of the plant will comply as a minimum with the Manufacturers Recommendations. The affect of plant and equipment on the workplace will also be considered.

14.2 Assessment

…………………………….. will carry out an assessment of the most appropriate type of plant
Insert company name
and equipment for the required job. The assessment will include the identification of potential hazards, the level of risk and the provision of appropriate controls to eliminate, or minimise the risk to health and safety of workers. This process will include both the plant and/or equipment itself and its impact on the surrounding workplace.

When identifying potential hazards consideration will be given to all aspects of the plant and equipment including design, work environment, operational conditions, abnormal conditions, ergonomic principles, transportation, storage, installation and erection, access and egress for maintenance, adjustments, repairs, cleaning, use, operator competencies, dismantling and disposal.

14.3 Selection and Use

- **Where plant and equipment is hired** the same requirements for Occupational Health and Safety as those required on site will be specified by …………………………………….
  Insert company name
  to the Hire Company as a condition of the Hire Agreement.

- No item of plant will be brought on site without a current service/maintenance record or registration where required.

Note: Specific plant may require design registration, item registration or both.

Plant ID Register

………………………………………… **Project:______________________ Date:________**
Insert company name

The plant listed below will be brought onto site and operated under our control. None of the listed mobile plant will be operated, or static plant used, until registration details, appropriate plant inspection and maintenance records have been provided to the Principal Contractor. The form/s will be submitted on the first day of every month where plant is on-site for more than one month. All inspection and maintenance records will as a minimum standard comply with the manufacturers recommendations or relevant Australian Standard where appropriate (e.g. AS 2550 for cranes – use FORM 014 as a minimum requirement).

The following *static* (e.g. scaffold) or *mobile* (e.g Manatou) plant will be used on site:

Type	Registration Design: Design number: Item: Item number:	Purpose (use on site)	Inspection Date and Frequency	Inspected by (competent person)	Check List Record (What form?)
					 Form Sighted ☐
					 Form Sighted ☐
					 Form Sighted ☐
					 Form Sighted ☐
					 Form Sighted ☐

Hired-In Plant Inspection Report

(Cranes Excepted)

Location: …………………………………...Date: …………………………………………..
Owner: ……………………………………..Unit/fleet No: …………SMU:…………………
Make:……………………………………….Model: ………………..S/No:…………………

The following items are *minimum* requirements:
R.O.P.S. CANOPY (except for Road Trucks, Drills, Excavator)…………..…...Yes/No
All Safety Guards
Fitted?……………………………………………………………...Yes/No
Seatbelt fitted and in good condition?…………..…………………….……..Yes/No
Fire extinguisher fitted and charged?………………………………………Yes/No
Reverse alarm operation?……………………………………………………....Yes/No
All vehicle system operational?……………………………………………..Yes/No

Carry out the following checks and list other defects on the reverse side	**Action to be undertaken/Comments Tick if correct**
Engine	
Water leaks	
Radiator Hose and Clamps	
Radiator Core Condition	
Veebelt Condition and Adjustment	
Fan Hum Bearings	
Oil Leaks	
Air Intake Hoses and Clamps	
Air Cleaner Indicator Level	
Mountings	
Battery Condition	
Drive Train	
Transmission Oil Leaks	
Wheel Hub Oil Leaks	
Wheel Nuts and Locks	
Front and Rear Drive Line Condition	
Vehicle System	
Steering linkages	
Articulation Bearings and Retainers	
Main Frame Cracks	
Air Leaks	
Drain Air Tanks	
Hydraulic Operation	
Hydraulic Oil Leaks	
Service/Park Brake Operation	
Cab	
Steps/Grab Rail	
General Cab Condition	
Lights (Head, Tail and Dash)	
Warning Lights and Gauges	
Control Linkages	
Air Conditioner Operation	

Hired-In Plant Inspection Report cont.

TYRE ASSESSMENT

Tyres - Record Serial Number and Tread Depth:

POS.1 (LF)…………………...mm……….. POS.2 (RF) …………………..mm………..
POS.3 (LRO)…………………mm……….. POS.4 (LRI) ………….………mm………..
POS.5 (RRI)…………………mm……….. POS.6 (RRO) …………………mm………..

Attachments Fitted/Included:

Condition Of Bucket, Bowl, Blade, Body:

Other Comments:

Inspected by: ....……….**Signature:** ....……

Qualifications: ....….………………………**Date:** ..../........./........……

Certification by Responsible Person:
I Certify that the described plant is to the manufacturers specifications and is being serviced and maintained by competent personnel to the manufacturers recommendations.

Signature: ....…………… **Date:** ....

Print Name: .... **Position:** ....

Hired-In Plant Inspection Report

(for Cranes)

Location: …………………………..…………Date: …..…………………………………………..
Owner: ……………………………………..…..Unit/fleet No: …………SMU:…………………
Make:……………………………………………Model: …………………S/No:…………..……..
Machinery Identification No.: ……………………………………

Attachments Fitted/Included: ………………………………... ☐ Photos Attached

The following items are *minimum* requirements:
R.O.P.S. CANOPY (except for Road Trucks, Drills, Excavator)…………..…...Yes/No
All Safety Guards Fitted?……………..…………………………………………...Yes/No
Seatbelt fitted and in good condition?……………………………....………..Yes/No
Fire extinguisher fitted and charged?……………………………………………Yes/No
Reverse alarm operation?……….………………………………………………...Yes/No
All vehicle system operational?…………………………………………………..Yes/No

Copy Of Certificates		**Attached**	**Current**
Crane		**Yes/No**	**Yes/No**
Hoist Ropes	**Main**	**Yes/No**	**Yes/No**
	Auxiliary	**Yes/No**	**Yes/No**
Hooks	**Main**	**Yes/No**	**Yes/No**
	Auxiliary	**Yes/No**	**Yes/No**

Carry out the following checks and list other defects on the reverse side	**Action to be undertaken/Comments Tick if correct**
Engine	
Oil Leaks	
Water leaks	
Radiator/heater hose condition	
Vee belt condition and adjustment	
Fan bearing condition	
Air induction system	
Air cleaner restrict level	
Exhaust system/muffler	
Radiator core condition	
Engine Mounts	
Battery condition/leads	
Drain air tanks	
Drive Train	
Transmission oil leaks	
Wheel hub/axle oil leaks	
Wheel nuts/locks	
Drive shaft/uni joints	
Tyre condition	POS 1 POS 2 POS 3 POS 4 POS 5 POS 6
Tyre Pressure	POS 1 POS 2 POS 3 POS 4 POS 5 POS 6
Axle pivot condition	
Axle pivot lock out	

Hired-In Plant Inspection Report cont.

(for Cranes)

Steering/Braking System	Action to be undertaken/Comments Tick if correct
Steering cylinder oil leaks	
Tie rod condition	
Tie rod end condition	
Service brake operation/adjustment	
Park brake operation/adjustment	
Fluid level service/park	

Winches	Main	Auxiliary
Mounting bolts		
Oil leaks – gear box		
Oil leaks – hydraulic motor		
Brake linings/adjustment		
Brake oil/fluid leaks		
Drum cracks		
Safety pawl operation		
Disorderly rope winding		
Oil level/gear box		
Ropes and Hooks		
Rotation of hook		
Deformation of hook		
Safety latch fitted		
Deformation of rope guard		
Rotation of sheaves		
Lubricate sheaves		
Kinks in wire rope		
Broken strands in rope		
Corrosion of rope		
Wedge correctly fitted		
Rope clip fitted to end		

Slew System	Action to be undertaken/Comments Tick if correct
Slew table cracks	
Slew motor leaks	
Slew box leaks	
Slew box mounting bolts	
Slew box oil level	
Slew break operation/adjustment	
Rotary connection leaks	
Upper house lock pin	

Hired-In Plant Inspection Report cont.

(for Cranes)

Boom	Action to be undertaken/Comments Tick if correct
Hoist cylinder leaks	
Hoist cylinder pins and retainers	
Hoist cylinder hose condition	
Boom pivot pin and retainers	
Inspection of boom cracks/damage	
Sliding wear pad condition	
Tele cylinder leaks	
Tele cylinder hoses	
Angle indicator condition	
Inspect fly damage	
Fly retaining pins	
Fly storage correct	
Boom sheaves	
Fly sheaves	
Cab And General	
Operation of all gauges	
Control levers/play	
Load meter	
Warning buzzers	
Windscreen condition	
Wiper condition	
Anti two block operation	
Work lamps	
Steps/grab rails	
Load chart condition	
Operators manual present	
Horn operation	
Seat condition	
Fire extinguisher present	
Set up level indicator	
Outriggers	
Vertical cylinder leaks	
Vertical cylinder hoses	
Horizontal cylinder leaks	
Horizontal cylinder hoses	
Outrigger pad condition	
Horizontal slides	
Outrigger box cracks	
Outrigger pin and retainers	

Hired-In Plant Inspection Report cont.

(for Cranes)

Other Comments:

Inspected by: ....…….

Signature: ....…...

Qualifications: ....………

Date: ....…

Certification by Responsible Person:

I Certify that the described plant is to the manufacturers specifications and is being serviced and maintained by competent personnel to the manufacturers recommendations.

Signature: ....… **Date:** ....

Print Name: .... **Position:** ....

Plant Certification Report

Tick the appropriate category

☐ **Mobile plant**
☐ **Static plant**

Project:___________________________ **Contractor:** ___________________________

Responsible Person: _____________________________

Work performed for:____________________________ **Of:** ______________________

Full Details of Work Performed

____
____
____
____
____
____
____
____
____

Inspection Report

____
____
____
____
____
____
____
____
____

Certification:

The work described above is complete and the equipment is considered to meet the manufacturers specifications and is deemed safe to be put into service.

Name of Responsible Person: ……………………………**Signature:** ………….……….…

Qualifications: ………………………………………………..**Date:** …………………………….

15.0 Personal Protective Equipment (PPE)

15.1 Procedure

Where other means of protection are not practicable ……………………………. will supply
Insert company name
clothing or equipment designed to protect parts, or all, of the body. This equipment may include: gloves, hearing protection, high visibility garments, breathing apparatus, thermal wear, eye protection, sun cream, safety belts and harnesses. Steel cap boots and hard hats are the minimum requirement for entry to a construction site.

15.2 Assessment

During the development of control measures for Safe Work Method Statement the “Best” to “Worst” guide to controls outlined in the Safe Work Method Statement section of this Pack will be used to help minimise reliance on PPE.

15.3 Selection and Use

- ……………………………. will ensure all items of PPE are manufactured, used and
  Insert company name
  maintained in accordance with the relevant Australian Standard. Proof of Australian Standard compliance will be provided, e.g. labeling.

- All issues of PPE to each individual will be recorded on FORM 016 (one for each individual).

- Each employee will be instructed and or trained in the correct use of each PPE item prior to use.

Personal Protective Equipment Issue Record

Employee Name:_________________________**Occupation:**_________________________

Project:____**Date:**___________

PPE item	Date of issue/ replacement	Name of recipient	Signature of recipient I have received the listed PPE with appropriate instruction/training in its correct use.

16.0 Fire Protection

16.1 Procedure

The Project Manager, or his/her representative, shall ensure that an adequate number and type of fire extinguishers are available at the workplace and additional extinguishers are located in the immediate vicinity of any work that may create a fire risk. This requirement will apply without exception to any hot work such as welding.

……………………………..….will ensure all personnel carrying out hot work have a fire
Insert company name
extinguisher close-by, are fully trained in the use of extinguishers and that adequate evidence of such training is provided before work commences. A list and current service history of all fire fighting equipment to be brought on site will be provided on FORM 017.

……………………………. will ensure that all mobile plant is fitted with an appropriate
Insert company name
fire extinguisher.

16.2 Inspection

……….……………………….. will check the "charge level" of all of our fire extinguishers on
Insert company name
site at ………………… intervals. All fire extinguishers will be serviced and maintained by competent persons and a record completed and maintained in accordance with Australian Standard AS-1851.

Combustible materials will not be allowed to accumulate in work areas to prevent a fire risk.

16.3 Selection and Use

- All personnel carrying out hot work will be fully trained in the use of extinguishers and a record of the training provided in the appropriate register of this Pack, FORM 004.
- All personnel will be made aware of the site specific emergency procedure and emergency service phone numbers shall be clearly displayed at a central phone location.

Fire Protection

………………………………………………… Project:________________________________

Insert company name

The fire extinguishers listed have been maintained in accordance with Australian Standard AS-1851 and will be brought on site.

Extinguisher Type	Serial No.	Condition & Charge Level	Date of Last Inspection	Inspected by	Date of next Inspection Required	Comments

17.0 Tool Box Talks

17.1 Procedure

Occupational Health and Safety Legislation requires the identification of potential workplace hazards, the assessment of the risk of the hazard and the development of controls to eliminate or minimise the risk. To assist in hazard identification and the development of controls ……………………………..…… employees will undertake consultation in the form of
Insert company name
Tool Box Talks conducted by:
1……………………………………. or 2………………………………..at……………… intervals.

All Tool Box Talks will be recorded on form FORM 018 and signed off by participants. Any corrective action will be followed up and signed off by the nominated person.

17.2 Consultation

……………………………..…… recognise the involvement of workers as essential in identifying
Insert company name
potential hazards that can be eliminated, or minimised, before injuries occur.

Tool Box Talks will be used to help Supervisors manage safety, to provide a forum for workers to have their say about safety issues and to help ensure safety awareness is maintained throughout the project.

Where required specific safety issues will be raised, accidents reviewed, Safe Work Method Statement developed and presented for evaluation and familiarisation or safety alerts discussed.

Tool Box Talks will be used to induct workers into and "sign off" their understanding of the controls provided in Safe Work Method Statement for the specific work in which they will be involved.

Record of Tool Box Talk

Workplace:	**Date:**
Supervisor/presenter:	
Subject:	**Duration:**

Persons Present

Print Name	Signature	Print Name	Signature

Comments & points raised:

Corrective Action	Action by	Action Complete	
		Sign off	Date

18.0 First-aid & Accident Investigation

18.1 Procedure

………………………… will/ will not rely on the provision of First-aid services by the Principal
Insert company name
Contractor. Where ……………………… will provide First-aid services, the following minimum
Insert company name
requirements will be undertaken and personnel provided.

		Type of Kit Required			Type of Certificate Required		
Place of work and no. of persons on the job	**First-aid room**	**Kit A**	**Kit B**	**Kit C**	**First-aid Certificate**	**Occupational First-aid Certificate**	**None**
For Construction 100 or more	•					•	
25-99		•			•		
24 or less			•				•

18.2 First-aid Personnel and Location of First-aid

The qualified First-aid person/s on site is …………………………………………
Name
The nearest First-aid box/room/shed to the work in progress is ______________________
____

18.3 Reporting

All injuries will be reported to the appropriate First-aid Officer on site. Injuries will be recorded in the Site Injury Register and by……………………………………..… on FORM 019
Insert company name
or its equivalent.

Records will be kept for a minimum of 5 years. Where the injury results in an absence from the workplace of 7 days or more the injury and its circumstances will be reported to the WorkCover Authority using the appropriate form.

18.4 Investigation

……………………………………….. will investigate all accidents within ……….. hours.
Insert company name

Investigation will be recorded on Accident Investigation FORM 020 or its eqivalent.

Accidents will be recorded by ………………………..…………..……………
.……..……….…………………………
Name Position

Accidents will be investigated by ………………………………..………………
…..…………………………………
Name Position

Accidents will be reported to WorkCover by ……………….……………………..….
………………………………..

Name Position

Register of Injury

Details of Injured Person:

Name:

Surname: ____________________ Given Name/s:______________ Sex(M/F): ________

Address:

No. _____ Street: __________________ Suburb: ________________ **Post Code: _____**

City: ________________ State: ______ Contact Phone No: (__)____________________

Employer:

Business Name: ____

Address:

No. _____ Street: __________________ Suburb: ________________ **Post Code: _____**

City: ________________ State: ______ Business Phone No: (__)__________________

Accident/Incident Details:

Description of Events:

Date of injury: ___/___/___ Time of Injury: ______ am. / pm.

Task/operation undertaken at the time of the injury:

____

____

Physical location (area) where injury occurred:

____

____

Type of injury: (e.g bruise, cut, fracture, grit in eye)

____

____

____

Part of Body Injured: (e.g arm, torso, head) ___________________________________

____

Cause of injury: (what happened) ____

____

____

____

____

____

Treatment Given/Action Taken: ____

____

____

____

Person completing this form:

Surname: _______________ **Given Name/s: _____________ Signature: _____________**

Date: ___/___/___ Time: ______ am. / pm.

Did the person cease work? Yes /No.

Has a referral for further treatment been issued? Yes /No

(cross out whichever is not applicable)

FORM 020

Accidental Investigation Report

NOTE: A separate form should be completed for each person injured. This investigation is aimed at identifying causes, not attributing blame. All investigating personnel should be trained in investigation techniques.

Reference No. ________________ ☐ Injury ☐ Damage ☐ Near Miss

1. Project: ____

2. Personal Details:

Surname | First Name | Other Initials

Date of Birth: Day Month Year | Gen: M/F | Preferred Language | Contact No.

3. Occupation/Job Title & Details:

Description of occupation or job title

How long at this Occupation/job: Day Month Year

Main tasks performed

Training provided:
- ☐ Induction.
- ☐ Trade/task specific.
- ☐ Both of the above.
- ☐ Neither of the above.

4. Time& Date of Damage/Acc/Near Miss: am/pm Day Month Year

Time & Date Report Received: am/pm Day Month Year

5. Accident Results:

- ☐ Fatal
- ☐ Hospital inpatient
- ☐ Doctor only
- ☐ First aid only
- ☐ Property damage
- ☐ Nil (injury/damage)

Nature of injury, disease or damage:

____
_
____
_
____
_
____

Nature Code

Bodily location of injury, disease or damage:

____
_
____
_
____
_
____

Bodily location Code

6. Outcome: (Questions to be answered, as information becomes available)

Rehabilitation
- ☐ Not Required
- ☐ Required

Date of Resumption
- Short-term alternate duties
- Permanent alternate duties

Normal duties

Day Month Year

Total number of days lost.

Government report completed and sent.

Investigation undertaken.

7. Description of Incident: **(include any particular chemical, product, process, equipment involved)**

What was the worker doing at the time?

Name/s of witnesses	Signature of worker	Date:

Mechanism of injury Code

How exactly was the injury, disease or damage sustained?

Breakdown agency Code

What happened? (undesired event)

Reconstruct the sequence of events that led to the undesired event.

1.	4.
2.	5.
3.	6.

List contributing factors

Investigating Person:

Name	Position	Signature

Date investigation conducted:

Day Month Year

8. Corrective Action Undertaken:

Estimated Cost of Incident: $	**Estimated Cost of Correction: $**

9. Manager's Comments: **(manager, employer or Principal Contractor to sign and date)**

Signature:	**Date:**

10. Safety Co-ordinator's Comments: **(sign and date)**

Signature:	Date:

19.0 Subby Pack Check List

19.1 Procedure

……………………………… will be provide a copy of the Subby Pack to enable verification of
Insert company name
the requirements of Occupational Health, Safety and Rehabilitation. For the purposes of verification a *current* copy of the completed Subby Pack will be checked using the method outlined below and made available to the Principal Contractor at monthly intervals for the purposes of auditing.

No.	Item	Score						Average Score
		Yes/ No Score	Date	Yes/ No Score	Date	Yes/ No Score	Date	
1	Introduction							
2	Policy							
3	Roles & Responsibilities							
4	Document Control							
5	Hazard Identification & Risk Assessment							
6	Safe Work Method Statement							
7	Skills & Competencies							
8	OHS Induction							
9	Workers Compensation & Rehabilitation							
10	Hazard Reporting							
11	Electrical							
12	Hazardous Substances							
13	Lifting Gear							
14	Plant							
15	Personal Protective Equipment							
16	Fire Protection							
17	Tool box Talks							
18	First-aid & Accident Investigation							
	Average							

Score Legend (optional): **5 Best Practice……………………………………....** **4 Continuous Improvement** **3 Above Standard** **2 Minimum Standard** **1 Non Compliance** **0 Not Acceptable**	**Checked by:………………………………..** **Date:………….……………….……………..**

- NOTES -

WorkCover Offices

HEAD OFFICE
Office Hours 8:30am–5:00pm
Monday to Friday
400 Kent Street
SYDNEY NSW 2000
Phone: (02) 9370 5000
Fax: (02) 9370 5999
Postal Address
WorkCover NSW
GPO Box 5364
SYDNEY NSW 2001

Client Contact Centre
Office Hours 8:30am–4:30pm
Monday to Friday
Ground Floor, 400 Kent Street
SYDNEY NSW 2000
Phone: 13 10 50
Fax: 9370 6150

REGIONAL and LOCAL OFFICES
Office Hours: 8:30am-4:30pm
Monday to Friday

REGIONAL OFFICES
Newcastle
956 Hunter Street
NEWCASTLE WEST 2302
Phone: (02) 4921 2900
Fax: (02) 4921 2929

Parramatta
Level 8, 128 Marsden Street
PARRAMATTA 2150
Phone: (02) 9841 8550
Fax: (02) 9841 8490

Wollongong
106 Market Street
WOLLONGONG 2500
Phone: (02) 4222 7333
Fax: (02) 4226 9087

LOCAL OFFICES
Albury
463 Kiewa Street
ALBURY 2640
Phone: (02) 6021 5911
Fax: (02) 6041 2580

Batemans Bay
Shop 6, Fenning Place
12 Orient Street
BATEMANS BAY 2536
Phone: (02) 4472 5544
Fax: (02) 4472 5060

Blacktown
125 Main Street
BLACKTOWN 2148
Phone: (02) 9671 8701
Fax: (02) 9831 8246

Dubbo
Suite 3, 157 Brisbane St,
DUBBO 2830
Phone: (02) 6884 2799
Fax: (02) 6884 2808

Central Coast
3/13 Anzac Road
TUGGERAH 2259
Phone: (02) 4350 6370
Fax: (02) 4353 2373

Goulburn
21-23 Clifford Street
GOULBURN 2580
Phone: (02) 4822 1243
Fax: (02) 4822 1242

Grafton
NSW Government Offices
49 – 51 Victoria Street
GRAFTON 2460
Phone: (02) 6641 5111
Fax: (02) 6641 5100

Griffith
NSW Government Offices
104 – 110 Banna Avenue
GRIFFITH 2680
Phone: (02) 6964 2027
Fax: (02) 6964 1738

Hurstville
Level 4, 4-8 Woodville Street
HURSTVILLE 2220
Phone: (02) 9598 3366
Fax: (02) 9585 0261

Lindfield
345 Pacific Hwy
LINDFIELD 2070
Phone: (02) 9936 3000
Fax: (02) 9936 3030

Lismore
Suite 4, Level 4
Manchester Unity Building
29 Molesworth Street
LISMORE 2480
Phone: (02) 6622 0088
Fax: (02) 6622 0090

Liverpool
Suite 4, Ground Floor
157 – 161 George Street
LIVERPOOL 2170
Phone: (02) 9827 8600
Fax: (02) 9827 8690

Narrabri
Level 1, 55 Maitland Street
NARRABRI 2390
Phone: (02) 6792 4643
Fax: (02) 6792 3532

Newcastle
956 Hunter Street
NEWCASTLE WEST 2302
Phone: (02) 4921 2900
Fax: (02) 4921 2929

Orange
74 McNamara Street
ORANGE 2800
Phone: (02) 6361 7070
Fax: (02) 6362 8820

Parramatta
Level 8, 128 Marsden Street
PARRAMATTA 2150
Phone: (02) 9841 8550
Fax: (02) 9841 8490

Port Macquarie
Shops 1 & 2,
Raine & Horne House
145 Horton Street
PORT MACQUARIE 2444
Phone: (02) 6584 1188
Fax: (02) 6584 1788

Shellharbour
134 – 134A Lamerton House
Shellharbour Square
BLACKBUTT 2529
Phone: (02) 4297 3796
Fax: (02) 4296 8914

Tamworth
Shop 20, 341 Peel Street
TAMWORTH 2340
Phone: (02) 6766 2490
Fax: (02) 6766 4972

Lake Macquarie
Shop 2, 33 The Boulevarde
TORONTO 2283
Phone: (02) 4959 6366
Fax: (02) 4950 5587

Tweed Heads
Suite 5, 1 Sands Street
TWEED HEADS 2485
Phone: (07) 5536 3262
Fax: (07) 5536 4389

Wagga Wagga
Level 2, 76 Morgan Street
WAGGA WAGGA 2650
Phone: (02) 6937 3600
Fax: (02) 6937 3616

Wollongong
106 Market Street
WOLLONGONG 2500
Phone: (02) 4222 7333
Fax: (02) 4226 9087

Annexure 3

Pedestrian & Traffic Management Plan

Pedestrian & Traffic Management Plan

Excavation Phase

Project Name:	**Camellia West**
Address:	181 James Ruse Drive
	CAMELLIA NSW 2142
Job No.:	CAMJAM
Commencement Date:	25 May 2012

For

CEJ Constructions Pty Ltd

ABN 17 125 903 817

Controlled ☐

Uncontrolled ☒

Controlled Document Register

The following is used to record any Controlled Document issued. It is optional and not necessary to record Uncontrolled documents issued.

Issue	Section	Page	Document/Description	Issued To	Date
1	n/a	n/a	n/a	Head Contractor	25 May 2012

Document Revision Status

The following is used to record any changes.

Section	Revision	Date	Amendment Description

Contents

Page

1.00 General

1.01 Introduction

This Pedestrian & Traffic Management Plan has been written specifically for the undertaking of remediation, excavation and associated works relating to the property.

1.02 Site

The site has frontage to James Ruse Drive with a secondary frontage to Grand Avenue North as shown in Appendix 1.

The site is under a re-zoning application to Parramatta Council for industrial, commercial and retail use.

While this re-zoning application is under consideration by Parramatta Council it is proposed to remediate the site.

2.00 Pedestrian & Traffic Management Plan

2.01 General

The pedestrian and traffic management plan for the demolition, excavation, remediation and shoring phase of the development is set down through the following sections:-

- site location and road network;
- overall principles for traffic management;
- hours of work;
- truck routes;
- traffic and parking effects;
- pedestrians; and
- pedestrian and traffic management plan.

2.02 Site Location and Road Network

The site is on the eastern side of James Ruse Drive and southern side of Parramatta River (Tasman Street is part of the site on the southern site boundary) at Camellia. There is also a corridor of land running parrel to the railway line (eastern boundary). The site location is shown at Appendix 1.

James Ruse Drive provides a six lane divided carriageway with three traffic lanes in each direction. There are clearways in both directions during weekday morning and afternoon peak periods and no parking at any time in both directions. James Ruse Drive provides access to adjacent commercial, retail and residential properties. There are bus stops on both sides of the road close to the site.

Tasman Street is the site entry off James Ruse Drive. Heading north along James Ruse Drive there is a right turn lane from James Ruse Drive into Tasman Street. There is a left turn only from Tasman Street into James Ruse Drive.

2.03 Overall Principles for Traffic Management

The overall principles for traffic management during demolition, excavation remediation and shoring of the development are:-

- provide a convenient and appropriate environment for pedestrians;
- minimise effects on pedestrian movements and amenity;
- manage and control vehicular movements to and from the site;
- maintain traffic capacity at intersections and mid-block in the vicinity of the site;
- maintain existing on-street parking in the vicinity of the site where practical;
- maintain access to other properties adjacent to the site;
- restrict vehicle activity to designated truck routes through the area;
- maintain safety for workers;
- provide appropriate access to the site for demolition, excavation, remediation and shoring traffic; and
- manage and control vehicle activity in the vicinity of the site.

It is not anticipated that an on street works zone or crane standing area will be required for the demolition, excavation, remediation and shoring phase. However, should an on-street works zone or crane standing area be required, separate application will be made to Parramatta Council.

2.04 Hours of Work

Work associated with demolition, excavation, remediation and shoring for the development will be carried out between the following hours:-

- Monday to Friday: 7:00am to 5:00pm;
- Saturday: 7:00am to 4:00pm; and
- Sunday/Public Holidays: no work.

Any work outside these times would be subject to a separate application to Parramatta Council. The control of hours of operation avoids truck movements during the early hours of the morning, before 7:00am and in the evening, after 6:00pm.

2.05 Truck Routes

During demolition, excavation, remediation and shoring, trucks transporting material from the site will be accommodated on site. Vehicular access to and from the site will be provided from Tasman Street, at the southern end of the site, in the location of the approved access point to the site. Tasman Street feeds into James Ruse Drive. Access arrangements and vehicle movements to and from the site will be managed and controlled by site personnel.

It is proposed that trucks travel to and from the site along the following designated construction routes:

.01 Approach Routes

- James Ruse Drive, right turn lane into Tasman Street (from south); and
- James Ruse Drive, left turn into Tasman Street (from north).

.02 Departure Routes

- Tasman Street, left turn into James Ruse Drive (to the south)
- Tasman Street, left turn into James Ruse Drive, Western Motorway (to the east and west); and
- Tasman Street, left turn into James Ruse Drive, Western Motorway, Silverwater Road (to the north).

The proposed truck routes are shown in Appendix 2. When departing to the north it is proposed to turn left from Tasman Street into James Ruse Drive, vehicles would use the Western Motorway and Silverwater Road when departing to the north.

When departing there is also a possibility of trucks turning right or left from James Ruse Drive into Hassall Street or Grand Avenue respectively. These roads have adjacent industrial land uses and their use by construction vehicles would be consistent with existing traffic in these streets.

The designated truck routes to and from the site are proposed to restrict truck traffic, as far as possible, to the main road network through the area. The approach and departure routes of construction vehicles to and from the site are considered appropriate.

2.06 Traffic and Parking Effects

The major traffic generating activities during the demolition, excavation, remediation and shoring period are anticipated to be as follows:

- Demolition, remediation and excavation: 2010; and
- Remediation and excavation: 2010-2011.

It is anticipated that the majority of traffic will be generated by trucks taking demolition and excavated material from the site. During the demolition and excavation period, there will be a total of some 10 to 15 trucks per day taking demolition and excavated material from the site. These trucks will be covered and have their wheels washed.

This is a low volume of traffic, equivalent to an average of one to two trucks per hour. The surrounding road network and its intersections will be able to cater for this traffic.

Trucks will enter the site and be loaded by an excavator, prior to exiting the site in a forward direction. Drivers will be in radio or mobile telephone contact with the site supervisor who will coordinate the arrival of trucks as required.

It is anticipated that during the demolition, excavation, remediation and shoring period, there would be less than 10 employees on the site. Employees will be encouraged to use public transport when travelling to and from the site. Public transport timetables will be made available to employees. During these stages of the development, for safety reasons, parking will not be provided on the site for employees.

2.07 Pedestrians

Pedestrian routes around the site will be maintained during demolition, excavation, remediation and shoring. Pedestrian activity in James Ruse Drive, Grand Avenue, Tasman Street, Rail Corridor (eastern boundary) will be protected with the provision of Class A construction fencing and overhead protection, where required:

- Tasman Street (main site entry) – An opening will be provided in the hoarding and construction fence for access to and from the site for construction vehicles;
- Grand Avenue North (secondary entry) – It is envisaged that existing fenced/gated access will not be used; and
- Parramatta River – Due to existing fencing, depth of river and steep bank this boundary not accessible to pedestrians.

Pedestrian activity to James Ruse Drive across the proposed access (Tasman Street) will be managed and controlled by appropriately qualified site personnel. Pedestrian warning signs will be located adjacent to the Tasman Street.

Where demolition activities occur on the site boundary, the construction fence and associated overhead protection (where required) will be extended beyond the site boundary to provide additional protection for pedestrians.

2.08 Pedestrian and Traffic Management Plan

The proposed pedestrian and traffic management plan for demolition, excavation, remediation and shoring of the development is shown on Appendix 3. The plan presents the principles of traffic management and is subject to WorkCover requirements, as well as survey and final design.

Signage, fencing, overhead protection, safety barriers and line marking details, as required, will be provided in accordance with Australian Standards and the Roads and Traffic Authority's Manual for Traffic Control at Work Sites. A copy of the traffic management plan will be kept on-site at all times. Signage details, the control of pedestrians in the vicinity of the site, and the control of trucks to and from the site will be the responsibility of the site contractor.

As shown in Appendix 3, the pedestrian and traffic management plan for the demolition, excavation, remediation and shoring includes the following:

- demolition, excavation, remediation and shoring activity to be provided for on-site;
- demolition, excavation, remediation and shoring vehicle access to the site will be provided from Tasman Street at the south/west corner of the site;
- the movement of trucks on and off the site to be managed and controlled by appropriately qualified site personnel;

- truck movements to and from the site to be restricted to designated truck routes through the area;
- Class A construction fencing and overhead protection where required, will be provided adjacent to the James Ruse Drive site frontages. Existing class A construction fences to other boundaries will be made good and maintained;
- an opening will be provided in the construction fence for access to the site from Tasman Street to James Ruse Drive;
- where demolition activities occur on the site boundary, the construction fence will be extended beyond the site boundary to provide additional protection for pedestrians;
- the management of the site works will be the responsibility of the site contractor;
- pedestrian activity across the site access driveways will be managed and controlled by appropriately qualified site personnel;
- pedestrian warning signs to be utilised in the vicinity of the site;
- pedestrian arrangements, demolition/excavation activity and erection of safety
- fencing will be provided in accordance with WorkCover requirements; and
- construction signage to be provided in James Ruse Drive (adjacent to Tasman Street) in accordance with Australian Standards and the Roads and Traffic Authority's Manual for Traffic Control at Work Sites.

The pedestrian and traffic management plan for the demolition, excavation, remediation and shoring phase of the development is considered appropriate to provide for traffic and pedestrian activity.

3.00 References

Standards Australia AS/NZS1742 Manual of Uniform Traffic Control Devices:

- AS 1742.1 – 2003 General Introduction and Index of Signs;
- AS 1742.2 – 2009 Traffic Control Devices for General Use;
- AS 1742.3 – 2009 Traffic Control Devices for Works on Roads; and
- AS 1742.10 – 1990 Pedestrian Control and Protection

NSW RTA Traffic Authority's Manual for ‘Traffic Control at Work’ Sites (version 3.1 April 2006)

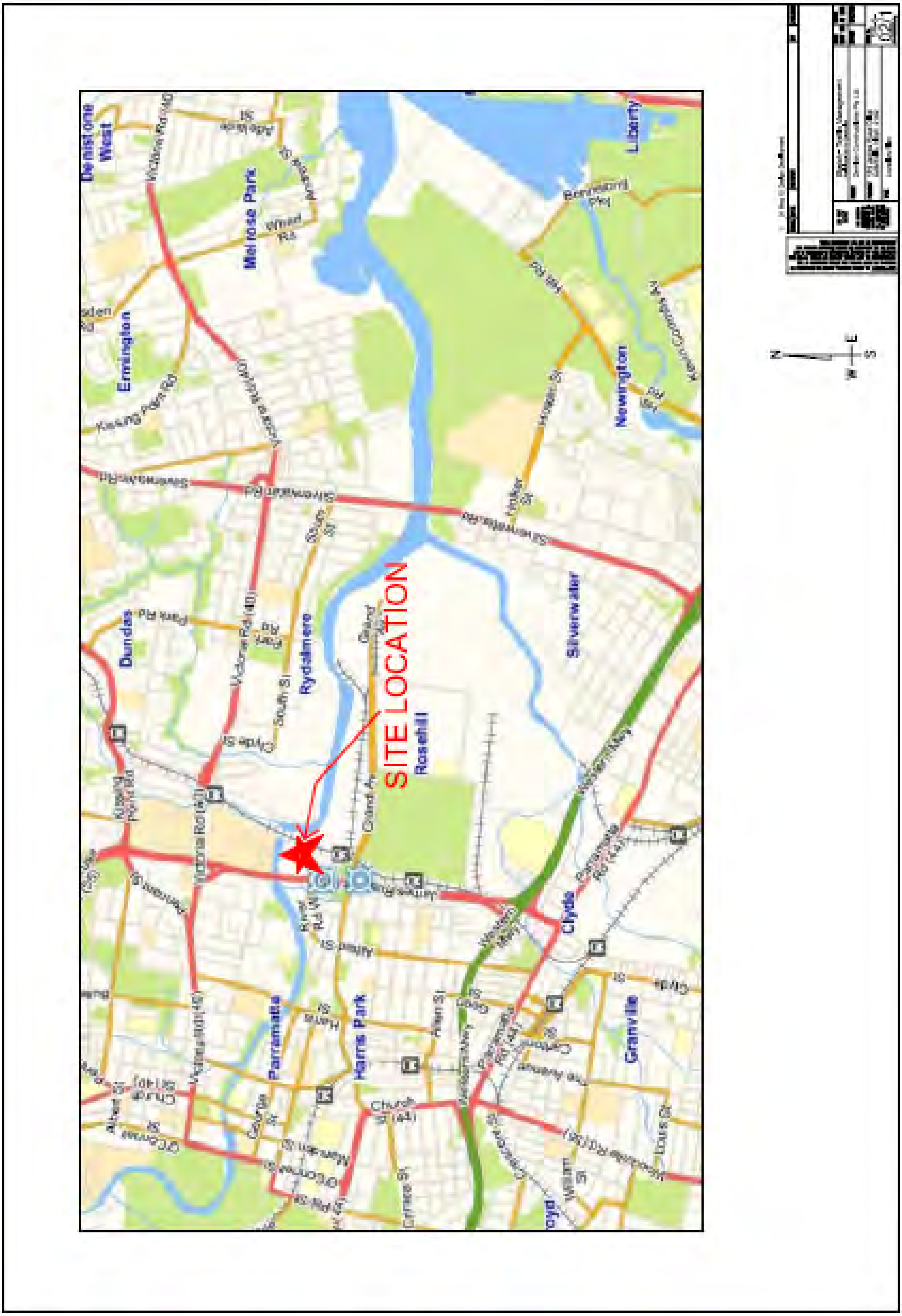
WorkCover Occupational Health and Safety Regulation 2001 (NSW)

WorkCover Code of Practice – Overhead Protective Structures – 20 March 1995 (in preparation of this document envisage ‘Overhead Protection’ not required but referenced if required at a later stage)

4.00 Legend

EPA	EPA (NSW Environmental Protection Authority) changed name to DECCW (Department of Environment Climate Change & Water) and on 4/04/2011 it was incorporated into the OEH (Office of Environment and Heritage a division of the NSW Department of Premier and Cabinet)
Head Contractor	Advanced Holdings Pty Ltd
PPE	Personal Protection Equipment

Appendix 1 Location Plan



Appendix 2 Truck Routes

Appendix 3 Pedestrian & Traffic Management Plan

Annexure 4

Risk Analysis

Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

Original ITF605 reviewed Tuesday 25 May 2010 (preliminary Risk Analysis) and again on Monday 31 May 2010 a Detailed Risk Analysis for the project was conducted 22 May 2012. In attendance were Project Manager – David Smedley, Foreman – Elie Demian & Foreman – Joe Azar.

On Tuesday 22 May 2012 another Detailed Risk Analysis for the project was conducted. In attendance were:

Project Manager – David Smedley   Foreman – Elie Demian   Foreman – Joe Azar

Project Engineer – Andrew Hanna

The analysis was conducted in the Builder's Head Office on Monday 31 May 2010, commencing at 4:00pm and concluding at 6:00pm.

The scope of the Risk Analysis incorporated rectification works, structure, refurbishment and 'fit-out'; including the following trades & services:

Working at Heights	Manual Handling	Plant and Equipment	Electricity	Oxy Acetylene
Power Tools	Explosive Power Tools (EPT)	Materials Handling	Personnel	Hazardous Substances
Confined Spaces	Materials Falling	Brick Saw	Scaffold	Ladders
Materials Storage	Penetrations	Dust	Noise	Sun
Slips and Trips	Access and Egress	Housekeeping	Emergencies	Air Quality
Sedimentation Control	Noise & Vibration	Traffic Control	Perimeter Security	Excavation & Drainage
Mobile Crane	Formwork (incl. Prefabricated)	Perimeter Protection	Scaffold	Masonry (brick& blockwork)
Waterproofing	Structural Steel	Carpentry (framing & fixout)	Electrician	Plumber
Mechanical	Fire	Environmental		

The analysis follows in the form of risks associated with the above trades & services. It is anticipated that this analysis will be reviewed within six months to ensure its relevance.

Method prepared by:	Andrew Hanna	**Approved:**	David Smedley
With assistance from:	Elie Demian & Joe Azar	**Date:**	20/12/2012

SIGNIFICANCE EVALUATION OF ON SITE ISSUES

Stage 1: Identify Steps in the Process

- Identify all activities to be undertaken on the project
- Identify the Safety & Environmental Aspects / Risks of that activity (i.e. interaction of the activity with the Safety & Environmental processes)
- Document those activities which interact with the Safety & Environmental processes in Form at Column A

Stage 2: Derive & Define possible impacts & potential hazards

- Derive & define the possible impacts and hazards of that activity on Safety & Environmental processes (i.e. changes introduced into the Safety & Environmental process wholly or partially). Safety & Environmental impacts could be derived from Safety & Environmental Impact Assessment (SEIS), Contract documentation, Review of Safety & Environmental Factors etc.
- Document these impacts in the Form at Column B

Stage 3: Assess the probability of Safety & Environmental Event (Impact or Hazard) occurring

- Based on the Normal Controls that will be implemented or available at site, determine the probability of the Safety & Environmental event occurring
- Use the Probability Table to arrive at a descriptor of event
- Enter the descriptor of the probability in the Form at Column C

Stage 4: Assess the consequences

- Based on the probabilities at Stage 3, determine the consequences
- Use the Consequences Table to describe the rating of the consequence
- To help you in this process details of Safety & Environmental offences are furnished in the Project Safety & Environmental Plan (SP 93)
- Use Consequences Table in conjunction with Contractual/Company requirements & Safety & Environmental offences to determine the rating of the Consequence
- Enter this at Column D of Form

Stage 5: Rank the Significance of Aspect to determine Risk

- Use the Significance Ranking Table, to rank the aspect based on the “Consequence” x “Probability” of the event
- The risk calculation is defined in the Risk Factor Table
- Enter the Significance Rank (Risk) at Column E of Form

Stage 6: Implement Controls

- For significance which are classified as “H (HIGH)”, detailed Operational Control Procedures & additional controls are to be developed and implemented. Details of Operational Control Procedure and additional controls to mitigate the significance ranking shall be entered at Column F of Form
- For significance which are classified as “M (MEDIUM)”, Normal Controls and additional controls shall be developed and implemented as decided by the Project Team. Details of additional controls or other logical decisions for deploying normal controls as mitigating actions shall be entered at Column F of Form
- For significance which are classified as “L (LOW)”, normal controls are good enough. Details of Normal Controls are to be entered at Column F of Form

Stage 7: Allocate Responsibilities

- An individual(s) on site needs to be identified to ensure controls are implemented. This responsibility is to be communicated in the form of a toolbox talk prior to the commencement of the activity

- Enter the person(s) responsible at Column G of Form

PROBABILITIES

DESCRIPTION	SCORE	DESCRIPTION
Almost Certain	5	The event is expected to occur in most circumstances e.g.: Daily/Weekly/Monthly
Likely to Occur	3	The Event will probably occur in some circumstances e.g.: Infrequent (few times in a year or over a period of time)
Could Occur	2	The Event could occur sometime
Not Likely to occur	1	The event is unlikely to occur on this site or an isolated chance of event occurring

CONSEQUENCES

RATING	SCORE	SAFETY & ENVIRONMENTAL	LIABILITIES
Disaster **Class 1**	10	Large incident. Significant long term Safety & Environmental harm	**Company Fine, legal & clean up cost > $ 1.0 Million/ Company Image affected through media coverage**
Major **Class 1**	5	Major incident on site which is beyond control by sources available at site (lead to prosecution in NSW)	**Maximum Penalty to Company $1.0 Million/ Company image affected through media**
Moderate **Class 2 LTI**	3	Incident on site that may cause moderate Safety & Environmental harm (lead to a Mid Range Offence in NSW)	**Maximum Penalty to Company $250,000/ Contravene company/contractual requirements**
Minor **Class 2 no LTI**	2	Incident site that may cause minor Safety & Environmental harm (lead to Infringement in NSW)	**Maximum Penalty to Company $1,500.00**
Insignificant **Class 3**	1	Incident on site which has minimal impact on Safety & the Environment & can be restored by site crew	**No penalty to company**

SIGNIFICANCE RANKING TABLE

	PROBABILITY	CONSEQUENCES				
		INSIGNIFICANT 1	MINOR 2	MODERATE 3	MAJOR 5	DISASTER 10
5	**Almost Certain**	M (5)	M (8)	H (15)	H (25)	H (50)
3	**Likely to Occur**	L (3)	M (6)	M (9)	H (15)	H (30)
2	**Could Occur**	L (2)	L (4)	M (6)	M (10)	M (20)
1	**Unlikely to Occur**	L (1)	L (2)	L (3)	M (5)	M (10)

RISK FACTOR TABLE

SIGNIFICANCE (P x C)	RISK RANK	COMMENT
1 – 4	LOW (L)	Low Significance. Normal controls are good enough to control the Safety & Environmental Risk.
5 – 10	MEDIUM (M)	Medium Significance. Normal Controls and additional controls as decided by Project Management (Additional Controls must be considered – but may not be mandatory). Project Management shall use good judgement and rationale for implementing the necessary controls.
11+	HIGH (H)	High Significance. Detailed operational controls required. Develop additional controls (ITPs & Checklists) and monitor at appropriate intervals. OHSR, Environmental & Quality Manager is to be consulted to verify the adequacy of the control.

A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
1a	Working at Heights *(all trades)*	Falling	5	5	H	Scaffold & or other approved systems (pending formwork system) will be in place covering all floors and the working deck Handrails & Fencing erected to eliminate falls of 1.8m or more Fall arrest system in place when working on the edge of slab – i.e., inertia reels, or other lanyard system A craneable stretcher will be located on site in case of emergency System clearly defined in SWMS	Builder Formworker Prefabricated Wall System
1b		Struck by falling objects	5	5	H	Scaffold & or other approved systems (pending formwork system) in place covering all floors and the working deck Refer to Scaffold section for specific locations Handrails & Fencing erected to eliminate falling materials Lanyard tools when working on the edge of a slab Maintain Housekeeping at all times	Builder Specific Trades
1c		Access & Egress	3	3	M	Clearly defined, well-maintained access in and around site Internal Stairs to level below deck Scaffold loading bays fitted as required (refer drawings) Access from temporary amenities sheds to site and signage requirements	Builder

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
2a	Manual Handling *(all trades)*	Heavy & awkward loads	5	3	H	Use of mechanical lifting apparatus – mobile crane, pallet mover, forklift, and manitou Dual lifts when lifting awkward loads SWL (Safe Working Load) to be identified on all bins & containers. Register of SWL to be kept All bins on site will be emptied by the crane or forklift Majority of bins on wheels to be $1m^3$ bins, all other bins to be moved by fork, crane or multiple men SWMS for manual handling & Manual Handling training including chutes if required	Builder
2b		Repetitive twisting and bending	5	3	H	Use of mechanical lifting apparatus when possible Well maintained material storage area Manual handling training Job rotation where applicable Materials delivered to site done so in orderly, controlled fashion	Builder Structural Trades
3a	Plant and Equipment *(all trades)*	New Plant causing damage	2	3	M	Plant induction by Builder – including operator induction Pre-commencement checklist Historical references for major plant Safety Procedure (SP 082) for Flowchart for Site Safety Inspection/Checklist	Builder

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
3b		On site operation of Plant and Equipment - Contact with building works - Mechanical failure	2	5	M	Induction of operators, including competency check Competent, experienced operators Daily operator inspection where required (mobile crane, fork lift, compressor & concrete pumps, lines and booms) Monthly inspection by Builder (register, log books & visual inspection to be maintained) Regular servicing as required, referenced in log books Clearly defined and well maintained access Safety Monitoring Plan to detail inspection requirements Reference Procedure for Plant and Equipment	Builder Plant Operators
4a	Electricity *(all trades - particularly electricians)*	Electrocution	5	5	H	ELCB strictly enforced Committee rules and inspections to clarify 30m leads, no adaptors or “piggy” backing, and leads to be raised over wet areas and access ways Regular inspections and testing, tagging completed monthly, log submitted to Builder for inspection Builder to ensure adequate access to power Erect permanent substation ASAP to manage temp power supply Only qualified electricians to work on electrical distribution boards, they must have an appropriate procedure in place SWMS reference for access and controls	Electrician Builder

A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
4b		Electricians installing - Manual handling - Falls (slips & trips) - Electrocution	5	5	H	Work processes referenced in SWMS When working on main boards safety signage is required No working on live boards – site rule, localised distribution and site procedure in place Regular toolbox meetings Verification of Licenses required at induction	Electrician Builder
4c		Sub Station/Kiosk - Electrocution - Manual Handling	5	10	H	Energy Australia to detail process in SWMS Area to be protected with fencing and signage until works completed	Energy Australia
5a	Oxy Acetylene *(all trades - particularly plumbers)*	Storage – Explosion – Fire – Unlawful use	5	5	H	Ensure lock up facility clearly labelled and secure Adequate ventilation to lock-up, signage and fire protection No more than six bottles to be stored in one location Potable units to be chained and fire retardant provided Referenced in SWMS	Builder Plumber Handrail installer
5b		Use - Personal damage - Manual handling	3	3	M	Adequate PPE, including face masks, and screens where necessary Where possible use in well ventilated area SWMS to document controls Fire retardant accessible at all times Adequately stored at end of shift or when not in use	Builder Plumber Handrail installer Painter

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
6a	Power Tools *(all trades)*	Safe use - electrocution - slips and trips - wrist injuries	5	2	M	All tools to be tagged monthly – Site Committee to check All leads to be raised – especially in access ways No "piggy" backing of leads - site rule Regular inspection and maintenance At the end of shift all tools to be locked away All hired equipment to be inspected visually prior to use on site Adequate instruction on how to use and safely operate hired equipment to be given by hirer, or Builder's foreman	All Trades Builder
6b		Personal Protection - eye, ear & head damage	5	3	H	Appropriate PPE to be worn – including steel capped boots, helmets, eye, ear and face protection, in designated areas All guards to be maintained and used appropriately – Site Committee to inspect Controls referenced in SWMS	All trades Builder
7a	Explosive Power Tool (EPT) *(all trades)*	- Unauthorised Operation - Eye & Ear Damage - Punctures	5	5	H	No Direct Action EPT's permitted on site (use Piston Action) Qualified operators identified and tickets checked in induction and by the Site Committee Equipment well maintained and serviced regularly When in use area to be clearly signed, appropriate PPE to be worn and charges to be stored in lockable container	Formworker Bricklayer Builder & Others

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
8a	Materials Handling *(all trades)*	Cranage - Falling materials - Manual Handling - Crush injuries	5	5	H	Experienced personnel to form crane crew Crane Operator has two way communication & back up battery Plant induction and inspection – including log and maintenance book check Competent, qualified operators – tickets inspected in induction Clearly defined loading and unloading areas All lifts to be timetabled 24hrs prior on noted on crane board All slings, chains and shackles checked regularly (quarterly by qualified person – similar to 'Alsafe Lifting') All dogman to have toolbox talk prior to commencement Dogmen have "right of way" on site Limit lifting over sheds as indicated by general foreman Refer to "Crane" trade breakdown for additional requirements to be contained in crane operator SWMS Special attention to loading onto consistent and even ground (e.g. 'good-ground')	Crane Operator Builder

A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
8b		Fork lift & Manitou - Falling materials - Struck by forklift - Noise & Dust	5	3	H	Plant & equipment to be inspected prior to operation on site Log books maintained Operators ticket to be copied at induction Experienced operators only Clearly defined and well maintained access routes Storage area to be well maintained, free of debris Loading bays to be regularly inspected. Speed limit of less than 5km hour on site	Builder Operator
8c		General - Slips, trips and falls - Manual Handling	3	3	M	Use of mechanical aids where necessary SWMS reference Well defined and maintained material storage area Housekeeping daily – including daily rubbish removal De-watering by all trades immediately after rain & during excavation/trenching Materials Handling Plan to be documented by Builder's general foreman	All trades

A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
9a	Personnel *(all trades)*	Personal Behaviour - Physical damage	2	3	M	All personnel inducted before commencing work Site rules clearly defined & displayed by Site Committee Ongoing training on needs basis Regular toolbox meetings to address safety issues Builder Management & Site Committee to be involved in any ongoing dispute Re-induction for ongoing non compliance Issue of Personnel Protective Equipment (PPE), e.g. clothing, footwear Sexual harassment not to occur (special attention to neighbours' terraces, pool and balcony areas Discipline policy in place and discussed during induction Issue of Safety Notification for non conformance	All Personnel
10a	Hazardous Substances *(all trades)*	Storage of Hazardous Substances • Pollution • Explosion, fire and leakage	5	3	H	All Substances require an MSDS Storage to be defined in the MSDS, and/or SWMS Hazardous Substances to be clearly identifiable and contained in appropriate container (as per MSDS requirements) Site Committee to randomly inspect all substances Hazardous Substances to be registered and distributed to first aid	All trades Builder

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
10b		Use of Hazardous Substances • Personal health and safety risk • Pollution	5	3	H	As per MSDS Site Committee to ensure compliance Adequate Instruction and Training to be provided and referenced in the form of a toolbox meeting Adequate PPE to be provided and used accordingly When required the area is to be cordoned off & adequately signed Hazardous Substances to be registered and distributed to first aid including a summary of first aid treatment	Builder
11a	Confined Spaces	General Awareness	1	3	L	Not anticipated to be a significant hazard Review on a needs basis	Builder
12a	Materials Falling *(all trades)*	Material falling from upper levels	5	5	H	As per item 1 Daily housekeeping – including the removal and replacement of bins on a needs basis (all bins replaced before close of business)	All Trades
13a	Brick Saw	Noise - Hearing loss	3	3	M	Isolate brick saw to specific area on site Provide adequate PPE Use modern blades which reduce noise Screen and provide adequate water, which is to be controlled SWMS reference	Brick layer Paver

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
13b		Personal injury - Hand & Arm injuries	2	3	M	Ensure well maintained and fitted guards Training of personnel SWMS reference	Brick layer Paver
14a	Scaffold	Falls from Scaffold	3	5	H	Access and Egress points to be clear of all materials and defined accordingly Competent and licensed scaffolders are the only personnel permitted to interfere with the integrity of the scaffold – this includes removal of scaffold ties and other components Under no circumstances are scaffold ties or components to be removed unless by a qualified scaffolder Handrails and toe boards to be in place at all times. Chain mesh, shade cloth and brick guards are to be maintained Incomplete scaffolds are to labelled accordingly Regular cleaning of debris from scaffold	Scaffolder
14b		Collapse	2	10	H	Access permitted only after the scaffold has been signed off by the scaffolder No storage of materials on scaffold Incomplete scaffold to be barricaded and signed accordingly Monthly inspection of scaffold by a licensed scaffolder	Scaffolder

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
15a	Ladders *(all trades)*	Falls from Ladders	3	3	M	Where possible ladders to be replaced by scaffold, mobiles or Elevated Work Platforms (EWP's) Ladders to be tied top and bottom, 1:4 stand, and protrude 1m passed the clearly defined landing area No materials to be carried up the ladder, they are to be passed, hoisted or craned up Three point hold at all times Working off ladders to be limited wherever possible Ladders not to be used within 3m of edge of slab. If this is not feasible a fall arrest systems is to be in place and defined in the specific SWMS	All Trades
16a	Materials Storage	Manual Handling Slips, Trips & Falls	3	3	M	Several areas on site available for storage Once lower level has been stripped materials will be able to be stored in this area, with a forklift operating Lockable Store located near amenities Regular housekeeping essential Subcontractors to set up storage areas as per general foreman guidelines	All Trades

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
17a	Penetrations *(all trades)*	Fall of personnel and materials through penetration	3	5	H	All penetrations to be covered and permanently secured – where possible mesh & collars to be cast in plus ply protection When working in or near penetrations (greater than 1.8m) appropriate fall arrest system to be used, area to be barricaded and signed accordingly (especially Air conditioning risers) At completion of work area to be adequately protected SWMS to be detailed by general foreman, i.e.: stair well construction & riser work	Structural & Service Trades
18a	Dust *(all trades)*	Inhalation and vision	3	3	M	Daily housekeeping 'Clean as you go' applies to all trades Dampen dust before sweeping Wear appropriate PPE, limit personnel in area Medium Density Fibreboard (MDF) trades to ensure SWMS and MSDS details are followed on site – a specified cutting area is to be identified on site with adequate ventilation and controls	All Trades MDF Trades
19a	Noise *(all trades)*	Hearing loss	3	3	M	Define specific areas on site for noisy operations as per item 13 Hearing protection available at all times, and to be worn when required – Site Committee to police Limit the number of personnel exposed where possible Hearing tests are available on site	All Trades

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
20a	Sun *(all trades)*	Sun burn and eye damage	3	2	M	Ample supply of Sunscreen SPF 15+ available near sheds Issue of SPF protected clothing to all Builder personnel Ensure shirts worn at all times – Site Committee to police Protective eye ware and brims on hard hats encouraged Posters and programs reinforcing good practices on site	Structural & External Trades
20b		Dehydration	3	1	L	Adequate supply of cool running water for all areas on site Excessive heat to be monitored by site committee Water points as required	All Trades
21a	Slips and Trips *(all trades)*	Personal Injury - Lower back damage - Joint damage - Superficial injury	3	3	M	Daily housekeeping – including emptying of bins Clear access ways, and reinforce “clean as you go” Adequate storage areas to be defined on site All personnel to be inducted into their work activity prior to commencing work Induction for all personnel on site as per NSW COP (i.e. WorkCover Code of Practice) Adequate supervision by Builder and Site Committee to ensure personnel behave in the appropriate manner Issue of Safety Instruction for non compliance	All trades

A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
22a	Access and Egress *(all trades)*	Unofficial Site Access of general Public Injury to public	2	3	M	Displayed Induction sticker required to enter site Builder or nominee to accompany all visitors to site Builder to police access, manage traffic & deliveries All visitors must report to the site office Appropriate signage to be erected at entry and exit points on site – including “Construction Site – No Entry” “Report to Site Office” “Hard Hat Area” “Hearing Protection Required” etc.	All Trades Builder
22b		Within site - • accidental collision • orientation • evacuation Resulting in: - Physical injury – slips, trips & falls - Disputes on site	2	2	L	Clearly defined access pathways, ongoing housekeeping and efficient materials storage Use of mechanical lifting where possible Manual Handling instruction and training Duel lifts for awkward loads where mechanical devise not optional Reference Procedure for Emergency Evacuation and site layout during site induction Site lay out posters clearly defining access, egress and amenities to be displayed in prominent positions Site notice board to be provided All incidents & accidents to be reported to the Builder’s Management and first aid immediately for an appropriate investigation	All Trades

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
23a	Housekeeping *(all trades)*	Slips, trips and falls - Physical injury - Disputes on site	5	3	H	'Clean-as-you-go' for all trades & daily housekeeping by all subcontractors Removal of full bins a priority All bins to be replaced before close of business Daily inspection by Builder's Foremen Site Committee to police Reinforced in induction and toolbox talks	All Trades
24a	Emergencies *(all trades)*	Fire, explosion, earthquake, bomb scare, gas leak etc	2	10	H	Site Specific Emergency evacuation procedure Training and education Referenced in the Site Induction Builder's General Foreman's discretion (i.e. review of reports and trial evacuations) Posters clearly outlining Evacuation Procedure to be displayed in prominent locations around the site facilities	Builder
25a	Air Quality	Dust from construction activities Dust from plant & equipment	3	2	M	All heavy vehicles used on site to be monitored for excessive dust generation (water cart may be required) Minimise traffic on exposed areas Cover vehicles leaving site (waste trucks) Use of water to dampen any visible dust Regular clean up of site perimeter	All Trades

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
26a	Sedimentation Control	Contamination of water ways Excess water on site resulting in runoff	3	5	H	Perimeter controls in place; including 1. Geotech Fabric 2. Hay bales 3. Sedimentation drums used for excess water 4. Low lying area identified and extra controls in place 5. Regular quarterly inspection and testing of site runoff and sediment controls, if required 6. No water to be pumped off site without being tested, any excess or contaminated waste will be trucked off accordingly 7. Weekly & monthly inspections	Builder
27a	Noise & Vibration	Plant & Equipment Hours of Operation	3	2	M	Mobile Cranes to be well maintained and serviced to reduce noise No work prior to 7.00am and after 5:00pm (Mon-Fri) and prior to 7:00am and after 3:30pm (Sat) or as per council requirements (unless authorised) General construction noise on site to be treated as per Site Safety & Environmental Plan requirements Excavation work to be monitored by Builder – all major plant to be managed as per SP 067 Plant & Equipment	All Trades Builder

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A		B	C	D	E	F	G
Risk		**Potential Hazards**	**P**	**C**	**Level of Risk**	**Control Measures**	**Responsibility**
28a	Traffic Control	Pedestrian Deliveries Local Traffic Crane work Injury to public	3	5	H	A complete Materials Handling Plan is to be documented by the general foreman Builder qualified Stop / Slow operator available If deliveries arrive early, they are to circle the site All crane lifts are to be time tabled in to the Builder 24hrs prior If trucks arrive without the Builders knowledge they are to be sent back to base immediately All deliveries to be coordinated with the Builder's Management	Builder
29a	Perimeter Security	Access by Public Falling materials	2	3	M	Perimeter fences to be secure and monitored. Security guards may be required – general foreman to review.	Builder

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Following is a continuation of the Risk Assessment broken down into specific areas of work. These trades have been highlighted and a comprehensive review of their SWMS is required to ensure the relevant hazards are addressed.

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
A	Excavation & Drainage	• Plant & equipment • Trenching & cutting – collapse & subsidence • Working in and around deep excavations (cuttings, lift shaft & footings) • Storage of petrol's & other hazardous substances • Personnel – qualifications and experience, work activity induction • De-watering & shoring • Bored piers	5	5	H	
B	Mobile Crane	• Experienced Crane Operator Crane Crew – Dogman (one replacement driver & one full time crane driver) • Dedicated communication channel • Materials Handling Plan • All lifts timetabled in at least 24hrs prior (whiteboard located in office) – 'no-notification-no-lift' rule applies • Copy of daily lifts given to crane driver prior to commencement • All slings, chains & crane boxes to be engineered and tagged accordingly	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
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A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
C	Formwork – including, reo., concrete place & pour, pre-cast concrete and pre-fabricated wall system (note: to be reviewed once package is complete)	• Materials handling • Plant & equipment • Access and egress • No riding loads or jump when jumping • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • 'Pre-cast' concrete system • Pre-fabricated wall system • EPT – piston activated only • Detailed method of work • De-nailing • Mesh & collar casting • Stripping method – no drop stripping, 3 man team required • Capping reo bars • Waterproofing & casting in fire stops • Blowing decks • Compliance to Code of Practice for Formwork • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
D	Post tensioning	• Live ends • Working face • Plant & Equipment • Personnel – qualifications and experience, work activity induction • Refer to Code of Practice "Post Tensioning" • Cleaning & Housekeeping	3	5	H	
E	Perimeter Protection (to be reviewed once package is finalised)	• Procedure in place – including a specific checklist • Dedicated personnel allocated for reviewing process • Regular inspection and maintenance • Referenced in detailed SWMS • Wind & working loads required • Signage	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
F	Scaffold	• Construction method • Incomplete scaffold signage • Monthly inspections • Falling materials & perimeter protection • Working at heights • Entry & exit points • Loading bays • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Specifically around pergolas & plant room on the roof	3	5	H	
G	Masonry (e.g. brick & blockwork)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • EPT – piston activated only • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
H	Waterproofing	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	
I	Structural Steel	• Materials Handling Plan • All lifts timetabled in at least 24hrs prior (whiteboard located in office) – ‘no-notification-no-lift’ rule applies • Copy of daily lifts given to crane driver prior to commencement • All slings and chains to be engineered and tagged accordingly • Plant & Equipment • Personnel – qualifications and experience, work activity induction • Cleaning & Housekeeping • Referenced in detailed SWMS • Wind & working loads required	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
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Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
J	Carpentry (e.g. roof framing & fixout)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • EPT – piston activated only • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	
K	Ceilings & Partitions (e.g. gyprock)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • EPT – piston activated only • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
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A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
L	Roofer (e.g. roofing & roof plumber)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	
M	Render & Applied Finishes	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
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Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
N	Windows & Doors (e.g. aluminium & glass)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • EPT – piston activated only • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	
O	Tiling & Stonework	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
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A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
P	Floor Coverings (e.g. carpet)	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	
Q	Painting	• Materials handling • Plant & equipment • Access and egress • Working at height, & materials falling from height • Perimeter & edge protection – including a specific checklist • Detailed method of work • Refer to Hazard Analysis • Personnel – qualifications and experience, work activity induction • Training requirements	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
R	Electrician	• Working on live boards • Tagging procedure • Testing & signing off (QA) • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Compliance with WorkCover Code of Practice for Electrical Works • Commissioning procedure	3	5	H	
S	Plumber	• Materials handling • Manual handling • Plant & equipment • Hazardous substances • Penetrations • Testing and sign off (QA) • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Commissioning procedure	3	5	H	

Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
T	Mechanical	• Working at heights • Falling materials & personnel • Manual handling • Materials handling • Penetrations • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Commissioning procedure • Working in air-conditioning risers to be rigidly controlled by SWMS	3	5	H	
U	Fire	• Materials handling • Manual handling • Plant & equipment • Hazardous substances • Penetrations • Testing and sign off (QA) • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Commissioning procedure	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
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Ongoing Risk Analysis

Project: Camellia West – 181 James Ruse Drive CAMELLIA **Phase**: Early Works & Structure **Duration**: 6 Months **Job No**: CAMJAM

A		B	C	D	E	
Item	**Step in Operation**	**Potential Hazards – to be Documented & Controlled in SWMS**	**P**	**C**	**Level of Risk**	**Comments Additional**
V	Lift	• Working at heights, & materials falling from height • Materials handling • Manual handling • Plant & equipment • Hazardous substances • Penetrations • Testing and sign off (QA) • Materials storage & housekeeping • Personnel – qualifications and experience, work activity induction • Commissioning procedure	3	5	H	
W	Environmental	• Site Controls – as per risk assessment • Consultant to review as required • Quarterly Audit • Weekly foreman inspections • Subcontractor SWMS • Stormwater management to be maintained	3	5	H	

RISK: **H**IGH - The identified hazard is likely to occur and/or could lead to Class 1 damage (Death, permanent disability)
Medium - The identified hazard may occur and could lead to Class 2 damage (Lost Time Injury – LTI)
LOW - The identified hazard is unlikely to occur and/or it would not significantly affect people or the environment (Class 3–minor inconvenience/damage, no LTI)

Attachment 3: REMOVAL ACTION SUMMARY – JOHNS MANVILLE SITE
WAUKEGAN, LAKE COUNTY, ILLINOIS
Prepared for US Environmental Protection Agency Region 5 Emergency Response Branch
TDD No.: S05-0203-007
Date Prepared: December 12, 2002
Contract No.: 68-W-00-129
Prepared by TetraTech EM Inc.

TETRA TECH EM INC.

December 12, 2002

Mr. Brad Benning
On-Scene Coordinator
Emergency Response Branch
U.S. Environmental Protection Agency Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Subject: **Removal Action Summary**
Johns Manville Site
Waukegan, Lake County, Illinois
Technical Direction Document No. S05-0203-007
Tetra Tech Contract No. 68-W-00-129

Dear Mr. Benning:

The Tetra Tech EM Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) is submitting the enclosed removal action summary report for the Johns Manville Site in Waukegan, Illinois.

If you have any questions or comments about the report or need additional copies, please contact me at (312) 946-6457 or Thomas Kouris at (312) 946-6431.

Sincerely.

Lee Christenson
Project Manager

Enclosure

cc: Lorraine Kosik, START Program Officer
Thomas Kouris, START Program Manager

REMOVAL ACTION SUMMARY
JOHNS MANVILLE SITE
WAUKEGAN, LAKE COUNTY, ILLINOIS

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 5 Emergency Response Branch
77 West Jackson Boulevard
Chicago, IL 60604

TDD No.:	S05-0203-007
Date Prepared:	December 12, 2002
Contract No.:	68-W-00-129
Prepared by:	Tetra Tech EM Inc.
START Project Manager:	Lee Christenson
Telephone No.:	(312) 946-6457
U.S. EPA On-Scene Coordinator:	Brad Benning
Telephone No.:	(312) 353-7613

CONTENTS

FIGURES

1.0 INTRODUCTION

The Tetra Tech EM Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has prepared this removal action summary report for the Johns Manville Site in Waukegan, Lake County, Illinois, in accordance with Technical Direction Document (TDD) No. S05-0203-007, which the U.S. Environmental Protection Agency (U.S. EPA) assigned to START. The scope of this TDD was to perform removal oversight activities, which included monitoring site health and safety, documenting site contractor activities, reviewing and retaining site disposal documentation such as waste manifests, and monitoring START costs.

This removal action summary report discusses the site background, removal activities, and sampling activities, and provides a summary of the removal action. The appendix to this report presents a photographic log of removal activities.

2.0 SITE BACKGROUND

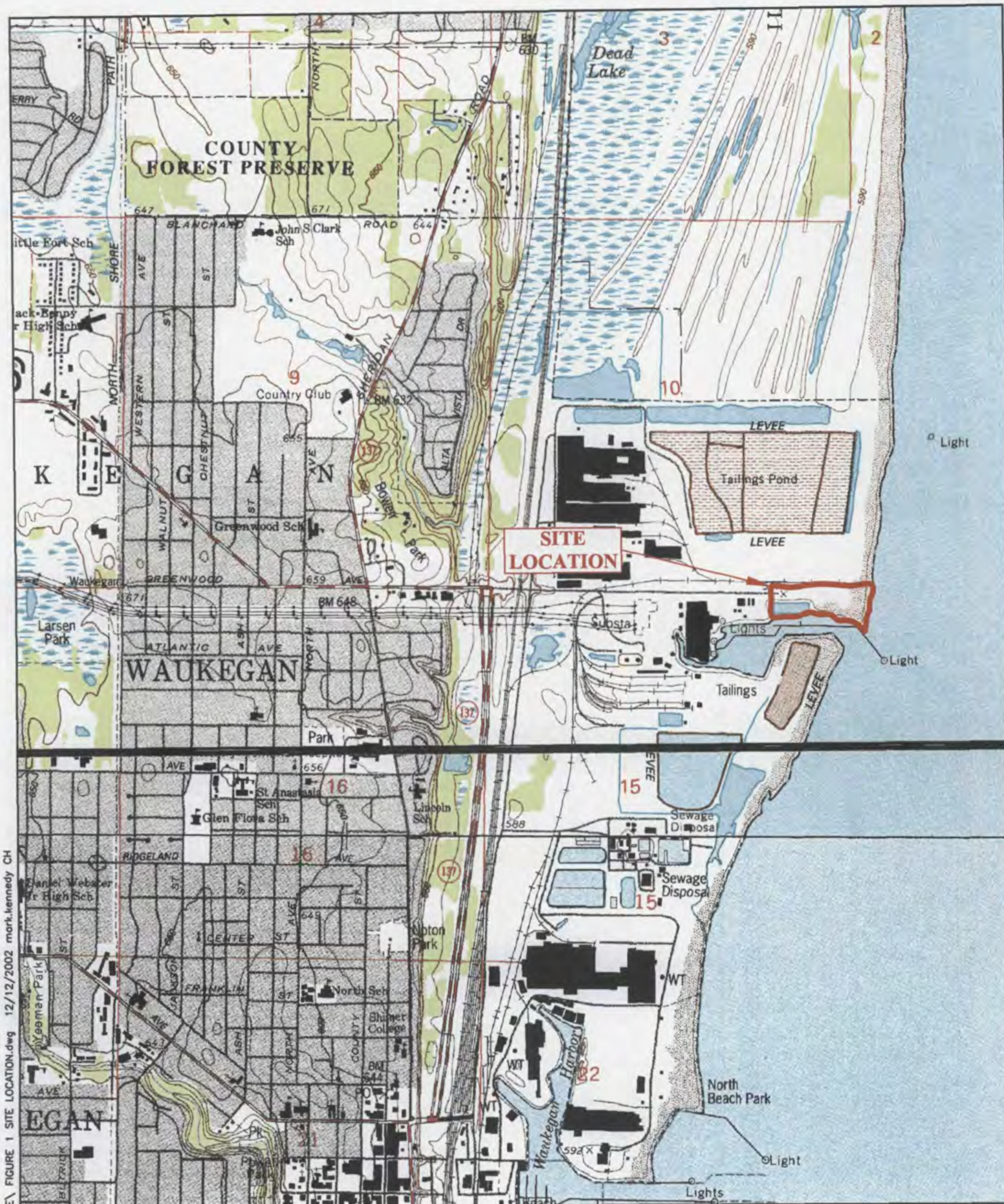
The Johns Manville Site 2 property is approximately 300 feet wide and 1,500 feet long. The site is located on the south side of Greenwood Avenue east of Pershing Road in Waukegan, Illinois (see Figure 1). The site lies between the Midwest Generation property and the Johns Manville Superfund site and is adjacent to Lake Michigan. The site geographical coordinates are latitude 42°23'05" north and longitude 87°49'26" west.

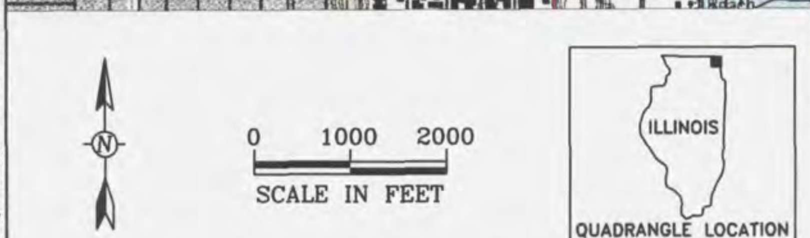
The site is located primarily on property owned by the City of Waukegan and Johns Manville Corporation and is currently under the management of the Illinois Department of Natural Resources (IDNR). In 1959, as part of a shooting range for the Pan American Games, a series of berms were constructed at the site to prevent bullets from traveling to neighboring properties. In the late 1960s, the berms were bulldozed to near grade.

Wastes present at the site originated from operations at the Johns Manville Superfund site north of Site 2. When the shooting range was constructed for the 1959 games, the Johns Manville corporation supplied asbestos-containing materials (ACM) for berm construction that contained asbestos. After activities at the Johns Manville facility ceased in 1998, a consultant to Johns Manville Corporation, ELM Consulting (ELM), conducted a site assessment of Site 2. Sample analytical results indicated that 17 grids, each measuring approximately 100 by 100 feet, contained ACM at depths of up to 3 feet below ground surface (bgs). Samples were also collected and analyzed for lead because of the past shooting range activities, but no lead-bearing materials were identified at site.

In June 1999, IDNR identified friable ACM at the site. A sample of this ACM was collected and analyzed. Analytical results indicated that the sample contained 40 to 45 percent asbestos.

Based on sample analytical results, U.S. EPA initiated a removal action at the site and directed START to support the removal action.





JOHNS MANVILLE SITE 2
WAUKEGAN, LAKE COUNTY, ILLINOIS
TDD NO. S05-0203-007

FIGURE 1

SITE LOCATION

Tetra Tech EM Inc.

SOURCE: MODIFIED FROM USGS, WAUKEGAN, ILLINOIS, QUADRANGLE, 1993; AND USGS, ZION, ILLINOIS - WISCONSIN, QUADRANGLE, 1993

G:\G\9009\L0203007-JOHNS-MANVILLE\ FIGURE 1 SITE LOCATION.dwg 12/12/2002 mark.kennedy CH

3.0 REMOVAL ACTIVITIES

This section discusses activities conducted during the 2002 time-critical removal action at Johns Manville Site 2. Site preparation is discussed below, followed by a detailed discussion of excavation activities and site restoration activities.

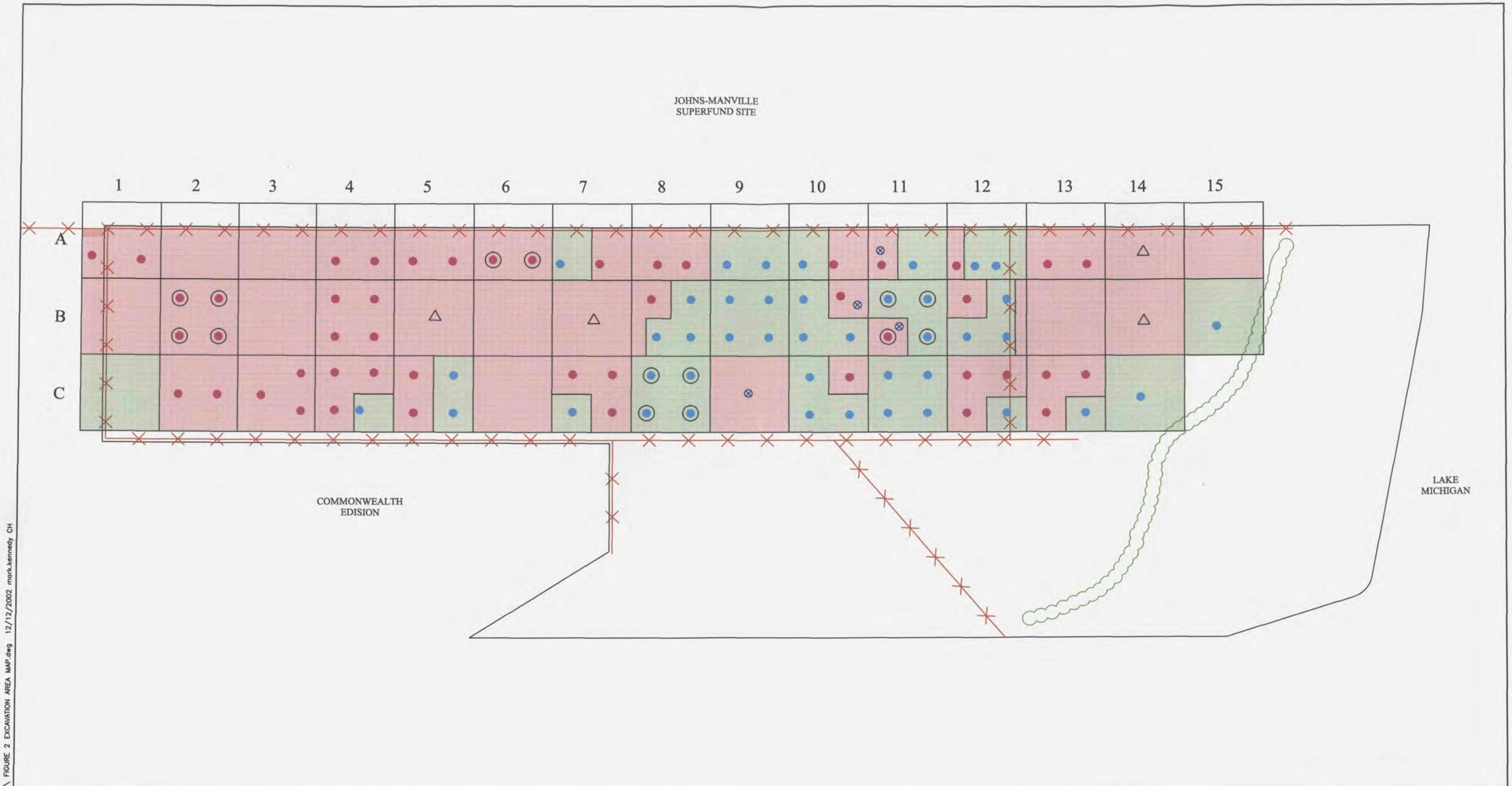
3.1 SITE PREPARATIONS

On May 17, 2002, U.S. EPA and START arrived at the Johns Manville site for the purpose of staking out the excavation grids using a global positioning system (GPS). Based on a site assessment conducted by ELM, a total of 17 grids were staked out and marked for excavation to either 1, 2, or 3 feet below ground surface (bgs). Excavation areas were marked with wooden stakes and fluorescent tape.

On May 20, 2002, START and U.S. EPA's Emergency and Rapid Response Services (ERRS) contractor mobilized to the site and established trailers. Equipment such as water trucks, dump trucks, storage trailers, excavators, and loaders were also mobilized to the site. The ERRS crew began clearing vegetation from areas to be excavated first. START collected perimeter air monitoring samples in order to establish background levels before excavation activities began.

3.2 EXCAVATION ACTIVITIES

On May 21, 2002, ERRS began excavation activities. Excavation began in the center of the site in grid B5 (see Figure 2). ERRS began a waste soil stockpile at the west end of the site in grids B2 and B3. The planned excavation depth in grid B5 was 3 feet bgs. During excavation it was observed that ACM seemed to extend below 3 feet bgs; however, START and U.S. EPA decided that removing ACM from the top 3 feet of soil and backfilling with clean fill was sufficient to eliminate the threat of exposure. On May 28, 2002, the loading of trucks with waste soil for off-site disposal began. ERRS double-lined the trucks with plastic sheeting and sealed them before the trucks left the site. Excavation of grid B5 was completed on May 29, 2002. Upon completion of the grid excavation, orange snow fencing was placed at the bottom of the excavation to indicate the lower extent of excavation during any future site activities. ERRS also began to stockpile clean sand on site to be used for backfilling.



LEGEND

- SITE BOUNDARY
- FENCE
- SHRUBS
- AREA NOT EXCAVATED
- AREA EXCAVATED
- VISIBLE ACM OR ASBESTOS PRESENT AT MORE THAN 1 PERCENT
- NO VISIBLE ACM OR SAMPLE NONDETECT
- COMPOSITE SAMPLE COLLECTED FOR FULL SCAN
- FULL SCAN OF CLAY BACKFILL
- SANDBACKFILL ANALYZED FOR ASBESTOS

0 60 120
SCALE IN FEET

N

JOHNS MANVILLE SITE 2
WAUKEGAN, LAKE COUNTY, ILLINOIS
TDD NO. S05-0203-007

FIGURE 2
EXCAVATION AREA MAP

Tetra Tech EM Inc.

G:\G\9009\L0203007-JOHNS-MANVILLE\ FIGURE 2 EXCAVATION AREA MAP.dwg 12/12/2002 mark.kennedy CH

By June 20, 2002, ERRS had completed excavating grids in the central portion of the site. Grids B5, B6, C6, B7, and, C9 were all determined to be contaminated in the initial site assessment and therefore were excavated. Grids B5, B7, and C9 were excavated to 3 feet bgs. Grids B6 and C6 were initially characterized as containing contamination to 2 feet bgs. After the top 2 feet of soil was removed, START collected confirmation samples from each grid. The grids were divided in four quarters, and one five-point composite sample was collected from each quarter. Analytical results from the two grid samples indicated that one half of grid B6 and three quarters of grid C6 still contained asbestos at a concentration greater than 1 percent. ERRS therefore excavated an additional 1 foot of soil from the areas exceeding the criteria.

During excavation of central portion of the site, ACM debris was often observed in grids marked as "clean" in ELM's site characterization report. For example, the north wall of the grid B6 excavation contained visible ACM and was chased into grid A6, and the east and south walls of the B7 excavation contained visible ACM and was chased into grids C7 and B8.

On June 20, 2002, excavation activities were moved to the east end of the site near the beach. ERRS began to excavate 1 foot of material from grid A14. During excavation it was noticed that the southwest portion of A14 contained ACM deeper than the 0 to 1-foot interval and it was chased to 3 feet bgs. Upon completion of excavation at A14, significant amounts of ACM were visible in the east wall of the A14 excavation. ERRS then chased ACM material east from A14 into A15. The next grid ERRS planned on excavating was B14, which was initially characterized by ELM as containing ACM at 1 to 2 feet bgs. Inspection of the south wall of the A14 excavation did not indicate any visual signs of ACM in grid B14.

On June 27, 2002, EPA, START, and ERRS discussed the major discrepancies between the initial site characterization report and the actual locations of ACM observed at the site. It was decided that before further excavation, START would conduct soil sampling in order to more accurately characterize site soil in the remaining grids. Grids were divided into four quarters, and one test trench was excavated in each quarter to an approximate depth of 3 feet bgs. Two trenches were excavated in grids that extended beyond the northern perimeter of the site. If visible ACM was present in the test trench, then no sample was collected and the trench was marked for excavation. If no visible ACM was present, then a 10-point composite sample from the trench walls was collected and sent to the laboratory for asbestos analysis. All grids yielding samples with an asbestos concentration greater than 1 percent were marked for excavation. Figure 2 shows sampling locations and final excavation areas based on test trench excavations.

By July 17, 2002, ERRS had completed excavation of grids on the east side of the site. As discussed above, grids were excavated based on the presence of visual ACM and analytical results from samples collected from test trenches. The surface areas of grids that were not excavated were scraped in case contamination from other grids had migrated because of vehicle traffic or weather conditions. Portions of grids A10, B10, C10 A11, B11, A12, B12, C12, and C13 were excavated to approximately 3 feet bgs. Grids A13, B13, A14, B14, and A15 were entirely excavated. Excavation activities then moved back to the central portion of the site to grids that were re-characterized.

Excavation of grids in the central portion of the site began with grid B8. By July 25, 2002, ERRS had completed excavation of portions of grids B4, B8, C4, C5, and C7, where either visual ACM was present or analytical results indicated the presence of asbestos at greater than 1 percent. ERRS continued to scrape surface areas of grids not excavated. ERRS then began excavating along the north perimeter of the site that includes an access road leading to the east end the site. Excavation of the site access road began with grid A8, moving west through A5. All soil characterization samples collected from the four grids, except A7 west, indicated asbestos concentrations greater 1 percent. Excavation of grid A5 was completed on August 1, 2002. Excavation activities then moved to grid B1.

Excavation of grid B1 was completed on August 5, 2002. The remaining grids marked for excavation included A1 through A4, B2, B3, C2, and C3. The remaining grids encompassed what remained of the site access road and the current load-out area. ERRS moved the tarping station north along row A so that excavation activities could begin in grids C2 and C3. ERRS completed excavating C2 and C3 and began excavating the remaining portion of the site access road in grids A1 through A4. In order to allow trucks site access, excavation of grids A1 through A4 was conducted in rows, starting in A1 and moving east through A4 and back until the grids were complete. ERRS completed excavation of A1 through A4 on August 16, 2002.

On August 19, 2002, ERRS began excavating B2 and B3 where the soil stockpile had been located. ERRS loaded out the remaining stockpile and began stockpiling and loading soil into trucks as the grids were excavated. On August 29, 2002, excavation and load-out activities were completed at Johns Manville Site. A total of 46,869.92 tons of ACM and soil was shipped off site to the Mallard Ridge landfill in Delevan, Wisconsin. ERRS scraped the surface of the concrete pad, used as a decon pad, located in row 4 of the site. Soil scraped from the pad was loaded out with the last truckload of ACM-contaminated soil.

3.3 SITE RESTORATION ACTIVITIES

On May 30, 2002, ERRS began backfilling grids that had been excavated. Backfilling began in grid B5. The first grids, B5 and B7, were backfilled with 3 feet of sand to grade. It was then decided that because contamination could extend beyond the maximum excavation depth of 3 feet bgs, the remaining grids would be backfilled with clay up to 1 foot bgs and the remainder of the grid would be filled with 1 foot of sand to grade. Grids on the far east end of the site were only backfilled with sand because this was the native makeup along the beach area. Backfilling and grading activities were completed on September 12, 2002.

ERRS then restored the site access road and parking lot. These areas were reconstructed by first placing geotextile in the access road and parking lot areas and then covering the geotextile with stone. Upon completion of the access road and parking lot, the site was hydro-seeded with vegetation that would grow in the sand cover on the site. On September 19, 2002, activities at Johns Manville Site were complete.

4.0 SAMPLING ACTIVITIES

This section describes sampling activities conducted at Johns Manville Site, including perimeter and personnel air sampling, soil sampling, and backfill sampling.

4.1 PERIMETER AND PERSONNEL AIR SAMPLING

During site activities, START collected perimeter and personnel air samples in order to monitor both the potential transport of airborne asbestos off site as well as the exposure of site workers to airborne asbestos. A dust monitor was also placed in the cab of the excavator during excavation activities. On May 20, 2002, START collected perimeter air samples prior to the start of excavation activities in order to determine background levels at the site.

Both perimeter and personnel air monitoring samples were analyzed using phase contrast microscopy (PCM) analysis with a turnaround time of 24 hours. Samples were collected at minimum flow rate of 2.0 liters per minute (L/min) and ran for a minimum of 500 minutes for a sample volume of at least 1,000 liters. A minimum of four perimeter air samples and one personnel air sample were collected every day. Once excavation activities moved away from the load-out area and additional site workers were on site, additional perimeter and personnel air monitoring samples were collected. A maximum of five perimeter air monitoring samples and three personnel air monitoring samples were collected. Perimeter air samples were collected at each of the four site boundaries, and personnel monitoring rotated daily among the site workers.

Both perimeter and personnel air monitoring sample analytical results were compared to the Occupational Health and Safety Administration (OSHA) permissible exposure level (PEL) for asbestos fibers of less then 0.1 fiber per cubic centimeter (cc) of air *(Title 29 Of the Code of Federal Regulations 1910.1001)*. Throughout the duration of site activities, all air sample analytical results were significantly below the OSHA PEL, with a maximum result of 0.0105 fiber per cc. On July 1, 2002, personnel air monitoring was suspended in accordance with the asbestos standard in 29 CFR 1926.1101(f) because personnel monitoring at the site had shown that exposure was below the PEL and that a "negative exposure assessment" had been demonstrated. Perimeter air monitoring samples were collected from May 20 through August 29, 2002, when excavation and load-out activities were completed.

4.2 SOIL SAMPLING

The initial site work plan called for 17 grids to be excavated at varying depths of 1 to 3 feet bgs based on ELM's initial site characterization report. Confirmation sampling was to be conducted at the base of all grids that were to be excavated to a maximum depth of 2 feet bgs. Once it was discovered during excavation activities that ACM was present in areas marked as "clean" in the initial site characterization report, U.S. EPA, START, and ERRS decided to conduct more comprehensive soil characterization sampling activities.

In order to more accurately define the extent of ACM at the site, a series of test trenches were excavated in the remaining grids. A maximum of four trenches were excavated in each grid depending on the size of the grid. If visible ACM was present in the trench after excavation, that portion of the grid was automatically marked for excavation. If no visible ACM was present, then a soil sample was collected from the test trench. Each soil sample consisted of a 10-point composite sample collected in an aluminum pie tin, homogenized, placed in a 4-ounce glass jar, and sent to the laboratory for asbestos analysis. Samples were analyzed by STAT Analytical in Chicago, Illinois.

A total of 90 test trenches were excavated at the site. Of those, 14 test trenches contained visible ACM and were not sampled. The remaining 76 test trenches were sampled and analyzed for asbestos. Analytical results showed that 33 of the 76 test trenches sampled contained greater than 1 percent asbestos. The results for the remaining 43 test trenches were non-detect for asbestos. Portions of grids containing either visible ACM or asbestos greater than 1 percent were excavated to 2 to 3 feet bgs. Figure 2 shows the test trench locations, which test trenches were determined to contain ACM, and which portions of the grids were excavated.

A total of 4 composite soil samples were collected from grids A6, B2, B11, and C8. The samples were analyzed for volatile organic compounds, semivolatile organic compounds, RCRA metals, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, and pesticides. All analytical results were below remedial criteria

4.3 BACKFILL SAMPLING

Prior to the start of site restoration activities, START collected samples from the clay and sand sources to be used as backfill on the site. Clay and sand samples were analyzed for volatile organic compounds, semivolatile organic compounds, RCRA metals, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, and pesticides. All analytical results were below remedial criteria and indicated that the backfill could be used at the site.

5.0 SUMMARY

The Johns Manville Site 2 is located on property owned by the City of Waukegan and Johns Manville Corporation and is currently under the management of IDNR. In 1959, as part of a shooting range for the Pan American Games, berms were constructed on the site to prevent bullets from traveling to neighboring properties. Materials used in the construction of the berms contained off-specification materials from the Johns Manville manufacturing facility located adjacent to the property. In the late 1960s, the berms were bulldozed to near grade. When its manufacturing activities ceased in 1998, ELM, a consultant to Johns Manville Corporation, conducted an assessment of Site 2. Sample analytical results indicated that 17 grids, each measuring approximately 100 by 100 feet, contained ACM at depths of up to 3 feet bgs. Samples were also collected and analyzed for lead because of the past shooting range activities, but no lead-bearing materials were identified.

On May 20, 2002, U.S. EPA, START, and ERRS mobilized to the site to began a removal action. Planned excavation activities were based on the ELM site characterization report. A total of 17 100-by-100-foot grids were to be excavated to depths of either 1, 2, or 3 feet bgs. For all grids not excavated below 2 feet bgs, START planned on collecting soil confirmation samples to ensure that contamination did not extend beyond the predetermined depth for each grid.

On May 21, 2002, ERRS began excavation activities. As excavation activities progressed, it became apparent that ACM was present both beyond the depths indicated in the ELM site characterization report as well as in neighboring grids marked as "clean" in the site characterization report. It was then decided by U.S. EPA, START, and ERRS that additional sampling would need to be conducted to accurately determine the extent of ACM at the site.

On June 27, 2002, ERRS began excavating test trenches in order to better define asbestos contamination at Site 2. A total of 90 test trenches were excavated on site. START inspected the test trenches for visible ACM. If visible ACM was present in the trench, the trench was not sampled and that portion of the grid was automatically marked for excavation. If no visible ACM was present, START collected a soil characterization sample and shipped it to the laboratory for asbestos analysis. All portions of grids with test trenches yielding samples with analytical results greater than 1 percent asbestos were marked for excavation. Of the 90 test trenches excavated, 14 contained visible ACM, 33 contained asbestos at greater than 1 percent, and 43 were non-detect for asbestos. The remaining grids were excavated to 2 to 3 feet bgs.

During all site excavation activities, START collected daily perimeter and personnel air samples in order to monitor the transport of airborne asbestos off site and to monitor worker exposure. A minimum of four and a maximum of five perimeter air samples were collected depending on the location of site activities. A minimum of one and a maximum of three personnel air monitoring samples were collected depending on the number of site workers for the day. Analytical results were compared to the OSHA PEL of less than 0.1 asbestos fiber per cc. All analytical results were significantly below the PEL.

On August 29, 2002, excavation activities at Johns Manville Site 2 were completed. A total of 46,869.92 tons of ACM and soil was shipped off site to the Mallard Ridge landfill in Delevan, Wisconsin. Excavated grids were backfilled with approximately 2 feet of clay and an additional 1 foot of sand. After backfilling activities were completed, the site access road and parking lot were re-established and the site was hydro-seeded. On September 19, 2002, all removal activities at the site were completed.

APPENDIX

PHOTOGRAPHIC LOG

(21 Pages)

Photograph No.:	1	**Orientation:**	South
TDD Number:	S05-0203-007	**Date:**	May 21, 2002
Location:	Johns Manville Site 2		
Subject:	Beginning of excavation at grid B5		

Photograph No.:	2	**Orientation:**	North
TDD Number:	S05-0203-007	**Date:**	May 22, 2002
Location:	Johns Manville Site 2		
Subject:	North air monitoring station		

Photograph No.:	3	**Orientation:**	Northeast
TDD Number:	S05-0203-007	**Date:**	May 28, 2002
Location:	Johns Manville Site 2		
Subject:	Lining of trucks		

Photograph No.:	4	**Orientation:**	South
TDD Number:	S05-0203-007	**Date:**	May 29, 2002
Location:	Johns Manville Site 2		
Subject:	Watering soil during excavation		

Tetra Tech EM Inc.

Photograph No.:	5	**Orientation:**	Northeast
TDD Number:	S05-0203-007	**Date:**	May 30, 2002
Location:	Johns Manville Site 2		
Subject:	Load-out of ACM-containing soil		

Photograph No.:	6	**Orientation:**	East
TDD Number:	S05-0203-007	**Date:**	June 12, 2002
Location:	Johns Manville Site 2		
Subject:	Power washing of truck tires before truck leaves		

Photograph No.:	7	**Orientation:**	Southeast
TDD Number:	S05-0203-007	**Date:**	June 17, 2002
Location:	Johns Manville Site 2		
Subject:	ACM in south wall of grid B7		

Photograph No.:	8	**Orientation:**	Northeast
TDD Number:	S05-0203-007	**Date:**	June 24, 2002
Location:	Johns Manville Site 2		
Subject:	ACM from grid A15		

Tetra Tech EM Inc.

Photograph No.:	9	**Orientation:**	Northeast
TDD Number:	S05-0203-007	**Date:**	July 1, 2002
Location:	Johns Manville Site 2		
Subject:	ACM in north wall of grid C13		

Photograph No.:	10	**Orientation:**	West
TDD Number:	S05-0203-007	**Date:**	July 2, 2002
Location:	Johns Manville Site 2		
Subject:	ACM in west wall of grid B13		

Photograph No.:	11	**Orientation:**	West
TDD Number:	S05-0203-007	**Date:**	July 3, 2002
Location:	Johns Manville Site 2		
Subject:	Test trench C10-northwest		

Photograph No.:	12	**Orientation:**	North
TDD Number:	S05-0203-007	**Date:**	July 10, 2002
Location:	Johns Manville Site 2		
Subject:	Test trench B2-southeast		

Photograph No.: 13
TDD Number: S05-0203-007
Location: Johns Manville Site 2
Subject: Test trench A8-southwest

Orientation: North
Date: July 15, 2002

Tetra Tech EM Inc.

Photograph No.:	14	**Orientation:**	Southeast
TDD Number:	S05-0203-007	**Date:**	July 17, 2002
Location:	Johns Manville Site 2		
Subject:	Scraping surface of grids		

Photograph No.: 15
TDD Number: S05-0203-007
Location: Johns Manville Site 2
Subject: Excavation of grids C2 and C3

Orientation: East
Date: August 6, 2002

Photograph No.: 16
TDD Number: S05-0203-007
Location: Johns Manville Site 2
Subject: Asbestos pipe in grid B2

Orientation: Northeast
Date: August 19, 2002

Photograph No.: 17
TDD Number: S05-0203-007
Location: Johns Manville Site 2
Subject: Load-out of remaining soil

Orientation: Northeast
Date: August 27, 2002

Photograph No.:	18	**Orientation:**	Northeast
TDD Number:	S05-0203-007	**Date:**	August 30, 2002
Location:	Johns Manville Site 2		
Subject:	Backfilling of grids B2 and B3 with clay		

Photograph No.:	19	**Orientation:**	West
TDD Number:	S05-0203-007	**Date:**	August 30, 2002
Location:	Johns Manville Site 2		
Subject:	Grids after backfilling with 2 feet of clay and additional 1 foot of sand		

Photograph No.:	20	**Orientation:**	Southeast
TDD Number:	S05-0203-007	**Date:**	September 6, 2002
Location:	Johns Manville Site 2		
Subject:	Access road and parking lot re-establishment		

Photograph No.:	21	**Orientation:**	Southeast
TDD Number:	S05-0203-007	**Date:**	September 6, 2002
Location:	Johns Manville Site 2		
Subject:	Central portion of site completely backfilled with clay		

ALTERNATIVE ASBESTOS DUST CONTROLS FOR LARGE SCALE PROJECTS STATEWIDE PLANNING PTY LTD 181 JAMES RUSE DRIVE CAMELLIA *CAMELLIA REMEDIATION PROJECT*

Prepared for: Environmental Strategies
Statewide Planning Pty Ltd

Prepared by: R T Benbow, Principal Consultant
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APPENDICES

1. INTRODUCTION

An asbestos safe work method statement has been prepared for the Camellia Project. Two specialised reports have then been prepared to provide the technical details of the methods proposed in this Statement as these depart from the use of a negative air pressure enclosure.

These two reports are titled:

- *Environmental Assessment of Using Foams for Asbestos Fibre Control*
  Report No. 131039_Environmental Assessment_Rev2.

- *Alternative Asbestos Dust Controls for Large Scale Projects*
  Report No. 131039_Alternative_Asbestos_Dust Controls_Rev2.

These two reports provide greater detail on the alternative asbestos dust controls which have resulted in a far superior and effective solution of achieving the following:

- Prevent the release of asbestos fibres at source.
- Provide safeguards to prevent wind from causing asbestos dust and fibres from becoming airborne.
- Provide methods that will be efficient, practical and proven to contain asbestos dust and fibres to within a work zone.

The purpose of this Alternative Asbestos Dust Controls for Large Projects Report is to provide a discussion of alternative methods of asbestos dust and fibre control rather than through the use of negative air pressure enclosures for the Camellia Project.

Use of newer technologies specifically developed to prevent asbestos fibres being able to be released are the basis of the alternative solution combined with the use of 'wet barriers', water 'blankets' and wind shields that would be used in pairs. These features are combined into a design being called a 'wind mitigating device' to separate it from being classified as an enclosure or merely a wind break or wind shield.

The need for an alternative solution arose from the nature of the Camellia Project being substantially different from asbestos in soil removal projects.

The Camellia Project will involve the extraction of asbestos containing materials and asbestos wastes expected to have the appearance of a sludge rich in friable asbestos.

The licensed asbestos contractors consider that the use of negative pressure enclosures will be impractical for the Camellia Project. Our findings support this conclusion.

Although there have been projects undertaken within negative pressure enclosures none of these, to our understanding, have involved excavating material that will be 100% asbestos containing either as bonded or friable mixed with sludge and with all asbestos containing materials to be removed being saturated with water.

The Camellia Project is unique and must rely on technologies that are suited to this project. The use of negative air pressure enclosures is not supported for this type of project and we advise against its use for reasons explained in the report.

Human health issues will arise if negative air pressure enclosures are insisted upon as these are the incorrect approach for this project.

Benbow Environmental offer far more reliable and superior process for asbestos remediation projects. This process achieves the same outcomes required of a negative air pressure enclosure using the following strategy:

A purpose designed device that provides the following:

- Protection from the wind;

- Water blanketing of the asbestos containing materials – saturation of their surfaces before these are disturbed;

- Water barriers formed by water fogging nozzles that fill the disturbance area with fine water particles that interact with and intercept fine asbestos dust particles and asbestos fibres. Wetting agents are used on the water droplets to effectively wet any free dust particles or fibres;

- Water barriers above the work area that within the addition of wetting agents will provide millions of water droplets that will fall to ground and sweep away any free dust particles or fibres down to the ground; and

- Use of specialised foams to cover the disturbed surfaces of the materials being removed by the cutting action of the excavator. This approach is what is required for a remediation project of this type.

The other methods available of wetting or dust capture will not be as effective which will result in asbestos dust and fibres being released. These then have to be prevented from being dispersed.

As the excavator bucket is raised, foam will be applied to the exposed edges of the waste materials. The foam has a binding action that maintains a foam blanket over the surface it covers. The foam blanket remains in place for more than sufficient time for the trip to the containment cells. Foam applicators would be available at the tipping area and the need for their use would be decided at the start of the week.

The smoke testing would be undertaken along the length of the two wind mitigation devices to establish that there is no leakage within the work zone. Smoke testing would be used at the two open ends of the work zones to establish that there is no movement of air from within the work zone to the outside of the work area. Smoke testing would also be conducted across the top of the opening between the two wind mitigation devices to establish that there is no mist of fine water particles to the air above the devices. These techniques would be used to set the angles of the water fogging nozzles.

Extensive use of risk assessment analysis and training of the workforce would occur at the pilot programme. During the pilot programme air monitoring would be conducted at several locations described below to prove the effectiveness of the controls.

- Work station monitored uses the membrane filter method often abbreviated to PCM filter phase contrast microscopy;
- On the inside of the walls of the wind mitigation device using PCM;
- Outside the walls of these devices using PCM;
- Near the excavator bucket, above the dump truck body, above the top of the devices, at a reference locations 10m from the devices and again at 50m at a North, South, East, and West positions using the transmission electron microscopy method.

These measurements would be repeated at the stockpile area that would be needed for the pilot programme. A stockpile area would be used during the initial excavation of the first cell.

- Contingency Plans would be in place to ensure the pilot programme did not fail. These are the following:

  - ► The excavation of the asbestos waste materials would be carried out at a slower rate so that the new surfaces made when the surface is broken can be liberally covered in foam.

    As the excavator bucket is raised the foam blanket would be continuously observed to ensure the blanket remained complete.

    This process would be continued as the excavator moves the bucket across to the dump truck and lowers the material into the bucket – it does not drop the material from height.

    As the bucket is being removed, again the integrity of the foam blanket on remnants of the asbestos waste that may be clinging to the teeth of the bucket and inside the bucket would be visually checked and if needed foam would be applied.

    By attention to detail the opportunities for failure would be eliminated. These methods would be documented and used in the training program for the work force.

  - ► The rate of removal of the materials is a large factor in this method failing. Adherence to using all of the controls continuously while material is being excavated or hauled is another factor that could lead to failure. These risk factors would be controlled through training and inspection.

  - ► If the method fails there are other contingencies available and these would be used based on understanding why the method failed. The air monitoring will identify the cause visual observation will provide the technical reasons.

  - ► There are several contingencies available.

    1. Apply foam after the water blanket has covered the material and before the material is disturbed.
    2. Place a roof over the two wind mitigation device.
    3. Place doors across the ends of the work zone.

4. Wash down the excavator bucket using water in the form of fan jets in between loading the dump truck.
5. Wash down the external surfaces of the dump truck before it leaves the work zone.
6. Wait a period of time it could be 1 minute up to 5 minutes before the dump truck drives out of the work zone.

There will be others but short of undertaking the pilot programme Benbow Environmental cannot be expected to advise what these are.

This request is ‘a safeguard in a safeguard’ as the USA EPA – a highly reputable body, which has undertaken two similar projects and needed only water sprays to meet 0.01 fibre/millitre at spectator position.

The need for the safeguards provided by the wind mitigation device is to gain acceptance of remediating sites such as Camellia.

A final contingency would be to require a negative air pressure enclosure to be used and it will fail to achieve compliance in the air within the enclosure and around the outside of the enclosure as it is ineffective to control and capture the asbestos dust and fibres at source. The walls and underside of the roof of the enclosure will become new sources of release of asbestos dust and fibres as the enclosure is relocated, given that no treatment is typically made to these surfaces under this control scheme.

Soil containing asbestos, usually fragments of asbestos cement, are typically removed using a water hose to dampen the soil prior to and during its removal.

Air sampling undertaken readily meets the 0.01 fibres/ml exposure limit at workers’ breathing zones. This is from direct experience. Negative pressure enclosures were not required as the risk of this exposure level being exceeded was very low.

The opportunity is not to have to use negative pressure enclosure. This is also stated both in the WorkCover Codes of Practice (Reference 1), the Work Safe Australia Code of Practice (Reference 2), the OSHA document, Asbestos Standard for the Construction Industry OSHA 3096-2002 Revised (Reference 3) and the US NESHAP document National Emission Standard for Asbestos (Reference 4) (Current as of August 1, 2013).

This overall finding was further supported from air monitoring data provided by the US EPA Region 5 on two projects undertaken at Waukegan Illinois.

1.1 REQUIREMENT TO USE NEGATIVE PRESSURE ENCLOSURES

On large scale asbestos removal work and principally in buildings, the use of negative pressure enclosures is the correct practice as containment of the release of asbestos fibres is of paramount importance.

In such an application the access into and out of the negative pressure enclosure is usually a man sized door and not as would occur at the Camellia Project where large earth moving machinery is required to drive out of the work area. Hence, the start of the thinking that the application of a negative pressure enclosure to the Camellia Project would be impractical. This discussion will demonstrate why it is impractical to rely on the air movement that would be generated at 4 or 12 air changes per hour to remove asbestos fibres away from worker breathing zones and to be able to prevent asbestos fibres being moved with the air drawn by a large earth moving machine as it drives out of an enclosure.

The alternative method that has been developed specifically for the Camellia Project, for technical reasons will be far more effective.

Within a negative pressure enclosure used in buildings or within large plants in an outdoor environment (typically oil refineries), vacuum cleaners are used to capture the asbestos fibres at source if the asbestos insulation is unable to be wet through thoroughly enough to prevent asbestos fibres being released.

The air movement generated by the exhaust fans in a negative pressure enclosure is a laminar flow and is therefore distributed reasonably evenly across the depth and width of the enclosure. The velocity of the air is a fraction of the capture velocity needed to remove the asbestos fibres from the point of release. Calculations will demonstrate the limitation of a negative pressure enclosure.

The purpose of a negative pressure enclosure is to contain the asbestos fibres that are released to within the enclosure and prevent these from contaminating other areas of building or a refinery. This argument would also apply to the Camellia Project. However the need to open ends of an enclosure to allow a vehicle as large as a dump truck to pass out of the enclosure would require the dump truck to have to wait until there are no airborne asbestos fibres floating within the enclosure as the 4 to12 air changes per hour remove the fibres that are present.

Any movement of a dump truck will stop the negative pressure enclosure from being able to prevent airborne fibres being withdrawn by the drag that occurs around the structure of the dump truck and this would negate the effectiveness of the negative pressure enclosure providing the containment of asbestos fibres. Other methods of control would be required and these have been identified and were described in some detail in the Asbestos Safe Work Method Statement. Further detail is provided in this Alternative Asbestos Dust Controls Report.

A negative pressure enclosure must, as explained in the Codes of Practices (Reference 1 & 2) remain subjected to at least 12 Pascals vacuum or 0.02 inches water gauge (Reference 3) [12 Pascals = 0.05 inches wg) at all times. This would not be technically possible at 4 to 12 air changes per hour. Vacuum will be immediately lost as soon as the opening is made for the dump truck.

The alternative solution being recommended in this report would be to use 'mini enclosures' as provided by the cabins of the mobile equipment and these would be re-engineered to be under positive pressure to prevent any airborne asbestos fibre or water droplets containing asbestos fibres from being drawn into the cabins.

This is a common approach in hardrock quarries where respirable silica (a carcinogen) may be present in the rock being quarried.

1.1.1 Legislative Requirements

The Work Health and Safety Regulations 2011 state the following in relation to removing friable asbestos

"477 Removing Friable Asbestos"

(1) A licensed asbestos removalist removing friable asbestos must ensure, so far as is reasonably practicable, the following:

(a) the asbestos removal area is enclosed to prevent the release of respirable asbestos fibres,
(b) subject to subclause (3), negative pressure is used,
(c) the wet method of asbestos removal is used,
(d) subject to subclause (3), the asbestos removal work does not commence until the air monitoring is commenced by a licensed asbestos assessor,
(e) air monitoring is undertaken during the asbestos removal work, at times decided by the independent licensed asbestos assessor undertaking the monitoring,
(f) any glove bag used to enclose the asbestos removal area is dismantled and disposed of safely.

Maximum penalty:
(a) in the case of an individual-$6,000, or
(b) in the case of a body corporate-$30,000.

(2) A licensed asbestos removalist must ensure that any enclosure used in removing friable asbestos is tested for leaks.

Maximum penalty:
(a) in the case of an individual-$6,000, or
(b) in the case of a body corporate-$30,000.

(3) Subclauses (1) (b) and (1) (d) do not apply if glove bags are used in the Class A asbestos removal work.

The other sub Clauses (4) – (6) are not reproduced for this discussion.

The term 'so far as is reasonably practicable' is very relevant and the air flow calculations will show that for the Camellia Project a negative pressure enclosure is not only impracticable but will cause failure of the objectives of the Asbestos Safe Work Method Statement as release of asbestos fibres at source would not be adequately controlled by the air velocities present.

The subclause (2) will not be able to be satisfied as the dump truck moving out of the enclosure will provide a very large opening.

The Asbestos Safe Work Method Statement was referred to a licensed asbestos contractor and their considered opinion presented in Appendix 1 stated the same conclusion as has been reached in this discussion that a negative pressure enclosure will be impractical.

A better system has been devised that will use other technologies to provide a higher level of effectiveness through the following measures.

- Saturation as recommended and required in the Codes of Practice (References 1 and 2);
- Using water barriers as described in the OSHA documentation (Reference 3); and
- Forming mini 'enclosures' over the newly disturbed surfaces that are not saturated as the material is broken into by the teeth of the excavator bucket through the use of a foam specifically developed for containing asbestos dust and fibres.

1.1.2 Codes of Practice

The term 'so far as is reasonably practicable' is also referred to in Section 5 on page 43 of the very useful document provided by WorkCover and titled '*How to Safely Remove Asbestos' Code of Practice, December 2011* (Reference 1), in the following context:

> *"Where friable asbestos is removed, a licensed asbestos removalist that holds a Class A licence must remove the asbestos. The licensed asbestos removalist must ensure so far as is reasonably practicable the asbestos removal work area is enclosed (sometimes referred to as the "bubble") to eliminate or minimise the release of airborne asbestos fibres."*

Alternative means to eliminate or minimise the release of airborne asbestos fibres based on established methods from the US are recommended. Hard scientific data for a project similar to the Camellia Project where the alternative methods were used is not available as the US EPA Superfund projects met the same permissible exposure limits (as apply in NSW) by only using water and operators working in air-conditioned cabins.

The reports from two similar projects both undertaken at Waukegan Illinois were studied and the letter of the two reports complete with photographs provided in the Asbestos Safe Work Method Statement.

1.2 Results from US EPA Superfund Projects

The US EPA Superfund or CERCLA (i.e. Comprehensive Environmental Response Compensation and Liability Act) has undertaken several asbestos cleanup projects. The following were found from the research undertaken to prepare the Asbestos Safe Work Method Statement.

Although several are listed, those bolded were accessible or similar to the Camellia project.

- Montana Rail Link

  Asbestos cement fragments on railway lane.

- CMC Asbestos Boserman Facility
  APPF of the VCP
  2002 VCP Voluntary CleanUp Plan
  CMC: Chicago Milwaukee Corporation
  Final Supplemental Investigation Report
  Tetra Tech, January 6, 2009
  Project No. 1157720035 1200

  Soils containing asbestos were removed by truck to landfill, wet methods used, no air monitoring data readily accessible.

- Libby Asbestos Site
  US EPA Contract EP-W-05-049, June 18, 2010

  Asbestos fibres in a deposit of vermiculite and as surface contamination so not directly applicable.

- US EPA Region 5
  Removal Action Summary – Johns Manville Site
  Waukegan, Lake County, Illinois
  Prepared for US Environmental Protection Agency Region 5 Emergency Response Branch
  TDD No: S05-0203-007
  Date Prepared: December 12, 2002
  Contract No: 68-W-00-129
  Prepared by TetraTech EM Inc.

  This project and the previous remediation programme on the same site in 1988 were granted access through a freedom of information application. The CD of all the reports is available if further discussion is required.

  The later of the two projects on this site provided a summary report which as noted earlier was provided in the Asbestos Safe Work Method Statement. Only wet methods were used and permissible exposure limits (similar to those in NSW) were satisfied.

1.3 OSHA REQUIREMENTS

The OSHA document, '*Asbestos Standard for the Construction Industry*', OSHA 3096:2002 (Revised) is referenced as it is directly applicable to similar projects to the Camellia Project.

OSHA separates the type of work undertaken with asbestos into four Classes, each having specific requirements.

What is work classification?

The OSHA standard establishes a classification system for asbestos construction work that spells out mandatory, simple, technological work practices that employers must follow to reduce worker exposures. Under this system, the following four classes of construction work are matched with increasingly stringent control requirements:

Class I asbestos work is the most potentially hazardous class of asbestos jobs. This work involves the removal of asbestos-containing thermal system insulation and sprayed-on or toweled-on surfacing materials. Employers must presume that thermal system insulation and surfacing material found in pre-1981 construction is ACM. That presumption, however, is rebuttable. If you believe that the surfacing material or thermal system insulation is not ACM, the OSHA standard specifies the means that you must use to rebut that presumption. Thermal system insulation includes ACM applied to pipes, boilers, tanks, ducts, or other structural components to prevent heat loss or gain. Surfacing materials include decorative plaster on ceilings and walls; acoustical materials on decking, walls, and ceilings; and fireproofing on structural members.

Class II work includes the removal of other types of ACM that are not thermal system insulation such as resilient flooring and roofing materials. Examples of Class II work include removal of asbestos-containing floor or ceiling tiles, siding, roofing, or transite panels.

Class III asbestos work includes repair and maintenance operations where ACM or presumed ACM (PACM) are disturbed.

Class IV work includes custodial activities where employees clean up asbestos-containing waste and debris produced by construction, maintenance, or repair activities. This work involves cleaning dust-contaminated surfaces, vacuuming contaminated carpets, mopping floors, and cleaning up ACM or PACM from thermal system insulation or surfacing material.

A quick reference guide that summarises provisions (i.e. requirements) needed for these four Classes of Work is provided in the following table.

Table 1-1: Quick Reference of Provisions by Work Class

	Class I	Class II	Class III	Class IV
Definition	Removal of thermal system insulation (TSI) and surfacing material (SM) containing > 1% asbestos	Removal of material other than TSI or SM containing > 1% asbestos	Maintenance and repair operations disturbing material containing > 1% asbestos	Housekeeping and custodial cleanup of dust, waste, and debris from Class I, II, or III activities
Regulated Areas	Required (warning signs mandatory)	Required (warning signs mandatory)	Required (warning signs mandatory)	Required (warning signs mandatory)
competent person	• Must be onsite • Must inspect each work shift • Must attend supervisory training	• Must be onsite • Must inspect often • Must attend supervisory training	• Must be onsite • Must inspect often • Must attend operational and maintenance training	• Must be onsite • Must inspect often • Must attend operational and maintenance training
Air Monitoring	• Initial if no negative exposure assessment (NEA) • Daily unless positive pressure mode respirator is used • Additional if conditions change Note: Terminate if < permissible exposure limits (PELs)	• Initial if no NEA • Daily unless positive pressure mode respirator is used • Additional if conditions change Note: Terminate if < PELs	• Initial if no NEA • Periodic to accurately predict if > PELs • Additional if conditions change Note: Terminate if < PELs	• Initial if no NEA • Periodic to accurately predict if > PELs • Additional if conditions change Note: Terminate if < PELs
Medical > Surveillance	Required if • Wearing negative- pressure respirator, or • > 30 days of work/year	Required if • Wearing negative-pressure respirator, or • > 30 days of work/year	Required if • Wearing negative-pressure respirator, or • > 30 days of work/year	Required if • Wearing negative-pressure respirator, or • > PEL for more than 30 days/year
Respirators	Mandatory for all Class I jobs	Mandatory if • Non-intact removal, or • No NEA, or • > PEL, or • Dry removal (except for roofing), or • In emergencies	Mandatory if • No NEA, or • TSI or SM disturbed, or • > PEL, or • Dry removal (except for roofing), or • In emergencies	Mandatory • In regulated area where required, or • If > PEL, or • In emergencies

Table 1-1: Quick Reference of Provisions by Work Class

	Class I	Class II	Class III	Class IV
Protective Clothing and Equipment	Required for all jobs if • > 25 linear or 10 square feet of TSI or • SM removal, or • No NEA, or • > PEL	Required for all jobs if • No NEA, or • > PEL	Required for all jobs if • No NEA, or • > PEL	Required for all jobs if • No NEA, or • > PEL
Training	Equivalent to EPA Model Accreditation Plan (MAP) asbestos abatement workers course	Equivalent to MAP course if critical barriers required; otherwise, train on specific work practices and engineering controls that must be used	Equivalent to AHERA course for maintenance and custodial staff	Equivalent to AHERA course for maintenance and custodial staff
Employee and Equipment Decontamination	Required if > 25 linear or 10 square feet TSI or SM removal • Full decon unit • Equipment room, shower, and clean room in series connected to the regulated area; other decon facility arrangements are acceptable if the specified series arrangement is not feasible (see 29 CFR Part 1926.1101, Subpart Z) • Lunch areas Note: Must follow detailed decontamination procedures (see 29 CFR Part 1926.1101(j)(1)(iii) If < 25 linear or 10 square feet TSI or SM removal • Equipment room/area required • Impermeable dropcloths required • Area must accommodate cleanup • Must decontaminate all personal protective equipment (PPE) • •Must enter regulated area through equipment room/decon area No smoking in work area	If > PEL or no NEA Equipment room/area required Impermeable dropcloths required Area must accommodate cleanup Must clean work clothes with HEPA vacuum before removal Must Decontaminate all PPE Must enter regulated area through equipment room/decon area Must enter regulated area through equipment room/decon area No smoking in work area	> PEL or no NEA Equipment room/area required Impermeable dropcloths required Area must accommodate cleanup Must clean work clothes with HEPA vacuum before removal Must Decontaminate all PPE Must enter regulated area through equipment room/decon area Must enter regulated area through equipment room/decon area NEA must vacuum No smoking in work area	If cleaning up asbestos containing surfacing material or thermal system insulation debris from a Class I or III activity after the activity is finished • Equipment room/area required • Dropcloths required • Area must accommodate cleanup • Must clean work clothes with HEPA vacuum before removal • Must decontaminate all PPE • Must enter regulated area through equipment room/decon area • No smoking in work area Note: If cleaning up dust, waste, and debris while a Class I, II, or III activity is still in progress, the requirements of that activity apply.

Table 1-1: Quick Reference of Provisions by Work Class

	Class I	Class II	Class III	Class IV
Generally Required Work Practices and Engineering Controls	• Wet methods • HEPA vacuum • Prompt cleanup/disposal	• Wet methods • HEPA vacuum • Prompt cleanup/disposal	• Wet methods • HEPA vacuum • Prompt cleanup/disposal	• Wet methods • HEPA vacuum • Prompt cleanup/disposal
Required Work Practices and Engineering Controls to Comply with PELs	• HEPA local exhaust • Enclosure or isolation • Directed ventilation • Other work practices • Respirators	• HEPA local exhaust • Enclosure • Directed ventilation • Other work practices • Respirators	• HEPA local exhaust • Enclosure • Directed ventilation • Other work practices • Respirators	• HEPA local exhaust • Enclosure • Directed ventilation • Other work practices • Respirators
Prohibited Work Practices and Administrative Controls	• High-speed abrasive disc saws without HEPA • Compressed air without capture device • Dry sweeping/shoveling	• High-speed abrasive disc saws without HEPA • Compressed air without capture device • Dry sweeping/shovelling	• High-speed abrasive disc saws without HEPA • Compressed air without capture device • Dry sweeping/shoveling	• High-speed abrasive disc saws without HEPA • Compressed air without capture device • Employee rotation
Controls and Work Practices	• Critical barriers/isolation methods required if • > 25 linear or 10 square feet of TSI or SM removal • < 25 linear or 10 square feet of TSI or • SM removal only if no NEA or there are adjacent workers • HVAC isolation required • Impermeable dropcloths required • Directed ventilation required if no NEA or > a PEL • Objects must be covered One or more of the following controls must be used: • Negative-pressure enclosure • Glove bag • Negative-pressure glove bag • Negative pressure glove box • Water spray process	For indoor work only Critical barriers/isolation methods required if • no NEA • likely > a PEL • non-intact removal • Impermeable dropcloths required For removal of vinyl and asphalt flooring materials • No sanding • HEPA vacuum • Wet methods • No dry sweeping • Any mechanical chipping must be done in negative-pressure enclosure • Intact removal if possible • Dry heat removal allowed • Assume contains asbestos without an analysis For removal of roofing materials	• Critical barriers required • If no NEA • > Pel via monitoring • Impermeable dropcloths required Local HEPA exhaust required Note: Enclosure or isolation of operation required if TSI or SM is drilled, cut, abraded, sanded, sawed, or chipped	See Generally Required Work Practices and Engineering Controls in this table

Table 1-1: Quick Reference of Provisions by Work Class

	Class I	Class II	Class III	Class IV
	• Mini enclosure	• Intact removal if possible • Wet methods if feasible • Cutting machine misting • HEPA-vacuum debris • Lower to ground as soon as possible but no later than day's end • Control dust of unbagged material • Prevent intake of airborne asbestos< through roof vent system Class II For removal of cement-like siding, shingles, or transite panels • Intact removal if possible • Wet Methods • Lower to ground via dust-tight chute, crane, or hoist immediately or place in an impervious waste bag or wrap in plastic sheeting and lower to ground by day's end • Cut nail heads For removal of gaskets • Use glove bags if not intact • Wet removal • Prompt disposal • Wet scraping Additional requirements • Wet methods • Intact removal if possible • Cutting, abrading, or breaking prohibited		

The OSHA Regulations permit alternatives and these include a water spray process or mini enclosure.

As Class 1 work fits the description of the Camellia Project the compliance requirements for this type of work is discussed separately.

Again from the OSHA document the following is referred to.

What are the compliance requirements for Class I work?

A designated competent person must supervise all Class I work, including installing and operating the control system. The competent person must inspect onsite at least once during each work shift and upon employee request.

Employers must place critical barriers over all openings to regulated areas or use another barrier or isolation method to prevent airborne asbestos from migrating for the following jobs:

- *All Class I jobs removing more than 25 linear or 10 square feet of thermal system insulation or surfacing material.*
- *All other Class I jobs without a negative exposure assessment.*
- *All jobs where employees are working in areas adjacent to a Class I regulated area.*

If using other barriers or isolation methods instead of critical barriers, employers must perform perimeter area surveillance during each work shift. No asbestos dust should be visible. Perimeter monitoring must show that clearance levels are met (as contained in 40 CFR Part 763, Subpart E of the EPA Asbestos in Schools rule) or that perimeter area levels are no greater than background levels.

Employers must ensure the following for all Class I jobs:

- *Isolating heating, ventilating, and air-conditioning (HVAC) systems in regulated areas by sealing with a double layer of 6 mil plastic or the equivalent.*
- *Placing impermeable drop cloths on surfaces beneath all removal activity.*
- *Covering and securing all objects within the regulated area with impermeable drop cloths or plastic sheeting.*
- *Ventilating the regulated area to move the contaminated air away from the employee breathing zone and toward a HEPA filtration or collection device for jobs without a negative exposure assessment or where exposure monitoring shows the PEL is exceeded.*

In addition, employees performing Class I work must use one or more of the following control methods:

- *Negative-pressure enclosure systems when the configuration of the work area does not make it infeasible to erect the enclosure.*
- *Glove bag systems to remove ACM or PACM from piping.*
- *Negative-pressure glove bag systems to remove asbestos or PACM from piping.*
- *Negative-pressure glove box systems to remove asbestos or ACM from pipe runs.*

- *Water spray process systems to remove asbestos or PACM from cold-line piping if employees carrying out the process have completed a 40-hour training course on its use in addition to training required for all employees performing Class I work.*
- *Small walk-in enclosure that accommodates no more than 2 people (mini-enclosure) if the disturbance or removal can be completely contained by the enclosure.*

For the specifications, limitations, and recommended work practices of these required control methods, refer to Occupational Exposure to Asbestos, 29 CFR Part 1926.1101. Employers may use different or modified engineering and work practice controls if they adhere to the following provisions:

- *Control method encloses, contains, or isolates the process or source of airborne asbestos dust, or captures and redirects the dust before it enters into the employees' breathing zone.*
- *Certified industrial hygienist or licensed professional engineer qualified as a project designer evaluates the work area, the projected work practices, and the engineering controls and certifies, in writing, that based on evaluations and data the planned control method adequately reduces direct and indirect employee exposure to or below the PEL under worst-case conditions. The planned control method also must prevent asbestos contamination outside the regulated area, as measured by sampling meeting the requirements of the EPA Asbestos in Schools rule or perimeter monitoring.*
- *Employer sends a copy of the evaluation and certification to the OSHA National Office, Office of Technical Support, Room N3653, 200 Constitution Avenue, N.W., Washington, DC 20210, before using alternative methods to remove more than 25 linear or 10 square feet of thermal system insulation or surfacing material.*

The OSHA requirements specifically address practicality in the following:

- *Negative pressure enclosure systems when the configuration of the work area does not make it feasible to erect the enclosure.*

The section of the OSHA requirements goes onto say:

'Employers may use different or modified engineering and work practice controls if they adhere to the following provisions:

- *Control method encloses, contains or isolates the process or source of airborne asbestos dust, or captives and redirects the dust before it enters into the employee's breathing zone.'*

Other barriers or isolation methods are permitted to be used to prevent asbestos migration. Several barrier types have been designed into the 'wind mitigation device'.

The alternative methods discussed in this report will satisfy these requirements and be more effect for the Camellia Project. Similar projects undertaken by the US EPA and referenced in the report and with detailed reports provided were able to satisfy the OSHA permissible exposure limits using wet methods.

1.4 US – NESHAP – NATURAL EMISSION STANDARD FOR ASBESTOS

Regulated asbestos containing material is to be kept wet before removal. This is referenced in the following Clauses.

Clause 61.149 Standard for waste disposal for asbestos mills.

Each owner or operator of any source covered under the provisions of §61.142 shall:

(a) *Deposit all asbestos-containing waste material at a waste disposal site operated in accordance with the provisions of §61.154; and*

(b) *Discharge no visible emissions to the outside air from the transfer of control device asbestos waste to the tailings conveyor, or use the methods specified by §61.152 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. Dispose of the asbestos waste from control devices in accordance with §61.150(a) or paragraph (c) of this section; and*

(c) *Discharge no visible emissions to the outside air during the collection, processing, packaging, or on-site transporting of any asbestos-containing waste material, or use one of the disposal methods specified in paragraphs (c) (1) or (2) of this section, as follows:*

(1) *Use a wetting agent as follows:*

(i) *Adequately mix all asbestos-containing waste material with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, before depositing the material at a waste disposal site. Use the agent as recommended for the particular dust by the manufacturer of the agent.*

(ii) *Discharge no visible emissions to the outside air from the wetting operation or use the methods specified by §61.152 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.*

(iii) *Wetting may be suspended when the ambient temperature at the waste disposal site is less than −9.5 °C (15 °F), as determined by an appropriate measurement method with an accuracy of ±1 °C (±2 °F). During periods when wetting operations are suspended, the temperature must be recorded at least at hourly intervals, and records must be retained for at least 2 years in a form suitable for inspection.*

(2) *Use an alternative emission control and waste treatment method that has received prior written approval by the Administrator. To obtain approval for an alternative method, a written application must be submitted to the Administrator demonstrating that the following criteria are met:*

(i) *The alternative method will control asbestos emissions equivalent to currently required methods.*

(ii) *The suitability of the alternative method for the intended application.*

(iii) *The alternative method will not violate other regulations.*

(iv) *The alternative method will not result in increased water pollution, land pollution, or occupational hazards.*

(d) When waste is transported by vehicle to a disposal site:

- *(1) Mark vehicles used to transport asbestos-containing waste material during the loading and unloading of the waste so that the signs are visible. The markings must:*
  - *(i) Be displayed in such a manner and location that a person can easily read the legend.*
  - *(ii) Conform to the requirements for 51 cm × 36 cm (20 in × 14 in) upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and*
  - *(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.*

2. COMPARISON OF ASBESTOS ABATEMENT TECHNIQUES IN A PETROLEUM REFINERY

Research to support the use of other technologies than a negative pressure enclosure was undertaken due to the perceived concern that such enclosures would be ineffective and impractical for the type of asbestos containing materials to be removed in the Camellia Project and the type of equipment that would need to be used, e.g. excavators and dump trucks.

A detailed study was found.

Title: *Exposure Comparison of Outdoor Asbestos Abatement Techniques in a Petroleum Refinery*
By: J. F. Kim Friats and Lindsay E, Booker
24 February 2011
Published in the Applied Occupational and Environmental Hygiene, 11:9, 1139-1148

The article in full is provided in Appendix 2.

The study evaluated four different types of enclosures used in an outdoor environment.

The four methods are:

- Negative pressure enclosure;
- Negative pressure glove bag;
- Open top five-sided enclosure; and
- Windscreen/extended barricade which is also described as a less than five-sided enclosure.

A large number of samples, some 11,451 samples were analysed over a three year period and the following was found:

> *'The results show that trained workers using adequate wetting techniques and partial enclosures can achieve downwind concentrations equivalent to negative pressure enclosures. All techniques yielded down wind perimeter concentrating well below the OSHA permissible exposure limit of 0.1 f/cc.'*

This article led to considering combining a wet barrier method over two vertical planes, combined with using a specific foam to provide rapid enclosing of any new unsaturated surface.

Research of foams found that one has been patented and is commercially available for asbestos fibres.

A separate detailed document to discuss foams has been prepared.

Foams have proven to be effective for a range of purposes from odour control, fire fighting, dust suppression and now preventing the release of asbestos fibres where the velocities at which the asbestos dust and fibres are generated are minimal – as is the case when excavating.

Examples of high speed generation of asbestos dust and fibres are rotary saw cutting, grinding, using pneumatic chisels, feeding asbestos containing material through trommel screens, vibratory conveyors, bucket elevators, rubber conveyors or allow the asbestos dust and fibres to fall from height greater than a metre or to be exposed to breezes or wind of velocities >2 km/hr, i.e. ~0.6m/sec.

These are low velocities at which control of the flow of asbestos fibres would be lost unless the effects of wind transporting the asbestos dust and fibres is mitigated by three techniques:

- Providing a still air environment within these velocity parameters;
- Providing a damp atmosphere where water droplets in a fogged atmosphere are able to meet asbestos dust and fibres and allow gravity to cause these to come to ground; and
- Use a foam to envelop the release points where asbestos dust and fibres could be generated.

The advantage of foam is in being able to envelope the disturbed surfaces of the asbestos containing materials, wet the surface, use surface tension to maintain the large number of ‘mini enclosures’ formed by the bubbles and prevent the slight air currents generated by the movement of the excavator bucket from giving newly exposure particles of asbestos dust and fibres freedom of movement.

The ‘wind mitigation devices’ designed specifically for the Camellia Project are unique and have not been used before. All the elements of the design have been used separately for asbestos dust control.

Scientific data, other than for the US EPA use of wet methods – which proved to be more than adequate – are not available until the trial or pilot programme is undertaken.

Effectiveness of the use of foams has been discovered in measurements undertaken on two projects using Foam shield – a foam specifically developed to contain the release of asbestos dust and fibres.

The separate report on foam provides the scientific data obtained at these two projects.

3. NEGATIVE PRESSURE ENCLOSURES – STRENGTHS AND WEAKNESSES

For use in buildings, as glove enclosures or enclosures over small work areas, negative pressure enclosures serve a most useful purpose. For large spaces in buildings that can be kept sealed negative pressure enclosure are ideally suited and very effective in preventing the release of asbestos fibres from out of the work area. The author has direct experience with their use.

For outdoor areas where the soil may contain an odour or fragments of asbestos cement enclosures have been used however the effectiveness of the air extraction system to be able to capture asbestos fibres at source is not technically achievable at an air change rate of 4 per hour or 12 per hour which is the range of air changes usually used. This is because the air velocity required to capture asbestos dust particles or fibres is non-existent within the enclosure except at the face of the extraction fans. This is acceptable for enclosures inside buildings. It is not acceptable for a work area in an outdoor environment where asbestos containing materials will be excavated.

A good example to enable the reader to visualise this discussion is a hard rock drill. These use percussion provided many years ago by air but now these use hydraulics to hammer the drill bit and rod into the material bring drilled.

As this occurs the material is pulverised into minute particles and fragments. These are drawn to the ground level surface so that the hole will be cleared of this debris.

A dust collector hood is placed around the surface of the hole (at ground level). The hood has an opening that surrounds part of the perimeter of the hole and enables air at high velocity – very much like a domestic vacuum cleaner function – to provide removal of the minute particles. Examination of the hood shows no escape of these minute particles. The air capture velocity at the hood opening is high above 1m/second.

Capture velocities will vary depending on the distance from the point of release and where the section hood can be located.

A useful example to visualize is an open top tank used to mix solvent based paint.

The tank may be 1m in diameter or larger for this discussion. The solvent vapours are to be captured. A hood may be placed over the top of the tank and allow the vapour to be drawn up into the hood. The capture velocity needs to be able to collect the vapours so that vapour does not rise above the tip of the open tank and float down the side of the tank as solvent vapour (solvent used in paint) are denser than air.

The hood achieves the effectiveness of control by using a high air capture velocity. Another technique in this same application is to use a slot that has a very high capture velocity that is able to draw the vapour across open surface the tank. An air stream can be provided to push the air and vapour across the top of the tank across to the suction hood. This technique, known as push-pull, is effective.

Application of these techniques would be needed to make a negative air pressure enclosure to work effectively for a remediation project of the nature of Camellia.

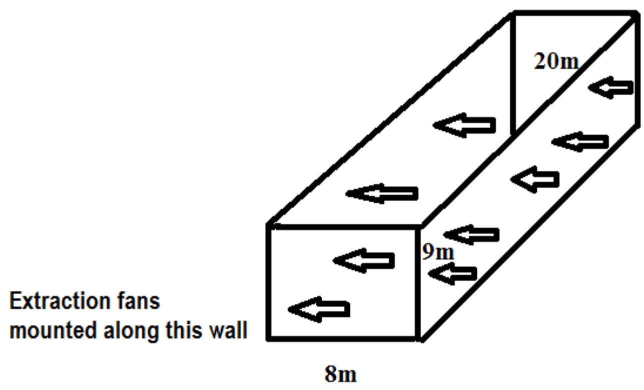
The application of these techniques is aimed at capture at source not prevention of the release at source. This is the fundamental difference. Prevention of release at source is a far more effective technique.

A minimum air capture velocity where particles have no induced velocity from the process and may be falling due to gravity or convection currents is 0.6 m/sec to 1 m/sec. These velocities can be referenced from the following references 5 and 6.

A comparison of the air velocities within the negative pressure enclosure can simply be calculated for 4 and 12 air changes per hour.

The work area – the cell where the excavator and dump truck will be operating - would typically be 20m long, 8m wide and 9m high. This area has a volume of $1600m^{3.}$ 4 air changes per hour require extraction fans removing $106.7m^3$/minute i.e. 1.8 m^3/sec, as air changes $320m^3$/minute i.e. $5.3m^3$/sec.

Referring to the sketch below and the air flow being from right to left:



The average velocity across the width of the enclosure would be:

- 4 air changes 0.01m/sec.
- 12 air changes 0.03 m/sec

Higher capture velocities would only occur in front of the extraction fans and this decreases rapidly to the laminar air flow velocities above.

If the enclosure remains sealed it will not allow asbestos fibres to escape. If the end of the enclosure is opened, this would have to be through an air lock and at a very slow rate of travel of the dump truck for no transport of asbestos fibres along with the truck to occur.

There is no capture velocity that is effective across the length or width of the enclosure. A comparison with 0.6 m/sec shows the order of magnitude that is missing. Within negative pressure enclosures capture of asbestos fibres and therefore control of the release of these fibres and their transport fate are not addressed for the Camellia Project.

An enclosure would contain the release of the fibres if the enclosure remain closed as happens when negative pressure enclosures are used for the applications discussed e.g. inside buildings, odour control, soil with asbestos where generation rates are miniscule and enclosures are not warranted.
A far more effective control strategy is the device described in the Asbestos Safe Work Method Statement and redescribed in more detail in the following section of the report.

This strategy uses the enclosures provided by the cabins of the mobile equipment to provide enclosure for the operators. The strategy uses enveloping of the asbestos fibres at the release points through the innovative use of foam as 'mini enclosure'.

The strategy combines these techniques with providing a work area protected from wind generated currents and 'wet barriers' formed by foggers instead of a roof.

The strategy also adds water fan jets that blanket the excavation layer prior to extraction occurring. Control of these devices would be through a PLDC device rather than being manual.

Use of the foam lances would be manual although this may also be able to be provided at the bucket of the excavator. Relying on manual control where the foam can be rapidly directed is preferred.

4. THE 'WIND MITIGATION DEVICE'

The following discussion provides a summary using the headings:

- Issue;
- Solutions;
- Benefits; and
- Proof

Issue	Solution	Benefit	Proof
• Negative pressure enclosures for this project will be impractical • Negative pressure enclosures for this project will be ineffective in preventing human health exposures to the workforce • Negative pressure enclosures will fail no large vehicles needs to have passage out of the enclosure.	US EPA found from their experiences into similar projects that wet methods are adequate to meet OSHA limits.	Greater workers' safety. Documentation of the generation of release of dust and fibres at source.	US EOA OSHA documentation Experience from foam Knowledge on ventilation design used to capture air contamination Practical experiment of Principal Consultant.
Negative pressure enclosures will not provide adequate control of the generation of asbestos dust and fibres at source	Prevent the release of asbestos dust and fibres using an alternative situation. In this area a specialised foam designed and specifically used in asbestos removal projects	Greater reliability; Ease of application / visible; able to be applied at distance from the source. Foam encloses the surfaces with a blanket of bubbles that are designed to bind together in a mass and not to dissipate.	Design details provided by foam manufacturers. Demonstrations are on web sites. Failure of negative pressure enclosures is based on the air capture velocities used to capture air contaminants.
The alternate solution has not been tried and proven.	Undertake a pilot programme with extensive air monitoring using phase contrast microscopy and transmission electron microscopy.	Work methods will be more reliable as based on sound engineering principles. Work zones and work methods will be practiced	USEPA just used water with wetting agents and not DSHA Standards. The Camellia Project is similar and has additional safeguards using proven engineering solutions.
Safeguards are adequate.	Benbow Environmental	Greater reliability.	USEPA experience.

	proposes a multi-focussed solution that includes: • A superior process; • Water saturation; • Water barriers formed from engineering the use of fogging spray nozzles significantly placed around and above the work zone; • Foam suppression of asbestos dust and fibres at source; • State of the art personel monitoring, training, monitoring, supervision, and auditing; • monitoring and within boundaries not used in Australia before; Use of transmission electron microscopy for on site, at boundaries and at reference locations.	Greater control at source. Confidence in the reliability of the safeguards. Lower risk of failure. Combination of a number of controls to provide a work zone free of release of asbestos dust and fibres at source.	Knowledge of ventilation designs used for capture of air contaminants. Experience on asbestos related projects where there was no previous experience and the methods work as designed. PWD Netherest Quarry is the best example

The device is given this name to separate it from being a partial enclosure or a wind shied as it is for more effective and has a number of design features.

These are:

- Water Barriers

  The water barrier is borrowed from OSHA and experience in designing dust controls access a wide range of applications.

- Water Blanketing

  The water fan jet comes from pioneering work undertaken mid 1980's at a Public Works rock quarry at Nethercote where tremolite seams were present in basalt rock quarried to build at breakwater at the part of Eden.

  Fan jets were extensively used to provide a low velocity high volumetric flow to saturate the tremolite scams.

- Foam lances were developed from the need for the Camellia Project to be able to envelope newly disturbed surfaces of the asbestos containing materials with a surface other than water to prevent asbestos dust and fibres being able to become air borne.

  The idea was borrowed from the use of foams for fire fighting of hydrocarbon fires. It was fortunate that foams specific for asbestos have been patented and are commercially available.

- These features would be housed along the inside of the wind shield provided by the wall of the device. This would be designed with wind deflecting panels – shown in the sketches as curved panels to more effectively achieve a calm/still area above the mobile equipment.

- Wind shields would have to be provided on both long sides of the work area to be effective. In this way the design features of the water barriers and the water 'blanketing' would reach across the full width of the work area.

This completes this report.

for Benbow Environmental

R T Benbow

R T Benbow
<u>Principal Consultant</u>

5. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared for the use of Statewide Planning Pty Ltd and Environment Strategies, as per our agreement for providing environmental services. Only Statewide Planning Pty Ltd and Environment Strategies are entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Statewide Planning Pty Ltd and Environment Strategies for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

6. REFERENCES

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   Elsevier 1985

APPENDICES

Appendix 1: Licenced Asbestos Contractor’s Opinion of the Asbestos Safe Work Method Statement

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ABN 36 649 931 173

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MANN
GROUP NSW
demolition • excavation

1st August, 2013-08-01

RE: **Statewide Planning Pty Ltd - 181 James Ruse Drive Camellia**

Brent,

In our capacity as the preferred asbestos removal contractors I have considered the Safe Work Method Statement prepared by Benbow Environmental for the proposed remediation of the site of asbestos waste material.

I support the proposed methodology and the recommendations of the consultant. In my opinion the alternative method of using an enclosure under negative pressure is not practical in the circumstances of this site and the quantities of material to be handled.

I endorse the *Safe Work Method Statement.*

Regards,

Leny Manassa
Operations Manager

Appendix 2: *Exposure Comparison of Outdoor Asbestos Abatement Techniques in a Petroleum Refinery*
By J. F. Kim Friats and Lindsay E, Booker, 24 February 2011, Published in the Applied Occupational and Environmental Hygiene, 11:9, 1139-1148

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Exposure Comparison of Outdoor Asbestos Abatement Techniques in a Petroleum Refinery

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Exposure Comparison of Outdoor Asbestos Abatement Techniques in a Petroleum Refinery

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This study reports on the comparison of four outdoor asbestos abatement methods which have been used at a large petroleum refinery. These methods are: negative pressure enclosure; negative pressure glove bag; and two types of partial enclosures, open top (five-sided enclosure) and windscreen/extended barricade (less than five-sided enclosure). The air monitoring results for each method are compared in terms of downwind area, personal time-weighted average, and personal excursion limits for workers abating asbestos thermal system insulation. The results show that for a large sample set (>11,000) accumulated over a 3-year period, all downwind area asbestos concentrations at prescribed distances from the abatement activity are essentially equivalent for all four abatement methods, with geometric means of 0.004 to 0.005 fibers/cc (f/cc). The data indicate that negative pressure enclosures provide no added protection for bystanders, as compared with the other abatement methods normally used in outdoor petroleum refinery environments. The data support the use of partial enclosure methods in certain situations since they yield downwind area exposure potentials that are statistically equivalent to those of the negative pressure enclosure method. The negative pressure glove bag method was shown to yield the lowest personal time-weighted average exposure potential. The geometric mean for this abatement method was 0.008 f/cc, with a geometric standard deviation of 3.1, in comparison with both negative pressure and partial enclosures, which had geometric means in the range of 0.020 to 0.023 f/cc, with a maximum geometric standard deviation of 5.6. A similar observation was made for excursion limit samples, with the negative pressure glove bag method yielding a lower average concentration than the other methods. The excursion limit geometric mean for the negative pressure glove bag method was 0.017 f/cc, with a geometric standard deviation of 2.6. This can be compared with a geometric mean of 0.031 f/cc, with a geometric standard deviation of up to 4.6 for the other three abatement methods. The results show that trained workers using adequate wetting techniques and partial enclosures can achieve downwind area concentrations equivalent to negative pressure enclosures. All techniques yielded downwind perimeter concentrations well below the proposed Occupational Safety and Health Administration permissible exposure limit of 0.1 f/cc. When it can be used in an outdoor petroleum refinery environment by experienced crews, the negative pressure glove bag method yields the lowest personal asbestos exposure concentration in comparison with negative pressure and partial enclosures. FROATS, J.F.K.; BOOHER, L.E.: EXPOSURE COMPARISON OF OUTDOOR ASBESTOS ABATEMENT TECHNIQUES IN A PETROLEUM REFINERY. APPL. OCCUP. ENVIRON. HYG. 11(9):1139–1148; 1996.

The purpose of this study is to report on the comparative protection afforded to abatement workers and bystanders when using four abatement methods common to outdoor petroleum refinery environments. These four methods are: negative pressure enclosure (NPE); negative pressure glove bag (NPGB); and two types of partial enclosures, open top (OT) (five-sided enclosure), and windscreen/extended barricade (WS/EB) (less than a five-sided enclosure).

There are a number of criteria for the selection of a particular asbestos abatement technique used in an outdoor petroleum refinery environment. The key criteria are: (1) the feasibility of constructing an enclosure of either the walk-in or the glove bag type, (2) the physical configuration and layout of equipment, (3) the potential for bystander (or nonabatement personnel) exposure, and (4) the results of historical air monitoring data for similar types of jobs and conditions.

From a health and safety regulatory perspective, the removal of asbestos-containing materials from a U.S. petroleum refinery falls under the jurisdiction of the Occupational Safety and Health Administration (OSHA). The recently proposed OSHA rule for the construction industry, 29 CFR 1926.1101,[(1)] offers the following guidance concerning abatement methods for class I work involving the removal of insulation or material containing more than 1 percent asbestos [Section g 4 (ii)(B)]:

> *The employer shall use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, subpart E, of the EPA Asbestos in Schools rule are met or that perimeter area levels measured by PCM are no more than background levels representing the same area before asbestos work began.*

The OSHA rule goes on to outline specific control methods for class I work [Section g (5)]:

> *. . . work shall be performed using one or more of the following control methods pursuant to limitations stated below:*
>
> *i) Negative Pressure Enclosure (NPE) systems: NPE systems shall be used where the configuration of the work area does not make the erection of the enclosure infeasible.*
>
> *ii) Glove bag systems . . .*
>
> *iii) Negative Pressure Glove Bag Systems . . .*
>
> *iv) Negative Pressure Glove Box*
>
> *v) Water Spray Process System*
>
> *vi) A small walk-in enclosure (mini-enclosure)*

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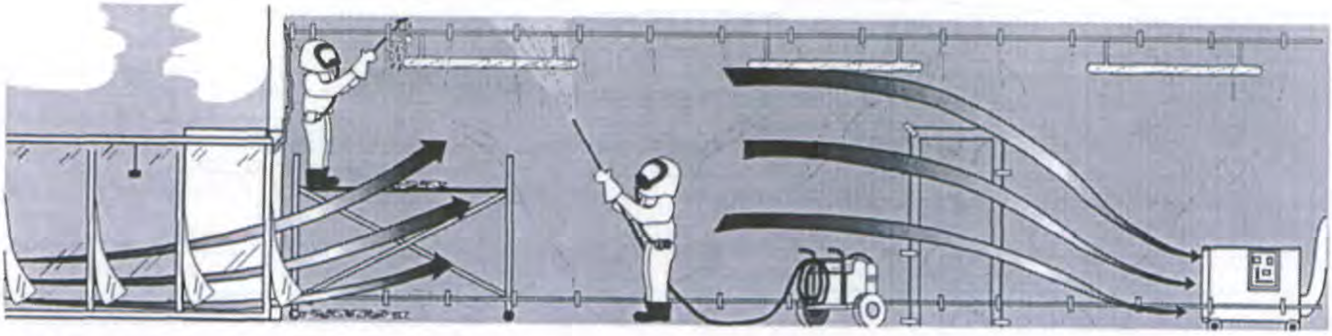

FIGURE 1. Schematic of a full NPE abatement technique. (Adapted from Skoog and Twombly.[13])

OSHA believes that outdoor Class I work may be safely done without enclosures.[2]

OSHA concluded that NPE systems are not appropriate as a universal requirement. This warrants a hard look at alternative abatement methods. A discussion of the four methods commonly used in a petroleum refinery environment follows.

The use of an NPE, as outlined by OSHA, usually finds its application in indoor environments, and specifically in occupied buildings. The feasibility of constructing an NPE in an outdoor petroleum refining environment is primarily dependent on whether or not the construction of such an enclosure would result in the development of a greater hazard. For example, in a petroleum refinery, the construction of an enclosure could possibly result in the accumulation of a toxic gas or flammable vapor due to fugitive emissions from process equipment. The development of such a situation and the resulting risk from fire and/or explosion would be justification not to construct an NPE. This is because the potential for fire or explosion constitutes a greater immediate hazard. Another case for determining that an NPE is infeasible is when there is a potential to develop excessively high temperatures due to insufficient heat release. Many situations in a refinery environment would yield heat buildup in enclosures to temperatures in excess of 140°F.

Equipment layout and configuration can also determine to what extent an NPE would be feasible. Elevated structures with minimal working area are good examples of situations where the greater hazard is due to a fall during construction or removal of the enclosure in an outdoor environment. An illustration of an NPE is shown in Figure 1. The standard protective measures utilized for an NPE include extensive wetting inside a barricaded area, at bagout, and at entry/exit points. A negative pressure of 0.02 inches water gauge is maintained and regularly monitored. Workers wear standard personal protective equipment (PPE) [i.e., negative pressure respirators with high efficiency particulate air (HEPA) filters, coveralls taped at gloves and boots, hard hat, and safety glasses]. During removal stages, full-face powered air-purifying respirators (PAPRs) were worn. A decontamination unit is set up on site, or, if infeasible, use of a remote decon facility is employed. Thus, it can be seen that for many applications in a petroleum refinery environment, whether due to heat, toxic or flammable gas/vapor accumulation, or layout, an NPE is usually infeasible.

Another abatement technique that lends itself more to outdoor environments is known as the negative pressure glove bag (NPGB). This is an OSHA-recognized abatement technique for carrying out abatement work on the thermal system insulation (TSI). This involves the use of a plastic bag which encloses the abatement area on the pipe or vessel and has gloved openings for the arms to reach in and remove the TSI. An opening to withdraw air and create a negative pressure using a HEPA vacuum is also provided. A 6-inch plastic barricade tape is placed 3.5 ft from the ground around the area 15 ft from the removal site, with a plastic drop cloth placed underneath the removal area. An illustration of this is shown in Figure 2. The utilization of an NPGB is restricted to pipes or vessels small enough to be enclosed within the glove bag, with temperatures low enough that the glove bag itself will not melt. Small- to medium-sized pipes or vessels and low temperatures (usually pipes <24 inches in diameter and temperatures <150°F) are needed to effectively use an NPGB. Equipment orientation and access play a big role in determining whether or not an NPGB can be used. During the use of an NPGB for this study, a barricade of at least 15 ft from the removal site was constructed around the abatement job. (See Table 1 for recommended barricade distances.) This barricade tape constitutes the perimeter for the abatement job, inside which only authorized, trained abatement personnel are allowed to enter. Workers wore standard PPE (i.e., negative pressure respirators with HEPA filters, coveralls taped at gloves and boots, hard hat, and safety glasses).

The remaining two abatement methods consisting of partial enclosures can be potentially considered as alternative control methods for class I work under the current proposed OSHA final rule.

The use of the open top (OT), or five-sided enclosure, technique may be considered when the accumulation of heat renders an NPE infeasible. A highly variable wind direction or close proximity to other work groups or bystanders also warrants this method in outdoor environments. The use of this method with wetting and downwind monitoring, plus a 25-ft barricade in all directions to keep bystanders away from the abatement activity, provides assurance that exposures to bystanders will remain below those concentrations specified by OSHA. The walls of the partial enclosure are constructed so that they extend at least 3 ft above the area to be abated. This is done to minimize the effects of fluctuating wind speed, so as to limit the potential for elevated downwind exposures (see Figure 3).

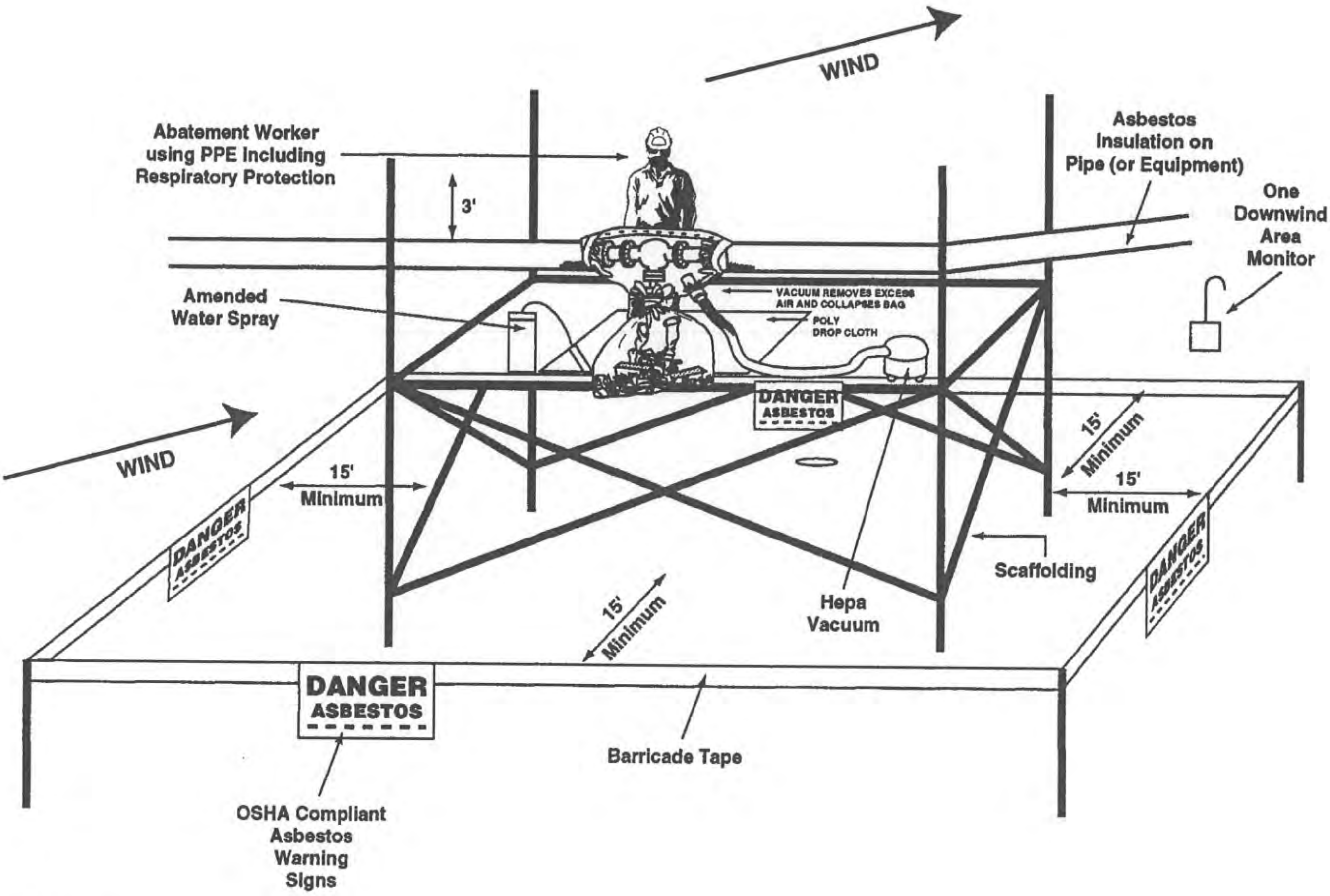

FIGURE 2. Schematic of the NPGB abatement technique.

Where equipment layout is appropriate and there is limited proximity to other work groups or individuals, the windscreen/extended barricade (WS/EB) technique can be employed. This involves the construction of a less than five-sided enclosure (usually two or three sides with a bottom) on the upwind side to minimize air currents in the area of abatement (see Figure 4). Again, extensive wetting techniques, downwind monitoring, and the introduction of an extended barricade distance of 25 ft in all directions assures asbestos concentrations below those specified by OSHA for unprotected bystanders (see Table 1).

For elevated structures of a given height, barricades were set at half this distance (e.g., for a 150-ft high distillation tower, the barricade would be set up 75 ft away from the point of abatement. Workers wore standard abatement PPE, including PAPRs, for both these partial enclosure methods.

In all four abatement techniques described, wet methods and prompt cleanup, including the use of HEPA vacuums and drop cloths, were used in the area of abatement. Wetting for all four methods was achieved using 5-gallon garden spray containers with surfactant (No. 32-61, Foster Products Corporation).

TABLE 1. Suggestions for Barricade Distances and Number of Downwind Samples for Asbestos Abatement in an Outdoor Petroleum Refinery Environment

Abatement Technique	Downwind Samples*	Barricade Distance (ft)	Comments
Negative pressure enclosure	1	0	15-ft barricade in bagout area
Negative pressure glove bag	1	15	
Open top	2	25	
Windscreen/extended barricade	2	25	For elevated structures of height h, place barricade at h/2 (feet).

*Number of samples recommended to be taken in the downwind position.

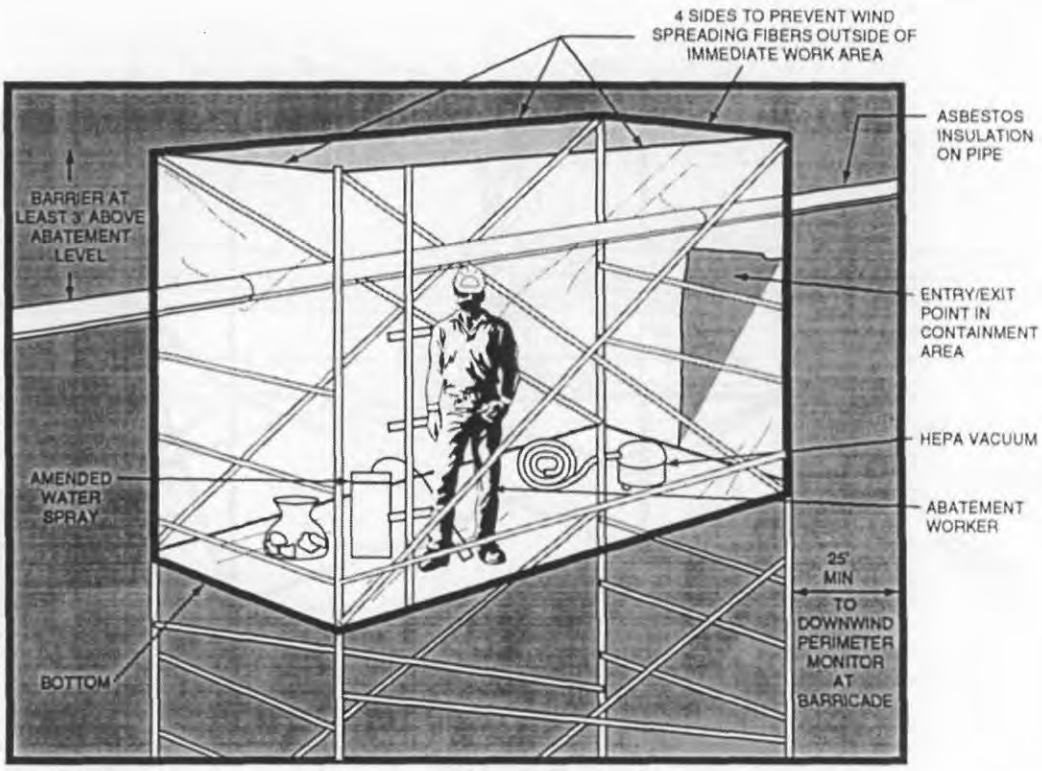

FIGURE 3. Schematic of the OT abatement technique.

Methodology

Airborne asbestos concentrations were obtained for each of the 1698 outdoor asbestos abatement jobs that were performed in a U.S. Gulf Coast petroleum refinery from September 1991 until March 1993. A written evaluation of each job was made by the job supervisor and a quality assurance supervisor. Each job was reviewed in terms of feasibility to construct an NPE considering the potential for toxic or flammable gas accumulation, temperature buildup, layout, and proximity of bystanders. Historical air monitoring results for work of similar circumstances and abatement techniques were also considered.[3–5] For jobs where it was determined to be infeasible to construct an NPE or an NPGB, a subsequent review was conducted by an industrial hygienist and another asbestos abatement specialist. This review documented reasons for enclosure or glove bag infeasibility and described a plan for abatement using an alternative method (i.e., a partial enclosure was described). A certified industrial hygienist (CIH) was responsible for reviewing these abatement method decisions. A listing of all of these outdoor jobs by abatement technique is shown in Figure 5.

Air monitoring was conducted on a minimum of 25 percent of the abatement workers during each job. Specific job tasks such as performing setup, gross removal, cleanup, and teardown were monitored. Each key aspect of the job was documented. This includes start and stop times of the crew, training, decontamination, special procedures, work area description, etc. The air monitoring documentation form is shown in Figure 6. Airborne asbestos concentrations were collected according to OSHA 1928.56, Appendix A.[6]

Samples were collected for the entire duration of the job, with 4 to 6 hours as the usual range of sampling times. Excursion samples were collected at the start of gross removal activities to represent that exposure where wetting was suspected to have limited impact on the minimization of airborne fiber concentrations.

An on-site calibration and fiber counting lab was set up to provide analytical capability for all jobs. Fibers were counted using phase contact microscopy as described by OSHA 1928.56, Appendix A.[6] The quality control procedure for the air monitoring involved a 10 percent blind recount of all samples and data entry, participation of the on-site lab in the Proficiency Analytical Testing sample program with acceptable proficiency, cross-referencing of results with an American Industrial Hygiene Association (AIHA)-accredited lab, and periodic quality assurance reviews by a CIH. An error rate of less than 1.0 percent was determined for both the counting and data entry steps. The counting technicians at the time of the sampling were not enrolled in the AIHA Asbestos Analysts Registry.

The data for each air sample were collected on a paper form and then entered into a computer database. A total of 108 fields of information for each sample record are contained within the database. A description of the sample fields is shown in Figure 6. The database used was Borland's Paradox 3.5, which is a relational database for personal computers. The database and its contents were upgraded to Paradox 4.0 later in the project. Subsequent periodic analysis of the data using descriptive statistics was performed to provide feedback to the asbestos

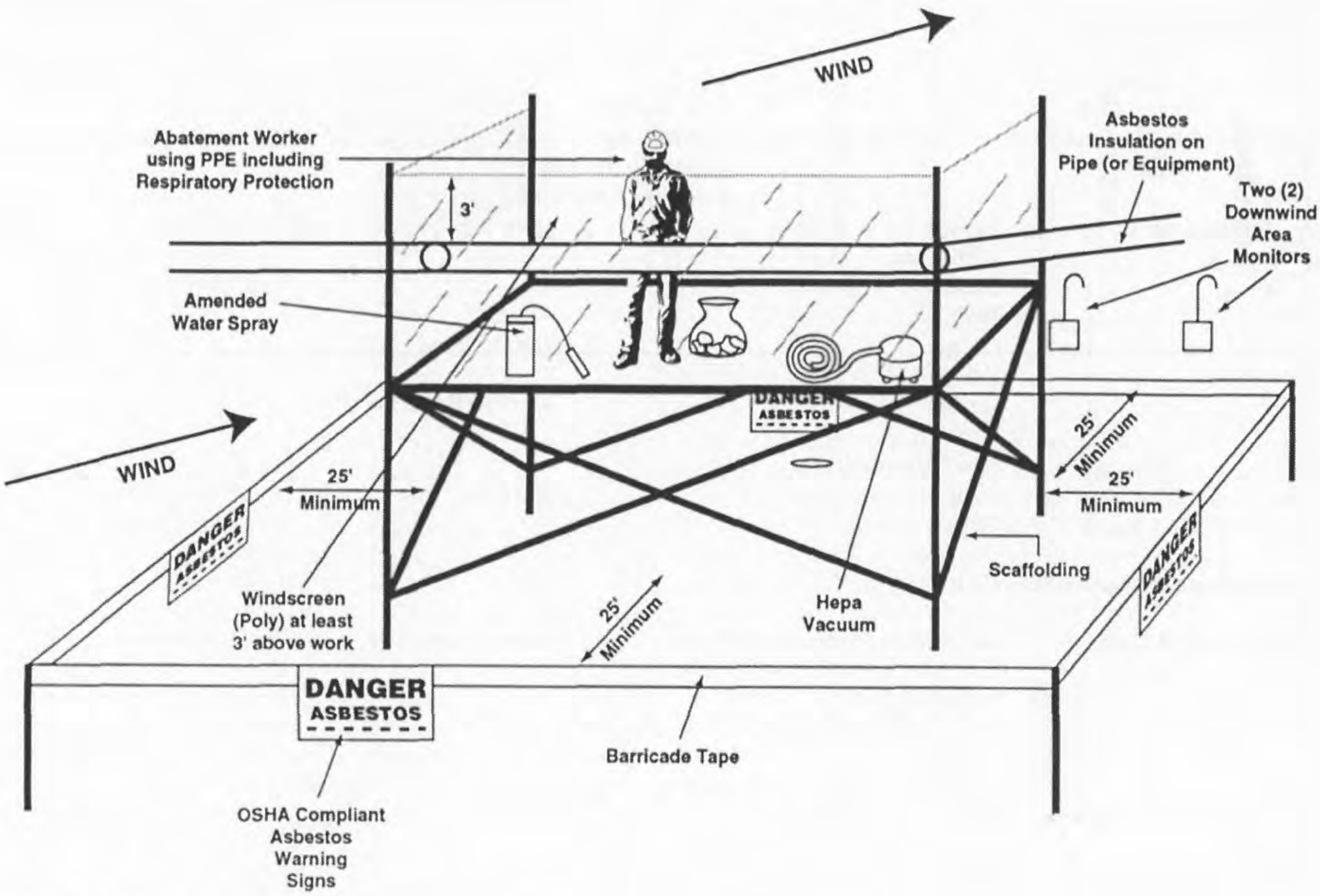

FIGURE 4. Schematic of the WS/EB abatement technique.

abatement team and various members of the refinery management. These descriptive statistics included arithmetic and geometric means and standard deviations.

Chain of custody for all samples was reviewed by the on-site lab supervisor. Field monitoring technicians were required to account for all samples. Void samples due to pump battery failure, loss of cassette, etc., averaged less than 2 percent. Due to the overall low error rate from sampling and analytical procedures, all sampling results were kept in the database for analysis, with detected errors corrected as they were reviewed.

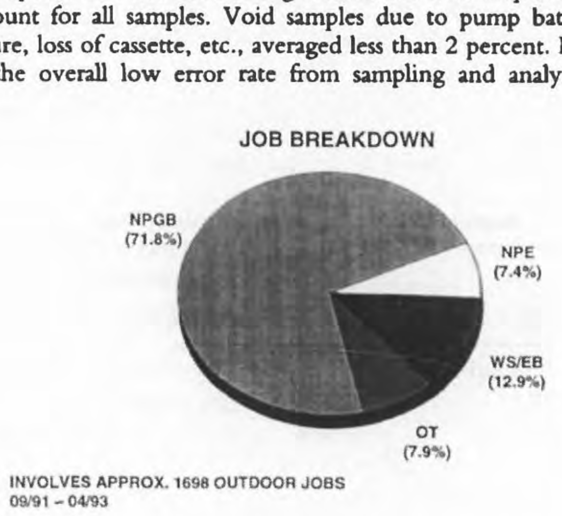

FIGURE 5. Asbestos abatement techniques: job breakdown.

Results

A total of 2903 personal samples were taken covering the entire exposure period, representing about 25 percent of the asbestos abatement workers. A total of 2113 30-minute excursion limit samples were taken during specific work tasks. A total of 3273 perimeter (downwind area) samples (i.e., samples taken at the barricade) were also collected, along with 3162 field blanks. The total number of samples analyzed was 11,451 (see Figure 7).

The results of the personal samples for each of the four abatement methods are shown in Table 2. The range of concentrations is shown for each method, with the approximate limit of detection (LOD) being 0.001 fibers/cubic centimeter (f/cc) for personal and area samples. The LOD for excursion samples was 0.007 f/cc. A graphical representation of the personal results showing ± 1 geometric standard deviation about the geometric mean is given in Figure 8. The NPGB method shows a geometric mean concentration of 0.008 f/cc. This can be compared to the geometric mean concentrations of 0.020 to 0.023 f/cc for the other three abatement methods. Partial enclosure personal concentrations

Data Entry Fields

Date:
Charge No.:
Area Code:
Equipment I.D.:
Unit:

Technician Name:
Supervisor:
Collected by:
Analyzed by:
Analytical Method:
Calibration Method:

Sample Method:
Wind Direction:
Pump No:
Sample Session:

Equipment:
( ) Tower
( ) Exchanger
( ) Drum
( ) Tank
( ) Flange
( ) Valve
( ) Furnace
( ) Pipe
( ) Pipe Diameter (in)
( ) Pump
( ) Other

Equipment Temperature (°F): _____

Control Method:
( ) Full Negative Pressure Enclosure
( ) Enclosure w/out negative pressure
( ) Surfactant/Fosters
( ) Encapsulate & Remove
( ) Open Top
( ) Windscreen/Extended Barricade
( ) Other

Insulation Type:
( ) Block
( ) Cloth
( ) Pipe
( ) Mvd
( ) Spray-Trowel Fireproofing
( ) Other

Insulation Jacketing:
( ) Metal
( ) Asbestos
( ) Cloth
( ) Wire & Mast
( ) Other

Condition:
( ) Good
( ) Bad

Thickness (In.): _____

Asbestos Type:
( ) Amosite
( ) Chrysotile
( ) Other

Work Done:
( ) Indoors/On-line
( ) Indoors/Off-line
( ) Outdoors/On-line
( ) Outdoors/Off-line

Crew Size:
____ # of people
____ # of people working with asbestos

Job Duration (hrs): ____

Amount Removed (ft.): ____

Job Code:
( ) Negative Air Bagger
( ) Double Bagger
( ) Wetter
( ) Transporter

Area Sample:
( ) Pre-clearance
( ) Up-wind
( ) Downwind
( ) Negative Air Discharge
( ) Clean Room
( ) Final clearance
( ) Work Area
( ) Background
( ) Blank

Task:
( ) Clean-up
( ) Patch & Repair
( ) Tearing down enclosure
( ) Gross removal
( ) Prepping/hanging poly
( ) Applying metal

Sample Desc.:
____ Start time
____ Stop time
____ Elapsed time
____ Start time
____ Stop time
____ Elapsed time

Sample Vol.:
( ) Sample volume ____
( ) Fiber/Field
( ) Fiber concentration (f/cc)
( ) TWA (f/cc)

Calibration:
Pre ____
Post ____
Avg ____

FIGURE 6. Air monitoring documentation form.

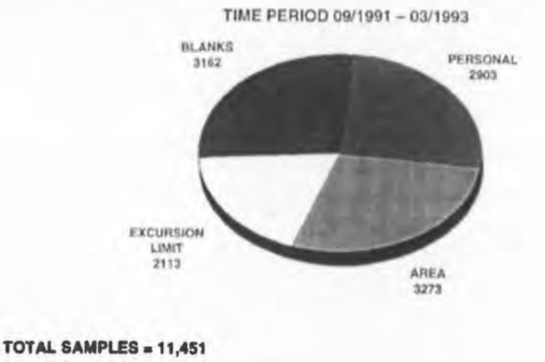

FIGURE 7. Number of samples by type.

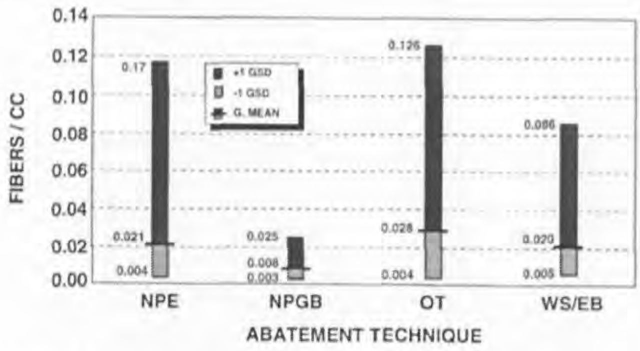

FIGURE 8. Personal results.

were about the same as for NPE. Excursion limit results (30-minute samples) are shown in Table 3.

The NPGB also shows the lowest excursion limit geometric mean of 0.017 f/cc in comparison to the other three abatement methods. A graphical representation of the excursion limit samples is shown in Figure 9.

The perimeter sampling results are shown in Table 4. These represent the downwind airborne concentration taken at the tape barricade. The geometric mean for perimeter samples is approximately 0.005 f/cc. This shows that there are no statistically significant differences in perimeter samples between each of the four asbestos abatement methods ($p = 0.01$) using a student's t test for significance between two means.[7] (These perimeter samples can also be described as area samples downwind at the perimeter of the regulated area while asbestos abatement activity was underway.) From site experience, these results are essentially equivalent to background levels when no asbestos abatement is taking place.[8]

All four abatement methods showed the potential for exceeding the proposed OSHA permissible exposure limit (PEL) based on personal samples of abatement workers for both full-shift exposures and excursion limits (Tables 2 and 3). The OT method showed the highest propensity for exceeding 0.1 f/cc, occurring about 19 percent of the time. This was closely followed by NPE and WS/EB, occurring about 16 and 14 percent of the time, respectively. The NPGB abatement method showed the lowest propensity for full-shift and excursion limit exceedances: 2.8 and 0.3 percent, respectively.

These results show that the combination of wet methods with the partial enclosure techniques OT and WS/EB go a long way toward minimizing asbestos dust entering abatement workers' breathing zones. These partial enclosure techniques yielded equivalent personal exposure concentrations similar to that of an NPE. Also, the results show that when using partial enclosures, the asbestos concentration is similar to the negative pressure methods at the perimeter of the regulated area.

A further analysis of the information was made on that set of samples which exceeded the proposed PEL of 0.1 f/cc for both personal and perimeter results (see Tables 5 and 6). Though further review is needed, many of these samples involved abatement of high temperature pipe or equipment insulated with amosite asbestos. The excursion limit samples which exceeded the 1.0 f/cc limit are shown in Table 6. Tables 5 and 6 provide a description of the mean and range of the concentrations exceeding the PEL. Again, high temperature pipes and equipment insulated with amosite formed the majority of the results that exceeded the excursion limit. A more in-depth analysis of specific tasks and equipment conditions for all four abatement methods is planned to help focus control efforts in order to reduce exposure to as low as reasonably achievable.

Discussion

The results of this investigation confirm the present OSHA position that outdoor asbestos abatement need not take place using NPEs. If a standard barricade distance of 25 ft is used, perimeter samples show no difference in airborne asbestos concentrations regardless of the abatement method used. This is contingent, of course, on adequate wetting, proper cleanup, and adequate isolation.

The fact that the concentrations associated with NPGBs were lower than the other abatement methods comes as no real surprise. This is the only one of the four abatement methods

TABLE 2. Personal Samples (Full Shift)

Abatement Technique	No. of Samples	Range (f/cc)	Geometric Mean (f/cc)	Geometric Standard Deviation	% of Results >0.1 f/cc
Negative pressure enclosure	233	0.001–3.40	0.021	5.55	16.3
Negative pressure glove bag	2228	0.001–4.19	0.008	3.10	2.8
Partial enclosures					
Open top	42	0.001–1.11	0.023	5.49	19.1
Windscreen/extended barricade	402	0.001–1.62	0.020	4.28	13.6

Dates: September 1991–April 1993.

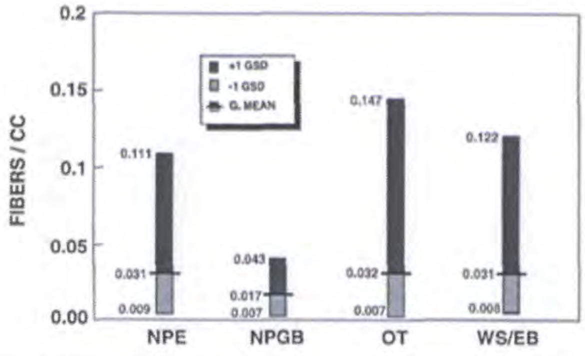

FIGURE 9. Excursion sample results.

discussed here that actually has physical barriers in place between the worker's breathing zone and the zone of disturbance of the asbestos thermal insulation. These lower concentrations substantiate the fact that NPGBs should be used whenever feasible for outdoor abatement activities.

The abatement workers monitored in this study had at least 2 years of full-time asbestos abatement experience at this facility prior to the initiation of this particular investigation. All were trained to state/Environmental Protection Agency (EPA) accreditation with annual updates. Many workers were also trained to the supervisor level according to state/EPA criteria. In short, this group of abatement workers could be considered highly motivated, well trained, and effectively supervised. All supervisors maintained their annual refresher training certification.

There was unusually low turnover in the workgroup. This high level of training may represent a best-case scenario when

TABLE 3. Excursion Limit Samples (30 Minutes)

Abatement Technique	No. of Samples	Range (f/cc)	Geometric Mean (f/cc)	Geometric Standard Deviation	% of Results >1.0 f/cc
Negative pressure enclosure	118	0.003–2.80	0.031	3.54	3.40
Negative pressure glove bag	1748	0.001–4.75	0.017	2.55	0.30
Partial enclosures					
Open top	21	0.004–0.68	0.032	4.60	0.0
Windscreen/extended barricade	226	0.002–1.71	0.031	3.94	3.1

Dates: September 1991–April 1993.

TABLE 4. Downwind Perimeter Samples (Full Shift)

Abatement Technique	No. of Samples	Range (f/cc)	Geometric Mean (f/cc)	Geometric Standard Deviation	% of Results >0.1 f/cc
Negative pressure enclosure	410	0.001–1.27	0.005	3.41	0.98
Negative pressure glove bag	1975	0.001–1.36	0.004	3.03	0.10
Partial enclosures					
Open top	100	0.001–0.08	0.005	3.55	0.00
Windscreen/extended barricade	788	0.001–0.08	0.005	3.09	0.00

Barricade distance: NPE = 0 ft, 15 ft at bagout; NPGB = 15 ft; OT = 25 ft; WS/EB = 25 ft.
Dates: September 1991–April 1993.

TABLE 5. Personal Samples >0.1 f/cc (Full Shift)

Abatement Technique	No. of Samples	Mean (f/cc)	Standard Deviation	Geometric Mean (f/cc)	Geometric Standard Deviation	Range (f/cc)
Negative pressure enclosure	38	0.742	0.795	0.433	2.90	0.10–3.40
Negative pressure glove bag	64	0.634	0.698	0.320	2.55	0.101–4.19
Partial enclosures						
Open top	8	0.382	0.337	0.289	2.14	0.131–1.11
Windscreen/extended barricade	55	0.345	0.319	0.253	2.10	0.10–1.62

Dates: September 1991–April 1993.

TABLE 6. Excursion Limit Samples (30 Minutes) >1.0 f/cc

Abatement Technique		No. of Samples	Mean (f/cc)	Standard Deviation	Geometric Mean (f/cc)	Geometric Standard Deviation	Range (f/cc)
Negative pressure enclosure	NPE	4	1.91	0.79	1.78	1.56	1.05–2.80
Negative pressure enclosure	NPGB.	5	2.93	1.24	2.70	1.61	1.28–4.75
Partial enclosures							
Open top	OT	0	—	—	—	—	—
Windscreen/extended barricade	WS/EB	7	1.32	0.22	1.30	1.18	1.08–1.71

Dates: September 1991–April 1993.

TABLE 7. Downwind Perimeter Samples >0.1 f/cc

Abatement Technique	No. of Samples	Mean (f/cc)	Standard Deviation	Geometric Mean (f/cc)	Geometric Standard Deviation	Range (f/cc)
Negative pressure enclosure	4	0.622	0.413	0.460	2.35	0.119–1.268
Negative pressure glove bag	2	0.753	0.611	0.442	3.09	0.143–1.364
Partial enclosures						
Open top	0	—	—	—	—	—
Windscreen/extended barricade	0	—	—	—	—	—

Barricade distances: NPE = 0 ft, 15 ft at bagout; NPGB = 15 ft; OT = 25 ft; WS/EB = 25 ft.
Dates: September 1991–April 1993.

compared with other work groups. In terms of comparing the results of this investigation with those of other researchers, studies referenced by OSHA in the preamble to the new proposed standard are most interesting.

Union Carbide[9] found that for 1220 perimeter samples for NPEs, 16.4 percent exceeded 0.1 f/cc. This can be contrasted to this study, which found that only about 1 percent of the 410 perimeter samples exceeded 0.1 f/cc. In terms of the 90 NPGB area samples that Union Carbide reported, 1.1 percent exceeded 0.1 f/cc. The NPGB perimeter monitoring of this study showed that for 1975 samples, only 0.1 percent exceeded the concentration value of 0.1 f/cc. A more direct comparison of personal samples shows that for NPEs, 60.9 percent of the 1001 samples reported by Union Carbide exceeded 0.1 f/cc. This is higher than the 16.3 percent which were found in this work to exceed the proposed PEL of 0.1 percent.

A Union Carbide[9] panel reported that the mean value of exposure for their modified NPGB was 0.02 f/cc. This is compared with a value of 0.008 f/cc for a single-use NPGB. Eighty personal samples for NPGB work in the Union Carbide data exceeded 0.1 f/cc, which is about 10 percent of the time. This is compared with 2.8 percent of the 2228 personal samples taken in this study which exceeded 0.1 f/cc while performing NPGB work. The differences in these results versus the Union Carbide study are not totally clear. Perhaps the high level of training and management oversight exercised during this investigation may explain some of the differences.

Other research[10,11] shows personal exposures to be similar in many ways to the results presented (e.g., asbestos concentrations are at low levels for many situations).

Conclusions

The use of NPGBs by experienced abatement personnel in outdoor environments resulted in statistically significant lower personal exposure potentials than the other three abatement methods (0.008 versus 0.020 to 0.023 f/cc) and supports the use of NPGBs whenever feasible for outdoor abatement activities. However, when the use of NPGBs is not feasible, OSHA has stated that other asbestos abatement technologies may be used if based on supporting data showing their effectiveness.[12] The data presented here show that the use of partial enclosures, with their associated work practices of wetting, cleanup, and barricades, prove themselves to be adequate alternative abatement methods. This is predicated on the presence of well-trained and well-supervised people carrying out these activities. The data presented in this work demonstrate that for outdoor abatement applications for the protection of bystanders, the use of partial enclosures can be considered as an equivalent method to other negative pressure abatement techniques. The concentrations were all at levels below the proposed OSHA standard, ranging between 0.004 and 0.005 f/cc. This study has also shown that partial enclosure abatement methods (a less than five-sided enclosure) do not yield abatement personnel personal exposure potentials significantly different from those of negative pressure enclosures (0.020 versus 0.021 f/cc).

Partial enclosures, with their respective methodologies involving wetting and use of a prescribed distance to the perimeter, illustrate that various combinations of engineering controls and work practices, when properly carried out by workers with adequate training, competent supervision, exposure assessments, and respirator use, constitute a cost-effective abatement approach to ensure acceptable levels of worker exposure to asbestos.

Acknowledgments

Special thanks to Tim Buhler and Herbert Irvin, who continue to effectively and efficiently manage asbestos abatement issues. The authors acknowledge Frank Zampello and Janet C. Smith, who were involved in the conceptual discussions for this work. Thanks to Wes Jennings, Glenn Johnson, Chip Sanchez, and the rest of their air monitoring team. Thanks also to Carl Gregory for help with the statistical analyses and computer report generation. We thank the late G. Roger Florky for his leadership and wisdom.

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ENVIRONMENTAL ASSESSMENT OF USING FOAMS FOR ASBESTOS FIBRE CONTROL "CAMELLIA PROJECT"

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APPENDICES

1. INTRODUCTION

This report provides an environmental assessment of the use of specialist dust suppressant foams for the control of the release of asbestos dust and fibres at source.

The use of specialist foams forms part of the alternative asbestos dust controls strategy detailed in Benbow Environmental's report 131039_Alternative_Dust Controls_Rev2.

These two reports support the Asbestos Safe Work Method Statement Report 131039_Rep_Rev7.

In preparing the environmental assessment of using specialist foams for asbestos dust and fibre control, suppliers of foams suitable for control of the release of asbestos fibres were researched and then contacted. These suppliers are based in the USA and have considerable experience with the development of foams and in particular the application of foam to the project is strongly supported as being highly recommended.

One of the suppliers - Foam Shield- have an outlet in Queensland and practical data from asbestos removal projects was provided. This included air monitoring.

The absence of air monitoring on a project exactly the same as what is proposed is not an impediment to the use of specialist foams.

The purpose of this report is to address the following two matters raised by the site auditor in relation to the use of dust suppressant foams for the Camellia Project:

These are the Issues:

1. Environmental risks associated with the use of dust suppressant foams, in particular the following issues:

    - Suitability for the foam to be placed into the containment cell;
    - The active ingredients in the foam;
    - Whether the active ingredients are or are not protective of ecological receptors, i.e. groundwater and the Parramatta River;
    - Suitability of placing Polycyclic Aromatic Hydrocarbons (PAH) with foam; and
    - Will the use of foams cause PAH's to become more mobile in the soil and groundwater?

- Evidence of the effectiveness of the foams.

This report addresses these issues and provides the Solutions along with the Benefits and Proof that is currently available. In addition, the matters raised relevant to the environmental risks have been referred to URS for consideration. URS have been provided with the list of active constituents in the foam. The MSDS has also been provided in Appendix D.

Since releasing Revision 1 of the report, an alternative supplier of foam has been researched and the active constituents of their foam reviewed. Technical responses to the matters raised by the site auditor have been provided by the Chemist / Environmental Specialist from this alternative supplier – Midwest Industries.

1.1 BACKGROUND TO THE CAMELLIA PROJECT

The Camellia Project involves the remediation of a site of 6 hectares which contains contaminated soils. The site is located at 181 James Ruse Drive, Camellia.

68,190 m^3 of contaminated materials would be excavated and placed into three containment cells. The purpose of the Project is to enable the land to be reused. For this Project, the reuse is proposed to be for "mixed use" comprising commercial and high rise residential.

The extraction of the contaminated material involves removing asbestos wastes in the form of asbestos cement materials and asbestos as friable material. Depth of the asbestos wastes varies from 300 mm to 3.8 m at the deepest point.

The effective control of asbestos fibres at source has been the major objective of an Asbestos Safe Work Method Statement.

The asbestos wastes would be excavated from within work zones that will be protected by high wind shields that would be purpose designed to provide the work zone with protection from air currents generated by wind.

The wind shields would be fitted with water fogging sprays to provide a water barrier to the release of airborne dust or asbestos fibres at two levels – across the top of the wind shield and at mid height above the extraction area and loading point of materials into the dump truck.

The fogging sprays would therefore be at two heights so that fogging would occur above the asbestos waste removal point when this is at or below ground level as extraction proceeds to depth.

The second level off fogging sprays would be above the top of the dump truck so that water particles would fill the air above the mobile equipment and fall to ground preventing any release of dust particles or asbestos fibres from outside the work zone.

The wind shields at ground level would have water fan jets that operate at low water velocities and would cause a "blanket" of water to form and cover the excavated area. Hence, saturation of the surface and body of the asbestos waste would occur prior to the excavation occurring.

During the action of the excavator bucket cutting into the saturated body of the asbestos waste new surfaces would form. These new surfaces would have asbestos fibres exposed and although the fogging systems would prevent these escaping the work zone, application of a foam dust suppressant will prevent the dust particles and asbestos fibres from being able to become airborne. The foam would form "mini enclosures" over asbestos fibres and encapsulate them during the excavation, transport and final placement.

Two foam applicator lances would be available, one on each side of the wind shields.

As these design features will be incorporated into the wind shield it has been deliberately called a wind mitigation device so that readers are aware it uses a number of design features to more effectively control the generation of dust and asbestos fibres at source and use fine water droplets as barriers against the movement of dust particles or asbestos fibres out of the work zone if these were generated.

A detailed article on the foam available for asbestos is presented in Appendix A.

The advantages of foam are discussed in Subsection 1.2.

A detailed practical discussion on dust suppression is provided in Appendix B.

Detailed designs to construction stage are not expected to be provided. A separate report titled "Asbestos Dust Controls for Large Scale Projects" Report No. 131039_Alternative Dust Controls_Rev1 provides the basic specification for the various elements that would make up the "wind mitigation device".
The types of fogging systems described would be incorporated into the final design of the wind mitigating devices.

The following section of the report discusses the foam types investigated.

1.2 USE OF FOAM IN ASBESTOS FIBRE CONTROL

The use of foam forms a part of the solution to provide an alternative to negative air pressure enclosures.

Foams are now commercially available that have been specifically developed to prevent the release of asbestos dust fibres at source. Two suppliers have been identified and both have provided technical data that supports the use of foam for asbestos dust and fibre control.

Foam has many advantages over water. It is a far superior wetting agent than water that is in the form of a fog or droplets. This advantage arises from foam being an expanded surface of water and is able to provide greater coverage of surfaces which provide layers or coverage, causing a depth of foam bubbles to form enveloping the surface being disturbed.

The foam achieves better saturation of the surface and with binding agents included in the chemical matrix of the foam, foam does not readily run off from the surface but will adhere to the surface.

The foams specifically developed for asbestos fibres have polymers present that provide structural integrity to the foam, allowing the surface tension of the individual bubbles to cause the bubbles to withstand further bursting once the asbestos fibres have been enveloped. The process of the foam bubbles making contact with the asbestos fibre causes the first bubbles in contact to burst wetting the asbestos dust particle or clump of fibres and weighing it down with the polymers that are in the surface of the bubbles. The other bubbles surround the particle or clump of fibres.

The foams specifically developed for control of asbestos dust and fibres produce a dense foam with a relatively long drain time – i.e. the time it takes for the foam to dissipate and become a wetted surface.

2. FOAMS INVESTIGATED

There are several different types of foams available for dust and/or asbestos suppression. Those that have been investigated include FoamShield, FiberStop, and Dust-Buster foam agents. FoamShield was initially found to be the most suitable for asbestos removal applications and have proven test results from previous asbestos removal works. Therefore, the following section will focus on the suitability of FoamShield for the Camellia Project.

Further information has since been received on Dust – Buster Foam SDC12000 and this provides on suitable alternative on environmental grounds.

2.1 FoamShield

FoamShield is a non-dangerous and non-hazardous substance that uses water, surfactants and air to create a foam blanket that isolates hazardous particles. The product acts as a wetting agent and fibre containment system. FoamShield can be used to remove asbestos contaminated materials effectively by containing or enclosing the asbestos containing material at the point of disturbance instead of the entire work area or building. The asbestos particles are prevented from becoming airborne as it becomes thoroughly and adequated wetted while using 90% less water.

The product is non-toxic, biodegradable, non-flammable, water based and is not ecotoxic to aquatic organisms due to the product's chemical composition. FoamShield is formulated to have minimal environmental impact and is safe to handle as it was designed for use indoors and outdoors.

FoamShield FS-A1 composition is described in the Table 2-1 below:

Table 2-1: FoamShield FS-A1 Composition

Ingredient	CAS Number	Proportion
Water	7732-18-5	>95%
2-butoxyethanol	111-76-2	1-2%
Ammonium alcohol (C6-10) ether sulphate	68037-05-08	<1%
Sodium C14-C16 olefin sulfonate	68439-57-6	<1%
Isopropanol	67-63-0	<1%

Details and test results of two previous asbestos removal jobs using FoamShield are provided in Appendix C. The test results for the removal of friable asbestos and demolition of a fire damaged house in Leichhardt show <0.01 fibres/mL of airborne asbestos were detected before and during works. The tile and mastic removal works at Wooloongabba had results of <0.01 to 0.01 fibres/mL of asbestos during control monitoring and 0.02 fibres/mL during personal exposure monitoring of the removalist.

FoamShield contains surfactants but it would most likely reduce the mobility of PAHs compared to other foam or wetting agents due to the reduced amount of water required.

The MSDS for FoamShield FS-A1 has been provided in Appendix D.

Information on the ingredients used in FoamShield has been examined to determine the effects of the foam on the environment. These are described in the table below in Table 2-2.

Table 2-2: FoamShield Ingredient Characteristics

Ingredient	Incompatibilities	Toxicity	Ecotoxicity:
2-butoxyethanol	Reactive with oxidizing agents and alkalis	Toxicity to animals: Acute oral toxicity (LD50): 470 mg/kg [Rat] Acute dermal toxicity (LD50): 220 mg/kg [Rabbit] Acute toxicity of the vapour (LC50) 450 4 hours [Rat] Chronic effects on humans: Mutagenic effects for bacteria and/or yeast. May cause damage to blood, kidneys, liver and central nervous system. Other toxic effects on humans: Hazardous in case of skin contact, of ingestion, of inhalation.	Freshwater algae (EC50): 1840 mg/L 72 hr Freshwater Fish (LC50): 1490 - 2950 mg/L 96 hr Water Flea (EC50): 1550 mg/L 48 hr, 1698 – 1940 mg/L 24 hr
Ammonium alcohol (C6-10) ether sulphate	N/A	N/A	N/A
Sodium C14-C16 olefin sulfonate	May react with strong oxidizing agents	Toxicity to animals: Acute oral toxicity (LD50): 2310 mg/kg [Rat] Acute dermal toxicity (LD50): 6300 mg/kg [Rabbit] Hazardous effects on humans: May cause irritation to eyes, skin and respiratory system	Readily biodegradable

Table 2-2: FoamShield Ingredient Characteristics

Ingredient	Incompatibilities	Toxicity	Ecotoxicity:
Isopropanol	Reactive with oxidizing agents, acids and alkalis	<u>Toxicity to animals:</u> Acute oral toxicity (LD50): 3600 mg/kg [Mouse] Acute dermal toxicity (LD50): 12800 mg/kg [Rabbit] Acute toxicity of the vapour (LC50) 16000 8 hours [Rat] <u>Chronic effects on humans:</u> Carcinogenic effects: A4 (Not classifiable for human or animal) by ACGIH and 3 (Not classifiable for human) by IARC <u>Other toxic effects on humans:</u> Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact.	Fathead Minnow (LC50): 100000 mg/L 96 hrs, 64000 mg/L 96 hrs

2.2 Dust Buster SDC 12000

The technical staff of the manufacturer, Midwest Industries, provided answers to the issues raised by the site auditor.

- SDC 12000 does not contain any solvent or co-solvents other than water. 99% of the foam when applied is water. The active ingredients are not readily volatilized and therefore pose minimal to negligible impact on the containment cell.
- The active ingredients are:
  - Sodium alpha olefin sulfonate 15-22%
  - Propretary non-ionic surfactant blend 23-30%
  - Water is the balance

These ingredients are surfactants and soaps. Testing of the sodium alpha olefin sulfonate has found the following:

- This active ingredient has rapid and complete biodegradation in aerobic conditions;
- An aerobic degradation is slow;
- Bio accumulation potential is very low;
- Acute oral toxicity to mammals is low; and
- Aquatic species (fish and invertebrates) when debuted for application as practically non- Toxic with LC_{50} > 4,000 pm.

- The non-ionic surfactant when the foam concentrate is diluted would have LC_{50} levels in the "*practically non-toxic"* range.
- There would be no interaction between the ingredients in SDC12000 and PAH's. The composition of Dust-Buster SDC12000 ready for application is presented in the following table:

Table 2-3: Dust-Buster SDC12000 Composition

Ingredient	CAS Number	Proportion
Water	7732-18-5	99%
Sodium alpha olefin sulfonate	68439-57-6	0.15-0.22%
Non ionic surfactant	Not available – proprietary	0.23-0.3%

3. CONCLUDING REMARKS

A summary of the findings are presented under the headings:

- Issues;
- Solution;
- Benefits; and
- Proof.

Table 3-1: Summary of Findings

Issues	Solution	Benefits	Proof
Suitability of the foam to be placed into the containment cell. Active ingredients in the foam. Whether the active ingredients not protective of ecological receptors.	The active constituents are highly diluted. The containment cell is of reinforced concrete and once sealed would not be disturbed. The water containing the active constituents will be absorbed by the asbestos waste materials and would remain distributed through the body of the asbestos wastes. Separation of the water if it occurs would flow to the floor of the cell. There would be degradation processes occurring of the active constituents.	Foam active constituents are highly diluted and these have been chosen by the foam manufacturers so these do not cause the foam to be considered as a hazardous substance or ecotoxic.	The data available supports the conclusions provided by the foam suppliers. The data we independently researched supports their statements.

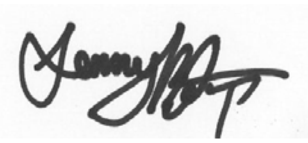
Table 3-1: Summary of Findings

Issues	Solution	Benefits	Proof
Suitability of placing polycyclic aromatic hydrocarbons with foam. Will the use of foams cause PAH's to become more mobile.	The active ingredients in both foam types being considered are not reactive with the active ingredients as these are diluted. If further safeguards are needed then a containment area formed with an impermeable layer could be established in Cell 1 for the soils that contain clinker and tar. The TCLP test show this to have low propensity to leach, the surfactant in the foam are expected to remain attached to the water absorbed by the asbestos wastes. If a further safeguard is required, then a sump could be installed with inspection cover so that the containment for these soils could be checked for leachate and whether these needed to be removed. This could readily be included in the monitoring programme for the site.	These safeguards remove uncertainty.	The safeguards are very basic and well proven.

Table 3-1: Summary of Findings

Issues	Solution	Benefits	Proof
Evidence of effectiveness of foams.	Two suppliers will provide warranty documents on the effectiveness of their foams for preventing the release of asbestos. Both have extensive experience with the development of foams for a wide range of industries. One has provided direct experience with projects.	There is confidence that a proven technology with basic design features that make it suited to the purpose is being included in the set of controls. Foam is in addition to wet methods. This may be considered to be too conservative as other projects completed by US EPA did not require foam.	Foam will provide the additional safeguards needed for the specific location of this project.

The matters raised by the site auditor regarding the effectiveness of foam as an asbestos dust and fibre suppressant have been addressed in detail. Further consideration of matters that relate to environmental risks has been referred to from manufacturers and URS.



Jenny Bo
<u>Environmental Engineer</u>

R T Benbow
<u>Principal Consultant</u>

4. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared for the use of Statewide Planning Pty Ltd and Environmental Strategies, as per our agreement for providing environmental services. Only Statewide Planning Pty Ltd and Environmental Strategies are entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Statewide Planning Pty Ltd and Environmental Strategies for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

APPENDICES

Appendix A: Asbestos Removal Contractors - FoamShield Use

Uses

ASBESTOS REMOVAL CONTRACTORS

The FoamShield™ method is the concept of containing or enclosing the Asbestos Containing Material (ACM) instead of the entire work area or building. Obviously, the savings in labor and materials is dramatic, but the main advantage is that asbestos fibers are contained at the point of disturbance. This means that airborne fibers are not generated in the work area. This in turn means that there are no airborne fibers in the worker's breathing zone, nor is there airborne contamination to be controlled for the protection of the owner's facility or the environment. Protection of the worker is of paramount importance in asbestos removal. Secondarily, would be the protection of the public and the environment, and thirdly would be minimizing the cost associated in accomplishing the first two objectives. The FoamShield™ process accomplishes all three objectives in ways that are far superior to conventional asbestos abatement procedures. It is the only procedure that is always pro-active in these respects, not reactive as the conventional, traditional containment and worker protection methods are (attempting to control asbestos particulate after they have been generated).

In addition to the above advantages, water consumption is far less using the FoamShield™ method than when using normal amended water, as the FoamShield™ method uses air pressure to generate the foam instead of water pressure. This minimizes clean-up and the risk of uncontrolled water leaking from the work area.

Federal and local regulations must always be complied with. The FoamShield™ method is completely compatible with the federal EPA and OSHA regulations and in fact is more in keeping with the spirit of the OSHA standards than are the conventional methods.

DEMOLITION CONTRACTORS

The safest and most cost effective way to demolish a building containing Category I and many Category II ACMs is to demolish the structure with the ACM in place. This eliminates the potential for worker exposure during handson removal of ACM, and the cost associated with that removal before demolition. The FoamShield™ procedure of foaming both the interior and exterior of the building before demolition, and the use of foam during the demolition procedure effectively eliminates the potential for release of asbestos fibers into the ambient air. In the case of NESHAP ordered demolition, where Regulated Asbestos Containing Material (RACM) must be demolished in place, there is not a better or safer method than the FoamShield™ method. The volume of water necessary to adequately wet most demolition projects is greatly minimized, thereby avoiding any water containment or run off problem. By eliminating most, if not all of the asbestos removal cost before demolition, many needed demolition projects in this country can be accomplished with the minimal funding currently available, at huge cost savings to the owner.

RESTORATION CONTRACTORS

Emergency response / water restoration work usually involves removal of damaged ceiling, wall and flooring materials. These materials, even in a private home, are suspect ACMs, and must be treated as asbestos unless proven non-asbestos by sampling and analysis. The problem is that most of this work must be done on a moment's notice, and budgets are limited by insurance settlements. The most cost effective and timely method, while still complying with regulations is to skip the asbestos inspection, assume the material to be asbestos, and using the FoamShield™ method, safely proceed with the remediation.

Even though the materials to be removed may be wet, that will not stop asbestos fiber emissions and worker exposure. However, the simple application of FoamShield™, even on wet material, effectively stops the possibility of airborne asbestos fibers. This avoids the liability associated with claims of exposure when buildings are reoccupied. The use of FoamShield™ will give the contractor a competitive edge, while safely complying with the regulations.

FACILITY MAINTENANCE WORK

Most facility maintenance work (replacing the broken floor tile, mounting a smoke detector on a ceiling, cutting an outlet in a wall) disturbs ACM. Even if a facility maintenance employee knows about the asbestos issues, he will usually proceed with the work without controls in the interest of time and convenience. After all, it would cost a lot in dollars and time to contact a consultant and have an asbestos inspection done, and we can't afford either the cost or the time. As far as exposure to asbestos goes, surely a few minutes won't matter? As far as regulatory compliance, we hope we won't get caught.

The above scenario is the main reason that the incidence of asbestos disease is so widespread among building users and janitorial (maintenance) workers. The result of this is increased liability to building owners and maintenance contractors.

The simple and cost effective solution to the above scenario is to make it a practice to use FoamShield™ when disturbing any manufactured building material. The time and cost associated with building inspections for asbestos can be avoided by simply assuming that the materials are indeed asbestos containing. The use of FoamShield™ will put the employer / building owner in compliance with the regulations meant to protect the worker, with no added costs such as personal protective equipment (PPE) and containments. The simple use of a one gallon pump-up foamer is all that is needed, and that can be easily added to the employee's tool kit or work cart.

EMERGENCY RESPONSE / MAJOR CATASTROPHY

Major catastrophe clean-up usually involves asbestos containing materials (ACM), but may also include hazards such as biological or radiation. FoamShield™ foam can be formulated to control any of these hazards and more.

Simply applied with high volume foamers, FoamShield™ will put a protective barrier between the debris and the clean-up workers, and also neutralize most biological hazards. Regulatory issues can be easily complied with instead of ignored, particulate and biological hazards can be controlled, water consumption minimized and the public and environment protected, all at minimal cost compared to conventional methods. FoamShield™'s compact, transportable high volume foamers can be shipped around the globe or hauled across the city without the use of heavy equipment. The high volume foamer is completely self-contained, operating without the need for auxiliary backup equipment.

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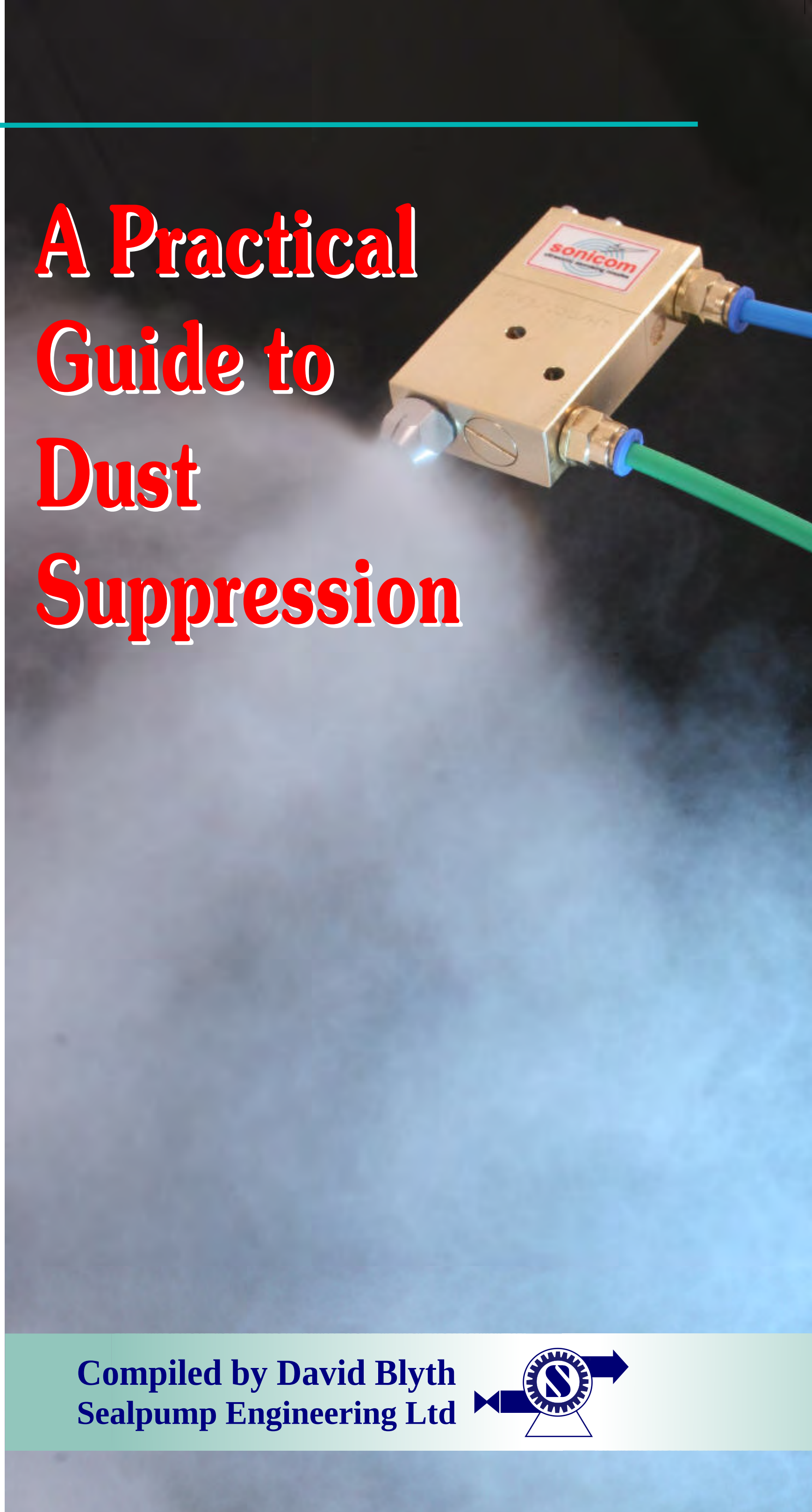
Appendix B: A Practical Guide to Dust Suppression

A Practical Guide to Dust Suppression



Compiled by David Blyth
Sealpump Engineering Ltd

Preface

Any time a bulk solid material is altered or moved, it must be assumed that dust will be generated. Many times a dust cloud is visible; if a dust cloud is visible, there will also be non-visible respirable dust present. However, it cannot be assumed there is no material being emitted if there is no visible cloud.

When silica, limestone, cement, coal, aggregate and other respirable dust particles ranging in diameter from 0.1 to roughly 70 microns are airborne, they become an occupational nuisance. As a source of physical discomfort, lost materials and wear on conveying pulleys, idlers, belting and motors: such dust is a significant factor in lowered productivity and added operating costs.

Conveyor transfer points are a prime source for fugitive material, both as spillage and as airborne dust. Depending on a number of factors, including the nature of the material carried on the conveyor, the height of drop onto the belt, the speeds and angles of unloading and loading belts, systems to capture or control airborne dust may be required at conveyor transfer points.

The first consideration is whether the volume of dust generated can be reduced. Although it is unlikely that dust can be completely eliminated, a change in system design or production technique will minimise the amount of dust produced. The less energy released by the falling stream of materials at the impact area, the less energy is imparted into the material and the fewer dust particles/fines will be driven off. Consequently, it is best to design conveyor layouts with low material drops. Since this may not always be possible, dust suppression control systems must be employed.

An important consideration is the use of well-designed, enclosed chutes, since material which is allowed to fall freely from one belt to another may allow a high concentration of dust to become airborne. In it's simplest form, dust control may involve nothing more than attention to the enclosure of the transfer point chutework or the use of water sprays to suppress the creation of dust.

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A Practical Guide to Dust Suppression

Dust Suppression is the application of water and/or chemicals, either to the body of material to prevent fines from being carried off into the air, or to the air above the material to return fugitive airborne fines to the material bed.

A significant advantage of dust suppression is that the material does not have to be handled again. The suppressed dust returns to the main body of conveyed material and the process without requiring additional material handling equipment.

There are a number of systems used for this purpose ranging from "garden hose" technology, through water and surfactant sprays, foam and fog generation systems. These various suppression technologies call for adding different volumes of moisture to the material. **Fig 1** presents typical amounts of added moisture.

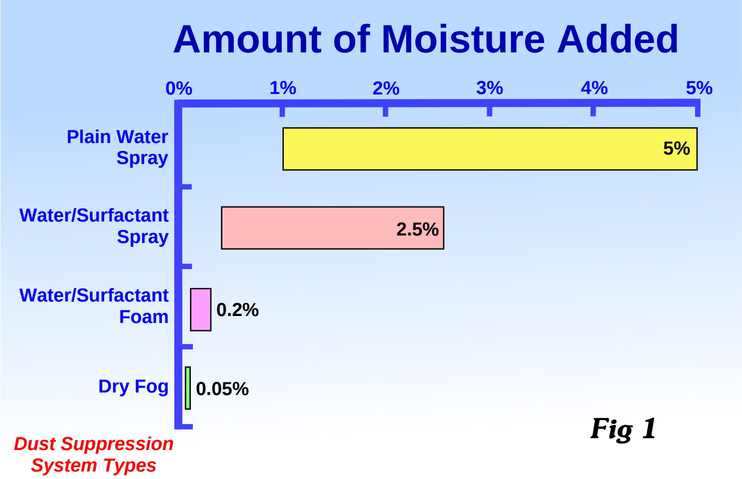


Fig 1

Water Suppression

Perhaps the oldest method for controlling fugitive dust is the application of water over the body of material. By wetting the fines, either as they lay in the material body or as they are being picked up into the air, the weight of each dust particle is increased so they are less likely to become airborne. The moisture also increases the cohesive force of the material body itself, creating larger, heavier groups of particles and making it more difficult for air movement to carry away the dust particles. This can be done by applying the water through a series of properly sized spray nozzles at a point where the material expands and takes in air, such as during discharge from the head drum in a transfer chute.

Water can also be applied to create a "curtain" around a transfer point, so any dust fines that become airborne come into contact with the water sprays surrounding the open area around the chute. The water droplets are expected to make contact with the dust fines, increasing their mass to remove them from the air stream.

The most effective sprays come from low-velocity systems. High-velocity sprays can add energy to the air and the dust particles. This energy is counterproductive to the task of keeping (or returning) the dust with the material body. High velocity air movement can keep dust particles in suspension.

Water-based suppression systems can become more sophisticated as the engineering moves beyond "garden hose" technology in efforts to improve results. The effectiveness of water spray systems is dependent on the velocity of applied water, the size of the nozzle's orifice and the location of the spray nozzles. The techniques to improve plain water-spray dust suppression include a reduction of droplet size, an increase in droplet frequency, an increase of the droplet's velocity, or a decrease in the droplet's surface tension, making it easier to merge with dust particles.

The application of dust suppression water and/or chemicals at transfer points must be controlled automatically so that water is applied only when the conveyors are running and there is a material present. This can be accomplished with conveyor system interlocks and other sensors, including microwave (or similar) sensors that read both material on the belt and loaded belt movement.

Fig 2

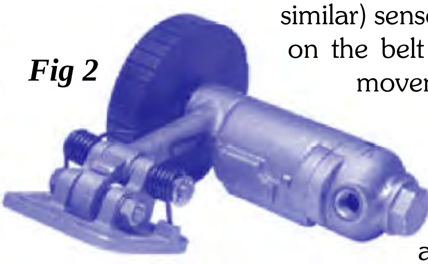


Fig 2 shows a spray control valve capable of controlling the flow of any fluid by mechanically sensing belt movement without the need for an independent power supply. The valve can be positioned so that the wheel contacts the belt when it is loaded, therefore operating only when material is being conveyed. **Fig 3**.

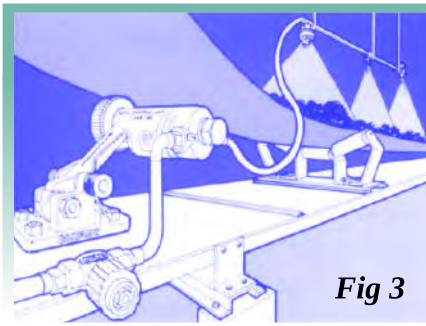


Fig 3

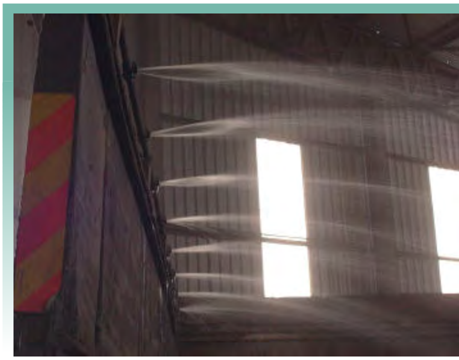
Plain water spray application systems are relatively simple to design and operate, and water has only a minimal residual effect. Water is generally inexpensive, it is usually easy to obtain; it is safe for the environment and for workers who come into contact with it.

Dust suppression systems utilising water are relatively simple systems that do not require the use of a costly elaborate enclosure or hoods. They are typically cheaper to install and use far less space than the dry collection systems. Changes can be made after startup with minimum expense and downtime. Unfortunately the application of water has several liabilities to be considered.

Dust Suppression over open rail track hoppers

With Water, Less is More

A plain water spray may appear to be the most inexpensive form of dust control available. The water is available almost free in many operations (such as mines), and it can be applied through low-technology systems. But this cost justification can be a false equation. Many bulk solids are hydrophobic; they have a high surface tension and are adverse to combine with water. To achieve effective suppression, the amount of water is increased. Because the material does not mix well with water, there will be some particles that remain dry and others that become very wet, which can lead to material build-ups on chute walls, screens and conveyor belts.



When applying water to conveyor systems, a good axiom is “less is more”. For mineral handling in general, the addition of excess moisture prior to screening can cause material to adhere to a screen cloth, blinding the equipment. Excess water may promote belt slippage and increase the possibility of wet (and hence sticky) fines accumulating within chutes and around the transfer points. The addition of moisture can cause material to stick together, complicating the flow characteristics of the material being conveyed.

Problems occurring in plain water dust suppression systems include the possibility of excess moisture in the material, which can downgrade future performance in power generation or other thermal processing. Specifically, excess water addition to coal and coke used for boiler fuel results in a BTU penalty which can have a detrimental effect on utility heat rates. The more water added, the greater this penalty.

The Thermal Penalty for Added Moisture

There is a substantial performance penalty added to combustion and other thermal processes when the water content of the fuel is increased. In applications like coal-fired power plants and cement plants, water added to the material going into the thermal process must be "burned off" by the process. This can dramatically reduce the process efficiency and increase fuel costs.

It requires 3,064 kilojoules per litre (1,320 BTU per pound) to raise water from 21°C (70°F) to it's vaporization temperature of 149°C (300°F). It only takes 9.1 kg or 9.1 litres (20 pounds) of water to increase the moisture content of one tonne of material by one percent. As a gallon of water weighs approximately 4.5 kg (10 pounds), the addition of less than 2.0 gallons (9.1 litres) of water to a tonnne of material will raise the moisture content of a tonne of material by 1 percent. Vaporizing this modest amount of water produces a heat loss of 27,850 kilojoules (26,400 BTU).

The thermal penalty typically created by the various dust suppression methods is displayed in **Fig 4**.

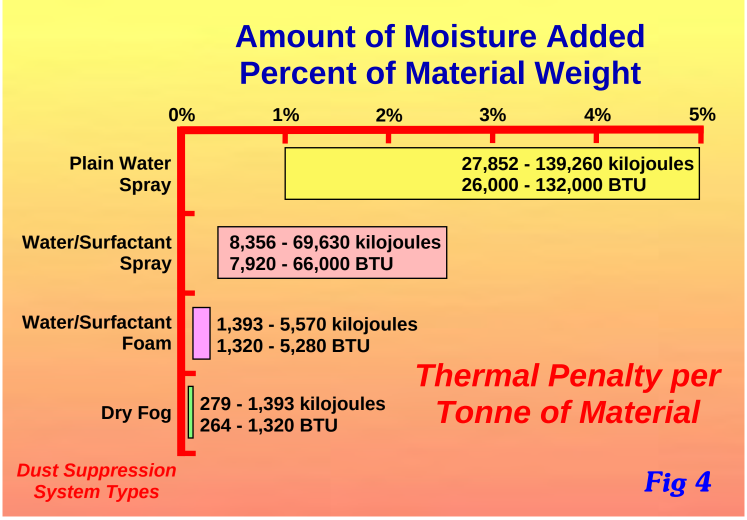


Fig 4

Because a "plain" water spray requires the highest volume of moisture for effective dust suppression, this method extracts the highest thermal penalty. While the use of a simple water spray for dust suppression may be a lower cost because the water is readily available and there is less "out-of-pocket" expense, the penalty for the addition of surplus moisture can be very costly indeed.

To prevent this problem, moisture addition must be minimised. Methods to improve dust suppression while limiting the addition water include the use of a "dry fog" or the addition of surfactant chemicals to water which is then applied as a spray or as a foam.

"Dry Fog" being added to coal over a conveyor head drum

Foam spray added to limestone at a crusher inlet

Ultrasonic Dry Fog Suppression Systems

"UltraFine Fog" fugitive dust suppression works like a combination of a wet scrubber and a fabric filter. The generated ultra-fine fogging blanket acts like a fabric filter in that a dust particle cannot pass through it without colliding with a droplet. Since the droplet consists of water, the dust particle does become somewhat wet as in a true flooded scrubber. This phenomenon can be called agglomeration and solving fugitive dust emission problems with ultra-fine water droplet atomisation begins with the theory of agglomeration. Agglomeration can be defined as the gathering of mass into a larger mass, or cluster.

Agglomeration probability is greatly increased between bodies of similar size. The agglomeration of these bodies produces a large enough mass to cause settling. For example, a dust particle of 5 microns will continue to follow the air stream around a water droplet of 200 microns, therefore, avoiding collision. With the dust particle and a water droplet of similar size, the air stream is not as great and collision occurs, causing agglomeration.

Fig 5 shows the aerodynamics of what can happen when the water droplets are larger than the dust particle.

Fig 5

Diagram illustrates the importance of droplet size for particle agglomeration. Airflow around the large water droplet (left) prevents the dust particle from contacting the droplet. However, the dust particle easily impacts the small droplet (right) triggering agglomeration.

Fog suppression is one method to optimise the application of water to dusty materials. These systems use special ultrasonic nozzles to produce extremely small water droplets (10 microns or less) in a dispersed mist. These droplets mix and agglomerate with dust particles of similar size, with the resulting larger combined particles falling back to the material body.

Compressed air passes through the nozzle's inner bore through a convergent/divergent section at high velocities and expands into a resonator cavity where it is reflected back to complement and amplify the primary shock wave. The result is an intensified field of sonic energy focused between the nozzle body and the resonator cap. **Fig 6**

Any liquid capable of being pumped into the shock wave is vigorously sheared into fine droplets by the acoustic field. Air bypassing the resonator carries the atomised droplets downstream in a soft plume shaped spray. In **Fig 7** the droplets have low mass and low forward velocity with low impingement characteristics. Fine atomisation ensures uniform distribution of the liquid with minimum over spray and waste.

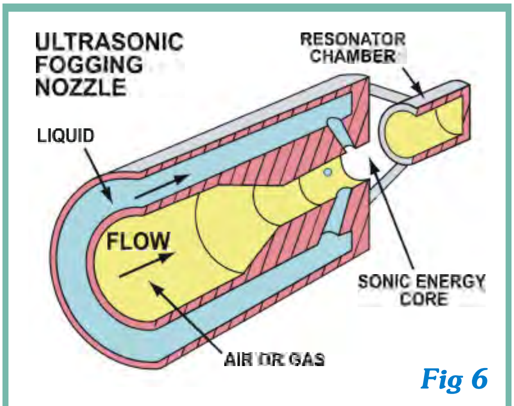


Fig 6

Ultrasonic atomising nozzles operate at very low liquid pressures and have large orifices. The large orifices and low pressures virtually eliminate orifice wear and prevent deterioration of the quality of atomisation while greatly extending useful nozzle life.

Fig 7

The plume leaving the fog system nozzles is so fine it will not freeze, but the water supply system itself can freeze if drain or heating elements are not provided.

Mist Suppression Systems

Atomisation is designed to reduce the surface tension of the water droplets, while increasing the number of droplets in a given area and eliminating the need for the addition of surfactants or other additives. The low level of water added through the fog/mist systems - typically at 0.01% to 0.05% by weight of the material - generally will not degrade the performance of the material.

There are two methods of producing atomised water mist.

Two-Fluid Atomisation (Fig 8)
One method produces mist from water and compressed air by passing them together through a two-fluid nozzle. Here the external air supply is the vehicle that fractures the water supply into the droplet mist to capture the dust. The supply of compressed air to this system provides an additional expense for the installation and operation of this system. The cost of producing the compressed air must also be considered in the economics of the system.

Fig 8

Single-Fluid Atomisation (Fig 9)
This system uses an ultra-fine stream of water pumped at high pressure through single-fluid atomising nozzles. It does not require compressed air or an additional power source other than the electricity to run it's pump. Single-fluid nozzles use hydraulic atomisation to generate the mist. Water is forced under pressure through a small orifice that shatters the water droplets into microscopic particles. The energy created by the high-pressure is used to atomise the water droplets, rather than increase water velocity, thereby minimising displaced air. By eliminating the compressed air requirement, single-fluid nozzles simplify installation and reduce operating costs. To keep nozzles clear, any suspended solids must be removed from the water. However, the low volume of water applied to the material makes this relatively easy to accomplish with good filtration.

Fig 9

Placement and Position of Nozzles

The placement of the fogging nozzles is the most important aspect to producing effective results with no wetting of material. The fog should be generated and contained in a properly designed shrouding. This eliminates dissipation due to wind and also produces the treatment time necessary to suppress the dust. The fog is generated above the dust problem area, not on the material. As the airborne dust enters the confine, UltraFine Fog agglomeration occurs and the dust is suppressed in situ.

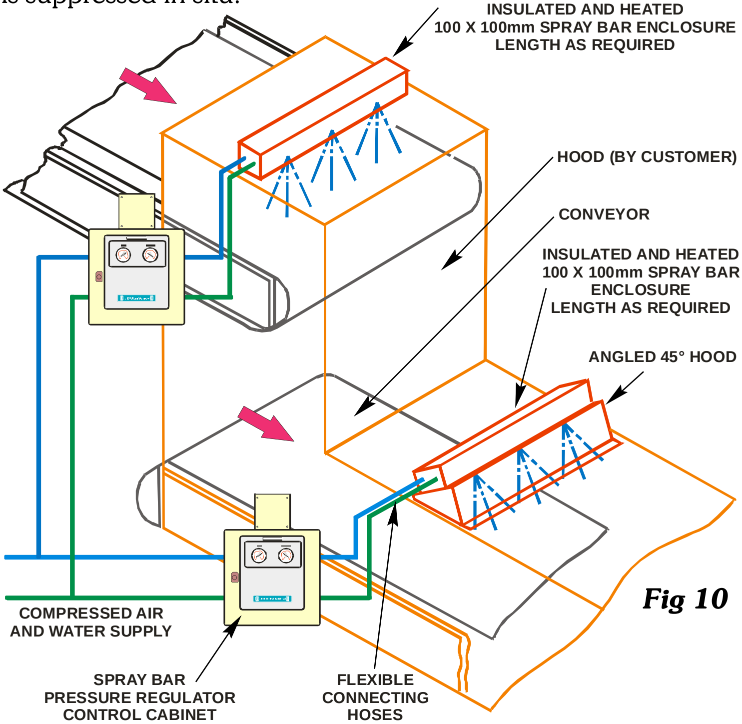


Fig 10

A simple system schematic is shown in **Fig 10**. In this picture two spray bars are mounted on the covers. They are heat traced and insulated assemblies. The enclosure has a quick release cover, which makes it easy to service the nozzles as required. This picture also shows the regulator control cabinets, which are used to regulate the air and water pressures and would also include solenoid valves linked into the conveyor drives, along with the flex hoses used to connect the two fluids.

Typical conveyor transfer point and crusher shrouding along with location of the nozzles are shown in **Fig 11** and **Fig 12** respectively.

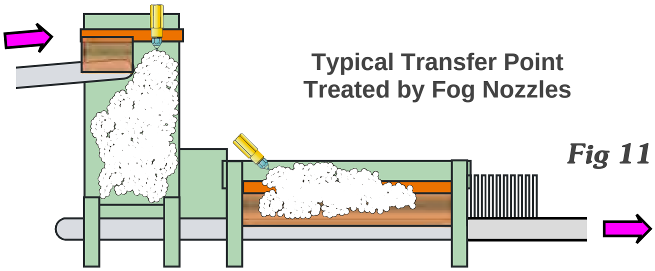


Fig 11

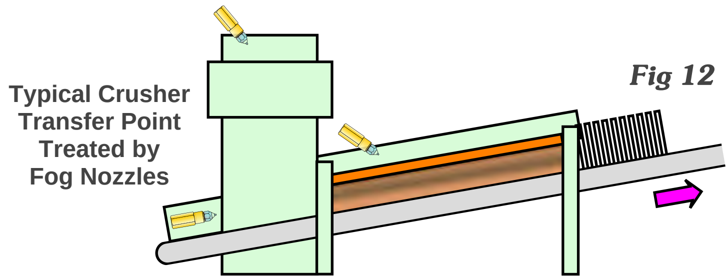


Fig 12

A general rule of thumb is that the height of the conveyor cover be approximately 1 metre above the product level on the belt and the cover length 3 times the belt speed (m/s). The basic principles involved for location of the nozzles are as follows:-

- **Nozzle spray pattern must not directly impinge upon any surface.**
- **Nozzles should be mounted in order to maximise the ability to fill the shrouding.**
- **The fog should avoid direct contact with the material being suppressed.**
- **Nozzles must be protected or shielded to avoid damage from falling material.**
- **Nozzles should be mounted to minimise exposure to a heavy-laden dust air stream. This will void erosion of the nozzle components.**
- **Spray pattern of nozzles should be generated so that all the fugitive dust emissions are forced to pass through the blanket of fog.**

Pros & Cons of Fog and Mist Systems

Fog systems provide highly effective dust capture combined with economical capital and operating costs.

A well designed fogging system can provide excellent control of dust at the point of application without the need for chemical additives. This is especially important for processes such as wood chip transport destined for fine paper making. Many mills are very concerned over the application of any chemical that might negatively affect the pulp or degrade the quality of the finished paper.

Since fog systems only add water, they protect the integrity of the customer process. Total moisture addition to the bulk material can be realistically less than 0.1%. This makes fog suppression systems attractive in industries that cannot tolerate excess moisture, such as cement and lime production.

Mains water is typically required for fog suppression systems, so filtration to remove suspended solids from the water supply is required. As high pressure misting nozzles have a very small orifice to produce droplets, the water used for this operation must be treated to be free of particulate and suspended solids. Nozzles can clog if the water treatment system is not serviced at required intervals.

Another consideration prior to choosing a fogging device is the air volume and velocity at the open area surrounding the transfer point or chute. For truly effective performance, fog dust suppression systems require tight enclosure of the transfer point that minimises turbulent, high-velocity air movement through the system. Since the fog droplets are very small, both the fog droplets and the dust can be carried out of the treatment area onto surrounding equipment by high-velocity air exiting the chute.

This type of system works well where the area to be treated is not large. A potential drawback of a fogging application is that treatment is site specific. That is, dust control is achieved only at the point of application. Several fogging devices may be required for a conveyor system with multiple transfer points.

Adding Chemicals to Water

To improve the wetting characteristics of water and also reduce overall water usage and minimise the drawbacks associated with excessive moisture addition, it is a common practice to "enhance" the water by adding chemical surfactants. The purpose of the surfactant addition is to improve the dust suppressant performance of the water.

If dust from coal, petroleum coke or other similar materials falls onto a pool of water on the ground, the dust particles can lay on top of the water. If undisturbed, this dust can remain on the surface of the pool for hours. This phenomenon takes place because these materials are hydrophobic; they do not mix well with water. It is not possible or practical to alter the nature of the dust particles to give them greater affinity for water. Therefore chemicals are added to alter the water molecules, so they attract or at least join with the dust fines which they contact.

By adding chemicals (usually surfactants - surface acting agents) the surface tension of the water is reduced, allowing the dust fines to become wet. To understand surface tension, imagine a drop of water lying on a smooth, flat surface. It will usually form a liquid bubble with well-defined sides. It is the surface tension of the water that prevents the droplet walls from collapsing and spreading as a thin water sheet. A drop of water that has been mixed with a surfactant such as dishwashing soap, for example, will not form a liquid bubble on the same surface because its surface tension has been drastically reduced. The "walls" on the side of the droplet cannot support the weight of the droplet, because the forces holding the walls together have been altered. This is the reason surfactant technology is applied to dust control. If the water droplets no longer have a surface that is a barrier to contact with the dust fines, then random collisions between droplets of treated water and dust will result in wetting of the fines.

Location, Location, Location

In fog, foam, water and water/chemical spray applications, the sites chosen for nozzle placement and suppressant delivery patterns are as important as the selection of material to be applied. Even the best designed program will fail if the suppressant material is not delivered to the correct location to allow intimate mixing with the dust fines.

The success of the suppression effort relies on the proper mixing together of the material and the suppressant at the transfer point. When applying dust control, whether the suppressant is simply water or a surfactant/water mix as a spray or foam, it is best to locate the suppression system as close to the beginning of the transfer point as possible. That way, the forces of the moving material fold the suppressant into the material body as it moves through the transfer point.

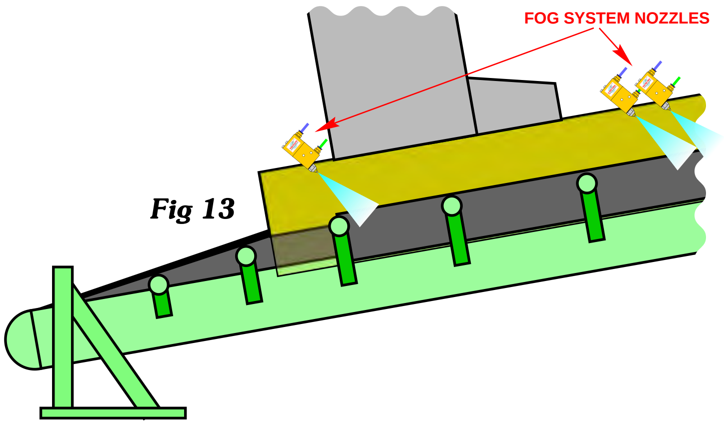


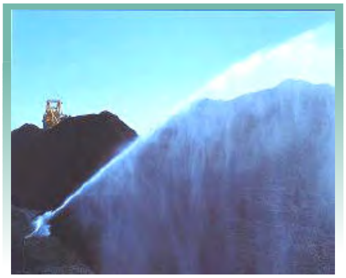
Fig 13

The installation of fog systems is a little different in that fog systems are designed to treat the air above the material, rather than the material body itself. Therefore, the application point for the fog mist is generally near the end of the transfer point **Fig 13**. This allows the material load to settle and any pickups for active or passive dust collection systems to remove dust-laden air without the risk of binding the filtration media with moistened dust particles. Fog generation nozzles are installed to cover the full width of the conveyor's skirted area. It is recommended that skirtboard height be at least 800mm to allow the plume of the nozzle output to reach optimum coverage.

Other Dust Suppression Equipment

Sprinklers: Used mainly where wetting is required over a wide area such as roadways and open yards. They are limited by the throw achievable from each head and rely on good water pressure and flow. Sizes are selected according to the application and the units can be set to spray full or part circle patterns. This ensures maximum areas are covered with the minimum of over lap between spray heads. Water consumption varies typically between 0.3 and 95 m^3/hr.

Rain Guns: Dust suppression rain guns have been specifically designed to provide immediate and efficient dampening/wetting over large areas with minimal water consumption.



A high frequency drive mechanism provides a fine water curtain and gives excellent water distribution with minimum maintenance. Units can be self adjusting and range from 12 to 150 m^3/hr with spray trajectories up to 120 metres.

Sprinklers and rain guns can be used together to achieve an overall suppression effect over areas of concern and provide the best possible results with budget costs and water conservation in mind.

Water Spray Nozzle Systems: Such systems provide immediate dampening of general material handling processes and site boundaries. The nozzle design ensures a cone spray pattern is achieved at pressures from 1 to 8 Bar.

These types of nozzle systems are a low cost option for material handling processes/site boundaries where wetting is not a problem. Nozzles are available in various materials including plastic, stainless steel and brass with flow volumes ranging from 0.3 lts/min up to 90 lts/min per nozzle.

Fog Cannon: When vast open spaces require dust suppression and a semi permanent system is not a practical option, the solution may lie with the introduction of a fog cannon to the site.

These huge mobile and expensive units can utilise up to 60 hydraulic spray nozzles mounted circumferentially around the outlet head of a large fan assisted barrel. The concentration of nozzle spray together with the high flow of air from the fan, throws the droplets many metres towards the source of the dust activity. The droplets scatter in a plume of relatively soft spray and can capture fugitive dust before it becomes airborne and a major problem.

CONVERSION TABLES

Multiply	*by*	*to obtain*
Area		
cm^2	0.0010764	ft^2
cm^2	0.1550003	inch^2
ft^2	0.09290304	m^2
ft^2	929.0304	cm^2
ft^2	92903.04	mm^2
inch^2	0.0006452	m^2
inch^2	6.4516	cm^2
inch^2	645.16	mm^2
m^2	1.19599	yard^2
m^2	10.7639	ft^2
m^2	1550.003	inch^2
mm^2	0.00001076391	ft^2
mm^2	0.00155	inch^2
yard^2	0.8361274	m^2

Flow		
ft^3/min	1.699	m^3/hr
ft^3/min	0.0283	m^3/min
ft^3/min	0.000472	m^3/sec
ft^3/min	1699	lt/hr
ft^3/min	28.317	lt/min
ft^3/min	0.4719	lt/sec
ft^3/min	0.4719	dm^3/sec
lt/min	0.22	Imp gal/min
lt/min	0.264172	US gal/min
lt/min	0.035315	ft^3/min
lt/min	0.000589	ft^3/sec
lt/sec	0.22	Imp gal/sec
lt/sec	0.264172	US gal/sec
lt/sec	2.11888	ft^3/min
lt/sec	0.035315	ft^3/sec
lt/sec	0.06	m^3/min
lt/sec	0.001	m^3/sec
m^3/sec	2118.88	ft^3/min
m^3/sec	35.31	ft^3/sec
m^3/sec	13198.15	Imp gal/min

Multiply	*by*	*to obtain*
Pressure		
bar	14.50377	lbf/inch^2
bar	1.02	Kgf/cm^2
bar	100,000.0	N/m^2 (Pa)
bar	750.1	mm Hg
bar	29.53	inch Hg
bar	0.9871668	atm
lbf/inch^2	0.06894757	bar
lbf/inch^2	0.07030697	Kgf/cm^2
lbf/inch^2	6894.757	N/m^2 (Pa)
lbf/inch^2	51.71	mm Hg
lbf/inch^2	2.036	inch Hg
lbf/inch^2	0.0680461	atm

Volume		
cm^3	0.0610234	inch^3
ft^3	0.02831685	m^3
ft^3	28.31685	litre
Imp gal	0.004546092	m^3
Imp gal	4.546092	litre
Imp gal	1.20032	US gal
Imp gal	0.16054	ft^3
inch^3	16387.06	mm^3
inch^3	16.38706	cm^3
inch^3	0.000016387	m^3
litre	0.001	m^3
litre	0.2199692	Imp gal
litre	0.03531466	ft^3
litre	61.0234	inch^3
m^3	219.9692	Imp gal
m^3	35.31466	ft^3
m^3	1000.0	litre
m^3	61023.4	inch^3
mm^3	0.000061024	inch^3

1 micron	equals	0.00004 inch
1 micron	equals	0.001mm

Appendix C: Asbestos Removal Test Results - FoamShield

9 May St, Leichhardt

Scope of Works: Removal of Friable Asbestos and Demolition of Fire Damaged House

Project: 9 May Street, Leichhardt

Project: 9 May Street, Leichhardt

envirohealth CONSULTING PTY LTD

BRISBANE LABORATORY REPORT
Estimation of Airborne Asbestos Dust

Report No:	Q13859R01	Date: 31 July 2012
Client:	Caylamax Group	
Client Address:	123 Kremzow Rd Brendale QLD 4500	
Sampled From:	9 May St, Leichhardt	
*Sampling Procedures:	In accordance with NOHSC Guidance Notes	
Sampled by:	V Masanamuthu	On: 31 July 2012
Test Method:	In Accordance with 2005 NOHSC Guidance Note on the Membrane Filter Method (as outlined in the laboratory method manual)	

Site Location	Filter I.D.	Time On/Off	Flow Rate L/min	Result Fibres/Field	Result Fibres/mL
Fence entrance - north Background	Q13859S01	0800/1200 240 min	2.0	0/100	<0.01
Fence - east Background	Q13859S02	0800/1200 240 min	2.0	0/100	<0.01
Fence - west Background	Q13859S03	0800/1200 240 min	2.0	0/100	<0.01

NATA Accredited for compliance with ISO/IEC 17025

Laboratory Accreditation Number 3375

Approved Counter

Approved Signatory
Michael Moecker

* "Sampling Procedures not covered by scope of accreditation"

ENVIROHEALTH CONSULTING PTY LTD
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www.envirohealth.com.au

envirohealth CONSULTING PTY LTD

BRISBANE LABORATORY REPORT
Estimation of Airborne Asbestos Dust

Report No: Q13917R01 Date: 06 August 2012

Client: Caylamax Group
Client Address: 83 Kremzow Rd
Brendale QLD 4500

Sampled From: 9 May St, Leichhardt

*Sampling Procedures: In accordance with NOHSC Guidance Notes

Sampled by: S Burdett On: 06 August 2012

Test Method: In Accordance with 2005 NOHSC Guidance Note on the Membrane Filter Method (as outlined in the laboratory method manual)

Site Location	Filter I.D.	Time On/Off	Flow Rate L/min	Result Fibres/Field	Result Fibres/mL
North fence Work In progress	Q13917S01	0915/1315 240 min	2.0	0/100	<0.01
West fence Work in progress	Q13917S02	0916/1316 240 min	2.0	0/100	<0.01
East fence W k in progress	Q13917S02	0918/1318 240 min	2.0	0/100	<0.01

NATA Accredited for compliance with ISO/IEC 17025

Laboratory Accreditation Number 3375

Approved Counter

* "Sampling Procedures not covered by scope of accreditation"

Approved Signatory
Michael Moecker

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FOAM SHIELD™
particle capture technology

Vulture Street, Woolloongabba

Scope of Works: Tile and Mastic Removal

Project: Vulture Street, Woolloongabba

FOAM SHIELD™
particle capture technology

Project: Vulture Street, Woolloongabba

Project: Vulture Street, Woolloongabba

ABN: 83 117 421 324
OCTIEF Pty Limited
1a/22 Ereton Drive, Arundel QLD 4214
Enquiries: 1300 138 366
Ph: (07) 5537 2536
Fax: (07) 5537 2535
corporate@octief.com.au
www.octief.com.au

Issue Date: 27/10/2011

Job #: AMQ00102514.0

Table 1 – Analytical results obtained from conducting fibre count analysis

Filter ID Number	Monitoring Type (control/clearance/etc.)	Sample Location	Start Time (HH:MM)	Finish Time (HH:MM)	Total Time (min)	Average Flow Rate (L/min)	Fibre Count (fibres/fields)	Result (fibres/mL)
10-086	Control	North Entrance to 2nd Level	8:35	12:35	240	2.0	3.0/100	<0.01
10-065	Control	West Side of Removals	8:36	12:36	240	2.0	5.0/100	<0.01
10-094	Control	Ground Level Next to Skip Bin East of Removal Area	8:50	12:50	240	2.0	2.0/100	<0.01
10-098	Control	Room Adjacent to Removals	8:37	12:37	240	2.0	19.0/100	0.01
						Reporting limit		**0.01**
						Control / clearance limit		**0.01**

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Issue Date: 27/10/2011

Job #: AMQ00102514.1

Table 1 – Analytical results obtained from conducting fibre count analysis

Filter ID Number	Monitoring Type (control/clearance/etc.)	Sample Location	Start Time (HH:MM)	Finish Time (HH:MM)	Total Time (min)	Average Flow Rate (L/min)	Fibre Count (fibres/fields)	Result (fibres/mL)
10-106	Personal Exposure	Removalist 1	**10:30**	**14:30**	240	2.0	26.0/100	0.02
09-231	Personal Exposure	Removalist 2	**10:30**	**14:30**	240	2.0	Sample Void – Filter Overloaded	
							Reporting limit	**0.01**

Appendix D: FoamShield FS-A1 MSDS

FS – A1

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name	FS – A1
Product Code	0760
Other Names	-
Product Use	Particle Capture Foam
Supplier Name	FoamShield
Address	83 Kremzow Road Brendale QLD 4500
Telephone Number	07 3205 3070
Emergency Telephone	0438 700 186

2. HAZARDS IDENTIFICATION

NON HAZARDOUS SUBSTANCE. NON DANGEROUS GOODS.
Not classified as hazardous according to the criteria of Safe Work Australia.

Hazards	-
Risk Phrases	-
Safety Phrases	-

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient (common name)	CAS Number	Proportion
Water	7732-18-5	>95%
2-butoxyethanol	111-76-2	1-2%
Ammonium alcohol(C6-10) ether sulfate	68037-05-8	<1%
Sodium C14-C16 olefin sulfonate	68439-57-6	<1%
Isopropanol	67-63-0	<1%

4. FIRST AID MEASURES

Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek immediate medical attention.
Ingestion	Do not induce vomiting. Give two glasses of water. Never give anything by mouth to an unconscious person. Seek immediate medical attention.
Skin	If skin contact occurs, immediately remove contaminated clothing and wash skin and hair thoroughly with soap and plenty of water. Seek medical attention if symptoms persist.
Eyes	If in eyes, hold eyelids apart and immediately flush the eye continuously with large amounts of water for at least 15 minutes. Seek medical attention if symptoms persist.

5. FIRE FIGHTING MEASURES

	For major fires call the Fire Brigade. Ensure that an escape path is available from any fire.
Suitable Extinguishing Media	Use media appropriate to surrounding fire conditions.
Hazardous Combustion Products	No information available.
Firefighting Equipment	Wear Safe Work Australia approved self-contained breathing apparatus and full protective clothing.
Unusual Fire or Explosion Hazards	No information available.
Hazchem Code	Not allocated.

6. ACCIDENTAL RELEASE MEASURES

Spills	**Small spill:** Contain spill. Absorb liquid and place in sealed container for disposal.

7. HANDLING AND STORAGE

Handling	Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Provide adequate ventilation.
Storage	Store in the closed, original container in a dry, well ventilated area. Keep container tightly closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Standards (Safe Work Australia)	**2-butoxyethanol:** TWA: 20 ppm / 96.9 mg/m^3 STEL: 50 ppm / 242 mg/m^3 **Isopropanol:** TWA: 400 ppm / 983 mg/m^3 STEL: 500 ppm / 1230 mg/m^3
Engineering Controls	Local exhaust ventilation is recommended when vapors can be released in excess of established airborne exposure limits.
Respiratory Protection	See Australian Standards AS/NZS 1715 and 1716 for more information.
Eye Protection	Safety glasses with side shields or goggles. See Australian Standards AS 1336 and AS/NZS 1337 for more information.
Skin Protection	Rubber or nitrile gloves. See Australian Standards AS 2161 and 2919 and AS/NZS 2210 for more information.
Hygienic Practices	Food, beverages and tobacco products should not be stored or consumed where this material is in use. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. Provide eyewash fountains and safety showers in close proximity to points of potential exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Brown liquid
Odour	Butyl odour
Solubility in Water	Soluble
pH	7
Boiling Point	No information available
Melting Point	No information available
Vapour Pressure	No information available
Specific Gravity (H_2O=1)	1
Vapour Density (Air = 1)	No information available
Flash Point	Not applicable
Upper Flammability Level	Not applicable
Lower Flammability Level	Not applicable
Evaporation Rate	No information available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable when stored under proper conditions.
Incompatible Materials	None reported.
Hazardous Decomposition Products	No information available.
Hazardous Polymerization	Will not occur.
Conditions to Avoid	No information available.

11. TOXICOLOGICAL INFORMATION

Toxicity

2-butoxyethanol:
Oral LD_{50} (rat) = 1480 mg/kg
Intraperitoneal LD_{50} (rat) = 550 mg/kg
Skin LD_{50} (rat) = 490 mg/kg
Skin LD_{50} (rabbit) = 2000 mg/kg
Inhalation LC_{50} (mouse) = 700 ppm/7h
Harmful by inhalation or ingestion and in contact with the skin. Narcotic. Skin, eye and respiratory irritant. Long-term exposure may cause kidney and/or liver damage. Possible teratogen.
Isopropanol:
Oral LD_{50} (rat) = 5045 mg/kg
Oral LD_{50} (mouse) = 3600 mg/kg
Oral TD_{LO} (man) = 223 mg/kg
Skin LD_{50} (rabbit) = 12800 mg/kg
May be harmful by inhalation, ingestion or skin absorption. May act as an irritant.

Routes of Exposure Inhalation, ingestion, eye and skin

Acute Health Effects

Inhalation:	May cause respiratory tract irritation. Can cause central nervous system depression.
Ingestion:	Harmful if swallowed.
Eye:	May cause eye irritation.
Skin:	Prolonged or repeated skin contact may cause Irritation.

Chronic Health Effects	No information available.
Existing Conditions Aggravated by Exposure	No information available.
Carcinogenicity	Isopropanol and 2-butoxyethanol is classified as IARC Group 3 - Non-classifiable as to its carcinogenicity to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity	**Isopropanol:** **Aquatic organisms:** Not ecotoxic at levels used in this product.
Mobility	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods and containers	Dispose according to applicable local and state government regulations.
Special precautions for landfill or incineration	Please consult your state Land Waste Management Authority for more information.

14. TRANSPORT INFORMATION

Not classified as a dangerous good according to the Australian Code for the Transport of Dangerous goods by road or rail (ADG 7).

UN Number	Not applicable
Proper Shipping Name	Not applicable
Dangerous Goods Class	Not applicable
Subsidiary Risk	Not applicable
Hazchem Code	Not applicable
Packing Group	Not applicable
Special Provisions	Not applicable
Limited Quantities	Not applicable
Packagings & IBCs - Packing Instruction	Not applicable
Packagings & IBCs - Special Packing Provisions	Not applicable
Portable Tanks & Bulk Containers – Instructions	Not applicable
Portable Tanks & Bulk Containers – Special Provisions	Not applicable

15. REGULATORY INFORMATION

Water, 2-butoxyethanol and isopropanol are listed in the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

Last Revision of MSDS	Rev 1.1 (02/04/2013)	
Prepared by	MSDS.COM.AU Pty Ltd	www.msds.com.au

Abbreviations Used

IARC: International Agency for Research on Cancer
STEL: Short term exposure limit
TWA: Time weighted average

Emergency Contacts

FoamShield	**07 3205 3070**
FoamShield – Emergency Number	**0438 700 186**
Police and Fire Brigade	**000**
Poisons Information Centre	**13 11 26**

The information contained in this material safety data sheet is provided in good faith and is believed to be accurate at the date of issuance. FoamShield makes no representation of the accuracy or comprehensiveness of the information and to the full extent allowed by law excludes all liability for any loss or damage related to the supply or use of the information in this material safety data sheet. MSDS.COM.AU Pty Ltd is not in a position to warrant the accuracy of the data herein. The user is cautioned to make their own determinations as to the suitability of the information provided to the particular circumstances in which the product is used.

Please read instructions / label before using product.

This MSDS is prepared in accord with the Safe Work Australia document “National Code of Practice for the Preparation of Material Safety Data Sheets” 2nd Edition [NOHSC:2011(2003)]

Appendix E: Midwest Dust Buster SDC 12000 MSDS

MIDWEST INDUSTRIAL SUPPLY, INC.
1101 3rd Street Southeast • Canton, Ohio 44707 USA
Emergency Phone Numbers: 330-456-3121

Dust-Buster® SDC 12000

MATERIAL SAFETY DATA SHEET

SECTION I -- IDENTIFICATION OF SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

TRADE NAME: DUSTBUSTER® SDC 12000
CHEMICAL NAME: FOAMING DUST SUPPRESSANT
SYNONYMS: WETTING AGENT
CHEMICAL FAMILY: SURFACTANT

SECTION II – HAZARDOUS COMPONENTS

NAME	CAS #
Sodium Alpha Olefin Sulfonate	68439-57-6

SECTION III – HAZARDOUS IDENTIFICATION

Sodium Alpha Olefin Sulfonate **Skin and Eye Irritant**

SECTION IV– FIRST AID MEASURES

EYE CONTACT: Do not rub eyes. Flush eyes with clear water for at least fifteen (15) minutes. If irritation persists, consult an ophthalmologist.

INHALATION: If respiratory irritation occurs remove victim to fresh air. Seek medical attention if distress or irritation persists.

SKIN CONTACT: Remove from source of irritation. Remove any contaminated clothing and wash affected area(s) thoroughly with a mild soap and water. Launder clothing before reusing. If irritation persists, consult a physician.

INGESTION: If swallowed and person is conscious give 1 – 2 glasses of water. Keep exposed person at rest and immediately call physician. Never give anything by mouth to an unconscious person.

SECTION V – FIRE & EXPLOSION DATA

FLAMMABILITY: No
FLASH POINT (TEST METHOD): N/A - Aqueous based solution
EXTINGUISHING MEDIA AND INSTRUCTIONS:
Product will burn when exposed to fire. Use dry chemical, water spray, water fog, carbon dioxide, foam or sand/earth. Water jet not recommended (frothing possible)
SPECIAL FIREFIGHTING PROCEDURES:
Firefighters should be equipped to prevent breathing of vapor, mist or products of combustion. Use NIOSH approved self-contained breathing apparatus for organic vapors and wear appropriate clothing.

SECTION VI – HANDLING AND STORAGE

HANDLING: Consumption of food and beverages should be avoided in work areas where product is being used. After using product, always wash hands and face with soap and water before eating, drinking, or smoking.
STORAGE: Keep container closed when not in use. Use in well ventilated area. Store in a location well away from strong oxidizers. Keep product between 55°F and 120°F. Do not allow product to freeze.

DOT SHIP NAME: Non-regulated **CLASS:** Non-regulated **UN#:** Non-regulated
NFPA- FIRE: 0 **HEALTH**: 1 **REACTIVITY:** 0 **OTHER:**

SECTION VII– EXPOSURE CONTROL/PERSONAL PROTECTION

GLOVES: Neoprene gloves, especially if frequent or prolonged contact is expected.
RESPIRATORY PROTECTION: If high vapor or mist concentrations are expected, use NIOSH approved respirator for organic vapors.
EYE PROTECTION: Safety goggles or chemical splash goggles, especially if splashing is anticipated.
PROTECTIVE CLOTHING: Wear clothing to minimize skin contact, long sleeves, boots or shoes. Change clothing frequently if contaminated with product. Launder soiled work clothes before re-using. For casual contact PVC gloves are suitable, for prolonged contact use neoprene or nitrile gloves.
SPECIFIC ENGINEERING CONTROLS TO BE USED WITH THIS PRODUCT:
This material has a low vapor pressure and is not expected to present an inhalation hazard at ambient conditions. However, if vapor is generated as the product is heated, misted, or sprayed, adequate ventilation in accordance with good engineering practices must be provided to maintain concentrations below the specified exposure or flammable limits.
DISPOSAL PROCEDURE: Dispose in accordance with local, state and federal regulations.

SECTION VIII – PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT (F):	100-105°C
VAPOR DENSITY:	N/D
SPECIFIC GRAVITY:	1.03 – 1.06 @ 25°C
SOLUBILITY IN WATER:	Soluble
APPEARANCE & ODOR:	Pale yellow liquid, bland odor
POUR POINT:	N/D
pH:	7 – 9 (10% solution in water)
VOC CONTENT:	contains no VOC's

SECTION IX – STABILITY AND REACTIVITY

STABILITY: Stable under normal handling conditions.
CHEMICAL INCOMPATIBILITY: Strong oxidizers such as, but not limited to, hydro chlorite.
HAZARDOUS DECOMPOSITION PRODUCTS:
Combustion may yield carbon dioxide, carbon monoxide and oxides of sulphur.
HAZARDOUS POLYMERIZATION: This product is not subject to polymerization.
CONDITIONS TO AVOID: **S**trong acids and strong oxidizing agents.

SECTION X – TOXICOLOGICAL INFORMATION

EFFECTS OF OVEREXPOSURE
INHALATION: Vapors and mist may be irritating to nose, throat and mucous membranes. Bronchitis, pulmonary edema, and chemical pneumonitis may occur. Symptoms include irritation, coughing, chest pain and difficulty in breathing.
SKIN: Frequent or prolonged skin contact without adequate personal protection may be irritation to exposed skin and may lead to dermatitis.
EYES: Vapors may be irritating to eyes. Liquid or mist may also cause irritation in addition to burning and redness if exposure is severe.
INGESTION: Swallowing large amounts may cause nausea and vomiting.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:

Exposure to product without adequate personal protection may aggravate pre-existing respiratory disease or skin condition (such as dermatitis).

CARCINOGENICITY: **Based on studies to date SDC 12000 is not known to be carcinogenic to humans.**

SECTION XI– DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:

Consult your local authorities for regulations. Preferred waste management: recycle or reuse, incinerate with energy recovery, disposal in a licensed facility. Disposal facility should be compliant with state, local and federal government regulations.

SECTION XII – REGULATORY INFORMATION

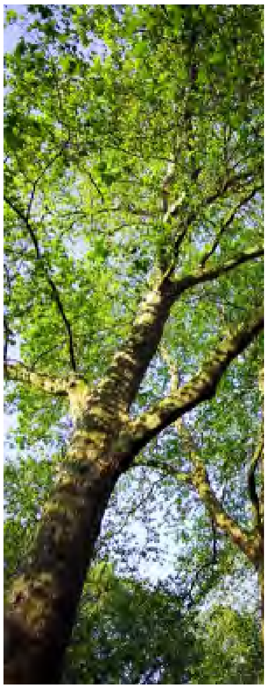
EPA SARA Title III hazard class:	acute health (irritant)
OSHA HCS hazard class:	N/A
EPA SARA Title III Section 313 (40CFR372) Toxic Chemicals present in quantities greater than the "de minimus" level are:	None

SECTION XIII – REGULATORY INFORMATION

ABBREVIATIONS AND SYMBOLS:

N.D.	- Not Determined	N.A.	- Not Applicable	N.T.	- Not Tested
<	- LESS THAN	>	- MORE THAN		

Appendix G Traffic Management Plan


Camellia West Remediation

Traffic Management Plan

June 2012

Statewide Planning

Mott MacDonald

Camellia West Remediation

Traffic Management Plan

June 2012

Statewide Planning

181 James Ruse Drive, Camellia

Mott MacDonald, Level 3, 90 Phillip Street, Parramatta, NSW 2150, Australia
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Issue and revision record

Revision	Date	Author	Checker	Approver	Description
A	12.06.12	D. Reilly	A. Hilly	C. Avis	For Client Review
B	29.06.12	A. Hilly	D. Reilly	C. Avis	For Client Review

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Content

1. Introduction

This Traffic Management Plan (TMP) has been prepared to accompany the documentation for the remediation (i.e. demolition, excavation, remediation and shoring) of the proposed Camellia West development. The TMP provides a management strategy for the remediation of the proposed development site and should be read in conjunction with the separate Remediation Waste Management Plan prepared by Mott MacDonald.

1.1 Aim of the TMP

The aim of this TMP is to:

- Set out access and egress requirements to be implemented prior to and during the remediation phase of the Camellia West development; and
- Coordination requirements.

The intended outcomes of the TMP are to:

- Minimise the disruption to the local traffic network;
- Allow the safe management of pedestrian and vehicle traffic throughout the duration of the project;
- Ensure road users are able to travel past or around work sites safely; and
- Ensure workers are protected in the vicinity of road works.

1.2 Project Description

1.2.1 Existing Site

The subject site is located at 181 James Ruse Drive, Camellia, and encompasses the western portion of a former industrial property. The site is bound by James Ruse Drive to the west, Parramatta River to the north, the Carlingford Rail Line to the east, and existing industrial properties to the south.

The existing site area of approximately 6.8Ha is predominantly vacant with areas of light vegetation, bitumen roads and concrete slabs on ground.

The land has a history of use by contaminating type industry and it is proposed that voluntary remediation of the site will be undertaken. This will be carried out in accordance with the Remedial Action Plan (RAP) associated with the current development.

1.2.2 Proposed Development

The proposed works consists of two phases; the remediation of the site, and the future construction of a multi storey mixed-use development. The proposed development is to include a mix of residential (approximately 183,900m^2 GFA), commercial (approximately 43,700m^2 GFA) and open space uses. The proposed buildings will be spread across the site with 2 levels of underground car parking capacity.

1.3 Quality Assurance

All tasks undertaken in relation to the project whether they be physical construction activities, office duties or procedural tasks; are to be undertaken in accordance with the following measures:

- Suppliers and contractors shall provide assurance of the quality of all goods, materials and services to be provided; and
- All materials and works are to be undertaken to the manufacturers' specification or industry standards.

2. Pre-Remediation Phase

Prior to start of remediation on-site, licenses and approvals and staff training are required, as set out below:

2.1 Approvals / Permits

The specific license or permit requirements for project activities will be the responsibility of the Project Manager and the Contractor. The Contractor will abide by all approvals and permits.

2.2 Training

Prior to commencing remediation activities, all of the Contractor's employees shall attend a project induction workshop carried out by the Contractor. This shall be documented and all participants are to sign an attendance sheet. Typically, the workshop would cover environmental aspects of the project, including the major environmental hazards, environmental management responsibilities (under the *Protection of the Environment Operations Act 1997* and as set out in this CECMS), the main proposed in-site controls and the reporting procedure for any incidents.

2.3 Preliminary Remediation (Compound Establishment)

The site compound shall be located as far away as practical from any residential areas, the defined Parramatta River watercourse (including the riparian zone) and nearby rail corridor. The compound area shall be clearly marked out prior to any establishment activities. All necessary erosion and sediment controls for the compound site, in the form of drains and sediment fences, shall be installed prior to site establishment of the compound. Noise attenuation devices, if required shall be installed and protection provided to any existing sewer carriers or service mains, which traverse the site.

3. Remediation Management

3.1 Access and Egress Management

Access and egress management is to be implemented to control the remediation, visitor vehicle and pedestrian movements both internal and external of the site.

Access and egress management throughout the duration of the remediation phase will be implemented by the following methods:

- Vehicle movements entering and leaving the site throughout the duration of the remediation process are to be in accordance with the regulations set by the *Traffic Control at Work Sites* manual 1998 RTA. Heavy vehicle movements are to enter and exit the site via Tasman Street from James Ruse Drive. Site access through the site area adjacent to the existing rail corridor will not be permitted. Access arrangements and vehicle movements to and from the site will be managed and controlled by site personnel.
- Trucks travelling to and from the site are to follow designated travel routes:
  - Approach Routes:
    - James Ruse Drive, right turn lane into Tasman Street (southern approach); and
    - James Ruse Drive, left turn to Tasman Street (northern approach).
  - Departure Routes:
    - Tasman Street, left turn into James Ruse Drive (to the south)
    - Tasman Street, left turn into James Ruse Drive, Western Motorway (to the east and west); and
    - Tasman Street, left turn into James Ruse Drive, Western Motorway, Silverwater Road (to the north).

  The designated truck routes to and from the site are proposed to restrict truck traffic, as far as possible, to the main road network through the area.
- Pedestrian movement along Tasman Street is to be diverted away from the vicinity of the work site by

erecting signage at each ends of Tasman Street, directing pedestrians to use the southern footpath. Pedestrian movements along James Ruse drive are to be protected through the use of adequate fencing/hoarding to provide a physical barrier to remediation works. If necessary, pedestrians can be directed to use the western side of James Ruse Drive through the implementation of adequate signage.

Refer to Appendix A for the Site Management Plan.

3.2 Site Management Plan

This detailed pedestrian and traffic management plan is to be implemented during the remediation phase to control traffic throughout the course of the works as well as manage other waste management practices.

3.2.1 Truck Shake Down

A truck shakedown facility will be constructed at each main entry to the site. Truck shakedowns will be used to prevent sediment and other material being tracked onto the adjoining roadways by vehicles.

3.2.2 Work Zones

It is not envisaged that work zones will be required on the site. Should these be required it will be co-ordinated through Parramatta City Council.

3.2.3 Road Occupation and Footpaths

Fencing will be aligned parallel to the northern kerb of Tasman Street and continue from the eastern boundary to James Ruse Drive for the extent of the development area. A gate will be erected along Tasman Street at the frontage of the development to provide access to the site. As there are only minor traffic movements through the area, there will be minimal disruption to traffic.

3.2.4 Pedestrian Management

Pedestrian movement during the remediation phase will not be adversely affected by the remediation works as these works will be carried out in stages. Pedestrian access will be maintained at all times along James Ruse Drive. There is sufficient room for minor diversions along Tasman Street for pedestrian movements for on-site personnel only.

3.2.5 Remediation Waste

Prior to the disposal of any material to land fill, a classification of the material is required to determine how the material should be managed. This classification is made against the NSW EPA Waste Classification Guidelines. Any material containing asbestos is automatically classified as asbestos waste and must be handled and disposed of accordingly. Containment within the proposed containment-cell is deemed a suitable disposal practice for the asbestos contaminated material and a valid form of site remediation.

Additionally, refer to the associated Remediation Waste Management Plan (WMP) to ensure that if possible, resources are conserved and non-contaminated waste is recycled responsibly to minimise waste generation within the site.

An accredited waste disposal company will be engaged to control site waste management and dispose of waste correctly.

The table below lists all non-contaminated materials extracted and diverted from landfill:

Mott MacDonald

Material	Re-Use
Dirt / Sand / Clay	Turf Underlay, Soil Mixes, Land Development
Asphalt	Road Bases
Bricks / Rubble	Aggregates, Road Base, Drainage, Paving
Concrete	DGB Road Base, Aggregates, Paving
Black Iron Steel	Recycled into all new Steel products
Copper	Recycled into all new Copper products
Aluminium	Recycled into all new Aluminium products
Stainless Steel	Recycled into all new Stainless products
Timber	Wood Chip, Garden Mixes
Plastics (PVC)	Recycled into all new PVC products
Cable Drums	Direct reuse or timber chip
Gas Bottles	Direct reuse
Cardboard	Recycled into new Cardboard products
Paper	Recycled into new Paper

3.2.6 Protection of the Site

Prior to any works commencing onsite the builder will erect a solid fence (timber hoarding – Type A) at 2.4 metre high that will protect pedestrians and property. The builder will erect the hoarding along the Tasman Street and James Ruse Drive frontage boundaries up to the dedication area.

3.2.7 Support of Neighbouring Buildings/Areas

There are no adjoining buildings to the remediation works. Parramatta River/Carlingford Rail Line traverse the site along the northern and eastern boundaries respectively and are to be maintained in the proposed works.

3.2.8 Site Drainage

There will be a sediment barrier installed around the perimeter of the fencing (where the fencing is on soil) to protect windblown materials from entering the Councils stormwater system. Further sediment barriers / hay bales and or sand bags will be deployed to all stormwater pits in the vicinity of the site to contain any stormwater runoff from site.

3.2.9 Site Offices and Amenities

Site offices, toilet facilities, change rooms and lunch rooms will be located within the site compound. The location of amenities will facilitate a safe passage to and from the work site and meet all requirements.

3.2.10 Workers Parking

No parking areas are available on-site.

3.2.11 Crane Plant and Equipment

No equipment is to be established within the existing rail corridor along the eastern boundary.

3.2.12 Signage

Appropriate signage will be displayed during the staged remediation works.

During remediation “Unauthorised Entry to the work site is prohibited” will be displayed. Contact details of the person in charge so that the person may be contacted outside work hours. Other signage such as helmets, safety boots and first aid will be located around the fencing and at the two main gate locations.

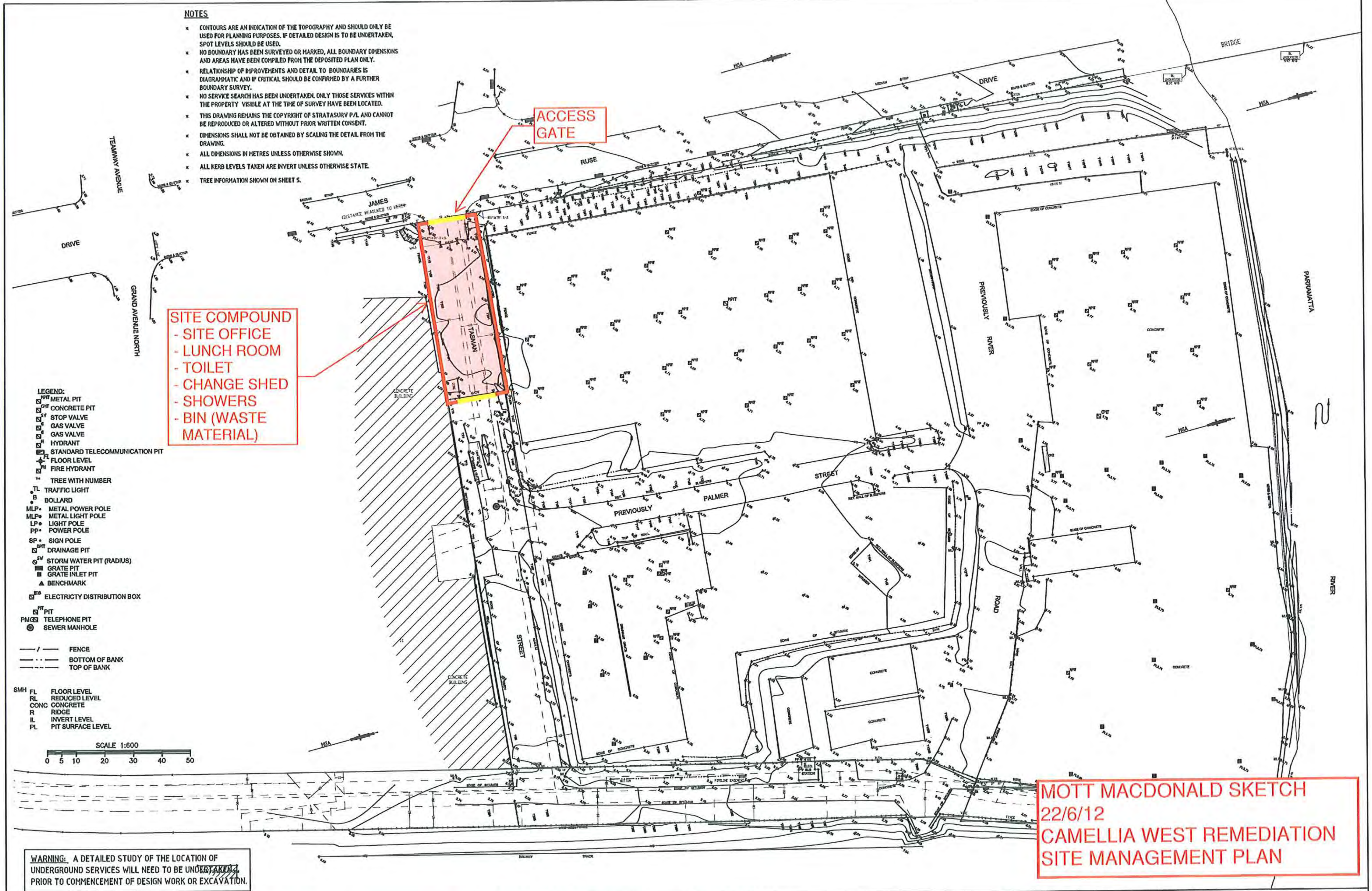
3.2.13 Working hours

The site will operate between the hours of 7.00am – 5.30pm Monday to Friday and 7.00am- 4.00pm Saturday.

Appendix A. Site Management Plan

NOTES

- CONTOURS ARE AN INDICATION OF THE TOPOGRAPHY AND SHOULD ONLY BE USED FOR PLANNING PURPOSES. IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED.
- NO BOUNDARY HAS BEEN SURVEYED OR MARKED, ALL BOUNDARY DIMENSIONS AND AREAS HAVE BEEN COMPILED FROM THE DEPOSITED PLAN ONLY.
- RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A FURTHER BOUNDARY SURVEY.
- NO SERVICE SEARCH HAS BEEN UNDERTAKEN. ONLY THOSE SERVICES WITHIN THE PROPERTY VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED.
- THIS DRAWING REMAINS THE COPYRIGHT OF STRATASURV P/L AND CANNOT BE REPRODUCED OR ALTERED WITHOUT PRIOR WRITTEN CONSENT.
- DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DETAIL FROM THE DRAWING.
- ALL DIMENSIONS IN METRES UNLESS OTHERWISE SHOWN.
- ALL KERB LEVELS TAKEN ARE INVERT UNLESS OTHERWISE STATE.
- TREE INFORMATION SHOWN ON SHEET 5.



WARNING: A DETAILED STUDY OF THE LOCATION OF UNDERGROUND SERVICES WILL NEED TO BE UNDERTAKEN PRIOR TO COMMENCEMENT OF DESIGN WORK OR EXCAVATION.

REV	DATE	REVISION DETAILS	DESIGN	SURV	DWN	CHK
C	29.10.07	SITE PLAN ADDED			PL	PS
B	22.10.07	BOUNDARIES, EASEMENTS & INTERSECTION ADDED		KB	PL	PS
A	28.09.07	PLAN ISSUED		J.M. & P.L.	K.C.	P.S.

CLIENT DETAILS: CHARLIE DEMIAN

KEY:

DATE OF SURVEY	28.08.07
ORIGIN OF RL'S	SSM 50207, RL 4.281
DATUM	AHD
CONTOUR INTERVAL	NA
CAD REF FILE:	

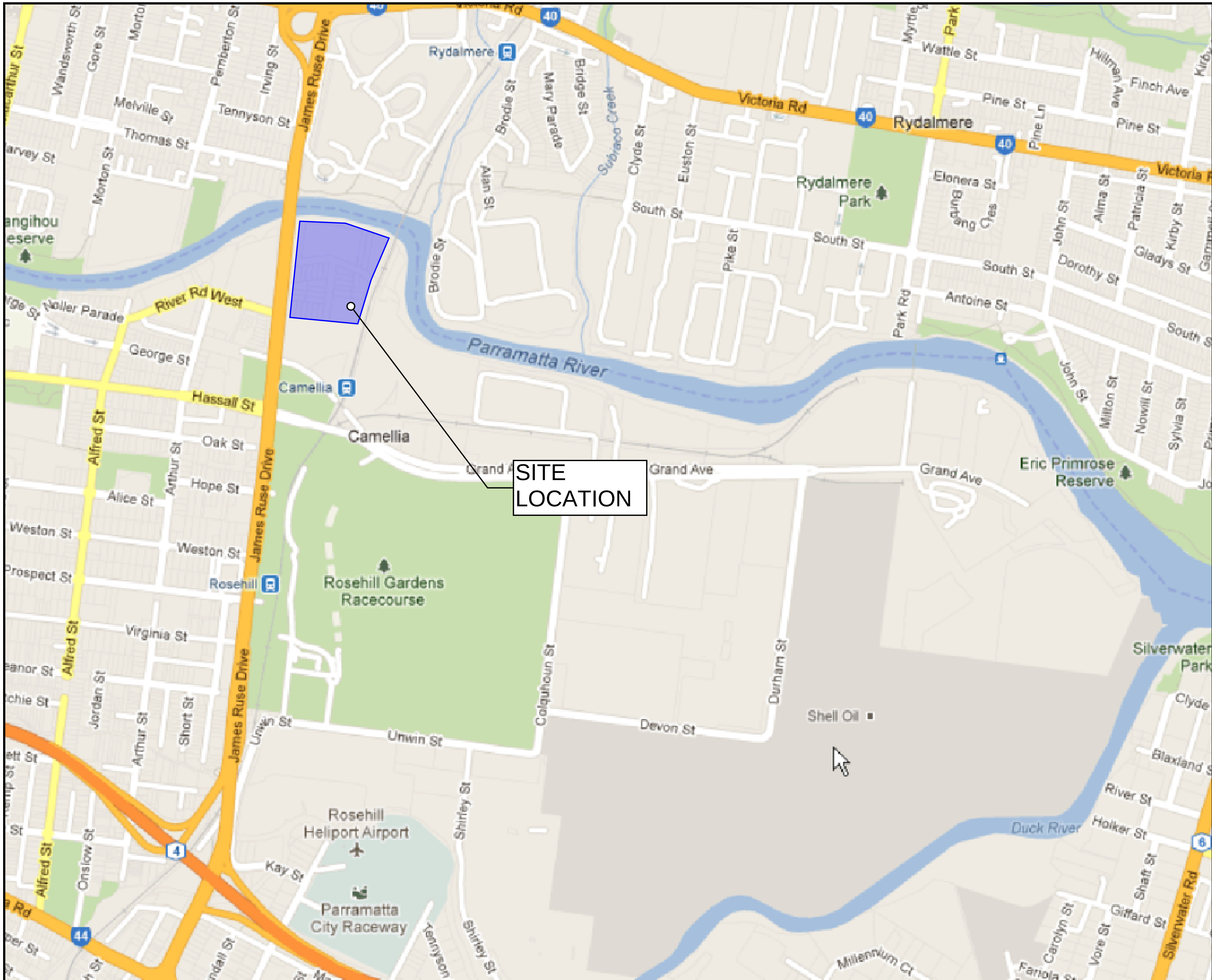
PROJECT: CAMELLIA (WEST) JAMES RUSE DRIVE

STRATASURV
REGISTERED SURVEYORS
DEVELOPMENT CONSTRUCTION STRATUM
Sydney · Melbourne · Brisbane · Newcastle · Gold Coast
TEL: +61 9715 1133 FAX: +61 9715 1144
EMAIL: surveyors@stratasurv.com.au

DRAWING TITLE: PLAN SHOWING DETAIL OF CAMELLIA (WEST)

DRAWING NUMBER	Sheet	Sheets	SCALE	REVISION
2226 - 01	06 OF	06	1:600@A1	B2

Appendix B. Site Location



Drawing1.dwg Jun 22, 2012 - 10:53AM rei55920

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	22.06.12	DR	ISSUED FOR INFORMATION	AH	-

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W www.mottmac.com.au

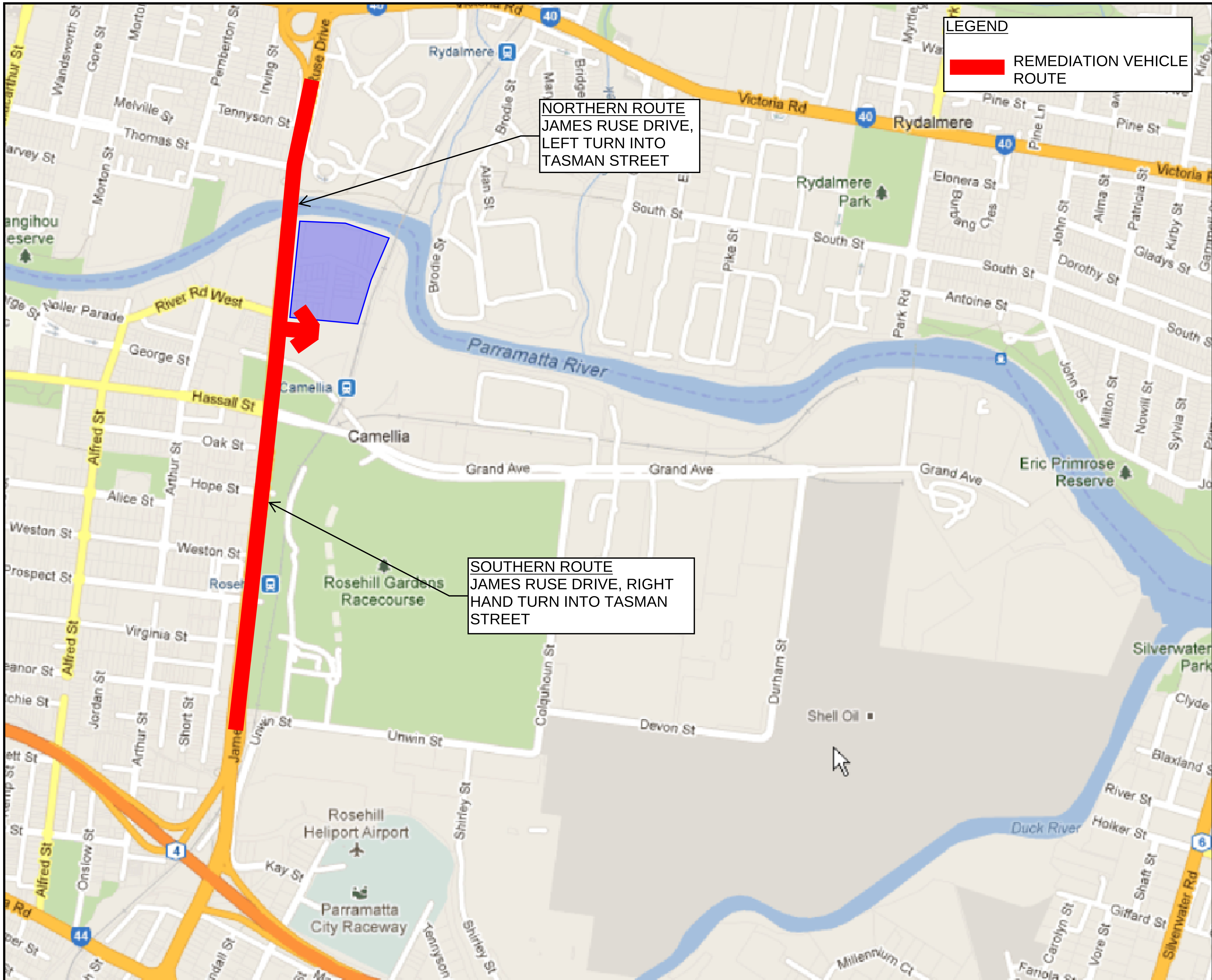
Client
DEMIAN GROUP

Title
CAMELLIA WEST
REMEDIATION SITE LOCATION
PLAN

Designed	DR		Eng check	X
Drawn	DR		Coordination	X
Dwg check	AH		Approved	X
Scale at A1: NTS		Status: PRE		Rev: P1

Drawing Number
MMD-308388-C-SK-00-XX-0100

Appendix C. Truck Vehicle Movements



Drawing1.dwg Jun 22, 2012 - 10:53AM rei55920

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	22.06.12	DR	ISSUED FOR INFORMATION	AH	-

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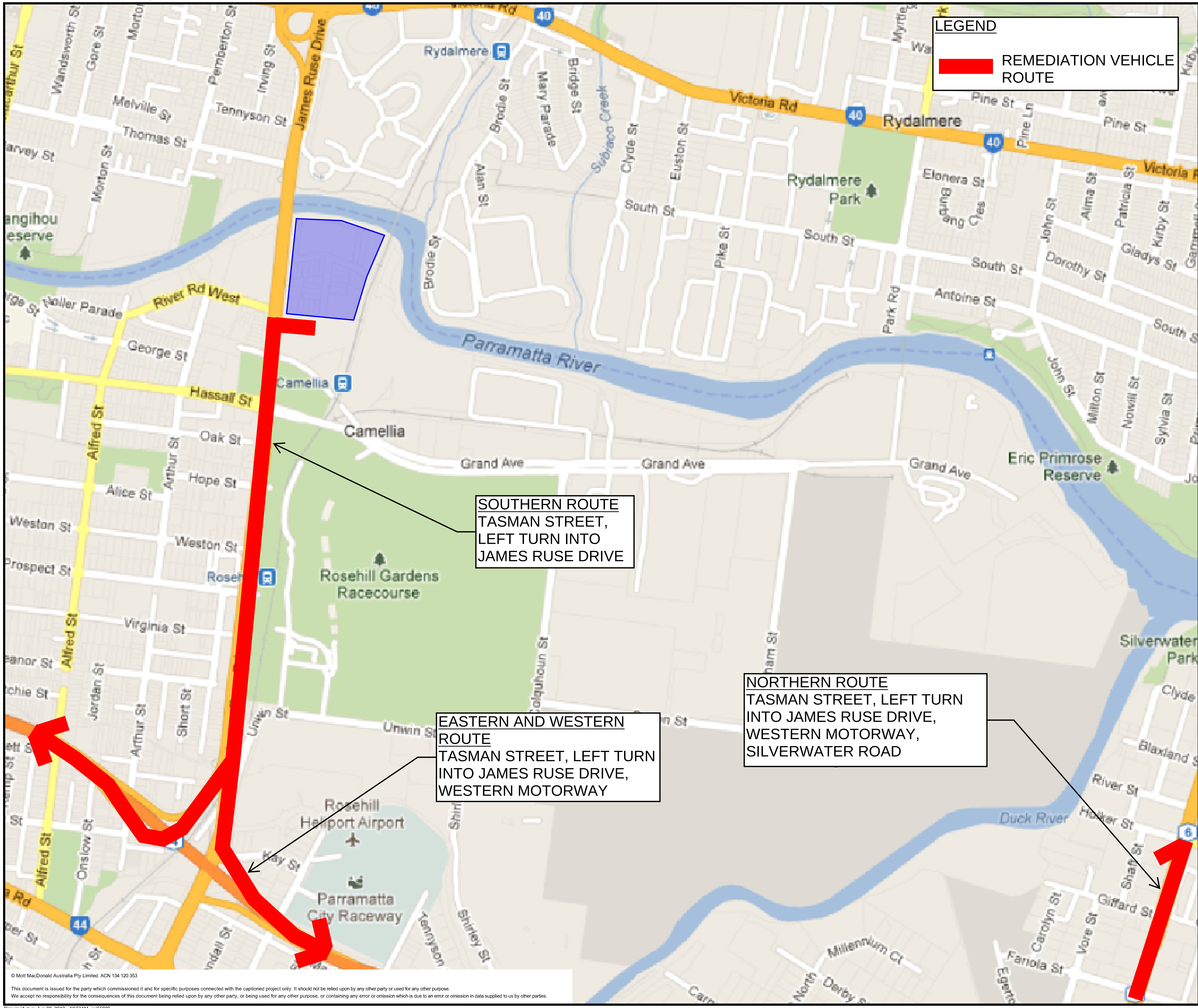
Client
DEMIAN GROUP

Title
CAMELLIA WEST
REMEDIATION TRUCK VEHICLE
MOVEMENTS - APPROACH ROUTES

Designed	DR		Eng check	X
Drawn	DR		Coordination	X
Dwg check	AH		Approved	X

Scale at A1	Status	Rev
NTS	PRE	P1

Drawing Number
MMD-308388-C-SK-00-XX-0101



Drawing1.dwg Jun 22, 2012 - 10:53AM rei55920

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	22.06.12	DR	ISSUED FOR INFORMATION	AH	-

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Client
DEMIAN GROUP

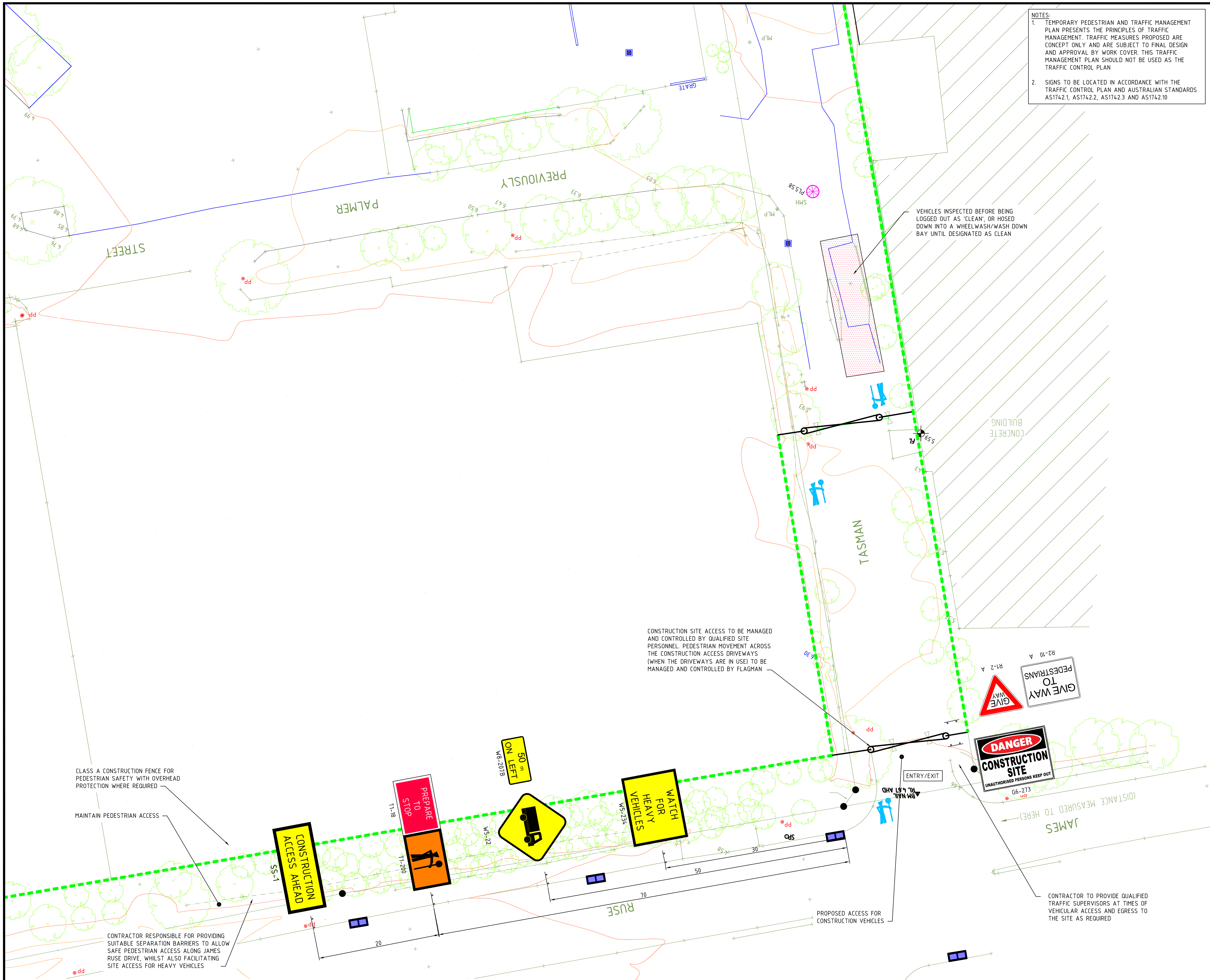
Title
CAMELLIA WEST
REMEDIATION TRUCK VEHICLE MOVEMENTS - DEPARTURE ROUTES

Designed	DR		Eng check	X
Drawn	DR		Coordination	X
Dwg check	AH		Approved	X

Scale at A1	Status	Rev
NTS	PRE	P1

Drawing Number
MMD-308388-C-SK-00-XX-0102

Appendix D. Pedestrian and Traffic Management Plan



NOTES:

1. TEMPORARY PEDESTRIAN AND TRAFFIC MANAGEMENT PLAN PRESENTS THE PRINCIPLES OF TRAFFIC MANAGEMENT. TRAFFIC MEASURES PROPOSED ARE CONCEPT ONLY AND ARE SUBJECT TO FINAL DESIGN AND APPROVAL BY WORK COVER. THIS TRAFFIC MANAGEMENT PLAN SHOULD NOT BE USED AS THE TRAFFIC CONTROL PLAN
2. SIGNS TO BE LOCATED IN ACCORDANCE WITH THE TRAFFIC CONTROL PLAN AND AUSTRALIAN STANDARDS AS1742.1, AS1742.2, AS1742.3 AND AS1742.10

Notes

2 0 5 10 20

PLAN SCALE 1:300 @ A1

Key to symbols

LEGEND

- WASH DOWN AREA
- TRAFFIC CONTROLLER
- TEMPORARY TRAFFIC MANAGEMENT SIGN
- CLASS A CONSTRUCTION FENCE

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd

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Client

STATEWIDE PLANNING PTY LTD

Title

CAMELLIA WEST REMEDIATION - TEMPORARY PEDESTRIAN AND TRAFFIC MANAGEMENT PLAN

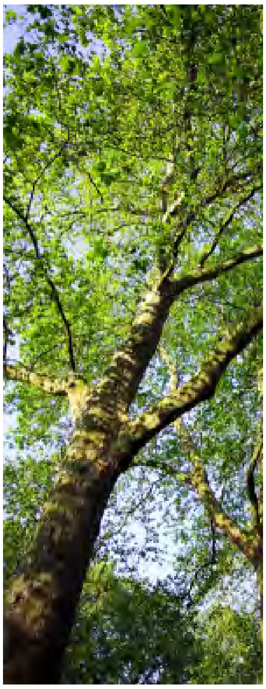
Designed	A HILLY		Eng check	A HILLY
Drawn	A PACIBEN		Coordination	C AVIS
Dwg check	A HILLY		Approved	C AVIS
Scale at A1 1:300		Status PRE		Rev P1

Drawing Number

MMD-308388-C-DR-00-XX-0200

P:\Parramatta\Projects\30xxxx\308388\8.0 Drawings\7.1 Internally Produced\Technical Software Files\MMD-308388-C-DR-00-XX-0200.dwg Jun 29, 2012 - 3:16PM pac55913

Appendix H   Waste Management Plan

Camellia West Remediation

Waste Management Plan

July 2013

Statewide Planning

Mott MacDonald

Camellia West Remediation

Waste Management Plan

July 2013

Statewide Planning

181 James Ruse Drive, Camellia

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Mott MacDonald

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	12.06.12	D. Reilly	A. Hilly	C. Avis	For Client Review
B	29.06.12	D. Reilly	A. Hilly	C. Avis	For Client Review
C	21.02.2013	D. Reilly	A. Hilly	C. Avis	Waste material quantities revised
D	05.07.2013	D. Reilly	A. Hilly	C. Avis	Waste material quantities revised

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Content

1. Introduction

This Waste Management Plan (WMP) has been prepared to accompany the documentation for the remediation (i.e. demolition, excavation, remediation and shoring) of the proposed Camellia West development and should be read in conjunction with the separate Remediation Traffic Management Plan prepared by Mott MacDonald.

In developing the WMP, we have carried out the following:

- Estimate the type and volume of waste materials which are expected to be generated during the demolition phase of the project;
- Estimate the types and volumes of waste materials which are expected to be generated during the excavation and remediation phases of the project.

As such, the WMP presents a general plan, the details of which may change depending on future contractual, physical and regulatory constraints.

2. Waste Management Plan

2.1 Proposal

Camellia West

181 James Ruse Drive, Camellia 2142

2.2 Applicant

Statewide Planning Pty Ltd

PO Box 411, Parramatta 2124

Ph: (02) 8830 0400

2.3 Existing Site

The subject site is located at 181 James Ruse Drive, Camellia, and encompasses the western portion of a former industrial property. The site is bound by James Ruse Drive to the west, Parramatta River to the north, the Carlingford Rail Line to the east, and existing industrial properties to the south.

The existing site area of approximately 6.8Ha is predominantly vacant with areas of light vegetation, bitumen roads, concrete slabs on ground, and light metal structures.

2.4 Project Description

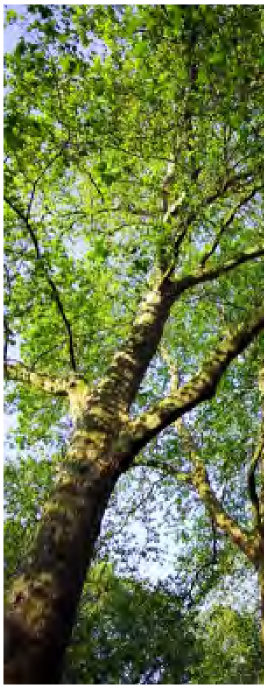
The proposed works consists of two phases; the remediation of the site, and the construction of a new multi storey mixed-use development. The proposed development is to include a mix of residential (approximately 183,900m^2 GFA), commercial (approximately 43,700m^2 GFA) and open space uses. The proposed buildings are to include 14 towers spread across the site with 2 levels of underground car parking capacity.

The following table outlines the waste material volumes that will be expected during the remediation phase of the project. It also describes the process in which the waste materials will be managed (utilised/recycled or disposed of).

3. Remediation Phase

Materials On Site		Re-Use and Recycling		Disposal Off-Site
Expected Waste Materials	Estimated Volume	On-Site	Off - Site	
Fill/ Excavation Material, including Hazardous Waste (asbestos, contaminated fill)	89,023m^3	Ensure excavation/hazardous materials are handled and disposed of correctly by licensed contractors to on-site containment cell.	Nil	Nil
Trees, Vegetation	60m^3	Separated. Some chipped, mulched and stored on site for reuse in landscaping.	Remainder to nearest Parramatta City Council waste depot.	Nil
Road Material	1,200m^3	Milled on-site for use as road base and structural fill	Remainder to nearest Parramatta City Council waste depot.	Unsuitable to nearest recycle / waste landfill
Concrete	9,000m^3	Excess material to be used as granular fill, levelling materials and road base.	Remainder to nearest Parramatta City Council waste depot.	Unsuitable to nearest recycle / waste landfill
Metal Structures – Fencing, signage	10m^3	Nil	Remainder to nearest Parramatta City Council waste depot.	Unsuitable to nearest recycle / waste landfill
Timber – Retaining Walls, Fencing	10m^3	Nil	Remainder to nearest Parramatta City Council waste depot.	Unsuitable to nearest recycle / waste landfill
Existing services to be demolished	1,500m	Nil	Remainder to nearest Parramatta City Council waste depot.	Unsuitable to nearest recycle / waste landfill

Appendix I Soil and Water Management Plan


Camellia West Remediation

Soil and Water Management Plan

September 2012

Statewide Planning

Mott MacDonald

Camellia West Remediation

Soil and Water Management Plan

September 2012

Statewide Planning

181 James Ruse Drive, Camellia

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Issue and revision record

Revision	Date	Author	Checker	Approver	Description
A	29.06.12	A. Hilly	J. Gilligan	C. Avis	DRAFT - For Client Review
B	11.09.2012	A. Hilly	J. Gilligan	C. Avis	Final – For Client Review

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Content

1. Introduction

This Soil and Water Management Plan (SWMP) has been prepared to accompany the documentation for the remediation (i.e. demolition, excavation, remediation and shoring) of the proposed Camellia West development. The SWMP provides a strategy for the management of stormwater and wastewater deposited or generated during the remediation process of the proposed development site.

1.1 Aim of the SWMP

The aim of this SWMP is to address the management of stormwater and waste water deposited or generated during the remediation works.

The intended outcomes of the SWMP are to outline procedures to be implemented to provide erosion, sediment and pollution control integration with stormwater and wastewater management.

1.2 Project Description

1.2.1 Existing Site

The subject site is located at 181 James Ruse Drive, Camellia and encompasses the western portion of a former industrial property. The site is bound by James Ruse Drive to the west, Parramatta River to the north, the Carlingford Rail Line to the east and existing industrial properties to the south.

The existing site area of approximately 6.8Ha is predominantly vacant with areas of light vegetation, bitumen roads and concrete slabs on ground.

The land has a history of use by contaminating type industry and it is proposed that voluntary remediation of the site will be undertaken. This will be carried out in accordance with the approved Remedial Action Plan (RAP) associated with the current development.

1.2.2 Proposed Development

The proposed works consists of two phases; the remediation of the site, and the future construction of a multi storey mixed-use development. The proposed development is to include a mix of residential, commercial and open space uses. The proposed buildings will be spread across the site with two levels of underground car parking capacity.

2. Soil and Water Management

Throughout the remediation phase, provision for minimising the impact of erosion and sedimentation on the local and surrounding environment should be of high importance considering the nature of contamination within the subject site.

The following principles for managing these impacts include;

- Erosion Control – can be achieved through proper management of runoff at non-erosive velocity, minimising exposed area during excavation works and providing protection to the soil surface.
- Sediment Control – involves trapping and containing the soil particles that have been eroded.

Erosion and sediment generation during the remediation phase of works will be unavoidable. Proper planning for this occurrence can reduce the potential for erosion but control measures.

2.1 Soil & Water Management

Removing the vegetation/pavement cover from an area leaves the underlying soil susceptible to erosion by stormwater run-off. Run-off can convey sediment from the remediation/construction site and deposit it into the downstream waterways, resulting in a reduction in water quality and a potential contamination hazard to the environment.

The remediation earthworks for the Camellia West development involve land disturbance to approximately 6.0Ha of land (total site area = 6.8Ha). To control the expected sediment build up on the site during the remediation process, staged erosion and sediment control measures have been prepared and will be enforced during the remediation phase of the development.

The work under this part comprises the provision of a complete soil and water management facility to control the erosion and promote sedimentation of any eroded material. The control facilities will convey all overland flows through the particular control facilities as nominated on the associated plans attached in Appendix A of this report.

The soil and water management system shall be installed, constructed and maintained in accordance with the NSW Department of Housing's "Managing Urban Stormwater; Soils and Construction." The work shall be undertaken in a manner that the erosion risk is minimised and those disturbed surfaces are progressively stabilised.

Assessment for the extent of the site preparation and erosion control measures required for this development is to be undertaken. All of this work is to be carried out within the development site prior to the commencement of any works that will increase the potential of erosion from the site.

2.1.1 Environmental Issues

The objectives of the SWMP are:

- To control the erosion of soil from disturbed areas on the site;
- To protect downstream water quality and prevent any sediment laden water from leaving the existing site;
- To provide rehabilitation for disturbed areas; and
- To establish an ecologically sustainable system of pollution control works during rehabilitation/construction.

2.1.2 Compliance and Best Practice Regulations

All site personnel will be required to minimise land disturbance to essential rehabilitation areas only with the purpose of reducing the soil erosion hazard on site.

Appropriate erosion and sediment controls are included in Appendix A. Through appropriate implementation of this SWMP, the impact on the natural and physical environment will be minimised. The plan is to be consistent with the objectives as outlined in the NSW Government Publication “Managing Urban Stormwater” March 2004 (“Bluebook”).

All soil and water management facilities shall comply with the NSW Government’s “Managing Urban Stormwater, Soils and Construction”. Where a particular type of facility is required, details are specified on the Soil and Water Management plans.

2.1.3 Work Instructions

The risk of sediment pollution of the waterways shall be minimised in accordance with the requirements of the Blue Book:

Where practical the following principles shall be applied for the control of erosion and sedimentation:

- Stabilisation of denuded areas shall commence as soon as possible but no later than thirty days following the areas being disturbed;
- Stabilisation of disturbed areas shall be hydro mulched with native seed mix (seed mix sourced from others);
- Stabilisation of disturbed areas shall be in accordance with the Specification for Grassing and/or Specification for Landscape Works as outlined in the Parramatta City Council’s Civil Works Specification;
- All temporary earth diversion channels/banks and sediment basin embankments shall be seeded as soon as possible but within fifteen days of completion of their earthworks;
- Stabilisation of all cut and fill slopes shall be undertaken as soon as possible but within fifteen days of completion of formation;
- All stabilisation measures shall be undertaken prior to issue of the Certificate of Practical Completion; and

- All stabilisation works are to be relocated or decommissioned and removed off site upon instruction by the superintendent.

Sediment basin storage will be provided in the location as shown on the design plans. Construction and maintenance of the sediment basins will be in accordance with the Blue Book.

If necessary, the settled water will be treated with a flocculation agent to assist in the settlement of fine particles. Flocculation will be undertaken in accordance with the Blue Book. If necessary, additional flocculation will also be undertaken to reduce contaminates including phosphorous, chlorine and salinity. Before any water is discharged, tests will be undertaken to determine the suitability and acceptability of the waters for release into the downstream drainage system.

A construction sequence shall be implemented to ensure all sediment control measures are in place before the commencement of any significant work practice on site.

The contractor will be required to implement and maintain a self-auditing program in accordance with Chapter 8 of the Blue Book. The Contractor must keep a complete set of the self-audit records on-site and make them available to SCC, NSW DECC, or any other authorised person on request.

Water quality samples will be required at regular intervals at the downstream end of sediment basins or other locations as directed by the superintendent. Samples will be tested by the principal appointed environmental consultant for suspended solids, pH and other tests as directed by the superintendent.

All records will be kept on site and made available to the DECC, Parramatta City Council and any other authorised person upon request.

A self-auditing program will be established based upon a checklist sheet. A site inspection using the checklist is required to be undertaken by the contractor's site manager:

- At least weekly;
- Immediately before site closure; and
- Immediately following rainfall events in excess of 5mm.

All sediment detention systems are required to be kept in good working condition. Particular attention will be given to:

- Recent works to ensure that they have not resulted in diversion of sediment laden water;
- Degradable products to ensure they are replaced as required; and
- Sediment removal to ensure the design capacity or less remains in the settling zone.

The location of each soil and water management facility shall be determined from the details on the attached drawings, unless otherwise directed by the Superintendent.

Additional erosion and/or sediment control works may be required to be constructed as they become necessary to ensure the desired protection is given to downstream lands and drainage systems.

All sediment and erosion control devices shall be maintained in a satisfactory working order throughout the works or until such earlier time as the area above has been stabilised and the Superintendent directs that the device be removed.

Inspect the devices after all storm events for structural damage or clogging by silt and other debris and make prompt repairs or replacement.

Gravel or other filter materials shall be cleaned and restacked or replaced when directed by the Superintendent to maintain effective performance.

In the case of the temporary construction exit, the contractor shall undertake daily surface cleaning to remove all build up of foreign material to the satisfaction of the Superintendent.

All works are to be contained wholly within the development site. If it becomes necessary to undertake work outside the property boundary of the site the relevant authority or owner shall be notified of the proposed works.

2.1.4 Responsibility

It is the contractor's responsibility to ensure that all sediment and erosion control practices outlined in the engineering plans and the regulatory requirements are implemented and that all reasonable measures are taken to minimise the risk of sediment and other pollutants being carried from the site by stormwater run-off.

At all times, the Contractor shall ensure that the disturbed areas are maintained with an even surface gradient that will enable surface water to drain freely to the sediment fences and discharge points.

In areas subject to prolonged exposure and/or where the nature of the surface is considered highly prone to erosion, the Superintendent may direct that one or more of the following control measures be implemented:

- Intercept or divert runoff from exposed areas by constructing diversion channels or bunds in accordance with the NSW Department of Housing's "Managing Urban Stormwater, Soils and Construction."
- Establish temporary and permanent vegetation or mulching. Temporary and/or permanent ground cover shall be established on disturbed areas as directed by

the Superintendent and in accordance with the Specification for grassing.

- Construct and maintain sediment traps at appropriate locations in accordance with the NSW Department of Housing's "Managing Urban Stormwater, Soils and Construction."

All necessary works and materials including excavation, supply, fixing, lay, installation of stakes, ties, silt barriers, straw bales, seeding material and sundry equipment required for the installation of the soil and water control facilities shall be provided.

3. Hydrological Sediment Basin Calculations

Sediment Basin calculations were undertaken for the remediation phase of the project through the use of hydrological calculations set out in the Blue Book.

Total disturbed catchment areas were calculated based on Remediation zones set out by Statewide Planning Pty Ltd. These zones are set out and shown in the attached Soil and Water Management plans in Appendix A.

3.1.1 Soil Type

The soil type present in the subject site is classified a Disturbed Landscapes (xx) with underlying Glenorie (gn) class.

The soil texture group is a Class D (dispersive clay).

3.1.2 Rainfall Data

Rainfall data generated by the Bureau of Meteorology (BoM) was used with a design rainfall depth of 5 days from the 75th percentile. Rainfall intensity of the 2 year, 6 hour storm was used to calculate a Rainfall Erosivity factor (R-factor) of 2630.

Storm Flow calculations were then undertaken to calculate the peak flows for each of the remediation zones at the time of their disturbance. Intensities are generated for the 1, 5, 10, 20, 50 and 100 year ARI events and an applied frequency factor (F_y) generates the peak flow.

3.1.3 Volume of Sediment Basins

Settling zone volumes are then calculated to provide capacity to contain all runoff expected from the 75th percentile rainfall event. The volume of the basins settling zone is then determined as a function of the basin's surface area and depth to allow for particles to settle.

A sediment storage zone is then calculated as 50% of the settling zone. These two are then combined to achieve the total basin storage requirement. The detailed calculations of the sediment basin storage required for each of the remediation zones is found attached in Appendix B.

Appendices

Appendix A. Soil and Water Management Plans

SOIL AND WATER MANAGEMENT NOTES

SWM1 THIS IS A CONCEPTUAL SOIL AND WATER MANAGEMENT PLAN (SWMP) ONLY, AND SHOWS A POSSIBLE WAY OF MANAGING SOIL EROSION. THE CONTRACTOR SHALL PREPARE A DETAILED PLAN AND OBTAIN APPROVAL FROM THE RELEVANT AUTHORITY - PRIOR TO THE COMMENCEMENT OF ANY WORKS.

SWM2 THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, AND ANY OTHER PLANS, WRITTEN INSTRUCTIONS, SPECIFICATION OR DOCUMENTATION THAT MAY BE ISSUED AND RELATING TO DEVELOPMENT OF THE SUBJECT SITE.

SWM3 THE CONTRACTOR WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE CONSISTENT WITH 'MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION' - ALSO KNOWN AS 'THE BLUE BOOK'.

SWM4 ALL BUILDERS AND SUB-CONTRACTORS SHALL BE INFORMED OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS.

SWM5 WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, IE THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.

SWM6 "SEDIMENT" FENCING WILL BE INSTALLED AS INDICATED ON THE PLANS AND AT THE DIRECTION OF SITE SUPERINTENDENT TO ENSURE CONTAINMENT OF SEDIMENT. THE SEDIMENT FENCING WILL OUTLET OR OVERFLOW UNDER STABILISED CONDITIONS INTO THE SEDIMENT BASIN, TO SAFELY CONVEY WATER INTO A SUITABLE FILTERING SYSTEM SHOULD THE PORES IN THE FABRIC BLOCK.

SWM7 THE SEDIMENT RETARDING BASINS WILL BE CONSTRUCTED WITH THE MINIMUM WET SEDIMENT CAPACITY OF 200 CUBIC METRES AND DESIGNED TO REMAIN STABLE IN AT LEAST THE 1 : 20 YEAR, CRITICAL DURATION STORM EVENT. ARTIFICIAL FLOCCULATION OF THE FINER PARTICLES MAY NOT BE NECESSARY IN THIS INSTANCE.

SWM8 STOCKPILES WILL NOT BE LOCATED WITHIN 2m OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS AND DRIVEWAYS. WHERE THEY ARE BETWEEN 2m AND 5m METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, EG. THROUGH INSTALLATION OF "SEDIMENT" FENCING.

SWM9 DURING WINDY WEATHER, LARGE, DISTURBED, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.

SWM10 UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

SWM11 WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE :

INSTALL A "SEDIMENT" FENCE ALONG THE BOUNDARY OR WHERE REQUIRED AS SHOWN ON PLAN,
LOCATE A 1.8m CHAIN WIRE FENCE AROUND THE BOUNDARIES AND ATTACH HESSIAN CLOTH OR SIMILAR TO IT ON THE WINDWARD SIDE (TIES AT THE TOP, CENTRE AND BOTTOM AND AT 1m INTERVALS OR AS INSTRUCTED BY THE SUPERINTENDENT), CONSTRUCT SEDIMENT BASIN IN ACCORDANCE WITH THE SOIL AND WATER MANAGMENT PLANS AND LOCAL AUTHORITY REQUIREMENTS, CONSTRUCT STABILISED CONSTRUCTION ENTRANCE AS SHOWN ON THE PLAN OR TO LOCATION AS DETERMINED BY SUPERINTENDENT, INSTALL GEOFABRIC SEDIMENT FENCE AND SEDIMENT TRAPS AS SHOWN ON THE PLAN, INSTALL DIVERSION ALONG BOUNDARY WHERE REQUIRED, REHABILITATE DISTURBED LANDS DOWNSLOPE FROM THE BASINS WITHIN 20 WORKING DAYS, INSTALL STORMWATER LINE AT BOUNDARY, ENSURING THAT THE SEDIMENT BASIN OUTLETS INTO IT, CONSTRUCT DIVERSION CHANNEL AT BOUNDARY TO DRAIN INTO SEDIMENT BASIN AND AS SHOWN ON PLAN, CONSTRUCT SEDIMENT TRAP AROUND ALL PERMANENT STORMWATER RETICULATION STRUCTURES.

SWM12 TEMPORARY PROTECTION FROM EROSIVE FORCES WILL BE UNDERTAKEN ON LANDS WHERE FINAL SHAPING HAS NOT BEEN COMPLETED BUT WORKS ARE UNLIKELY TO PROCEED FOR PERIODS OF TWO MONTHS OR MORE (eg. ON TOPSOIL STOCKPILES). THIS MAY BE ACHIEVED WITH A VEGETATIVE COVER. A RECOMMENDED LISTING OF PLANT SPECIES FOR TEMPORARY COVER IS -

i) AUTUMN/WINTER SOWING	- OATS/RYECORN @ 20 kg/ha
	- JAPANESE MILLET @ 10 kg/ha
ii) SPRING/SUMMER SOWING	- JAPANESE MILLET @ 20 kg/ha
	- OATS/RYECORN @ 10 kg/ha

WHERE PRACTICABLE, FOOT AND VEHICULAR TRAFFIC SHOULD BE KEPT AWAY FROM ANY SUCH REHABILITATED AREAS.

SWM13 DIVERSION BANKS/CHANNELS WILL BE REHABILITATED AS SOON AS POSSIBLE AND WITHIN 5 WORKING DAYS FROM THEIR FINAL SHAPING. OTHER THAN IN THE WINTER MONTHS, SUITABLE MATERIALS INCLUDE TURF GRASSES SUCH AS COUCH OR KIKUYU. DURING WINTER, OR AT OTHER TIMES WHEN TEMPORARY REHABILITATION (MORE THAN 3 MONTHS) IS REQUIRED, IT IS SUGGESTED THAT HESSIAN CLOTH IS USED BUT ONLY IF TACKED WITH APPROPRIATE PEGS AND AN ANIONIC BITUMEN EMULSION. FOOT AND VEHICULAR TRAFFIC SHOULD BE KEPT AWAY FROM THESE AREAS.

SWM14 TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

SWM15 FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

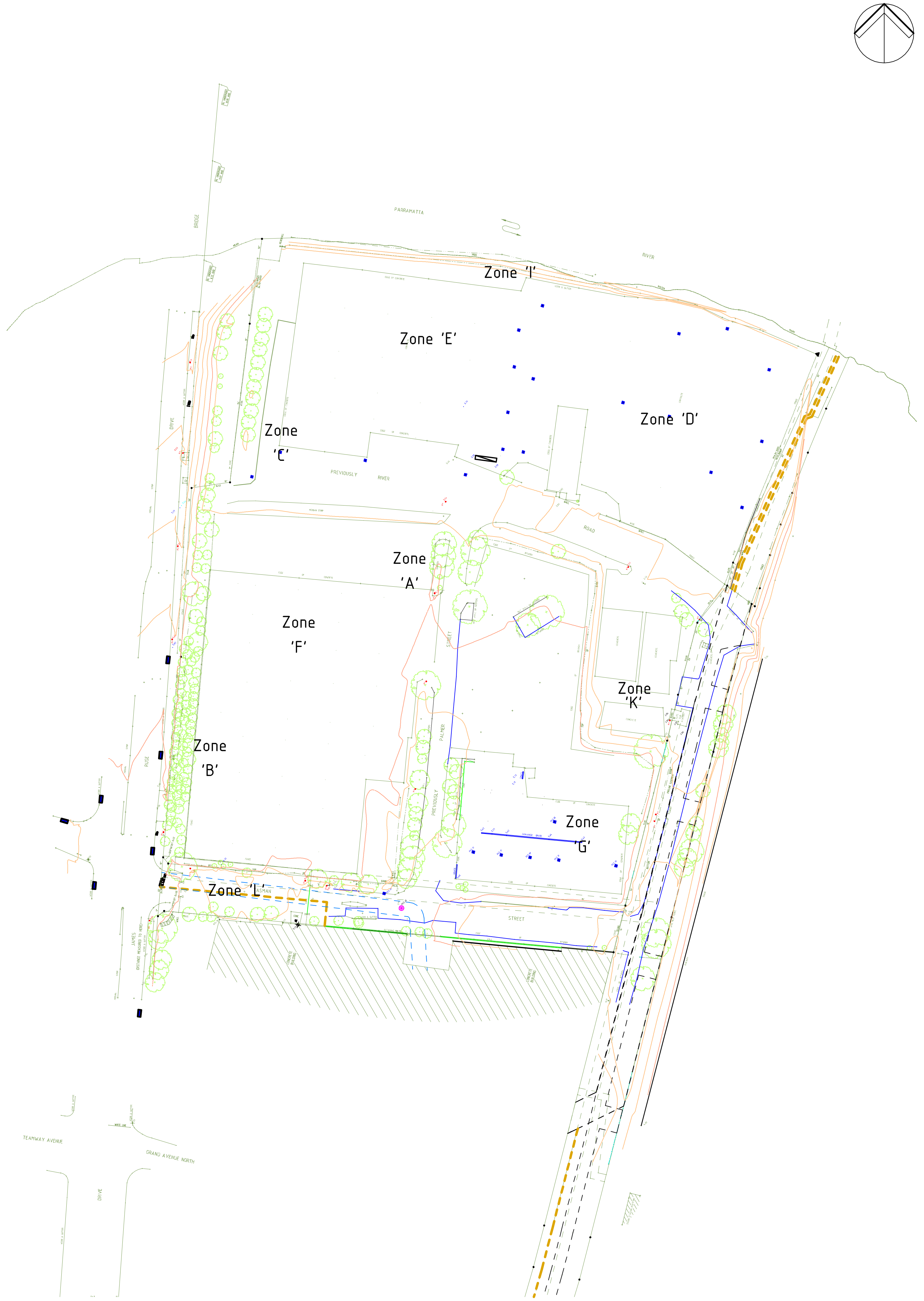
SWM16 AT LEAST WEEKLY AND AFTER EVERY RAIN FALL EVENT, THE CONTRACTOR WILL INSPECT THE SITE AND ENSURE THAT -

DRAINS OPERATE EFFECTIVELY AND INITIATE REPAIR OR MAINTENANCE AS REQUIRED, SPILLED SAND (OR OTHER MATERIALS) IS REMOVED FROM HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS, GUTTERS, PAVED AREAS AND DRIVEWAYS, SEDIMENT IS REMOVED FROM BASINS AND/OR TRAPS WHEN LESS THAN $20m^3$ OF TRAPPING CAPACITY REMAIN PER $1000m^2$ OF DISTURBED LANDS, AND/OR LESS THAN 500mm DEPTH REMAINS IN THE SETTLING ZONE. ANY COLLECTED SEDIMENT WILL BE DISPOSED IN AREAS WHERE FURTHER POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS IS UNLIKELY. REHABILITATED LANDS HAVE EFFECTIVELY REDUCED THE EROSION HAZARD AND INITIATE UPGRADING OR REPAIR AS APPROPRIATE.

EROSION AND SEDIMENT CONTROL LEGEND

- CONSTRUCT TEMPORARY SEDIMENT FENCE. (REFER DETAIL)
- PROPOSED SWALE
- OVERLAND FLOW PATH
- CONSTRUCT TEMPORARY STRAW BALE DROP INLET SEDIMENT TRAP (REFER DETAIL)
- CONSTRUCT TEMPORARY SANDBAG SEDIMENT TRAP AT LOWPOINT (REFER DETAIL)
- CONSTRUCT TEMPORARY SANDBAG SEDIMENT TRAP ON GRADE (REFER DETAIL)
- CONSTRUCT TEMPORARY STABILISED SITE ENTRY (REFER DETAIL)
- CONSTRUCT TEMPORARY GEOTEXTILE FILTER FABRIC OR STRAW BALE DROP INLET SEDIMENT TRAP (REFER DETAIL)
- INDICATIVE LOCATION FOR TOPSOIL STOCKPILE.
- INDICATIVE LOCATION VEHICLE PATH

NOTE:
THIS PLAN HAS BEEN PREPARED AS A CONCEPT ONLY. IT IS THE CONTRACTORS RESPONSIBILITY FOR THE DESIGN, CONSTRUCTION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL MEASURES.



Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	11.09.12	AMP	ISSUED FOR INFORMATION	AH	-

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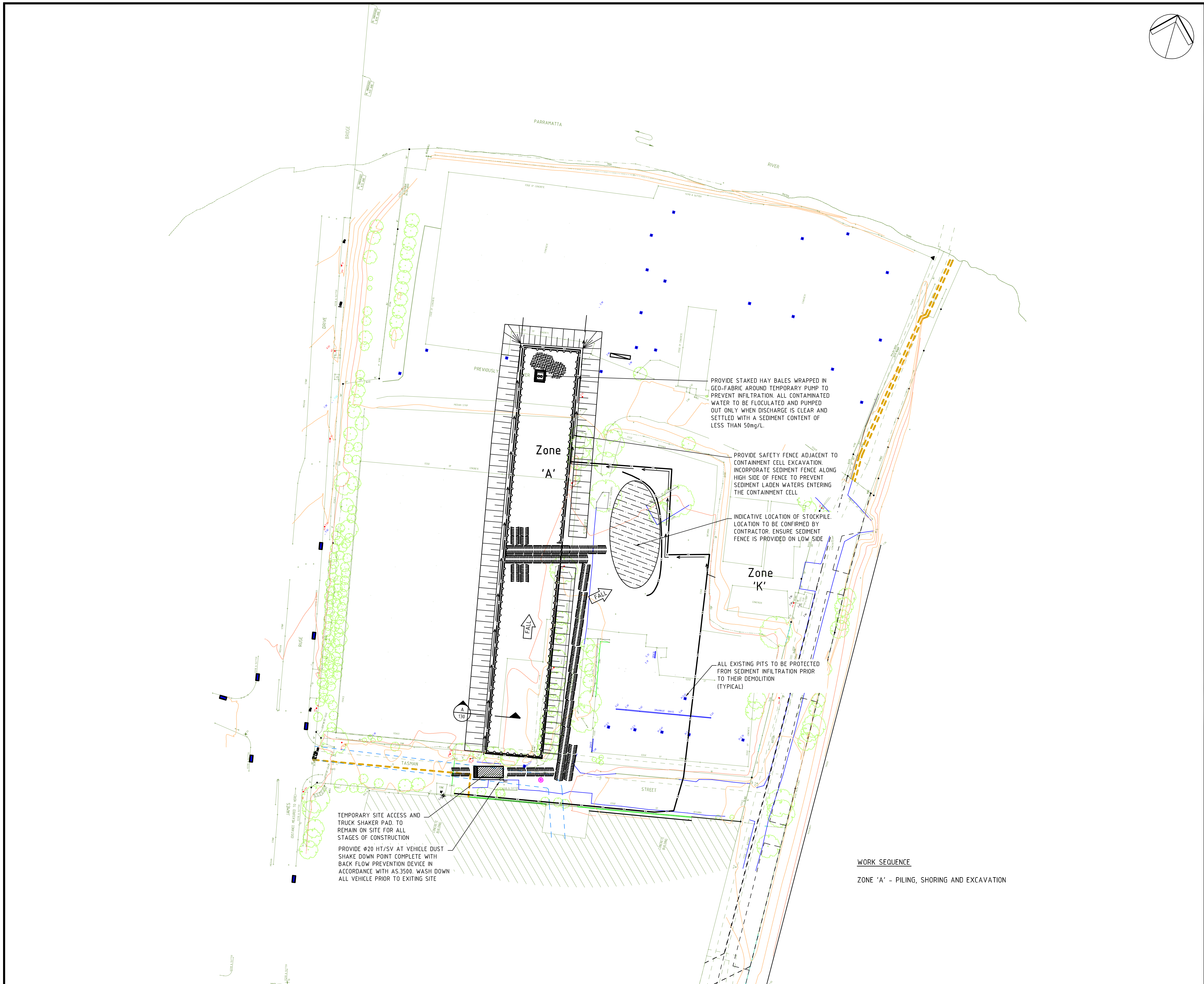
Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
KEY PLAN

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:1000	PRE	P1

Drawing Number
MMD-308388-C-DR-00-XX-0120



Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
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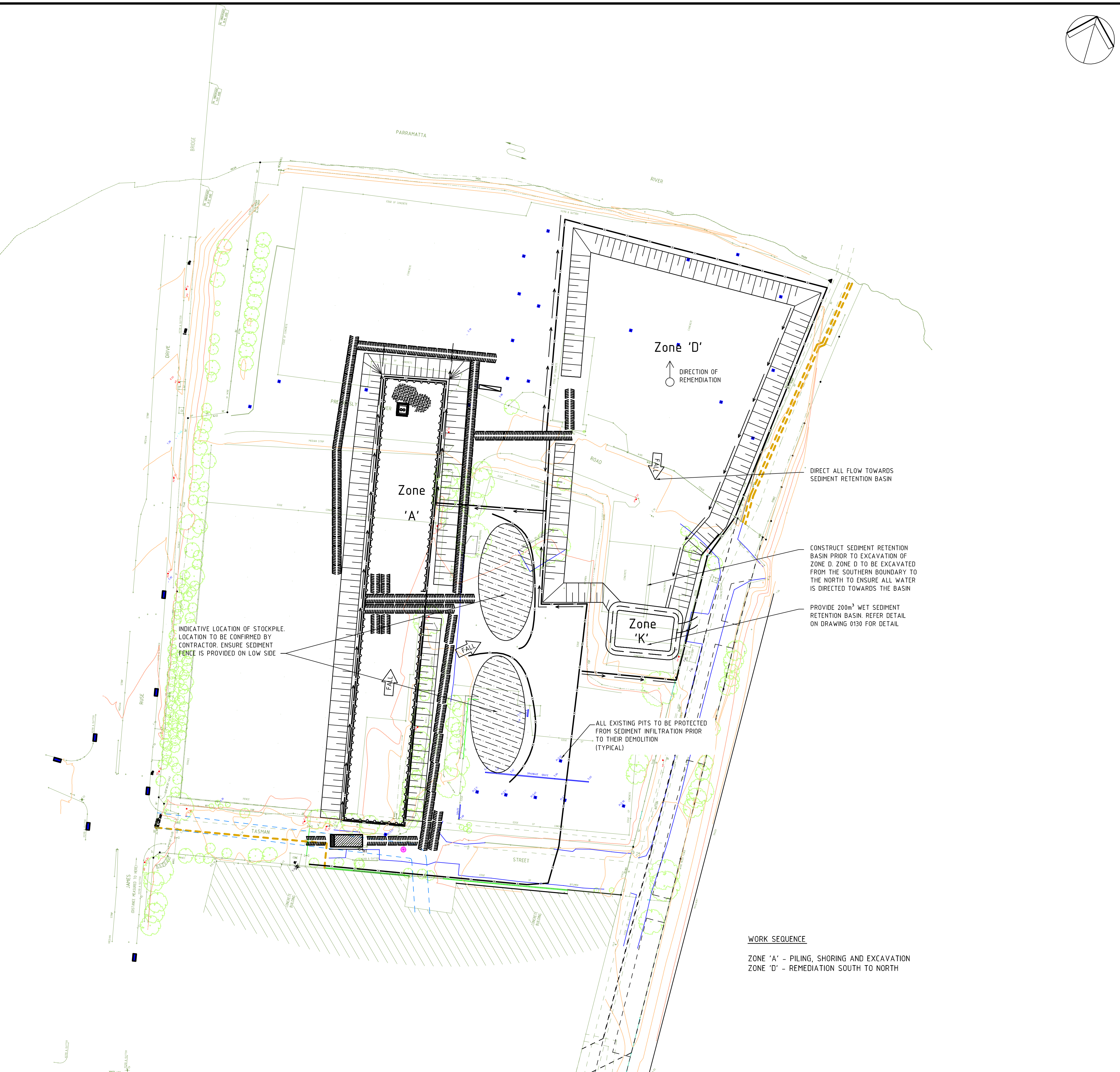
Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 1

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:800	PRE	P1

Drawing Number
MMD-308388-C-DR-00-XX-0121



WORK SEQUENCE

ZONE 'A' - PILING, SHORING AND EXCAVATION
ZONE 'D' - REMEDIATION SOUTH TO NORTH

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	11.09.12	AMP	ISSUED FOR INFORMATION	AH	-

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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 2

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:800	PRE	P1

Drawing Number
MMD-308388-C-DR-00-XX-0122

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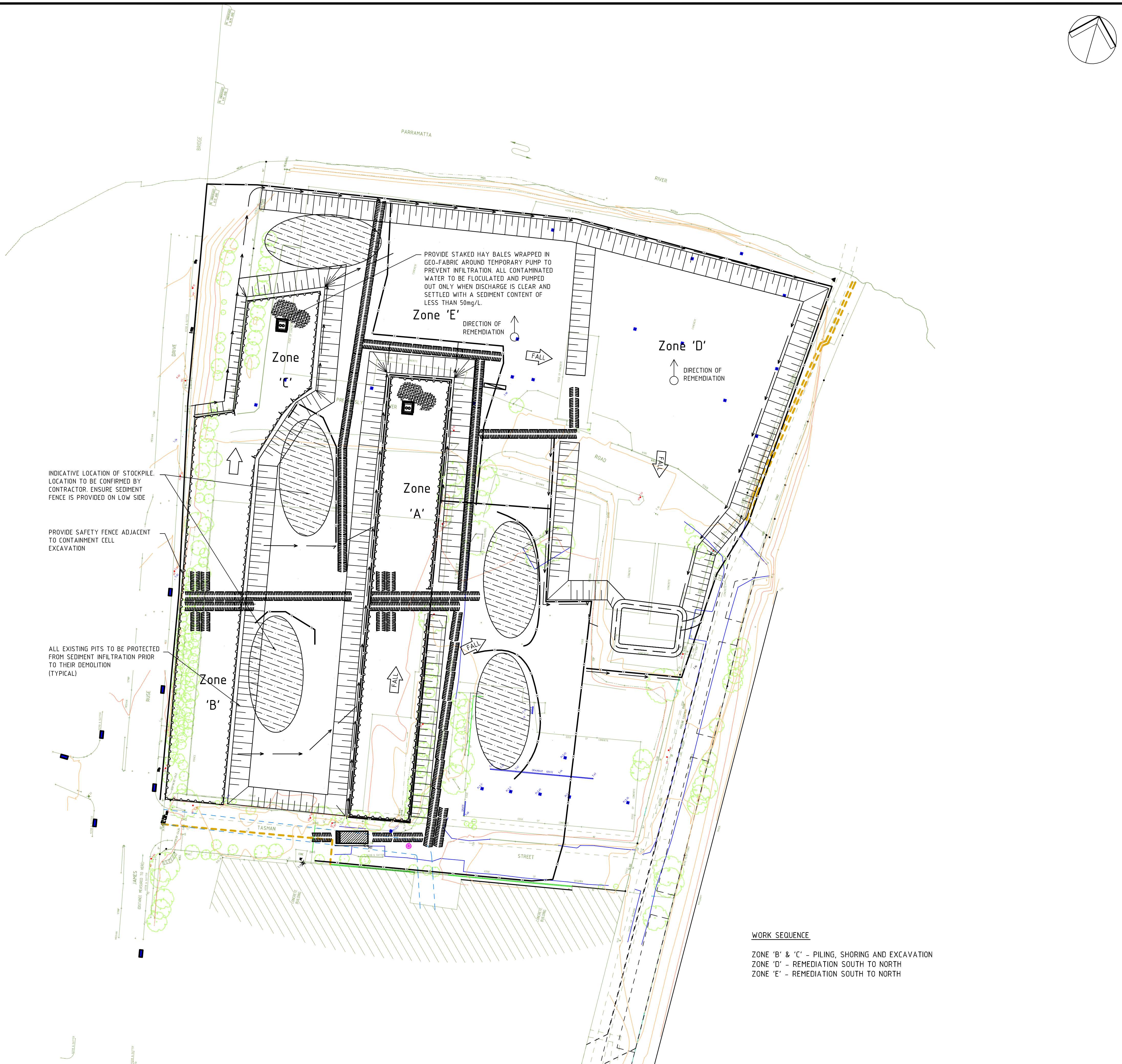

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST REMEDIATION WORKS SOIL AND WATER MANAGEMENT STAGE 3

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:800	PRE	P1

Drawing Number
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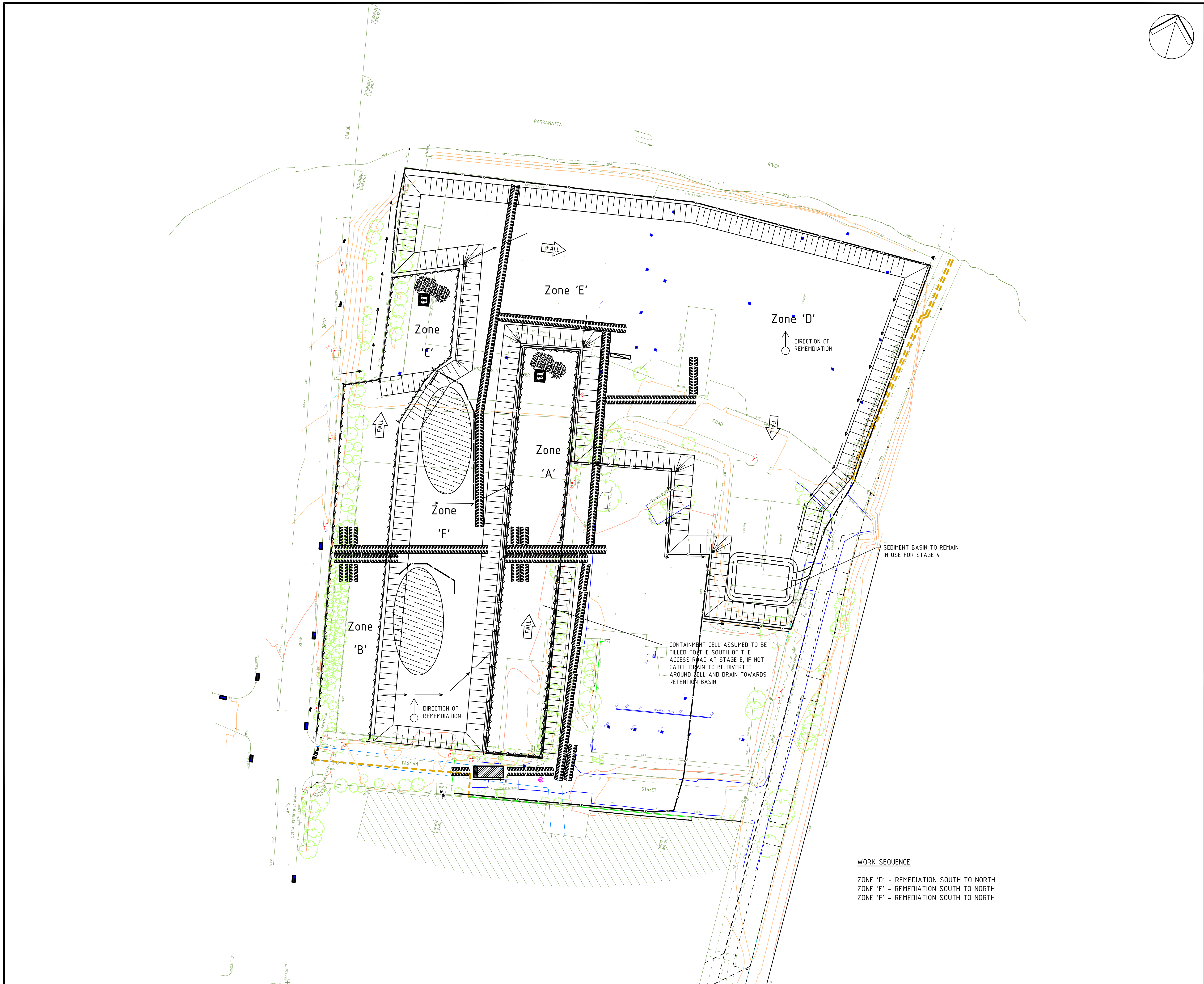

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
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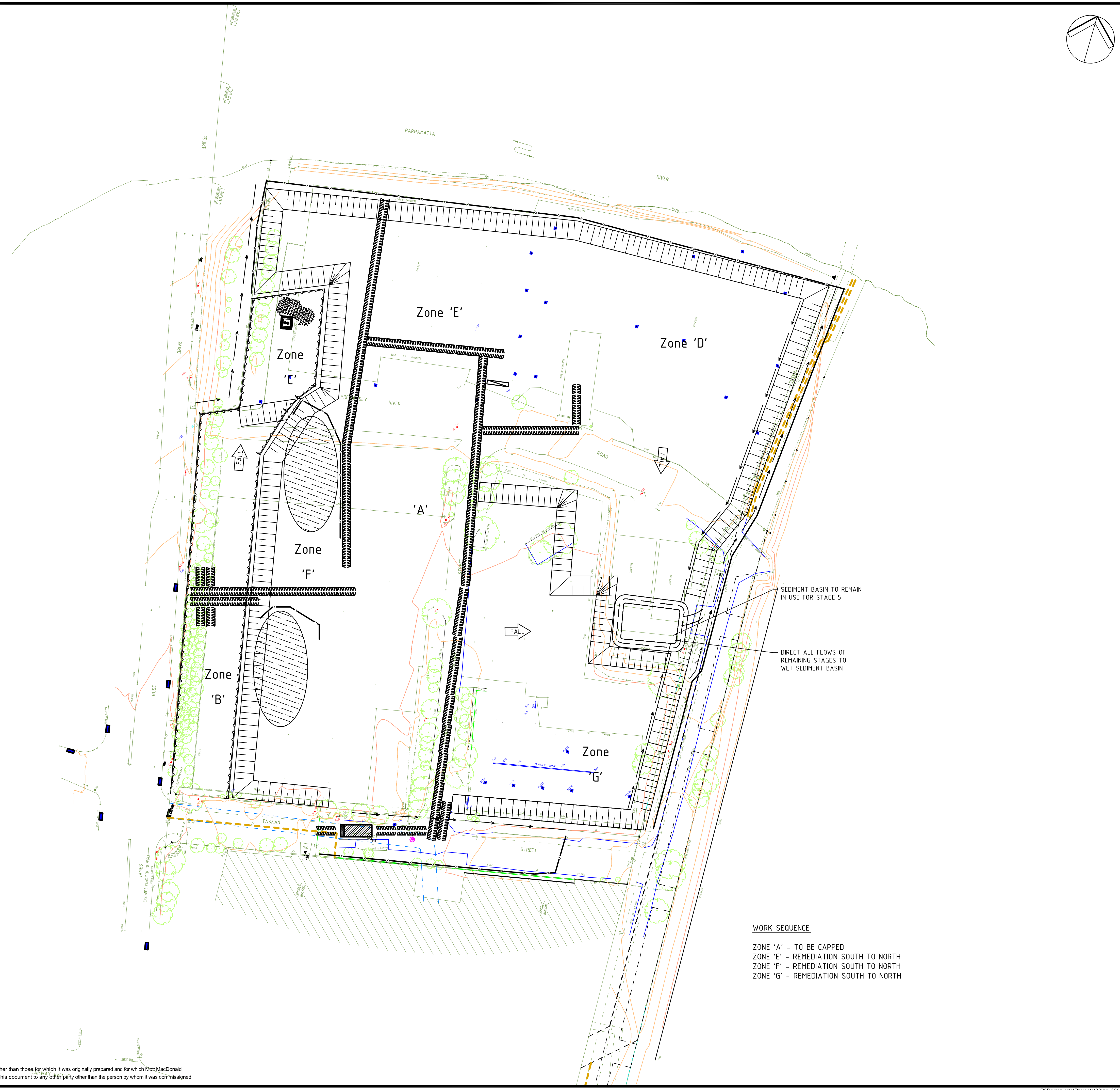
Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 4

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1: 1:800
Status: PRE
Rev: P1

Drawing Number
MMD-308388-C-DR-00-XX-0124



WORK SEQUENCE

ZONE 'A' - TO BE CAPPED
ZONE 'E' - REMEDIATION SOUTH TO NORTH
ZONE 'F' - REMEDIATION SOUTH TO NORTH
ZONE 'G' - REMEDIATION SOUTH TO NORTH

Notes

Key to symbols

Reference drawings

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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 5

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:800	PRE	P1

Drawing Number
MMD-308388-C-DR-00-XX-0125

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WORK SEQUENCE

ZONE 'F' - REMEDIATION SOUTH TO NORTH
ZONE 'G' - REMEDIATION SOUTH TO NORTH
ZONE 'I' - REMEDIATION EAST TO WEST

Notes

Key to symbols

Reference drawings

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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 6

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1: 1:800 | Status: PRE | Rev: P1

Drawing Number
MMD-308388-C-DR-00-XX-0126

WORK SEQUENCE

ZONE 'G' - REMEDIATION SOUTH TO NORTH
ZONE 'I' - REMEDIATION EAST TO WEST
ZONE 'L' - REMOVE TEMPORARY WORKS AND REMEDIATION

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	11.09.12	AMP	ISSUED FOR INFORMATION	AH	-

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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 7

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1	Status	Rev
1:800	PRE	P1

Drawing Number
MMD-308388-C-DR-00-XX-0127

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WORK SEQUENCE

ZONE 'K' - REMOVE TEMPORARY WORKS AND REMEDIATION
ZONE 'L' - REMOVE TEMPORARY WORKS AND REMEDIATION

Notes

Key to symbols

Reference drawings

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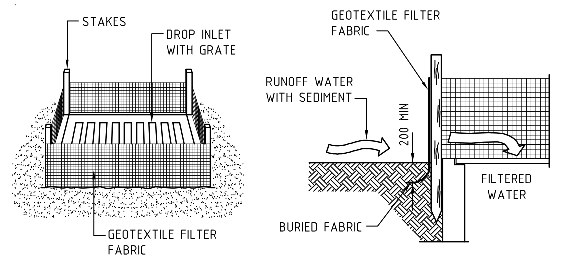
Client
STATE WIDE PLANNING

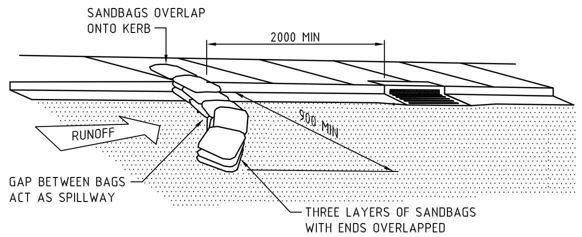
Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
STAGE 8

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.
Scale at A1 1:100		Status PRE		Rev P1	

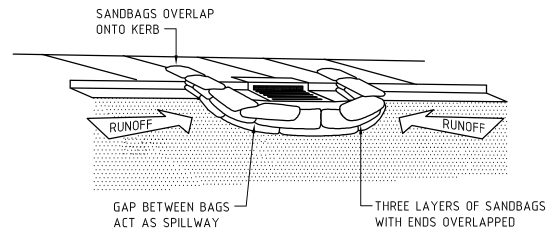
Drawing Number
MMD-308388-C-DR-00-XX-0128



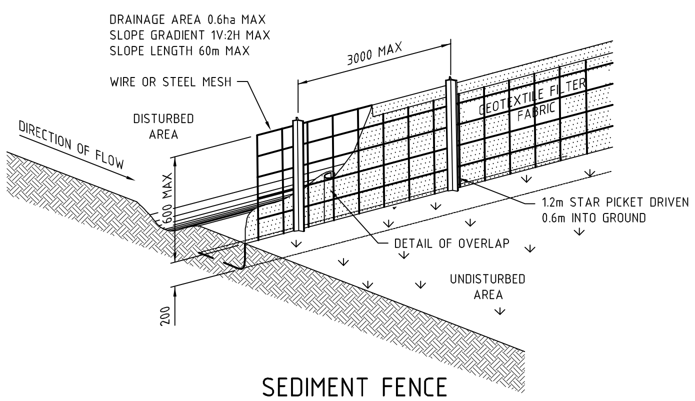
SEDIMENT TRAP FOR DROP INLET
(GEOTEXTILE FILTER FABRIC)
NOT TO SCALE



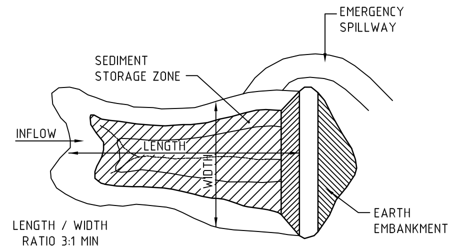
SEDIMENT TRAP FOR KERB INLET
(ON GRADE - SANDBAG)
NOT TO SCALE



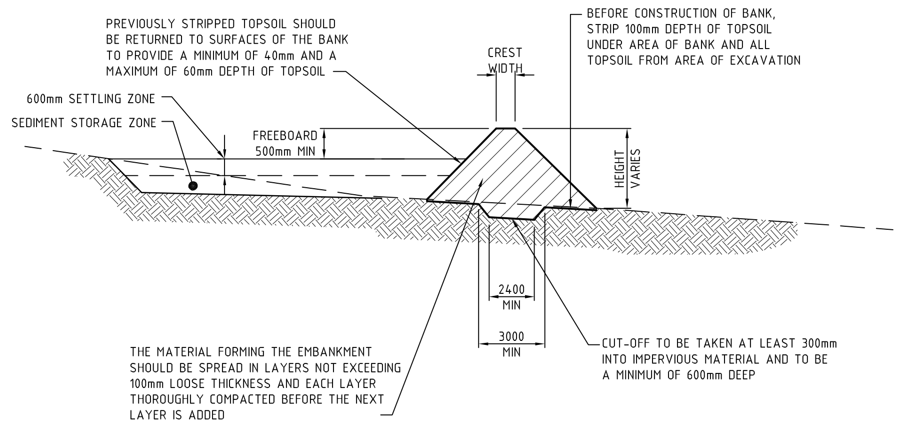
SEDIMENT TRAP FOR KERB INLET
(AT LOW POINT - SANDBAG)
NOT TO SCALE



SEDIMENT FENCE
(GEOTEXTILE FILTER FABRIC)
NOT TO SCALE



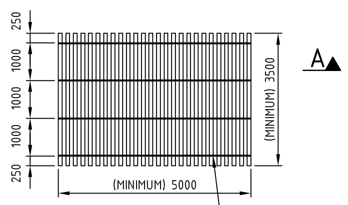
SEDIMENT BASIN WET (TYPICAL) PLAN - TYPE D AND F SOILS
NOT TO SCALE



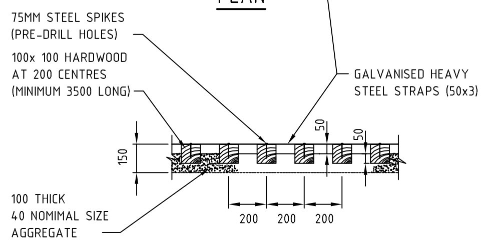
SEDIMENT BASIN WET (TYPICAL) CROSS SECTION - TYPE D AND F SOILS
NOT TO SCALE

CONSTRUCTION NOTES:

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTERLINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIAL WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95% STANDARD PROCTOR DENSITY
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP
7. CONSTRUCT THE EMERGENCY SPILLWAY
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP



PLAN

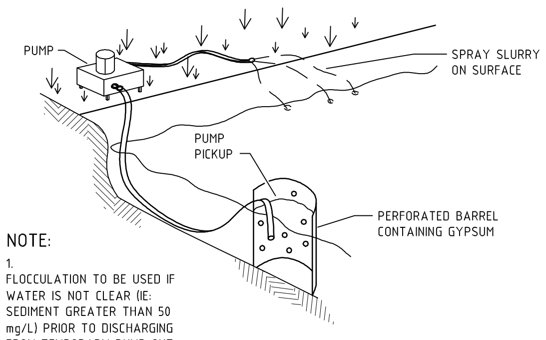


SECTION A-A

SHAKER GRID NOTES

1. THIS DEVICE IS TO BE LOCATED AT ALL EXITS FROM THE CONSTRUCTION SITE.
2. THE DEVICE IS TO BE REGULARLY CLEANED OF DEPOSITED MATERIAL SO AS TO MAINTAIN A 50 MM DEEP SPACE BETWEEN PLANKS.
3. ANY UNSEALED ROAD BETWEEN THIS DEVICE AND COUNCILS NEAREST ROADWAY TO BE TOPPED WITH 100MM THICK 40MM NOMINAL SIZE AGGREGATE.
4. ALTERNATIVELY, THREE (3) PRECAST CONCRETE CATTLE GRIDS (AS MANUFACTURED BY 'HUMES CONCRETE') MAY BE USED. NOTES 1, 2, 3, ABOVE ALSO APPLY.

TRUCK SHAKER GRID
NOT TO SCALE



NOTE:

1. FLOCCULATION TO BE USED IF WATER IS NOT CLEAR (IE: SEDIMENT GREATER THAN 50 mg/L) PRIOR TO DISCHARGING FROM TEMPORARY PUMP OUT

2. FOR RATES & AGENTS SEE APPENDIX E OF HOUSING NSW "MANAGING URBAN SW SOILS & CONSTRUCTION".

FLOCCULATION DETAIL
NOT TO SCALE

Notes

Key to symbols

Reference drawings

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Client
STATE WIDE PLANNING

Title
CAMELLIA WEST
REMEDIATION WORKS
SOIL AND WATER MANAGEMENT
DETAILS SHEET

Designed	AH	.	Eng check	AH	.
Drawn	DW	.	Coordination	CA	.
Dwg check	AH	.	Approved	CA	.

Scale at A1: NTS
Status: PRE
Rev: P1

Drawing Number
MMD-308388-C-DR-00-XX-0130

Appendix B. Hydrological Sediment Basin Calculations

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: **Camellia West**

Site location: **181 James Ruse Drive**

Precinct:

Description of site: **Camellia West Rehabilitation**

Site area	Site						Remarks
	Zone A	Zone B	Zone D	Zone E	Zone F	Zone G	
Total catchment area (ha)	0.4791	0.5656	0.9719	1.2242	0.6218	1.303	Area taken from Working Zone plan
Disturbed catchment area (ha)	0.4791	0.5656	0.9719	1.2242	0.6218	1.303	

Soil analysis

Soil landscape	Glenorie (gn)						DIPNR mapping (if relevant)
Soil Texture Group	D	D	D	D	D	D	Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5	5	5	5	5	5	See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75th	75th	75th	75th	75th	75th	See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	20.3	20.3	20.3	20.3	20.3	20.3	See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	11	11	11	11	11	11	See IFD chart for the site
Rainfall erosivity (R-factor)	2630	2630	2630	2630	2630	2630	Automatic calculation from above data

Comments: Soil Type classified as Disturbed Lanscapes (xx) with underlying Glenorie (gn) class.

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction runoff coefficients are given in Appendix F
- F_y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr						C_{10}
			$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
Zone A	0.479084	6	79.7	129	145	166	193	213	0.8
Zone B & C	0.5656054	6	79.7	129	145	166	193	213	0.8
Zone D	0.971923	8	72.4	117.5	132	151	175.5	194	0.8
Zone E	1.224237	9	68.75	111.75	125.5	143.5	166.75	184.5	0.8
Zone F	0.62182	7	76.05	123.25	138.5	158.5	184.25	203.5	0.8
Zone G	1.303013	9	68.75	111.75	125.5	143.5	166.75	184.5	0.8

Peak flow calculations, 2

ARI yrs	Frequency factor (F_y)	Peak flows						Comment
		Zone A (m^3/s)	Zone B & C (m^3/s)	Zone D (m^3/s)	Zone E (m^3/s)	Zone F (m^3/s)	Zone G (m3/s)	
$1_{yr,\,tc}$	0.8	0.068	0.080	0.125	0.150	0.084	0.159	
$5_{yr,\,tc}$	0.95	0.131	0.154	0.241	0.289	0.162	0.308	
$10_{yr,\,tc}$	1	0.154	0.182	0.285	0.342	0.192	0.364	
$20_{yr,\,tc}$	1.05	0.186	0.219	0.343	0.410	0.230	0.437	
$50_{yr,\,tc}$	1.1	0.226	0.267	0.417	0.499	0.280	0.532	
$100_{yr,\,tc}$	1.2	0.272	0.322	0.503	0.603	0.338	0.642	

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-\%ile, x-day}}\ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
Zone A	0.42	20.3	0.479084	41.138464	21	61.707696
Zone B & C	0.42	20.3	0.56560541	48.567971	24	72.8519564
Zone D	0.42	20.3	0.971923	83.4580561	42	125.187084
Zone E	0.42	20.3	1.224237	105.124007	53	157.68601
Zone F	0.42	20.3	0.62182	53.3950616	27	80.0925924
Zone G	0.42	20.3	1.303013	111.888423	56	167.832635

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: Camellia West

Site location: 181 James Ruse Drive

Precinct:

Description of site: Camellia West Rehabilitation

Site area	Site						Remarks
	Zone H	Zone I	Zone J	Zone K	Zone L		
Total catchment area (ha)	0.1449	0.3874	0.7413	0.2176	0.1121		Area taken from Working Zone plan
Disturbed catchment area (ha)	0.1449	0.3874	0.7413	0.2176	0.1121		

Soil analysis

Soil landscape	Glenorie (gn)						DIPNR mapping (if relevant)
Soil Texture Group	D	D	D	D	D		Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5	5	5	5	5		See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75th	75th	75th	75th	75th		See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	20.3	20.3	20.3	20.3	20.3		See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	11	11	11	11	11		See IFD chart for the site
Rainfall erosivity (R-factor)	2630	2630	2630	2630	2630		Automatic calculation from above data

Comments: Soil Type classified as Disturbed Lanscapes (xx) with underlying Glenorie (gn) class.

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$$

where:

- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction runoff coefficients are given in Appendix F
- F_y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr						C_{10}
			$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
Zone H	0.14487	4	85	138	154	177	205	227	0.8
Zone I	0.387431	6	79.7	129	145	166	193	213	0.8
Zone J	0.741344	7	76.05	123.25	138.5	158.5	184.25	203.5	0.8
Zone K	0.217602	4	85	138	154	177	205	227	0.8
Zone L	0.112115	4	85	138	154	177	205	227	0.8

Peak flow calculations, 2

ARI yrs	Frequency factor (F_y)	Peak flows						Comment
		Zone H	Zone I	Zone J	Zone K	Zone L		
		(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m3/s)	
$1_{yr,\,tc}$	0.8	0.022	0.055	0.100	0.033	0.017		
$5_{yr,\,tc}$	0.95	0.042	0.106	0.193	0.063	0.033		
$10_{yr,\,tc}$	1	0.050	0.125	0.228	0.075	0.038		
$20_{yr,\,tc}$	1.05	0.060	0.150	0.274	0.090	0.046		
$50_{yr,\,tc}$	1.1	0.073	0.183	0.334	0.109	0.056		
$100_{yr,\,tc}$	1.2	0.088	0.220	0.403	0.132	0.068		

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day}\ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
Zone H	0.42	20.3	0.14487	12.439842	6	18.659763
Zone I	0.42	20.3	0.387431	33.2683125	17	49.9024688
Zone J	0.42	20.3	0.741344	63.6584679	32	95.4877019
Zone K	0.42	20.3	0.217602	18.6852661	9	28.0278992
Zone L	0.42	20.3	0.112115	9.62720294	5	14.4408044

Appendix J Survey Plan

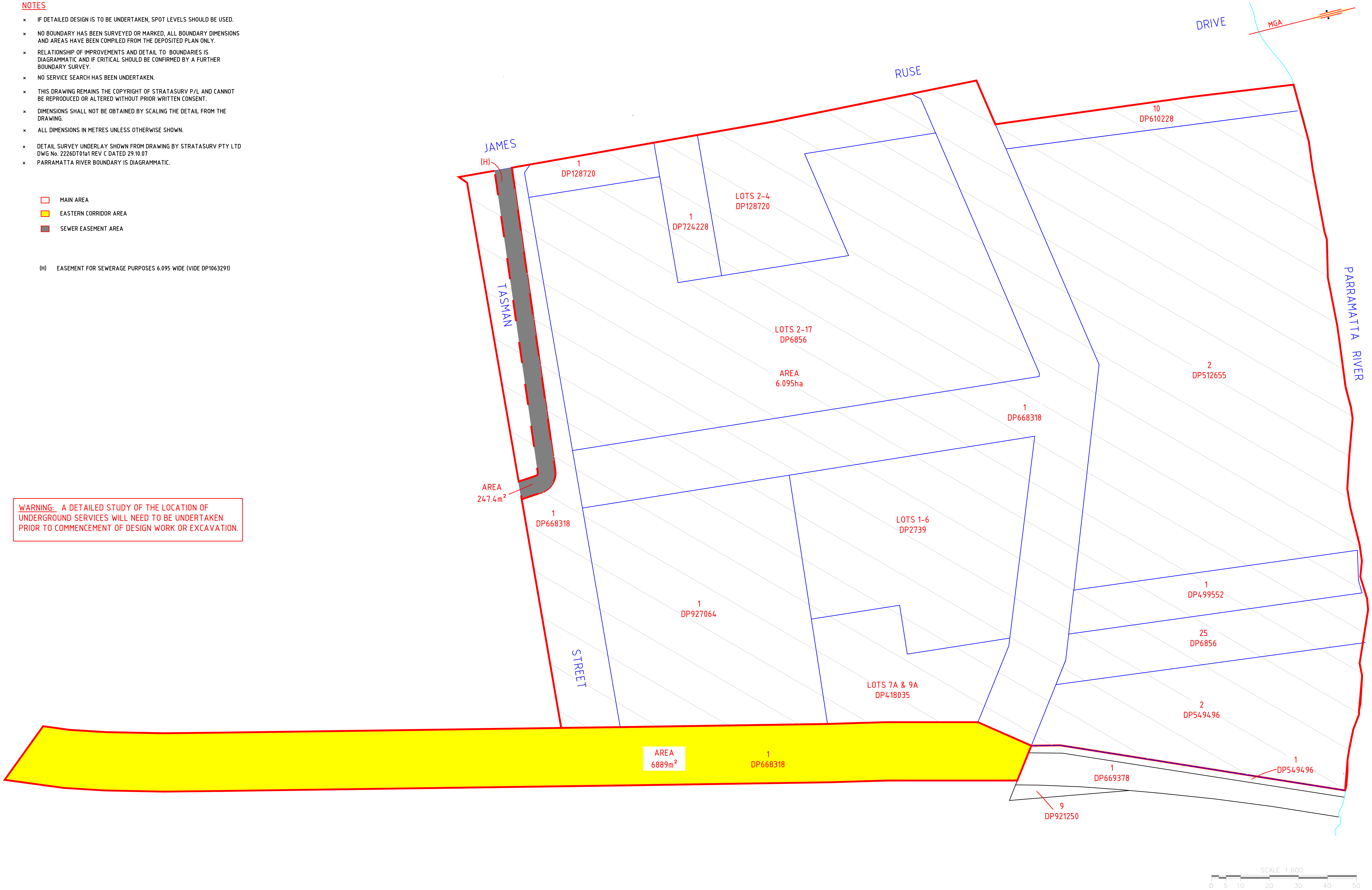
NOTES

- IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED.
- NO BOUNDARY HAS BEEN SURVEYED OR MARKED, ALL BOUNDARY DIMENSIONS AND AREAS HAVE BEEN COMPILED FROM THE DEPOSITED PLAN ONLY.
- RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A FURTHER BOUNDARY SURVEY.
- NO SERVICE SEARCH HAS BEEN UNDERTAKEN.
- THIS DRAWING REMAINS THE COPYRIGHT OF STRATASURV P/L AND CANNOT BE REPRODUCED OR ALTERED WITHOUT PRIOR WRITTEN CONSENT.
- DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DETAIL FROM THE DRAWING.
- ALL DIMENSIONS IN METRES UNLESS OTHERWISE SHOWN.
- DETAIL SURVEY UNDERLAY SHOWN FROM DRAWING BY STRATASURV PTY LTD DWG No. 2226DT01a1 REV C DATED 29.10.07
- PARRAMATTA RIVER BOUNDARY IS DIAGRAMMATIC.

MAIN AREA
EASTERN CORRIDOR AREA
SEWER EASEMENT AREA

(H) EASEMENT FOR SEWERAGE PURPOSES 6.095 WIDE (VIDE DP1063291)

WARNING: A DETAILED STUDY OF THE LOCATION OF UNDERGROUND SERVICES WILL NEED TO BE UNDERTAKEN PRIOR TO COMMENCEMENT OF DESIGN WORK OR EXCAVATION.



CLIENT DETAILS
CHARLIE DEMIAN

KEY:

REV	DATE	REVISION DETAILS	DESIGN	SURV	DWN	CHK
B	25.06.13	EASTERN CORRIDOR AREA AMMENDED			AI	
A	20.06.13	PLAN ISSUED			AI	PS

DATE OF SURVEY
ORIGIN OF RL'S
DATUM
CONTOUR INTERVAL
CAD REF FILE: 2226DT03b1.dwg

PROJECT:
CAMELLIA (WEST)
JAMES RUSE DRIVE

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DEVELOPMENT CONSTRUCTION STRATUM
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DRAWING TITLE
PLAN SHOWING AREA BREAKDOWN
CAMELLIA

DRAWING NUMBER	Sheet		Sheets	SCALE	REVISION
2226DT - 03	01	OF	01	1:600@A1	B1

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