



E.J. Cooper and Son Pty Ltd
Remediation Action Plan

Box Hill North, NSW

15 April 2015
43376/59205 (Rev 5)
JBS&G

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List of Abbreviations

ACM – Asbestos Containing Material
AEC – Area of Environmental Concern
AST - Above Ground Storage Tank
bgs – Below Ground Surface
COPC – Contaminant of Potential Concern
DCP – Development Control Plan
DECCW - NSW Department of Environment, Climate Change and Water (now OEH)
DQI – Data Quality Indicator
DQO – Data Quality Objective
EPA – NSW Environment Protection Authority
ESA – Environmental Site Assessment
ha - Hectare
HIL - Health Investigation Level
LOR - Limit of Reporting
NOW - Office of Water (formerly Department of Water and Energy, DWE)
OEH – NSW Office of Environment and Heritage
OCPs – Organochlorine Pesticides
OPPs – Organophosphate Pesticides
PAHs – Polycyclic Aromatic Hydrocarbons
PCBs – Polychlorinated Biphenyls
RAP – Remedial Action Plan
SEPP – State Environment Protection Policy
TRH – Total Recoverable Hydrocarbons
UST - Underground Storage Tank
WHS – Work Health and Safety

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by E.J. Cooper and Son Pty Ltd (EJC, the client) c/- APP Corporation Pty Ltd (APP) to prepare a Remedial Action Plan (RAP) at land at Box Hill North, NSW (the site). The site occupies part of the land bound by Boundary Road to the west, Old Pitt Town Road to the south, Maguires Road to the north, and Janpieter Road to the east, and has an area of approximately 380 hectares. The site location is shown in **Figure 1**.

It is understood that the site is proposed to be subdivided and developed comprising residential properties, commercial and retail, school and open space land uses. The site will be developed in a staged approach, with the site having been separated into nine separate Precincts (Precincts A-I).

In July 2013, JBS&G prepared the Draft Preliminary Site Investigation (PSI) report for the site (JBS 2013¹).

Based on the results of the investigation, it was concluded that there was potential for surface and subsurface contamination to be present resulting from current and previous site use (agricultural use). The PSI identified a number of Areas/Activities of Environmental Concern (AECs) across the site.

Consequently, a DSI was completed by JBS&G (JBS&G 2014²) which identified heavy metal, hydrocarbon and asbestos impacts to the soils at the site. Additionally, aesthetic impacts associated with asbestos and building rubble were identified at the site. Concentrations of contaminants of potential concern (COPCs) were not reported within the groundwater samples collected and analysed at the site. It was recommended that a RAP be prepared to address the identified impacts to render the site suitable for its proposed land uses.

Consequently, this RAP has been developed to address the identified impacts at the site to render the site suitable for the proposed land uses.

The objectives of the RAP are to:

- Summarise the Site characteristics;
- Define the extent of remediation required;
- Assess appropriate remediation options and select a preferred option;
- Document the remediation methodology, including the associated safety and environmental management controls;
- Establish pre-determined validation criteria relevant to the likely future land use and detail the validation program (including reporting);
- Identify the regulatory requirements relevant to the proposed remedial works; and
- Outline any potential ongoing monitoring or management requirements to ensure the continued protection of human health and the environment.

The preferred remedial option is to excavate impacted fill materials for potential onsite containment with management under an Environmental Management Plan (EMP) with excess material removed for offsite disposal. Offsite disposal of material may be required to suit the staged development to occur.

With the development to occur over the next ten years within the Precincts, the preferred remedial strategy can be applied across the site as a whole, or on a staged basis.

¹ Draft Preliminary Site Investigation, Box Hill North, NSW, JBS Environmental Pty Ltd (now JBS&G), July 2013 (JBS 2013).

² Detailed Site Investigation, Box Hill North, NSW, JBS&G, August 2014 (JBS&G 2014).

Subject to the successful implementation of the measures detailed in this RAP and subject to the limitations in **Section 15**, it is considered that the identified impacted soils can be remediated and validated without the need for further management.

However, should impacted material be retained at the site that does not meet the adopted land use scenario criteria then an EMP will be required to manage the potential risk to future site users.

1. Introduction

1.1 Introduction and Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by E.J. Cooper and Son Pty Ltd (EJC, the client) c/- APP Corporation Pty Ltd (APP) to prepare a Remedial Action Plan (RAP) at land at Box Hill North, NSW (the site). The site occupies part of the land bound by Boundary Road to the west, Old Pitt Town Road to the south, Maguires Road to the north, and Janpieter Road to the east, and has an area of approximately 380 hectares. The site location is shown in **Figure 1**.

The site is proposed to be subdivided and developed comprising residential properties, commercial and retail, school and open space land uses. The site will be developed in a staged approach, with the site having been separated into nine separate Precincts (Precincts A-I), with the development within each Precinct also completed in a staged approach that is yet to be finalised.

In July 2013, JBS&G prepared the Draft Preliminary Site Investigation (PSI) report for the site (JBS 2013³).

Based on the results of the investigation, it was concluded that there was potential for subsurface contamination to be present resulting from current and previous site use (agricultural use). The PSI identified a number of Areas/Activities of Environmental Concern (AECs) across the site.

It was considered unlikely that the AECs identified would have impacted the land to a degree that would prevent planning and development of the land for the intended use(s). It was recommended that a detailed site investigation (DSI) be completed to assess the extent of contamination prior to future development.

Consequently, a DSI was completed by JBS&G (JBS&G 2014⁴) which identified heavy metal, hydrocarbon and asbestos impacts within the soils at the site. Additionally, aesthetic impacts associated with asbestos and building rubble were identified at the site. Concentrations of contaminants of potential concern (COPCs) were not reported within the groundwater samples collected and analysed at the site. It was recommended that a RAP be prepared to address the identified impacts to render the site suitable for its proposed land uses.

Consequently, it was recommended that a RAP be developed to address the identified impacts at the site to render the site suitable for the proposed land uses.

It is understood that the remediation and validation is to be undertaken during the construction phases of each Precinct development. Consequently the RAP has been developed to be flexible and enable adjustment of approach to suit the staged development and changing requirements as development progress.

Review of both the RAP and future Validation reports is to be completed by a NSW EPA accredited Site Auditor.

The RAP has been developed in accordance with guidelines made and endorsed by the NSW EPA.

³ Draft Preliminary Site Investigation, Box Hill North, NSW, JBS Environmental, Pty Ltd (now JBS&G), July 2013 (JBS 2013).

⁴ Detailed Site Investigation, Box Hill North, NSW, JBS&G, August 2014 (JBS&G 2014).

1.2 Objectives

The objectives of the RAP are to:

- Summarise the Site characteristics;
- Define the extent of remediation required;
- Assess appropriate remediation options and select a preferred approach or approaches;
- Document the remediation methodology, including the associated safety and environmental management controls;
- Establish pre-determined validation criteria relevant to the likely future land uses and detail the validation program (including reporting);
- Present contingency options to enable flexibility in approaches to remediation as staged development progresses to remediation, or in the event an alternative approach is required;
- Present unexpected finds protocol to allow management of previously unidentified impacts;
- Identify the regulatory requirements relevant to the proposed remedial works; and
- Outline any potential ongoing monitoring or management requirements to ensure the continued protection of human health and the environment.

2. Site Conditions and Description

2.1 Site Identification

The location of the site is shown on **Figure 1**. Site Details are summarised in **Tables 2.1** and **2.2** and on **Figure 2**, and are described in more detail in the following sections. Precinct layouts are shown in **Figures 3** and **4**.

Table 2.1: General Site Information

Local Government Authority	The Hills Shire (formerly Baulkham Hills Shire)
Approximate co-ordinates (MGA 56) of the centre of the site	E: 305908.887, N: 6277394.06
Current Use	Rural Residential, Agricultural. Current ownership as per Table 2.2
Previous Use	Rural Residential, Agricultural, open space/vacant
Total Site Area	Approx. 380 ha (based on information provided by APP).
Proposed Use	Residential, Commercial/Industrial and Open Space, Recreational
Zoning	Zoning as per Table 2.2 .

The site was inspected during the previous investigation undertaken (JBS&G 2013).

The site is located approximately 42 km northwest of Sydney's CBD within a predominantly rural residential/agricultural area. The site is comprised of 31 lots and are summarised in **Table 2.2**.

Table 2.2 Summary Site Details

Map Ref (Figs 5a, 5b, 5c, 5d, 5e)	Lot/DP	Address	Current Owner	Size (ha)	Current Zoning*	Precinct
8	9/593517	155 Boundary Road, Box Hill 2765	Brian & Susan Eveston	10.01	RU6 Transition	D
27	17/255616	8 Cataract Road, Box Hill 2765	John & Lorraine Earl	12.03	RU6 Transition	A
3	1/207750	181-191 Boundary Road, Maraylya 2765	Anthony & Angela Brisindi	11.09	RU6 Transition	I
2	2/11126	195-205 Boundary Road, Maraylya 2765	Mario Rechichi & Mary Lawler	12.07	RU6 Transition	I
9	10/593517	153 Boundary Road, Box Hill 2765	Joe & Stella Sant	10.01	RU6 Transition	D
31	4/253552	121 Old Pitt Town Road, Box Hill 2765	Eugene Kavanagh	10.02	RU6 Transition	H
14	27/255616	14 Red Gables Road, Box Hill 2765	Michael & Jane Mathers	10.02	RU6 Transition	E
16	30/255616	5 Janpieter Road, Box Hill 2765	Fred & Elaine Dominello	10.01	RU6 Transition	F
23	18/255616	6 Cataract Road, Box Hill 2765	Charlie & Mary Portelli	10.06	RU6 Transition	B
11	23/255616	6 Red Gables Road, Box Hill 2765	Garry & Mary Galea	10.01	RU6 Transition	D
21	44/255616	7 Red Gables Road, Box Hill 2765	Joseph & Steven Bugeja	10.01	RU6 Transition	C
22	43/255616	9 Red Gables Road, Box Hill 2765	Zaren & Rose Bugeja	10.01	RU6 Transition	C

Map Ref (Figs 5a, 5b, 5c, 5d, 5e)	Lot/DP	Address	Current Owner	Size (ha)	Current Zoning*	Precinct
30	2/253552	117 Old Pitt Town Road, Box Hill 2765	D & A Kavanagh, T Akuila, R & R Edwards	10.35	RU6 Transition	H
5	4/135304 A & B	97 Maguires Road, Maraylya 2765	Paul & Margaret Gaudry	12.68	RU6 Transition	I
28	41/255616	11 Janpieter Road, Box Hill 2765	Paul & Diane Sammut	10.01	RU6 Transition	C
1	1/11126	207-217 Boundary Road, Maraylya 2765	John & Daphne Cox	12.07	RU6 Transition	I
20	45/255616	5 Red Gables Road, Box Hill 2765	E, M E G & A Micallef	10.02	RU6 Transition	B
19	46/255616	5 Red Gables Road, Box Hill 2765	E, M E G & A Micallef	10.03	RU6 Transition	B
13	26/255616	12 Red Gables Road, Box Hill 2765	Charlie & Pauline D'Anastasi	10.01	RU6 Transition	E
26	21/255616	7 Cataract Road, Box Hill 2765	Vera Joy Howes	11.02	RU6 Transition	A
6	5/658286	151 Maguires Road, Maraylya 2765	Twihaven Pty Limited	12.65	RU6 Transition	G
25	16/255616	5 Cataract Road, Box Hill 2765	John Martin Camilleri	10.56	RU6 Transition	A
15	31/255616	3 Janpieter Road, Box Hill 2765	Diverse Construction Group Pty Limited	10.34	RU6 Transition	F
4	3/11126	89 Maguires Road, Maraylya 2765	Maguires Road Pty Limited	12.68	RU6 Transition	I
29	40/255616	13 Janpieter Road, Box Hill 2765	Mahmoud & Jamila Hussein	10.01	RU6 Transition	C
17	29/255616	18 Red Gables Road, Box Hill 2765	Norma Jean Pike	10.08	RU6 Transition	F
12	25/255616	10 Red Gables Road, Box Hill 2765	Sam D'Anastasi	10.01	RU6 Transition	E
7	1/564211	169 Maguires Road, Maraylya 2765	John & Joyce Saliba	12.00	RU6 Transition	G
24	15/255616	3 Cataract Road, Box Hill 2765	I & M Zalac & G & C Galdes	10.03	RU6 Transition	A
10	22/255616	4 Red Gables Road, Box Hill 2765	E.J. Cooper & Son PL	10.13	RU6 Transition	D
18	47/255616	3 Red Gables Road, Box Hill 2765	E.J. Cooper & Son PL	10.15	RU6 Transition	B

The lots investigated as part of the previous investigation (JBS&G 2014) along with the Precincts are shown on **Figure 4**.

2.2 Site Description

A detailed inspection of accessible areas of the site was conducted between 20 and 24 May 2013 as part of the PSI (JBS 2013).

The site was comprised of predominantly rural residential/agricultural land which had been subdivided into 31 separate lots of between 10 and 12.7 ha.

The majority of the site lots contained rural residences and agriculturally-related outbuildings including workshops, with agricultural fields and uncleared woodlot. The agricultural fields consisted primarily of grazing land (cattle, horse stables) and land for growing crops (market gardens). Numerous farm dams and associated creeks were also located throughout the site. An electrical transmission corridor, oriented northeast-southwest, transected the northwest portion of the site.

2.3 Surrounding Land use

The current land uses of adjacent properties or properties across adjacent roads are summarised below:

- North - Maguires Road with rural residential, vacant/agricultural land, and bushland beyond.
- East – Janpieter Road and/or rural residential and vacant/agricultural land.
- South – Old Pitt Town Road and/or rural residential and vacant/agricultural land.
- West – Boundary Road and/or rural residential and vacant/agricultural land, and Sheyville National Park approximately 0.5 km further west.

2.4 Topography

Review of the regional topographic data outlined in the previous assessment (JBS&G 2014) indicated the site lies at approximately 40 m Australian Height Datum (AHD), with an overall gradient sloping gently to the west. The general topography of the site is relatively flat to gently rolling. Numerous small creeks cross the site, connecting farm dams, with the main creek, Cataract Creek, and oriented north-south at Lot 4 DP135304A&B at the north portion of the site.

2.5 Geology

Review of the previous assessment (JBS&G 2014) indicated the site is underlain by Middle Triassic Bringelly Shale, Mittagong Formation and Ashfield Shale, all part of the Wianamatta Group. The Bringelly Shale consists of shale, carbonaceous claystone, claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff. The Mittagong Formation consists of fine to medium-grained quartz-lithic sandstone. The Ashfield Shale consists of dark-grey to black claystone-siltstone and fine sandstone-siltstone laminite.

The site is located within two soil landscape groups, the residual Lucas Heights and Blacktown Soil Landscapes.

The Lucas Heights Landscape soils are typically found on gently undulating crests and ridges on plateau surfaces of the Mittagong Formation, with local reliefs of up to 30 m and shallow slopes. The soils generally consist of moderately deep hard setting yellow podzolic and yellow soloth soils. The profile is characterised by stony soil, low soil fertility and low available water capacity.

The Blacktown Soil Landscape soils are typically found on gently undulating rises overlying shales of the Wianamatta Group, with local reliefs of up to 30 m and shallow slopes. The soils generally consist of shallow to moderately deep hard setting podzolic soils, typically mottled red and brown on crests and grading to yellow on lower slopes and within drainage lines. The profile is

characterised by moderately reactive highly plastic subsoils, low soil fertility and poor soil drainage.

The intrusive investigation completed recently for the various lots indicates that the majority of the site is underlain by a silty clay and shale from near the surface.

2.6 Hydrology

The site lies approximately 7 km southeast of the Hawkesbury River, and Cataract Creek (a tributary to the Hawkesbury River) lies approximately 0.5 km northeast of the site. The site is predominantly unsealed, and as such the majority of precipitation falling on the site is expected to infiltrate to the underlying soils and/or be collected by numerous small creeks which flow to existing on-site farm dams. In addition, surface runoff across the site area is expected to flow to Cataract Creek, likely via an unnamed creek (oriented north-south) at Lot 4 DP135304A&B in the northern portion of the site.

2.7 Hydrogeology

Based on the previous investigation (JBS&G 2014) completed, groundwater was anticipated to flow to the northwest towards the Hawkesbury River and/or to Cataract Creek (a tributary of the Hawkesbury River).

A total of five groundwater monitoring wells (MW1-MW5) were installed at the site, with measured depth to groundwater ranging from 2.8 m below top of casing (btoc) to 7.4 (btoc).

It should be noted that two of the monitoring wells (MW3 and MW5) were dry.

2.8 Acid Sulfate Soils

Review of the previous investigation (JBS&G 2014) indicates that there is no High or Low probability of occurrence of acid sulfate soils within the soil profile located on the site. Additionally, no evidence of acid sulfate soils were reported during the previous investigation (JBS&G 2014).

2.9 Proposed Development

The site is planned to be subdivided and developed into the following land uses:

- Approximately 290 hectares of residential land, comprising 4100 lots, including high and low density housing;
- A 5.5 hectare town centre incorporating a mix of retail, commercial and business uses;
- A 2.2 hectare school site;
- Over 77 hectares of active and passive open space; and
- New roads and infrastructure.

The development plans are provided in **Appendix A** and **Figure 3** shows the proposed future land uses. It is understood that the development stages will be completed from A through to I.

As discussed in **Section 2.2** the site have been divided into nine Precincts for the future development works.

It should be noted that there are six lots that are included in the Precinct development plans but have not been investigated due to access restrictions. These include the following:

- Lot 1 DP782360 on Boundary Road in the northwest (adjoining lot reference #3, **Figure 2**);
- The lot between Lot 23 DP255616 and Lot 25 DP255616 (on Red Gables Road);

- The lot between Lot 27 DP255616 and Lots 29 and 30 DP 255616 (on Red Gables Road);
- The lots east of Lot 43 DP255616 (access via Janpieter Road);
- The lot west of Lot 2 DP253552 (on Old Pitt Town Road); and
- The lot between Lot 2 DP253552 and Lot 4 DP253552 (on Old Pitt Town Road).

The lots and the Precincts are summarised in **Table 2.3**, and the lots not investigated are summarised in **Table 2.4** following:

Table 2.3 Summary of Precincts

Precincts	Map Reference for Lots
Precinct A	24, 25, 26, 27
Precinct B	18, 19, 20, 23
Precinct C	21, 22, 28, 29
Precinct D	8, 9, 10, 11
Precinct E	12, 13, 14
Precinct F	15, 16, 17
Precinct G	6, 7
Precinct H	30, 31
Precinct I	1, 2, 3, 4, 5

Table 2.4 Summary of Lots not Investigated

Lot Location Description and Precinct	Map Reference for Lots
Lot 1 DP782360 on Boundary Road (Precinct D)	West of Map Reference #3 (Figure 2)
Lot 24 DP255616 between Lot 23 DP255616 and Lot 25 DP255616 (on Red Gables Road) (Precinct E)	Located between Map References #11 and #12 (Figure 2)
Lot 28 DP255616 between Lot 27 DP255616 and Lots 29 and 30 DP 255616 (on Red Gables Road) (Precinct E)	Located between Map References #14 and #16/#17 (Figure 2)
Lots 421-425 DP1183810 east of Lot 43 DP255616 (access via Janpieter Road) (Precinct C)	Located east of Map Reference #22 (Figure 2)
Lot 1 DP253552 west of Lot 2 DP253552 (on Old Pitt Town Road) (Precinct H)	Located between Map References #26/#27 and #30 (Figure 2)
Lot 3 DP253552 between Lot 2 DP253552 and Lot 4 DP253552 (Precinct H)	Located between Map References #30 and #31 (Figure 2)

Refer to **Figure 4** for Precinct land uses and lots.

3. Summary Site History

3.1 Site History

Based on the historical information provided in the previous investigation (JBS&G 2013) report, the history of the site is summarised in **Table 3.1** below

Table 3.1 Summary of Site History

Period	Activity	Source
1900s to 1940s	Portions of the site are owned by an orchardist and farmers (including dairy farmers). In the 1947 aerial photograph the site is mostly open grassed agricultural land with some limited rural residential farmhouses at the northern portion of the site off of Maguires Road. Medium density woodland/scrubland also located at the northern portion of the site.	Titles and 1947 aerial photograph
1940s-1970s	Site remains mostly as open grassed agricultural land, with increasing number of farm dams at scattered locations across the site. Woodland cover at the northern portion of the site gradually decreases. The south eastern portion of the site may have been used for horse training purposes. In 1978 Red Gables Road and Cataract Road appear to be under construction, and additional rural residential buildings at the northern portion of the site (between Red Gables Road and Maguires Road).	Titles and 1955, 1961, 1970 and 1978 aerial photographs
1979-1980	The site has been subdivided into its current layout, with site use predominantly remaining agricultural (market gardens).	Titles
1980s - present	The subdivision of the site as referenced for 1979-1980 is apparent (as observed in the 1986 aerial photograph) with rural residential buildings at the majority of the subdivided lots at the approximate centre and southern areas of the site (between Red Gables Road and Old Pitt Town Road, east of Cataract Road). Site use (agricultural, rural residential) appears consistent between 1980s and present.	1986, 1994 and 2005 aerial photographs, site inspection (May 2013).

3.2 Previous Investigations

3.2.1 JBS, PSI 2013

JBS was engaged by APP to conduct a PSI at land at Box Hill North, NSW.

The objectives of the investigation were to assess the potential for widespread contamination based on the current and historical site activities and to draw preliminary conclusions of the potential contamination status of the site, with the consideration of potential development of the site for residential use.

The scope of work comprised:

- Review of topography, geology and hydrogeology of the site and surrounding areas;
- Review of available Council documentation, aerial photos, legal title information, EPA records and Heritage records to identify areas of environmental concern and associated COPCs;
- Conducting a detailed inspection of 31 properties comprising the site; and
- Preparation of a PSI report.

The site investigation identified the following issues at the site:

- Areas in which asbestos fragments and asbestos containing material (ACM) piping were observed on and embedded in the ground surface, and buildings containing ACM were identified;
- Potential lead paint associated with current/historic buildings;

- Current/former workshop areas in which oil staining was observed, and at areas where petroleum products/diesel fuel were stored;
- Areas of surface debris, drums, burn pits and debris stockpiles;
- Areas where former orchards/tree nurseries were identified; and
- Areas where disturbed terrain/stockpiles and/or imported fill were observed.

Based on the results of the investigation, it was concluded that there was potential for subsurface contamination to be present resulting from current and previous site use (agricultural use). Based on the site observations and agriculturally-related site activities, it was considered that the potential for widespread contamination across the site was low, with the possible exception of asbestos.

Due to site observations at some site lots (such as large maintenance sheds, petrol/diesel and chemical storage), observations of potential commercial activities at some site lots, and limited access to some buildings and lot areas, there had been and currently was storage of Dangerous Goods at the site.

It was considered unlikely that the AECs identified would have impacted the land to a degree that would prevent planning and development of the land for the intended use(s). It was recommended that a Detailed Site Investigation (DSI) be completed to assess the extent of contamination prior to future development.

It was also recommended that, based on the age of the structures as identified on-site, and the presence of suspected ACM, a hazardous materials building inspection be conducted for all structures located on the site to enable appropriate management during future development.

3.2.2 JBS&G, DSI 2014

JBS&G Australia Pty Ltd (JBS&G) was engaged by E.J. Cooper and Son Pty Ltd (EJC, the client) c/- APP Corporation Pty Ltd (APP) to conduct DSI at the site. The previous sample locations are shown on **Figures 5a to 5e and Figure 6**.

The scope of works completed for this assessment comprised:

- Review and summary of relevant background information;
- A detailed inspection of the site;
- Soil sampling within 31 lots within the site boundary;
- Installation and groundwater sampling from five groundwater monitoring wells;
- Analysis of selected soil and groundwater samples for various COPCs;
- A detailed site inspection for hazardous building materials and preparation of a hazardous materials assessment report; and
- Assessment and preparation of a DSI report in general accordance with guidelines made or approved by the NSW EPA.

Based on the findings of the DSI, the following conclusions were made with respect to the site:

- Fill material was encountered from the ground surface at all sampling locations and generally comprised silty clay.
- Concentrations of arsenic, chromium and/or lead were reported in some soil samples exceeding the adopted health criterion in five separate lots.

- Concentrations of carcinogenic polycyclic aromatic hydrocarbons (PAHs) (including B(a)P) were reported to exceed the adopted health criterion in one soil sample collected from one lot.
- A total of eight soil samples exceeded the ecological criterion for TRH fractions, with these located in four lots.
- A total of five soil samples exceeded the Management Limits for TRH fractions, with these located within two lots.
- Non-friable ACM was observed across the site in 11 different locations within five lots. It should be noted that lots with heavy vegetation may obscure the occurrence of additional potential ACM fragment impacts. These pose a potential future risk to site users and if weathered could pose a potential migration risk from the site. Free asbestos (FA) fibres or asbestos fines (AF) were also reported in seven soil samples analysed from four lots.
- Aesthetic impacts have been identified including ACM on ground surfaces and in surface soils (as noted above), friable asbestos in soil, as well as minor isolated surface staining and odorous soils. These areas will require management as part of future development works at the site.
- Groundwater monitoring wells were installed at five locations across the site, with three being sampled. Two of the groundwater monitoring wells were found to be dry.
- Concentrations of COPCs were either not detected or below adopted investigation levels within the groundwater samples collected, which indicates that identified soil impacts are not impacting groundwater.
- The ASTs currently present at the site require management to prevent further impacts to the site.
- A total of 20 stockpiles were reported across the site.
- The DSI did not identify any widespread or gross soil contamination, with potentially unacceptable risks from soil contamination typically localised, limited in extent, and able to be readily managed to enable all proposed land uses at the site.

The DSI recommended that a RAP be prepared to address the identified impacts to render the site suitable for its intended uses.

4. Data Gaps

4.1 Background

Based on the previous investigations (JBS 2013 & JBS&G 2014) completed there are several areas that have been identified within the Precincts that require further assessment.

There are six lots that are included in the development proposal for the new Precincts but no assessment has been completed due to access restrictions (refer **Section 2.9** and **Table 2.4**).

A hydroponic installation located in the western portion of the site was not assessed during the previous investigations due to access restrictions.

Additionally, numerous farm dams have been identified at the site, once drained these dams will require assessment.

Based on results and observations made during the previous assessment (JBS&G 2014) further investigation is warranted in several lots to assist in the delineation of identified impacts prior to remediation and validation.

4.2 Data Gaps

Based on the information provided in **Section 4.1**, there exists data gaps at the site. These include the following:

- Six lots not previously investigated;
- Former farm dams, with one dam reporting ACM present;
- Hydroponic Installation;
- Assessment of footprints of buildings to be demolished;
- Assessment of a single AST located within Lot 31; and
- Delineation of impacts within several lots prior to remediation.

Based on the above, the following sections outline the assessment of these data gap areas.

4.2.1 Site Inspection

An initial site inspection of each future Precinct should be completed prior to construction works beginning due to potential changes to the site subsequent to this RAP being prepared. The confirmatory inspections will take place to ensure the following:

- Presence of known stockpiles;
- Presence of known ASTs;
- Presence of known ACM impacted areas;
- Identification of any illegal dumping, further weathering of identified ACM sheeting; and
- Identification of any unexpected finds.

The current site conditions are provided in **Table 5.1**.

4.2.2 Six Lots Not Previously Investigated

As discussed in **Section 2.9**, a total of six current lots are included in the Precinct development that have not been assessed due to access restrictions (refer **Table 2.4**). These lots include:

- Lot 1 DP782360 on Boundary Road in the northwest (adjoining lot reference #3, **Figure 2**);

- The lot between Lot 23 DP255616 and Lot 25 DP255616 (on Red Gables Road);
- The lot between Lot 27 DP255616 and Lots 29 and 30 DP 255616 (on Red Gables Road);
- The lots east of Lot 43 DP255616 (access via Janpieter Road);
- The lot west of Lot 2 DP253552 (on Old Pitt Town Road); and
- The lot between Lot 2 DP253552 and Lot 4 DP253552 (on Old Pitt Town Road).

Prior to development of the Precincts in which these lots are situated (**Figure 4**, hashed) will require assessment by an environment consultant. The assessment will involve a Phase 1 Environmental Site Assessment, detailing the history of the lot and preparation of a conceptual site model to assess the potential contamination present. The Phase 1 will require Auditor review and will detail whether further assessment is warranted.

During the development phase of works these lots will require assessment for potential environmental impacts. For each site, the Contaminated Sites: Sampling Design Guidelines (EPA 1995) has been reviewed to provide a recommended number of sampling locations. Where sites are above 5 Ha, the sampling guidelines do not provide a recommended number of sample locations. Consequently, the number of locations are to be targeted at specific AECs observed at the site. A Sampling Analysis and Quality Plan must be prepared and reviewed by the Site Auditor prior to assessment of each lot (if required).

Soil samples will be collected through either hand tools and/or an excavator.

The number of locations for each lot is provided in **Table 4.1** below:

Table 4.1 Six Lots Investigation

Lot	Approximate Lot Size (Ha unless stated)	Number of locations	Analytes
Lot 1 DP782360, west of Map Reference #3 (Figure 2)	2000 m ²	7	8 metals/total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX) PAH, Asbestos
Lot 24 DP255616 between Lot 23 DP255616 and Lot 25 DP255616, located between Map References #11 and #12 (Figure 2)	10	2 sample locations per hectare	8 metals/TPH/BTEX PAH, Asbestos
Lot 28 DP255616 between Lot 27 DP255616, Lot 29 and 30 DP 255616, located between Map References #14 and #16/#17 (Figure 2)	10	2 sample locations per hectare	8 metals/TPH/BTEX PAH, Asbestos
Lots 421-425 DP1183810 east of Lot 43 DP255616, located east of Map Reference #22 (Figure 2)	10	2 sample locations per hectare	8 metals/TPH/BTEX PAH, Asbestos
Lot1 DP253552 west of Lot 2 DP253552, located between Map References #26/#27 and #30 (Figure 2)	10	2 sample locations per hectare	8 metals/TPH/BTEX PAH, Asbestos
Lot 3 DP253552 between Lot 2 DP253552 and Lot 4 DP253552, located between Map References #30 and #31 (Figure 2)	10	2 sample locations per hectare	8 metals/TPH/BTEX PAH, Asbestos

4.2.3 Farm Dams

Within the sites, there exists farm dams. These will be drained and likely backfilled and areas re-shaped during the development works. After the initial draining but prior to re-shaping of the farm dams, assessment of the walls and bases of the dams is required.

An environmental consultant will complete an inspection of the drained dams and soil samples collected to assess for potential impacts including TPH, heavy metals, OCPs, ammonia and biological impacts, including E.Coli.

Additionally, potential ACM was been reported within the wall of one dam within map reference #9 (**Figure 3**) and consequently further assessment within the walls and base of this farm dam is required. Test Pits will be excavated into the dam wall and base to assess for asbestos impacts.

Test Pits completed within the dam walls must be completed at 1 sample per 50 m within the walls with at least 1 sample per wall being required. For the base of the drained dams, a base sample will be collected at a rate of 1 sample per 2500 m².

4.2.4 Hydroponic installation (Map Reference #23)

A hydroponic installation was located in the western portion of the site within map reference #23. This installation was not inspected or investigated during the previous investigations due to access restrictions.

Consequently, an assessment is required. During the construction works, after the installation has been decommissioned, soil samples are required to be collected within the former hydroponic site.

Test pits will be excavated in the former hydroponic installation, with assessment of asbestos and heavy metals required.

The hydroponic installation has been assumed to be approximately 500 m² and consequently it is considered appropriate to collect 5 samples, in accordance with the EPA 1995 sample design guidelines. Soil samples collected within the footprint of the installation will be analysed for asbestos, metals, OCPs and herbicides.

4.2.5 ASTs

During the DSI (JBS&G 2014) various ASTs were reported within several of the parcels and consequently there are potential impacts associated with the ASTs, including staining and/or odourous soils.

During the demolition stage of the development the various ASTs identified will be removed and disposed of offsite. During this process an environmental consultant will oversee the removal works to assess for any impacts to the surrounding area. An AST was reported within map reference #31 at the site but was not assessed during the previous investigation due to access restrictions.

Where ASTs have been present at the site, validation sampling will be completed below the base of the former AST regardless of aesthetic observations.

Where stained and/or odourous soil around the ASTs are observed, then further assessment is required to assess potential for leaks. Test pits will be completed using an excavator with samples collected within and below the identified impacts. Further validation will be required for delineation sampling.

Test pit samples will be analysed for heavy metals, TPH/BTEX, volatile organic compounds (VOCs) and PAHs.

Validation samples will be analysed for heavy metals, TPH/BTEX, VOCs and PAHs and will be collected on a frequency of 1 validation sample per 10 m linear of walls and 1 base validation sample per 25 m².

4.2.6 Delineation Sampling

Based on the previous investigation (JBS&G 2014), there are several areas which require further assessment to delineate identified impacts. Should further impacts that require remediation be reported during any further assessments then these should be addressed in the subsequent investigation reports and provided to the appointed site auditor for review.

These are summarised in **Table 4.2** below:

Table 4.2 Delineation Assessment

Lot	Location	Description	COPCs	Assessment	Sampling Frequency
1	A – around SS20 location	Structure contained lead paint, surface soils around property require further assessment	Lead	Surface Sampling	Initial sampling 1 m out from each wall of building, then at 5m out
3	A – around TP03 location	ACM on surface and in fill material Additional site inspection for ACM in long grass areas associated with TP04/TP05	ACM	Test Pitting & Inspection	4x test pits 5 m around initial location
6	Orchard	EIL exceedance in orchard requires further assessment	Metals	Surface Sampling	4x test pits 5 m around initial location
7	A – around SS01 location	ACM on surface and inspection of entire lot	ACM	Test Pitting	4x test pits 5 m around initial location. Extended if further asbestos identified.
8	G – around TP03 and TP04 location	ACM observed adjacent to dog kennels and a potentially filled gully	ACM, Aesthetic impacts	Test Pitting	4x test pits 5 m around initial location. Assessment of gully size and further test pitting
19/20	SP-around TP12 & TP05/06 locations	Animal remains	Biological Hazards including E.Coli, f coli and salmonella and heavy metals	Test Pitting	4x test pits 5 m around initial locations of animal remains
27	Dog Kennels	Dog Kennels potentially contain hazardous building materials	ACM, metals, TPH/BTEX	Site Inspection and surface sampling	4x test pits 5 m around initial location of dog kennels.
29	SP location Around TP02	Stockpiles of anthropogenic materials and anthropogenic materials in surface soils	ACM	Stockpile Sampling and test pitting	1 sample per 25 m ³ up to 200 m ³ . 4x test pits within initial location to assess material

4.2.7 Footprint of former structures

The development of the Precincts will involve the demolition of all the current buildings at the site. The demolition works are to be completed by be an appropriate demolition contractor with appropriate controls and management plans in place.

Subsequent to the demolition and removal of building materials, assessment within the footprints of the former structures will be required, using hand tools to assess the potential surface impacts from hazardous building materials as well as zinc and nickel due to run-off from building structures. Samples must be collected on a 20 m grid from within the former building footprints for lead asbestos, OCP and PCB analysis. Additionally, samples must be collected from no more than 1 m outside of the former building footprint on a 20 m grid to assess for potential for zinc, nickel, lead paint flakes and ACM fragments.

Additionally, an inspection of the footprint for visible lead paint flakes, staining and ACM fragments must be completed by a suitably qualified environmental consultant.

4.2.8 Stockpile Sampling

The stockpiles and the required remediation that have been identified at the site are provided in **Section 5**. However, should further stockpiles be generated (i.e. illegal dumping) subsequent to this RAP or if waste classification is required then further sampling as per **Table 7.3** will be required.

It should be noted that in certain lots there are more than one stockpile of material. For the purpose of this RAP the visual representation on the figures, reference is given to a single stockpile location. However, more than one stockpile may be present at these locations. Consequently, all stockpile material within each lot must be remediated as per the requirements in this RAP.

5. Remedial Options

5.1 Remediation Objectives

The remediation objectives are outlined as follows:

- Removal of unacceptable risks to human health and the environment from the identified asbestos, hydrocarbon and heavy metal impacted fill material at the site;
- Validate the remedial works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria; and
- Document the validation process.

The RAP is consistent with the following guidelines and legislation:

- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW Office of Environment and Heritage, August 2011* (OEH 2011).
- *Contaminated Sites: Guidelines for NSW Site Auditor Scheme, April 2006* (DEC 2006).
- *National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 2013* (NEPC 2013).
- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land; (DUAP 1998).*
- *Code of Practice for the Safe Removal of Asbestos, 2nd Edition, National Occupational Health and Safety Commission, April 2005* (NOHSC 2005).
- Work, Health and Safety Act 2011.
- *How to Safely Remove Asbestos: Code of Practice.* WorkCover 2012.
- *Waste Classification Guidelines Part 1: Classifying Waste.* NSW EPA, December 2014 (EPA 2014).
- *Use and Disposal of Biosolids Products “Stabilisation Grade A Product”,* NSW EPA (1997).
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia,* Department of Health Western Australia, May 2009 (DoH 2009).
- *Guidelines for the Assessment of On-site Containment of Contaminated Soil,* Australian and New Zealand Environment and Conservation Council, September 1999 (ANZECC 1999).

5.2 Extent of contamination

Based on the findings of the previous investigations (JBS 2013, JBS&G 2014) and subject to the limitations of those investigations the extent of contamination is outlined in the following section. The exceedances of the adopted HIL land use criteria are shown in **Figures 7a-7e**.

The boundaries of the remediation area shall be determined by the remedial excavation works. It is possible that contaminated soils, if identified, will require to be additionally chased out from the walls and base of the excavations formed by the removal of the impacted materials.

The known areas of remediation are shown in **Table 5.1** following and in **Figures 8a-8e, 9 and 10**. The exceedances reported, depth and the likely AEC that is the potential cause of the exceedances are provided in **Table 5.1**.

Table 5.1 Description of Remedial Areas

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
I	1/11126 207-217 Boundary Road, Maraylya (#1 on Figure 5a & 7a)	Residential Property, with several sheds. Stockpiles of building materials were present in the eastern portion of the lot. Several structures appeared to consist of ACM.	EILs: 2x copper, 3x nickel, 8x zinc HILs: 1x Chromium (VI) ACM in soil -4	2 samples from 17 for copper reported above EIL with 410 mg/kg in 1-SS02 (0.0-0.1 m) and 320 mg/kg in 1-A-SS10 (0.0-0.1 m). 3 samples from 17 for nickel above EIL with 63 mg/kg in 1-SS02 (0.0-0.1 m), 33 mg/kg in 1-A-SS10 (0.0-0.1 m) and 31 mg/kg in 1-SS15 (0.0-0.1 m) 8 samples from 17 for zinc above the EIL with 1100 mg/kg in 1-SS02 (0.0-0.1 m), 260 mg/kg in 1-SS04 (0.0-0.1 m), 180 mg/kg in 1-O-SS07 (0.0-0.1 m), 2300 mg/kg in 1-SS18 (0.0-0.1 m), 690 mg/kg in 1-TP02 (0.0-0.1 m), 370 mg/kg in 1-TP04 (0.0-0.1 m). 1 sample from 17 for Cr reported above the HIL-A with 120 mg/kg in 1-SS02 (0-0.1)/ 4 samples from 25 with asbestos in soil (1-SS01 (0-0.1 m), 1-A-SS 09 (0-0.1 m), 1-A-SS20 (0-0.1 m) and 1-A-SS28 (0-0.1 m)). All other results below adopted criteria	0.1 m	Building structures including lead paint flaking	ACM reported in surface soil
I	1/207750 181-191 Boundary Road, Maraylya (#3 on Figure 5a & 7a)	Residential Property, with several sheds. Stockpiles of building materials were present including drums. A burnt car was present adjacent to Boundary Road. The site appeared to have been used as a former orchard.	EILs: 1x copper, 3x zinc ACM in soil – 1	1 sample from 27 for copper reported above EIL with 240 mg/kg in 3-S-SS20 (0.0-0.1 m) 3 samples from 27 for zinc reported above EIL with 610 mg/kg in 3-S-SS18 (0.0-0.1 m), 580mg/kg in 3-S-SS20 (0.0-0.1 m) and 380 mg/kg in 3-TP03 (0.0-0.1 m). 1 sample from 14 with asbestos in soil (3-TP03 (0-0.1 m)). All other results below adopted criteria	0.1 m	Drum and shed present on lot	Bricks, concrete, plastic, cement tiles and charcoal present in fill

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
I	3/11126 89 Maguires Road, Maraylya (#4 on Figure 5a & 7a)	An abandoned residential property and sheds were present. The site appeared to have used as an orchard	EILs: 2x zinc	2 samples from 10 for zinc reported above EIL with 230 mg/kg in 4-SD-TP07 (0.0-0.1 m) and 230 mg/kg in 4-SD-TP07 (0.0-0.1 m) All other results below adopted criteria	0.1 m	Stockpiled material	Bricks, concrete, plastic, cement tiles and charcoal present in fill
I	4/135304 A & B 97 Maguires Road, Maraylya (#5 on Figure 5a & 7a)	Residential property with chicken coops.	ACM – Aesthetics	All results below adopted criteria. ACM in surface soils.	Surface (<0.1 m)	Building adjacent	ACM reported in surface soil
G	5/658286 151 Maguires Road, Maraylya (#6 on Figure 5a & 7a)	Residential property with storage shed used for machinery vehicles. Some staining was observed in the shed. Farm dams were	EILs: 1x nickel, 2x zinc	2 samples from 23 for zinc reported above EIL with 260 mg/kg in 6-O-SS12 (0.0-0.1 m) and 6500 mg/kg in 6-S-SS16 (0.0-0.1 m) 1 sample from 23 for nickel reported above the EIL with 67 for 6-S-SS16 (0.0-0.1 m). All other results below adopted criteria	0.1 m	Stormwater runoff from adjacent building	Some sandstone inclusions
G	1/564211 169 Maguires Road, Maraylya (#7 on Figure 5a & 7a)	Farm dam at north portion of site with stockpiles of building materials (including a large stockpile of roofing tiles) scattered near the dam	ACM in soil – 1	1 sample from 4 with asbestos in soil (7-SS01 (0-0.1 m)). All other results below adopted criteria	0.1 m	Waste disposal in paddock	-
D	9/593517 155 Boundary Road, Box Hill (#8 on Figure 5a & 7a)	Residential property with Sheds and dog kennels present, with wood stockpiles present behind house	ACM in soil – 1	1 sample from 3 with asbestos in soil (8-SS01 (0-0.1 m)). All results below adopted criteria	0.1 m	Dog Kennels	Brick and wood reported in fill
D	10/593517 153 Boundary Road, Box Hill (#9 on Figure 5a & 7a)	A residence, with various sheds containing equipment including drums. Some staining reported in these	EILs: 1x nickel and zinc ESL: 2x TRH >C10-C16 2x TRH >C16-C34 1x TRH >C34-C40	1 sample from 19 for nickel (reported above EIL with 75 mg/kg in 9-TP08 (0.0-0.1 m)) and zinc (reported above EIL with 530 in 9-TP08 (0.0-0.1 m)) 2 samples from 17 for TRH >C10-C16, >C16-C34 and/or >C34-C40 above ESLs (samples #9-AST-SS01	0.1 m	Hydrocarbon and metals impacts associated with AST	Some plastic, AST

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
		areas. An AST (petrol) was present. A dam was present.	Management Limits: 1x TRH >C10-C16 2x TRH >C16-C34	(0-0.1) and #9-SD-SS04 (0-0.1)), with TRH ranging between 140 mg/kg and 53 000 mg/kg 2 samples from 17 for TRH >C10-C16 and/or >C16-C36 above Management Limits (samples #9-AST-SS01 (0-0.1) and #9-SD-SS04 (0-0.1)), with TRH ranging between 2500 mg/kg and 53 000 mg/kg All other results below adopted criteria.		and drum storage.	
D	22/255616 4 Red Gables Road, Box Hill (#10 on Figure 5a & 7a)	Residential property with farm dams present.	EILs: 1x zinc	1 sample from 6 for zinc reported above EIL with 200 mg/kg in 10-SD-SS02 (0.0-0.1 m) All other results below adopted criteria	0.1 m	Stockpiled material	-
D	23/255616 6 Red Gables Road, Box Hill (#11 on Figure 5b & 7b)	Residential property with sheds. Disused machinery stored in shed. Fire pit present adjacent to property and farm dams present.	EILs: 1x zinc	1 sample from 7 for zinc reported above EIL with 2800 mg/kg in 11-TP02 (0.0-0.1 m) All other results below adopted criteria	0.1 m	Disused machinery store	Some gravel inclusions
E	25/255616 10 Red Gables Road, Box Hill (#12 on Figures 5b & 7b)	Residential property, with greenhouse. AST present and potential ACM within residence.	EILs: 1x zinc	1 sample from 8 for zinc reported above EIL with 1600 mg/kg in 12-AST-SS09 (0.0-0.1 m) All other results below adopted criteria	0.1 m	Buildings and stockpiled material. ACM associated with building materials	Bricks and ceramics present in fill AST
E	26/255616 Red Gables Road, Box Hill (#13 on Figure 5b & 7b)	Farm dam present, with scrap metal observed adjacent.	None	All results below adopted criteria	-	Anthropogenic impacts in fill material	Steel and glass in the fill material

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
F	30/255616 5 Janpieter Road, Box Hill (#16 on Figure 5b & 7b)	Residential property, with storage sheds. Building material stockpiles observed in the northwest portion of the lot. Multiple drums and old machinery observed in central-southern portion of the lot. Farm dams present	ESL: 1x TRHs EILs: 1x zinc	1 of 11 samples for TRH (C ₁₆ -C ₃₄) reported above the ESL at 1600 mg/kg in 16-SD-HA01 (0.0-0.1 m). 1 sample from 10 for zinc reported above EIL with 1100 mg/kg in 16-SD-HA04 (0.0-0.1 m) All other results below adopted criteria	0.1 m	Drums and stored machinery	-
F	29/255616 18 Red Gables Road, Box Hill (#17 on Figure 5b & 7b)	Residential property with building material/wood stockpile observed in	EILs: 1x copper, nickel zinc HIL: 1 x lead	1 of 11 samples reported lead above the HIL-A with 530 mg/kg in 17-SD-SS03 (0.0-0.1) 1 of 11 samples reported zinc above the EIL with 660 mg/kg, copper with 180 mg/kg and nickel with 35 mg/kg in 17-SD-SS03 (0.0-0.1) All other results below adopted criteria	0.2 m	Machinery	ASTs present adjacent to storage sheds
B	47/255616 3 Red Gables Road, Box Hill (#18 on Figure 5b & 7b)	Farm dam present, with sheds adjacent to residence	EILs: 1x zinc	1 of 6 samples analysed for zinc reported above EIL with 280 mg/kg in 18-SD-SS01 (0.0-0.1)	0.1 m	Dam wall	Blue staining in stockpile
B	45/255616 5 Red Gables Road, Box Hill and 46/255616 5 Red Gables Road, Box Hill (#19 and #20 on 5b & 7b & 7d)	General landscaped property, with various vegetated stockpiles of material that were used for fertilizer soils. Multiple old machinery and equipment present across the property including drums. An AST was present. A farm dam was present in the	EILs: 4x zinc, 1x nickel HIL: 1x lead HSLs: 4x TRH Management Limits: 3x TRH	1 of 32 samples for lead reported above HIL-A and HIL-C with 650 mg/kg in 20-SD-SS07 (0.0-0.1 m) 2 of 32 samples for TRH (C ₁₀ -C ₁₆) reported above ESLs with 310 mg/kg in 20-SD-SS01 (0.0-0.1 m) and 12000 mg/kg in 20-AST-SS02 (0.0-0.1 m) 1 of 32 samples for TRH (C ₁₀ -C ₁₆) reported above Management Limits with 12000 mg/kg in 20-AST-SS02 (0.0-0.1 m) 4 of 32 samples for TRH (C ₁₆ -C ₃₄) reported above HSLs with 19000 mg/kg in 20-SD-SS01 (0.0-0.1 m),	0.1-1.0 m	ASTs, machinery storage and drums.	Animal Remains identified. AST and Drums. Organic odours reported

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
		southern end of the property and contained tyres.		<p>26000 mg/kg in 20-AST-SS02 (0.0-0.1 m), 11000 mg/kg in 20-AST-SS07 (0.0-0.1 m) and 1400 mg/kg in #20-SS11 (0-0.1 m)</p> <p>3 of 32 samples for TRH (C₁₆-C₃₄) reported above Management Limits with 19000 mg/kg in 20-SD-SS01 (0.0-0.1 m), 26000 mg/kg in 20-AST-SS02 (0.0-0.1 m), 11000 mg/kg in 20-AST-SS07 (0.0-0.1 m).</p> <p>1 of 32 samples for TRH (C₃₄-C₄₀) reported above HSLs with 14000 mg/kg in 20-SD-SS01 (0.0-0.1 m)</p> <p>5 of 32 samples for zinc reported above EIL with 1800 mg/kg in 20-SD-SS07 (0.0-0.1 m), 210 mg/kg in 20-SD-SS08 (0.0-0.1 m), 220 mg/kg in 20-SS11 (0.0-0.1 m), 240 mg/kg in 20-SD-SS12 (0.0-0.1 m) and 680 mg/kg in #20-TP05 (0.9-1.0 m)</p> <p>3 of 32 samples for nickel reported above EIL with 62 mg/kg in 20-SD-SS07 (0.0-0.1 m), 41 mg/kg in 20-SD-SS08 (0.0-0.1 m), 37 mg/kg in 20-TP09 (0.8-0.9).</p>			
C	44/255616 7 Red Gables Road, Box Hill (#21 on Figure 5b & 7b)	Residential property in the southern portion of the site. Stockpiles of building material, including ACM present south of the residence. Farm dams present.	<p>EIL: 1x zinc</p> <p>ESL: 1x PAHs</p>	<p>1 of 9 samples for zinc reported above EIL with 910 mg/kg in 21-SS01 (0.0-0.1 m)</p> <p>1 of 7 samples for PAHs (benzo(a)pyrene) reported above ESL with 1.5 mg/kg in 21-SS01 (0.0-0.1 m)</p>	0.1 m	Storage shed. ACM associated with filling of dam wall	ACM on surface reported
C	43/255616 9 Red Gables Road, Box Hill (#22 on Figure 5b & 7b)	Residential property, with an ACM pipe located along driveway to residence. Farm dams present and staining	<p>EILs: 1x zinc</p> <p>ESL: 1x TRH</p>	<p>1 of 7 samples for zinc reported above EIL with 180 mg/kg in 22-S-SS05 (0.0-0.1 m)</p> <p>1 of 5 samples for TRH (C₁₆-C₃₄) above ESL with 1700 mg/kg in 22-S-SS05 (0.0-0.1 m)</p> <p>All other results below adopted criteria</p>	0.1 m	Metal storage shed	Staining reported ACM on surface reported Dam wall present

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
		observed within a storage shed.					
A	15/255616 3 Cataract Road, Box Hill (#24 on Figure 5c & 7c)	Vegetated property with farm dams.	EIL: 2x zinc	2 of 7 samples for zinc reported above EIL with 310 mg/kg in 24-AST-SS02 (0.0-0.1 m) and 180 mg/kg in #24-SP-TP01 (0.0-0.1 m) All other results below adopted criteria	0.1 m	AST. ACM associated with building adjacent	AST Wood and corrugated iron
A	16/255616 5 Cataract Road, Box Hill (#25 on Figure 5c & 7c & 7e)	Residential property with storage shed. Old machinery and cars present around shed. A burn pit was present adjacent to the shed.	EIL: 1x arsenic, 1x copper, 3x zinc HIL: 1x chromium 1x arsenic	1 of 6 samples for arsenic reported above the HIL-A and EIL with 270 mg/kg in 25-F-SS01 (0.0-0.1 m). 1 of 6 samples for chromium reported above the HIL-A with 140 mg/kg in 25-F-SS01 (0.0-0.1 m). 1 of 6 samples for copper reported above the EIL with 240 mg/kg in 25-F-SS01 (0.0-0.1 m). 3 of 6 samples for zinc reported above the EIL with 300 mg/kg in 25-F-SS01 (0.0-0.1 m), 390 mg/kg in 25-S-SS02 (0.0-0.1 m) and 400 mg/kg in 25-SD-SS04 (0.0-0.1 m)	0.1 m	Farm machinery	Charcoal in fill material
A	21/255616 7 Cataract Road, Box Hill (#26 on Figure 5c & 7c)	Property was used for horse training in the central area. Residence and storage sheds were present. Sheds used for storage of agricultural chemicals.	EIL: 1x zinc	1 of 6 samples for zinc reported above the EIL with 260 mg/kg in 26-SS02 (0.0-0.1 m).	0.1 m	Storage shed	-
A	17/255616 8 Cataract Road, Box Hill (#27 on Figure 5c & 7c)	Residential property, with concrete floored sheds and farm dams. ACM used to construct dog kennels and stockpiles of anthropogenic materials observed.	1x nickel	1 of 8 samples for zinc reported above the EIL with 33 mg/kg in 27-TP0515 (0.0-0.1 m).	0.1 m	Fill material	Suspected ACM within stockpiles

Precinct	Lots	Lot Description	Exceedances Above Adopted Criterion	Concentrations (mg/kg)	Impact Depth (m)	Suspected Source AEC	Further Comments
		Staining observed on concrete floor of sheds					
C	41/255616 11 Janpieter Road, Box Hill (#28 on Figure 5c & 7c)	Open vegetated property with farm dams	None	All results below adopted criteria	Surface Soils (<0.1 m)	ACM associated with stockpiled material and within the fill material, likely buried demolition materials	ACM reported in fill material and stockpiled material
H	2/253552 117 Old Pitt Town Road, Box Hill (#30 on Figure 5c & 7c & 7e)	A car park and tennis court. A burn pit was present adjacent to the tennis court car park. A farm dam was present. A stockpile of household goods such as furniture and organic matter was located adjacent to the residential property on the lot.	EILs: 1x arsenic, 1x copper, 1x chromium 1x zinc HIL: 1x arsenic, 1x chromium	1 of 7 samples for arsenic reported above HIL-A and EIL with 700 mg/kg in 30-F-SS01 (0.0-0.1 m) 1 of 7 samples for copper reported above EIL with 1100 mg/kg in 30-F-SS01 (0.0-0.1 m) 1 of 7 samples for zinc reported above the EIL with 290 mg/kg in 30-F-SS01 (0.0-0.1 m) 1 of 7 samples for chromium reported above HIL-A and EIL with 240 mg/kg in 30-F-SS01 (0.0-0.1 m)	0.1 m	Machinery and farm equipment and the dam	-
-	# 2, 14, 15, 23, 29 and 31. and 15	Subject to unexpected finds protocol.					

In addition to these areas, there are anthropogenic materials within fill material that may require remediation and this is outlined in **Section 7**.

Additionally, ASTs present at the site will need to be removed and disposed of in accordance with **Section 7** and the relevant standards.

A total of 20 stockpiles were identified at the site during the previous investigation and will require management during the proposed development. During the inspections completed as part of the previous assessment (JBS&G 2014) none of the stockpiles were reported above 200 m³.

The known stockpile locations are shown on **Figure 9**. The identified stockpiles are summarised in **Table 5.2** following.

Table 5.2 Known Stockpiles

Precinct	Lot	Stockpile	Exceedances	Comments
A	Lot 17 DP255616 (#27)	2x stockpile	-	ACM and building materials
A	Lot 15 DP255616 (#24)	1x stockpile	-	ACM and metal sheeting
B	Lot 47 DP255616 (#18)	1x stockpile	EIL	Blue staining
B	Lot 46 DP255616 (#19)	1x stockpile	EIL	Animal remains, staining and odours
B	Lot 45 DP255616 (#20)	1x stockpile		
C	Lot 44 DP255616 (#21)	2x stockpile	EIL	Building materials and building materials
C	Lot 41 DP255616 (#28)	2x stockpiles	-	ACM and building materials
C	Lot 40 DP255616 (#29)	1x stockpile	-	Building materials
D	Lot 9 DP593517 (#8)	1x stockpile	-	ACM
D	Lot 23 DP255616 (#11)	1x stockpile	-	-
E	Lot 25 DP255616 (#12)	1x stockpile	EIL	Drums, machinery, ACM
E	Lot 26 DP255616 (#13)	1x stockpile	-	Scrap metal stockpile
E	Lot 27 DP255616 (#14)	1x stockpile	-	Scrap metal stockpile
F	Lot 29 DP255616 (#17)	1x stockpile	HIL/EIL	Machinery
F	Lot 30 DP255616 (#16)	2x stockpile	-	-
G	Lot 1 DP564211 (#7)	1x stockpile	-	
H	Lot 2 DP253552 (#30)	1x stockpile	-	-
I	Lot 3 DP11126 (#4)	2x stockpiles	EIL	Building materials and ACM

5.2.1 Data Gaps

In addition to the remedial areas outlined there exists data gap areas at the site and these are discussed further in **Section 4**.

5.3 Possible Remedial Options

The Contaminated Sites: *Guidelines for the NSW Auditor Scheme* (DEC 2006) states that that soil remediation and management is implemented in the following preferred order in NSW:

1. On-Site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-Site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the Site;
3. Removal of contaminated soil to an approved Site or facility, followed, where necessary, by replacement with clean fill; and
4. Consolidation and isolation of the soil on-Site by containment within a properly designed barrier.

NEPC (2013) considers that if the first two options above are not practicable, then on-site containment is preferred over removal and disposal, with a further alternative being

implementation of a long-term management strategy to manage impacted materials on site where remediation would have no net environmental benefit or would have a net adverse environmental effect.

5.4 Discussion of Options

Within the context of the hierarchy, the development is to be staged. The preferred order of remediation may need to be adjusted for individual lots and Precincts during the staged development process. Due to development process being unknown at this stage one or more of the preferred remediation options may be utilised.

The aim of the development works would be retain as much material as possible to reduce costs and reduce material to be removed to landfill. However, this will be dependent on timing, on whether there is excess spoil or the storage areas for material to be retained at the site.

The preferred approach may change as the development progresses.

Based on the development at the site consisting of various different land uses there is scope to complete the remediation during the construction phase of works within each Precinct. The remediation strategy will consist of several options, including offsite disposal, cap and containment and onsite treatment. The application of these options will be dependent on final development designs within each Precinct but are summarised in the following sections.

5.5 Preferred Remediation Option

The preferred approach would be to retain as much material at the site as possible. With consideration to EPA's endorsed guidelines hierarchy for soil remediation options, a summary of the preferred remediation options are outlined as follows:

- 'Sparrow' picking of ACM from surface soils and disposal of ACM offsite with reuse of treated materials at the site;
- Treated materials to be placed in appropriate areas subject to the finalisation development plans;
- Excavation and offsite disposal of the impacted soils where retention at the site is not possible;
- in-situ containment of impacted soil within road reserves or less conservative land uses where the development plans allow;
- Offsite disposal of hydrocarbon impacts;
- Removal of any liquid within ASTs removed, the ASTs degassed and then removed offsite for appropriate destruction and recycling;
- Hazardous building materials to be removed by an appropriate licensed remediation contractor prior to demolition of the buildings;
- Removal of any surficial debris, such as drums and machinery; and
- Ongoing management through the development and implementation of an Environmental Management Plan (EMP) for the management of the retained contaminated materials where retained/contained onsite.

As the concept plan for the site has been divided into nine Precincts (**Section 2.9**), the remedial strategies can be applied across the site as a whole, or on a staged basis.

Excavation of the remedial areas will be completed based on particular AEC identified as per **Tables 5.1** and **5.4**, with the footprint of the AEC being remediated and validated. Consequently,

the remedial areas will be varied in size, with them based on the size of the AEC footprint. Where impacts are associated with buildings, the footprint will be extended by 1 m around the building to assess for potential runoff/flaking paint etc.

The remedial area excavated must be to the depth of the known impact (as described in **Table 5.1**). The excavation will be inspected and should further evidence of impacts (staining, odours etc.) be reported then further excavation will be required, as per **Section 7**. If no further impacts are observed then validation sampling will be completed.

The stockpiles identified will required to be managed/remediated as a whole. The preferred strategy is to retain stockpiles, where appropriate, at the site. Where stockpiles have been identified to contain only ACM impacts then 'sparrow' picking of ACM from the stockpiles is considered an appropriate method for remediation to allow retention at the site without the need for further management (**Section 7.3.2**). Alternatively, the stockpiles can be disposed offsite in accordance with the NSW EPA 2014 or alternatively non 'sparrow' picked impacted stockpiles could also be placed within a containment cell within a designated area and managed under a future long term management plan.

Additionally, all building footprints must be considered during the further assessment, remediation and validation.

Building materials must be inspected and assessed prior to being demolished and demolition waste sent for recycling. An environmental consultant must inspect the material for hazardous building materials (i.e. ACM) and aesthetic impacts prior to being removed offsite for recycling as per the EPA NSW (2014). Materials removed offsite must also be documented in the Validation report.

Based on the unknown development plan for the whole site various remediation strategies could be implemented.

A summary of the remedial strategy for the site is provided in **Table 5.3** following:

Table 5.3 Remedial Approach (by AEC)

AEC	Preferred Option	Contingency
ACM in surface soils	Reuse of material at the site <u>without ongoing management</u> subject to Sparrow Picking	Onsite containment of non-treated impacted materials or offsite disposal
ACM in subsurface soils	Reuse of material at the site <u>without ongoing management</u> subject to Sparrow Picking and Quantification	Onsite containment of non-treated impacted materials or offsite disposal
ACM in stockpiles	Reuse of material at the site <u>without ongoing management</u> subject to Sparrow Picking and Quantification	Onsite containment of non-treated impacted materials or offsite disposal
ACM in farm dams	Reuse of material at the site <u>without ongoing management</u> subject to Sparrow Picking and Quantification	Onsite containment of non-treated impacted materials or offsite disposal
Hydrocarbon HIL impacts (including stockpiles)	Offsite disposal	Onsite bioremediation subject to suitable volumes of material provided
Heavy metal HIL impacts (including stockpiles)	Reuse in less sensitive land use scenarios	Onsite containment of non-treated impacted materials or
Hydrocarbon ESL impact s(including stockpiles)	Offsite disposal	Onsite bioremediation subject to suitable volumes of material
Heavy metal EIL impacts (including stockpiles)	Reuse in less sensitive land use scenarios	Onsite containment of non-treated impacted materials or offsite disposal
Building Rubble (Aesthetic)	Potential Recycling and containment	Offsite disposal
ASTs	Offsite Disposal	-
Surface Debris (Drums, concrete etc.)	Offsite Disposal	-

The remedial strategy for each lot is provided in **Table 5.4** following.

Table 5.4 Remedial Approach (by Lot)

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
A	15/255616 3 Cataract Road, Box Hill (#24 on Figure 4c)	AST.	<u>EIL</u> : 2x zinc	AST	Investigation beneath AST	Removal of any liquid contents from the AST as per DECCW 2009, Removal and destruction of AST, surface sampling directly beneath AST after removal and remediation (if required) EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	2x areas for EIL heavy metal impacts associated with metal sheets. Excavate to 0.1 m with footprint of former metal sheets 1x AST area, approx. excavation area 3 m x 3 m x 1 m	AST removal. Removal of hazardous building materials during demolition. Removal of EIL exceedance offsite or placement within less conservative land use areas. Validation of any management of any impacts within dam walls or below AST
		ACM associated with building adjacent	ACM	Wood and corrugated iron ACM in stockpiles	Inspection of ACM across lot	Excavation, pick and reuse of ACM impacted stockpiles or removal offsite.	Stockpiles excavated to footprint and to a 0.1 m bgs (anthropogenic materials & ACM)*	Stockpile to material tracked if to be retained at the site or disposed of offsite. Remove site debris (metal sheets)
		Dam	-	-	Investigation within dam walls	-	-	Validation of any management of any impacts within dam walls
A	16/255616 5 Cataract Road, Box Hill (#25 on Figure 4c)	Fire Pit	<u>HIL</u> : 1x chromium 1x arsenic	-	-	Assessment for beneficial reuse at the site in under less sensitive land use scenarios. Alternatively, excavation and disposal of HIL/HSL impacts in the surface soils	1x area for HIL heavy metal impacts associated with fire pit, excavate footprint of fire pit to at least to 0.1 m bgs	Removal of HIL/HSL exceedance offsite disposal Validation of fire pit removal

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
						Fire pit to be excavated and removed offsite.		
		Farm machinery	<u>EIL:</u> 1x arsenic, 1x copper, 3x zinc	-	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas. Removal of site debris including used cars, machinery and other anthropogenic materials	2x areas for EIL heavy metal impacts associated with site debris. Removal site debris and excavate footprint to 0.1 m bgs and site inspection	Validation of the removal of any old machinery and site debris
		Charcoal in fill material, ACM in stockpiles	=	-	-	Excavation, pick and reuse of ACM impacted stockpiles or removal offsite.	Stockpiles excavated to footprint and to a 0.1 m bgs (anthropogenic materials & ACM)*	Stockpile to material tracked if to be retained at the site or disposed of offsite.
		Dam	=	-	Investigation within dam walls	-	-	Validation of any management of any impacts within dam walls
A	21/255616 7 Cataract Road, Box Hill (#26 on Figure 4c)	Storage shed	<u>EIL:</u> 1x zinc	-	Investigation of oil staining beneath sheds	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	1x area of EIL heavy metal impact associated with storage shed, excavation of storage shed footprint to at least 0.1 m bgs	Removal of EIL exceedance offsite or placement within less conservative land use areas. Removal of shed and validation beneath for footprint of shed
		Dam	=	-	Investigation within dam walls	-	-	Validation of any management of any impacts within dam walls

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
A	17/255616 8 Cataract Road, Box Hill (#27 on Figure 4c)	Fill material and Shed	EIL: 1x nickel	-	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	1x area of EIL heavy metal impact associated with sheds runoff. Excavation of shed footprint to least 0.1 m bgs	Removal of EIL exceedance offsite or placement within less conservative land use areas after removal of sheds.
		Stockpiles	-	-	-	Excavation, pick and reuse of ACM impacted stockpiles or removal offsite	Stockpiles contained ACM* Stockpile footprint to be validated.	Stockpiles either removed offsite or placed less conservative land use areas
		Dog Kennels	-	-	Investigation of Dog Kennels	-	-	Validation of any management of any impacts within dog kennels including potential hazardous building materials.
B	18/2556166 Cataract Road, Box Hill (#23 on Figure 4b)	Dam	-	-	Investigation of Dams	No Remediation Required	-	Validation of any remediation of any impacts within dam walls
B	47/255616 3 Red Gables Road, Box Hill (#18 on Figure 4b)	Stockpile	EILs: 1x zinc	Blue staining in stockpile		Further Waste Classification of Stockpile (if required) with removal for offsite disposal. EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	EIL heavy metal impacts associated with stockpile to be excavation to 0.1 m with stockpile footprint	Stockpile to material tracked if to be retained at the site or disposed of offsite.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
B	45/255616 5 Red Gables Road, Box Hill and 46/255616 5 Red Gables Road, Box Hill (#19 and #20 on Figure 4b)						1x stockpile (EIL, staining)*	
		Dam	=	-	Investigation of Dams	-	-	Validation of any remediation of any impacts within dam walls
		ASTs	<u>HIL:</u> 1x lead <u>HSLs:</u> 4x TRH <u>Management Limits:</u> 3x TRH	2x AST and Drums.	Investigation beneath ASTs	Assessment for beneficial reuse at the site in under less sensitive land use scenarios. Alternatively, excavation and disposal of HIL/HSL impacts in the surface soils and stockpiles Removal of any liquid contents as per DECCW 2009, Removal and destruction of 2x AST. Removal of any aesthetic issues offsite, including staining and metal offsite	2x AST, approx. excavation area 3 m x 3 m x 1 m 3x 10 x 10 area for TPH impacts to 1.0 m	ASTs removal. Removal of EIL/HIL exceedance offsite or placement within containment cell Validation of any management of any impacts below ASTs
		TP12	=	Organic odours reported	Delineation Sampling around TP12 location (Section 4) Delineation Sampling around TP05/06 location	-	-	Validation of any remediation completed for delineation sampling
		Stockpiles.	=	-	-	Excavation, pick and reuse of ACM impacted stockpiles or removal offsite	1x stockpile on site #19 and 1x stockpile on site #20 (ACM and	Stockpile to material tracked if kept onsite

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
							anthropogenic material, animal remains)* Removal of stockpile to entire footprint to 0.1 m bgs	
		Machinery storage and drums	<u>EILs</u> : 4x zinc, 1x nickel	-	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas or removed offsite.	All stockpiles of anthropogenic materials to be removed offsite.	Removal of EIL/HIL exceedance offsite or placement within containment cell
		Animal Remains identified.	-	-	-	Excavation and disposal of any animal remains encountered	Excavation and disposal of any animal remains encountered	Validation of any remediation completed for delineation sampling
		Dams	-	-	Investigation of Dams	-	-	Validation of any management of any impacts within dams
C	44/255616 7 Red Gables Road, Box Hill (#21 on Figure 4b)	Storage shed.	<u>EIL</u> : 1x zinc <u>ESL</u> : 1x PAHs ACM in surface soils (<0.1 m)	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal Removal of any aesthetic issues offsite including ACM impacted stockpile adjacent to site shed in south of lot EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	EIL heavy metal & PAHs impacts associated with stockpiled material. Removed offsite to 0.1 m bgs of entire stockpile footprint. 1x stockpile (EIL & anthropogenic materials)* near site shed to be removed offsite. Stockpile to excavation to 0.1 m	Removal of EIL exceedance offsite or placement less conservative land use areas Validation of any management of any impacts within dams Removal of sheds ACM impacted stockpile to be treated and placed less conservative land use areas or disposed of offsite or if untreated placed in containment

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
C	43/255616 9 Red Gables Road, Box Hill (#22 on Figure 4b)						bgs and removed offsite.	cell. Stockpile footprint to be validated from the near the south residence and removal of surface debris.
		ACM associated with filling of dam wall & Dams	ACM in surface soils	-	Investigation of Dams	Farm dam walls to be assessed and 'sparrow picked' for ACM. ACM to be removed offsite, with dam walls contained.	'Sparrow pick' or offsite removal	Validation of any management of any impacts within dams
		Metal storage shed	<u>EILs:</u> 1x zinc <u>ESL:</u> 1x TRH	-	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	EIL heavy metal & TPHs impacts of entire stained area to at least 0.1 m below the visible stained depth	Removal of EIL exceedance offsite or placement less conservative land use areas. Removal of EIL/ESL exceedance of stained soils associated with buildings
		Dams	ACM in surface soils	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts	ACM Surface pick of dam walls and surrounding area within lot	Removal of asbestos offsite, or treatment and placement in less conservative land use areas or placement of untreated material in containment Validation of any management of any impacts within dams Removal of ACM pipe if required.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
		Staining associated with Building	-	Staining reported	Further inspection of stained area associated with building	Excavation of stained surface soils due to aesthetic purposes	Excavation of stained surface soils due to aesthetic purposes	Excavation and removal of aesthetic impacts associated with stained soils
C	41/255616 11 Janpieter Road, Box Hill (#28 on Figure 4c)	ACM associated with stockpiled material	-	ACM reported in stockpiled material	-	Excavation, pick and reuse of ACM impacted stockpiles or removal offsite.	2x stockpiles (ACM and building materials)* removed offsite	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment Stockpile to material tracked if to be retained at the site or disposed of offsite. Validation samples collected from stockpile footprints after removal.
		ACM within the fill material, likely buried demolition materials	-	ACM reported in subsurface soils	-	Surface 'sparrow picking' and excavation of surface soils for asbestos impacts at the site or offsite disposal.	ACM Surface pick of entire lot	Validation inspection after sparrow pick of surface soils for ACM Subsurface demolition waste to be excavated and removed, ACM identified to be removed.
		Dams	-	-	Investigation of Dams			Validation of any management of any impacts within dams
C	40/255616 13 Janpieter Road, Box Hill	SP Location	None	-	Delineation Sampling around SP	Excavation and disposal offsite of impacts associated with delineation sampling	1x stockpile (Building materials)*	Stockpile to material tracked if onsite

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
	#29 on Figure 4c)				location (Section 4)	Removal of any aesthetic issues offsite Excavation and removal of stockpiled material	Aesthetic issues to be removed and inspection completed	Validation of any management completed for delineation sampling
		TP02	None	-	Delineation sampling around TP02	Excavation and disposal offsite of impacts associated with delineation sampling	Aesthetic issues to be removed and inspection completed	Validation of any management completed for delineation sampling
D	9/593517 155 Boundary Road, Box Hill (#8 on Figure 4a)	ACM in surface soils	ACM in surface soils	Brick and wood reported in fill, ACM in surface soils	Delineation Sampling around TP03 & TP04 location (Section 4)	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal	ACM Surface pick around dog kennels, buildings and sheds 1x stockpile (ACM)*	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment Stockpile to material tracked if to be retained at the site or disposed of offsite. Validation of any remediation completed for delineation sampling
		Dog Kennels	-	-	Investigation of dog kennels	-	-	Validation of any management of any impacts within dog kennels
		Dams	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dams

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
D	10/593517 153 Boundary Road, Box Hill (#9 on Figure 4a)	Hydrocarbon and metals impacts associated with AST and drum storage.	<u>EILs:</u> 1x nickel and zinc <u>ESL:</u> 2x TRH >C10-C16 2x TRH >C16-C34 1x TRH >C34-C40 <u>Management Limits:</u> 1x TRH >C10-C16 2x TRH >C16-C34	Some plastic, AST	Investigation of AST	Removal of any liquid contents from the AST as per DECCW 2009, Removal and destruction of AST Assessment for beneficial reuse at the site in under less sensitive land use scenarios. Alternatively, excavation and disposal offsite of surface impacts beneath AST	1x AST, approx. excavation area 3 m x 3 m x 1 m 1x area of EIL heavy metal impact associated with AST and drum storage. Footprint of AST and drum storage to be excavated to 0.1 m 2x area of ESL TPHs impacts associated with AST and drum storage. Footprint of AST and drum storage to be excavated to 0.1 m 1x stockpile (ACM)	Removal of AST and any aesthetic impacts. Removal of EIL/HIL exceedance offsite or placement within containment. Validation of any management of any impacts beneath AST ACM impacted stockpile disposed of offsite or treatment and placement in less conservative land use areas or placement of un-treated material in containment
		Dams	=	-	Investigation of dams	-	ACM Surface pick over dam	Validation of any management of any impacts within dams ACM impacted stockpile disposed of offsite or treatment and placement in less conservative land use areas or placement of un-treated material in containment
		ACM in surface soils	ACM in surface soils	-	-	Surface 'sparrow picking' or excavation of surface soils for	ACM Surface pick of entire lot	ACM impacted stockpile disposed of offsite or

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
						asbestos impacts and containment at the site or offsite disposal		treatment and placement in less conservative land use areas or placement of un-treated material in containment
D	22/255616 4 Red Gables Road, Box Hill (#10 on Figure 4a)	Sediment	EILs: 1x zinc	ESL exceedance within stockpiled material	-	EIL impacts are within debris piles, material will be inspected for anthropogenic materials prior to potential management at the site, with impacted materials not be placed in landscaped areas.	Removal of debris piles for EIL heavy metal impacts to 0.1 m within stockpile footprint	Removal of EIL exceedance offsite or placement within containment. Validation of removal of debris and inspection of surface soils
		Dams	=	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
		Burn Pit	=	-	-	Removal of burn pit	Removal of the burn pit offsite disposal	Visual validation of removal of burn pit
D	23/255616 6 Red Gables Road, Box Hill (#11 on Figure 4b)	Disused machinery store	EILs: 1x zinc	Some gravel inclusions	-	Excavation and removal of any aesthetic issues associated machinery store EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	Footprint of machinery store area for EIL heavy metal impacts to 0.1 m Aesthetic issues (drums, debris) disposed of offsite 1x stockpile (anthropogenic material)*	Removal of AST. Removal of EIL exceedance offsite or placement within less sensitive land use areas. Stockpile to material tracked if to be retained at the site or disposed of offsite. Drums removed offsite
		AST		AST	Investigation of AST	Removal of any liquid contents from the AST as per DECCW 2009, Removal and destruction of AST	1x AST, approx. excavation area 3 m x 3 m x 1 m	Validation of any management of any impacts below AST.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
						Excavation and removal of any aesthetic issues associated with the AST		
		Dams	=	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls
E	25/255616 10 Red Gables Road, Box Hill (#12 on Figures 4a and 4b)	Buildings and stockpiled material.	EILs: 1x zinc	Bricks and ceramics present in fill	-	Stockpiles of material to be managed onsite as part of the cap and containment. Removal of any aesthetic issues, including drums, metal offsite	1x stockpile (EIL, ACM, drums)* Aesthetic issues to be removed	Suitable evidence of stockpile management. Removal of anthropogenic materials offsite. Drums removed offsite and validation of EIL exceedances Stockpile to material tracked if to be retained at the site or disposed of offsite.
		Dams	=	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls
		ACM associated with building materials	=	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal	Aesthetic issues to be removed ACM Surface pick of areas identified with debris, where stockpiles, drums and machinery were stored	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment
E	26/255616 Red Gables Road, Box Hill	Anthropogenic impacts	None	Steel and glass in the fill material		Removal of any aesthetic issues offsite, including metal around the dam offsite	Aesthetic issues to be removed	Removal of anthropogenic materials offsite.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
	#13 on Figure 4b)	in fill material					1x stockpile (scrap metal)*	Stockpile to material tracked if to be retained at the site or disposed of offsite.
		Dams	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls.
E	27/255616 14 Red Gables Road, Box Hill (#14 on Figure 4b)	-	None	Anthropogenic materials reported	-	Removal of any aesthetic issues offsite, including metal offsite	Aesthetic issues to be removed 1x stockpile (scrap metal)*	Removal of anthropogenic materials offsite. Stockpile to material tracked if to be retained at the site or disposed of offsite.
F	31/255616 3 Janpieter Road, Box Hill (#15 on Figure 4b)	Dams	None	-	Investigation of dams	No Remediation Required	-	Validation of any management of any impacts within dam walls
F	30/255616 5 Janpieter Road, Box Hill (#16 on Figure 4b)	Drums and stored machinery,	<u>ESL:</u> 1x TRHs	Anthropogenic materials reported and stockpiles of debris	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	1x area of ESL TPHs impact associated with drum storage. Drum storage area footprint to be excavated to at least 0.1 m	Removal of old machinery. Removal of EIL exceedance offsite or placement within less sensitive land use areas. Stockpile to material tracked if to be retained at the site or disposed of offsite.
		Stockpiled anthropogenic material	<u>EILs:</u> 1x zinc	-	-	Removal of any aesthetic issues offsite, including metal offsite	EIL heavy metal impacts within stockpiles, excavation	Stockpile to material tracked if to be retained at the site or disposed of offsite.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
							of stockpiles to 0.1 m of footprint 1x stockpile (anthropogenic material)*	
		Dams	±	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls.
		Burn Pit	±	-	-	Removal of burn pit	Removal of the burn pit offsite disposal	Visual validation of removal of burn pit
F	29/255616 18 Red Gables Road, Box Hill (#17 on Figure 4b)	Machinery storage area	<u>EILs:</u> 1x copper, nickel zinc <u>HIL:</u> 1 x lead	-	-	Assessment for beneficial reuse at the site in under less sensitive land use scenarios. Alternatively, excavation and disposal of HIL/HSL impacts in the surface soils. EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas. Excavation and removal of any impacts and aesthetic issues associated with the machinery store	1x stockpile removed offsite to 0.1 m of footprint (HIL/EIL)* 1x area of EIL heavy metal impact associated with machinery. Machinery to be removed and footprint of storage area excavated to 0.1 m 1x area of HIL heavy metal impact associated with machinery. Machinery to be removed and footprint of storage area excavated to 0.1 m	Removal of stockpiled material offsite or treatment and placement in less conservative land use areas or placement of un-treated material in containment. Removal of EIL/HIL exceedance offsite or placement within containment Stockpile to material tracked if to be retained at the site or disposed of offsite.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
		Dams	±	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
		AST	±	-	Investigation beneath AST	Removal of any liquid contents as per DECCW 2009, Removal and destruction of AST. Investigation of material beneath AST. Excavation and removal of any impacts and aesthetic issues associated with the AST and machinery store	1x AST, approx. excavation area 3 m x 3 m x 1 m	Removal of AST and investigation beneath. Validation of any management of any impacts below AST.
G	5/658286 151 Maguires Road, Maraylya (#6 on Figure 4a)	Stormwater runoff from adjacent building	EILs: 1x nickel, 2x zinc	Some sandstone inclusions	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	1x area for EIL heavy metal to be remediation around building footprint to 0.1 m	Removal of EIL exceedance offsite or placement within less sensitive land use areas. Removal of building during demolition
		Dams	±	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls
		Orchard	±	-	Delineation sampling within orchard	-	-	Validation of any management of any impacts within the orchard
G	1/564211 169 Maguires Road, Maraylya (#7 on Figure 4a)	Waste disposal in paddock	ACM in surface soils	-	Lot inspection for visible asbestos	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal	ACM Surface pick of entire paddock dependant on further inspection 1x stockpile (anthropogenic materials)*	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment Stockpile to material tracked if to be retained

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
								at the site or disposed of offsite.
		SS01	-	-	Delineation Sampling around SS01 location (Section 4)	-	-	Validation of any remediation completed for delineation sampling
		Dams	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls.
H	2/253552 117 Old Pitt Town Road, Box Hill (#30 on Figure 4c)	Machinery and farm equipment	-	-	-	Excavation and removal of any impacts and aesthetic issues associated with the machinery store	1x stockpile (anthropogenic material)*	Removal of machinery Stockpile to material tracked if to be retained at the site or disposed of offsite.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
		Fire Pit	EILs: 1x arsenic, 1x copper, 1x chromium 1x zinc HIL: 1x arsenic, 1x chromium	-	-	Impacts likely associated with fire pit, with excavation and disposal of HIL/HSL impacts.	1x area of EIL heavy metal impact associated with fire pit. Fire pit to be excavated and removed to at least 0.1 m bgs 1x area of HIL heavy metal impact associated with fire pit. Fire pit to be excavated and removed to at least 0.1 m	Removal of EIL/HIL exceedance associated with fire pit offsite
		Dam	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls.
H	4/253552 121 Old Pitt Town Road, Box Hill (#31 on Figure 4c)	AST	None	AST	Investigation beneath AST	Removal of any liquid contents from the AST as per DECCW 2009, Removal and destruction of AST, surface sampling directly beneath AST after removal.	1x AST, approx. excavation area 3 m x 3 m x 1 m	Validation of removal of the AST Validation of any management of any impacts beneath AST
		Site Debris	-	-	-	Removal of any aesthetic issues, in asphalt in dam walls, offsite	Aesthetic issues to be removed including at site debris across lot	Validation inspection of removal of aesthetic issues.
		Dam	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dam walls.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
I	1/11126 207-217 Boundary Road, Maraylya (#1 on Figure 4a)	Building structures including lead paint flaking	<u>EILs:</u> 2x copper, 3x nickel, 8x zinc <u>HILs:</u> 1x Chromium (VI)		-	Assessment for beneficial reuse at the site under less sensitive land use scenarios. Alternatively, excavation of surface soils for Cr (VI) and removal offsite. EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	Removal of hazardous building materials Removal of EIL impacts through removal offsite of stockpile and excavation of 0.1 m below stockpiles within footprint Footprint of building (sheds) for HIL impacts to 0.1 m	Removal of hazardous building materials. Removal of EIL/HIL exceedance offsite or placement within less sensitive land use areas. Stockpiles to be retained assessed for aesthetic impacts
		ACM in surface soils associated with buildings and shed in 3x areas	ACM reported in surface soils	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal.	ACM Surface pick 10 x 10 area, removal offsite of stockpiles	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment.
		Dams	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
		SS20	-	-	Delineation Sampling around SS20 location (Section 4)	-	-	Validation of any management completed for delineation sampling
I	4/135304 A & B 97 Maguires Road, Maraylya (#5 on Figure 4a)	Building adjacent	None	-	-	Removal of buildings	Removal of hazardous building materials.	Removal of hazardous building materials.

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
		ACM in surface soil at current structure	ACM in surface soils	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal	ACM Surface pick around buildings including chicken coup	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of untreated material in containment
		Dam	-	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
I	2/11126 195-205 Boundary Road, Maraylya (#2 on Figure 4a)	-	None	Organic matter and tree mulch	-	No Remediation Required	-	-
I	1/207750 181-191 Boundary Road, Maraylya (#3 on Figure 4a)	Drum and shed present on lot	<u>EILs:</u> 1x copper, 3x zinc	Bricks, concrete, plastic, cement tiles and charcoal present in fill,	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	2x areas of EIL impacts associated with drum and shed storage areas to be excavated to maximum extent of fill (i.e to natural soils)	Removal of hazardous building materials. Removal of drums Removal of EIL exceedance offsite or placement within less sensitive land use areas Removal offsite of aesthetic issues (burnt car and other aesthetic issues)
		ACM in surface soils	ACM in surface soils	ACM in fill materials (TP03)	Delineation Sampling around TP03 location (Section 4) and sheds	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and containment at the site or offsite disposal Removal offsite of	ACM Surface pick all lot.	Removal of asbestos offsite or treatment and placement in less conservative land use areas or placement of un-

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
					Additional site inspection for ACM in long grass areas associated with TP04/TP05	anthropogenic and ACM impacted stockpiles		treated material in containment Validation of any management completed for delineation sampling
		Dams	±	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
I	3/11126 89 Maguires Road, Maraylya (#4 on Figure 4a)	Stockpiled material	EILs: 2x zinc	-	-	EIL impacts to be managed through excavation, transportation and placement of impacts in areas not designated for landscaped areas.	2 x stockpiles (EIL & ACM)*	Evidence of stockpile management Removal of EIL exceedance offsite or placement within less sensitive land use areas Stockpile to material tracked if kept to be retained at the site or disposed of offsite.
		Site Debris	±	Bricks, concrete, plastic, cement tiles and charcoal present in fill.	-	Removal of any aesthetic issues, offsite	Aesthetic issues to be removed including at site debris across lot	Validation inspection of removal of aesthetic issues.
		Dams	±	-	Investigation of dams	-	-	Validation of any management of any impacts within dams
		ACM in surface soils	ACM in surface soils	-	-	Surface 'sparrow picking' or excavation of surface soils for asbestos impacts and	ACM Surface pick around building structures and footprints	Removal of asbestos offsite or treatment and placement in less conservative land use

Precinct	Lots	Potential Source AEC	Exceedances Above Adopted Criterion	Further Comments	Further Investigation Required	Preferred Remediation Strategy	Remediation Summary	Validation required
						containment at the site or offsite disposal		areas or placement of untreated material in containment

Notes:

*Refer to **Section 5.2** and **Table 5.2** for additional detail of stockpile locations and descriptions. As reported in JBS&G 2014, none of the estimated stockpile volumes were reported to be above 200 m³.

6. Remedial Plan

A summary of the remedial scope of works is provided in the following sections.

6.1 Notifications

Prior to remediation works activities beginning at the site, the local council must be notified of the intent to remediate the site under the Department of Urban Affairs and Planning/EPA SEPP 55 guidelines (DUAP/EPA 1998), as per **Section 13**. Additionally, after the remediation is completed at the site, the council must be notified of the completion of the works.

It is anticipated that the notification to council will be completed during the development application process.

6.2 Define the Boundary of Contamination

The site boundaries are shown on **Figures 1 and 2** and the nine Precincts are shown on **Figure 3**.

The boundaries of the identified remedial areas shall be determined by the observations made during excavation works and validation results. However, based on the observations and analytical testing undertaken as part of the previous assessment (JBS&G 2014) the extent of impacts are outlined in **Section 5.2**.

Table 5.4 outlines the extent of impacts identified that requires remediation and validation at the site.

6.2.1 Data Gaps

As discussed in **Section 4**, there exists data gaps at the site which are to be addressed prior to remediation.

6.3 Expected Sequence of Works

The anticipated sequence of works for the future project, per stage, is expected to be as follows:

- Identification of potential containment cells;
- Confirmation of development of each stage;
- Site Mobilisation;
- Removal of vegetation;
- Draining of dams
- Demolition of buildings;
- Data Gap assessments including confirmatory site inspection;
- Remediation of known impacts;
- Remediation of any unexpected finds;
- Validation sampling of subsequent excavations, unexpected finds etc;
- Reinstatement of any excavations; and
- Final Validation report.

6.4 Site Establishment

An appropriately experienced and licensed contractor is required to undertake the works, under the guidance of an appropriately qualified and experienced environmental consultant.

All safety and environmental controls are to be implemented as the first stage of remediation works.

These controls will include but not limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Work area security fencing, with dust mesh on the fences;
- Site signage and contact numbers;
- Sediment fencing (attached to security fencing); and
- Stormwater runoff and sediment controls (hay bales).

6.5 Demolition of Structures

This RAP does not extend to providing an approach to demolition of structures at the site. However, demolition of structures is required to achieve future landuse objectives, and appropriate validation of the site.

Caution should be taken during demolition to ensure hazardous materials in structures, including identified lead-based paint and asbestos materials are removed appropriately.

Demolition materials should be removed off site for recycling or disposal at appropriately licensed facilities, consistent with the material content. Demolition materials containing ACM or other hazardous materials or contaminants should not be mixed with other demolition materials that are not impacted. Appropriate controls should be in place to protect human health and the surrounding environment, including measures to ensure demolition does not cause contamination of soil, surface water or groundwater.

Where no hazardous materials have been identified in the structures there is potential the materials could be crushed and utilised at the site or placed within containment cells. If the material is to be utilised at the site, the landuse of the propped area must be reviewed to ensure there are no aesthetic risks to the lot from demolition waste.

6.6 Farm Dam Dewatering & Sediment Removal

On the understanding that all water in the dams is to be removed prior to development, any water remaining in the farm dams present at the site will need to be removed. Given that the dams were likely used for agricultural purposes it is proposed to discharge the water to one or more of the creeks running through the site.

Prior to dewatering the Office of Water will need to be contacted in regards to discharging the water. Based on responses from the Office of Water, the water within the farm dams may require testing prior to discharge.

Should testing be requested/required prior to discharge, potential analyses may include the following:

- TPH;
- Heavy Metals;
- pH;
- Ammonia;
- Total Suspended Solids; and
- Biologicals, including E.Coli, Faecal coliforms and salmonella.

Appropriate sediment and erosion controls will need to be implemented prior to discharge to the creek.

Once the water has been removed from the farm dams, inspection and assessment of the dam walls and base should be undertaken, as per **Section 4**. This is further described in **Section 7**.

Samples will be compared against the criteria provided in **Section 8**. Should sample results exceed the adopted site criteria the sediment will either be disposed of offsite or excavated and placed within less conservative areas or within a containment cell. Geotechnical assessment may be required to ensure the material is geotechnically suitable.

6.7 Cap and Containment

As noted previously, there is the potential that on-site containment of impacted material at the site will be required. This is based on the potential for impacted fill material to be placed beneath new roads and pathways constructed as part of the new development and within less sensitive land use scenarios.

Containment of the impacted material and capping should be consistent with relevant EPA made or endorsed guidelines including ANZECC (1999⁵). The requirements are partly dependent on the type of materials and contaminants to be contained, and their relative mobility (potential to leach). Relatively immobile materials, such as asbestos containing material (ACM), and contaminants bound to a matrix such that they do not readily leach, can be contained without the need for impermeable liners, leachate collection and treatment systems or groundwater monitoring. It is these types of materials that are assumed to be proposed for cap and containment at the site.

Leachate analysis, including PAHs and heavy metals within materials to be contained must be analysed for TCLP to identify if they are relatively insoluble to ensure that impacts to groundwater from the site are considered to be low. If completed and found to be relatively insoluble then these materials will be considered to be suitable for cap and containment.

Capping retained contaminated material is required to prevent contaminant exposure to human and ecological receptors on the surface.

The capping should comprise the following minimum requirements:

- A marker layer placed over retained contaminated materials and/or appropriate demolition materials, to identify the top of contained material (and base of capping). A readily identifiable marker layer should be installed to provide adequate visual warning during any future ground disturbance;
- A capping layer of minimum 400 mm thick virgin excavated natural material (VENM) material or validated material from the site and relative compaction level of 85% MDD, and with an appropriate moisture content;
- If in landscaped areas, a growing medium (topsoil) layer of minimum 200 mm thickness should be placed over the capping layer. This topsoil layer should also be placed in loose layers and track-rolled by dozer or equivalent to the required 200 mm thickness and relative compaction level of 85% MDD, and with an appropriate moisture content. This topsoil layer thickness should be able to be vegetated with shallow rooted grasses and/or low shrubs;

⁵ Guidelines for the Assessment of On-Site Containment of Contaminated Soils, ANZECC (1999).

- If in the paved areas, under roads or under concrete slab buildings, the new paving will act at the capping layer. Consequently, the paved layer and sub-base is considered to be appropriate for capping of impacted materials.

Based on the potential changes to site levels during development, topography and drainage will need to be considered should vegetation include deeper rooted trees. This containment method would require the implementation of an EMP both for containment within open space areas and under roads.

Should an EMP not be suitable for implementation for the roads, due to Council requirements, then only material above EIL/ESL exceedances will be placed under road reserves to prevent the need for an EMP in these areas only.

6.8 Impacted Materials Remediation Works

The extent of the impacted areas requiring remediation is described in **Section 5** and shown on **Figures 8a-8e**. A variety of remedial strategies are to be utilised within the Precincts, with the following being utilised:

- Excavation, removal and disposal of impacted materials offsite;
- Excavation, removal and placement of impacted materials within road reserves or less conservative land use areas, with material tracking required; and
- Removal of ACM from surface soils by 'sparrow picking'.

Materials to be disposed off-site require a waste classification in accordance with the Waste Classification Guidelines (EPA 2014). Material tracking will be required for all materials transported on, to and from the site.

6.8.1 Soil Asbestos Remedial Works

The remediation and validation works of any asbestos impacted materials will be supervised by an appropriately qualified and experienced environmental consultant and undertaken by a licensed Class A asbestos removal contractor where friable asbestos is reported or a Class B asbestos removal contractor where non-friable asbestos works are required. Soil remedial works will be completed as per the following Sections.

6.8.1.1 Asbestos 'Sparrow' Picking

Asbestos 'Sparrow' picking involves the removal of visible non-friable bonded ACM fragments by hand by competent persons. This involves the inspection of an impacted area in 1 m transects and raking the top 0.1 m to identify any visible ACM.

Any suspected ACM is removed, doubled bagged and sealed for offsite removal.

Once raked and following the removal of any ACM for disposal offsite, an inspection will be completed by an experienced and suitably trained environmental consultant. If non-friable ACM is identified by the environmental consultant then further picking is required.

Any asbestos validation works must be completed in accordance with **Section 7.3**.

The aim of this method is to prevent the need for cap and containment as per **Section 6.7**. Picking of the material to below the adopted site criteria (**Section 8**) will allow the material to be retained at the site at depths greater than 0.1 m bgs without the need for management. However, should picking not be completed and material still be retained then it will need to be capped and contained and managed in accordance with an environmental management plan.

6.8.2 Hydrocarbon and Heavy Metal Remedial Works

The remediation and validation works of hydrocarbon and heavy metal impacted materials will be supervised by an appropriately qualified and experienced environmental consultant.

The validation works will be completed as per **Section 7**.

6.8.3 Delineation of Excavations

Where excavation of impacted soils is required, where they are identified either visually, from olfactory detection or through the use of a Photo-ionisation Detector (PID), shall be 'chased' out. This will be conducted under the direction and supervision of JBS&G. The procedure for undertaking this excavation activity will be by:

- Observation of the excavations and identification of potentially impacted soils;
- Excavation of impacted soils to lateral and vertical extent of field based identifiable impact, with additional break up and removal of concrete to remove soils where impact extends laterally until the soils meet the adopted validation criteria (**Section 8**); and
- Soils above the adopted site criteria will be classified as a waste and disposed offsite to an appropriately licensed waste facility or if suitable placed within road reserves and managed.

Excavation of the remedial areas will be completed by having a 10 x 10 m 'square' centred on the remedial area excavated to the depth of the known impact (as described in **Table 5.4**). The excavation will be inspected and should further evidence of impacts (staining, odours etc.) be reported then further excavation will be required. If no further impacts are observed then validation sampling will be completed.

Any unexpected finds will be managed as per **Section 9**.

6.8.4 Backfilling of Excavations

Upon confirmation of excavation validation, excavations will be reinstated using validated material from the site. No importation of VENM or excavated natural material (ENM) is proposed. Should VENM or ENM be required to be imported to the site, this will be completed as per the criteria in **Section 8** and the decision rules provided below in **Table 7.1**. Prior to importation to the site, the material must be assessed (including an inspection at the source site and appropriate sampling and analysis as per **Table 7.3**) by a suitably qualified environmental consultant, with documentation provided for its source, sampling certification and volumes.

Soil material characterisation reports will be reviewed or if no material characterisation provided, soil analytical data will be compared against the EPA endorsed criteria.

If material characterisation reports detail the imported material as VENM, ENM or other material covered by the NSW EPA exemption, or if the soil analytical data meets the above criteria, then the material is considered appropriate to be imported to the site.

If the material is classified as anything other than VENM, ENM or other material covered by the NSW EPA exemption in provided documentation, or it fails the specified criteria, then the material must not be brought to the site.

6.8.5 Offsite Disposal of Material

Impacted soils and ACM removed from remediated soil to be disposed off-Site shall require a waste classification in accordance with EAP NSW (2014) '*Waste Classification Guidelines Part 1: Classifying Waste*'. The potential presence of asbestos in fill materials must be noted in the preparation of the waste classification.

Stockpiles observed at the site on the have the potential to be retained, however, each stockpile of material must be tracked as to its final placement location.

Material to be removed offsite will be either loaded directly into trucks for offsite disposal or stored on hardstand to prevent cross contamination. All material will require material tracking.

6.8.6 Imported Fill Material

If required, VENM, ENM, or any other suitable material granted an applicable EPA Exemption under the Protection of the Environment Operations (Waste) Regulation 2014 may be imported to reinstate the excavations. Prior to importation to the site, the material must be assessed (including an inspection at the source site and appropriate sampling and analysis as per **Table 7.3**) by a suitably qualified environmental consultant, with documentation provided for its source, sampling certification and volumes.

6.8.7 Stockpiles

As discussed in **Section 5**, several lots contain stockpiles that require management. Each individual stockpile is required to be assessed for beneficial reuse in less sensitive areas. All stockpiles must be inspected for aesthetic suitability if to be reused at the site.

All material will require material tracking whether it be retained at the site or disposed of offsite at a suitable facility.

If stockpiles are to be removed for offsite disposal then they will require sampling and classification in accordance with the EPA 2014 waste guidelines.

6.9 Environmental Management Plan (EMP)

Should impacted material be retained at the site, then an environmental management plan (EMP) will be required to manage these impacts.

6.10 Air Monitoring

During any asbestos remedial works, perimeter air monitoring will be conducted. Air monitors will be set up on each of the perimeter boundaries within that particular work area.

Air monitoring will be conducted in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) Asbestos Code of Practice and Guidance Notes, in particular, the Guidance note for the estimation of airborne asbestos fibres [NOHSC 3002:2005].

6.11 ASTs

Petroleum infrastructure identified must be removed.

Prior to the removal of the ASTs, any liquid within the AST must be pumped out by a licensed contractor and disposed of off-site as “liquid waste” in accordance with DECCW (2009).

The environmental consultant will provide supervision and validation during any petroleum infrastructure removal process. Where removal is required, the following process is to be followed:

- Observation of AST and associated fuel infrastructure excavations and identification of impacted soils;
- Observation of excavation of impacted soils to lateral and vertical extent of physically identifiable impact, with additional removal of soils where impact extends laterally and vertically; and
- Observation of impacted soils transferred to a soil stockpiling area on the site.

7. Validation Plan

Validation will be required for the following areas:

- Validation of excavations from where heavy metal, hydrocarbon and asbestos impacted soils have been removed;
- Validation of the ACM removed from the surface soils at the site;
- Validation of the removal of aesthetic issues, including ACM, stockpiles, staining and other anthropogenic materials.
- Removal of ASTs present at the site;
- Validation of footprints of stockpiles of excavated impacted material prior to being removed from the site;
- Validation of the removal/containment of impacted stockpiled materials;
- Validation of any material placed beneath road reserves or cap and contained;
- Validation of former building footprints;
- Validation of any unexpected finds identified during the remedial works; and
- Validation of any material imported to backfill the sites excavations.

7.1 Data Quality Objectives

Data quality objectives (DQOs) were developed for the validation assessment, as discussed in the following sections.

7.1.1 State the Problem

Asbestos, heavy metal and hydrocarbon impacted in-situ soils and stockpiles have been identified at the site. The identified areas require remediation followed by validation of residual soils to ensure impacted material that may pose an unacceptable level of risk to site users or an ecological risk to the surrounding environment has been successfully managed during remediation works.

7.1.2 Identify the Decision

The following decisions are required to be made during the validation works:

- Are there any unacceptable risks to future on-site receptors from any residual soil contamination following the remediation of contaminated soil or within former buildings footprints and/or retained buildings?
- Are there any aesthetic (stains/odours/asbestos) issues at the site?
- Have all data gaps been addressed?
- Has material disposed of offsite been classified in accordance with the EPA 2014 and been transported to an appropriately licensed facility?
- Has any impacted material been retained at the site and has it been suitably managed in accordance with the requirements of the RAP?
- Did any material imported on to site as backfill meet the requirements of the RAP?
- Is there any potential migration from the site?
- Is ongoing management of residual contamination necessary?

7.1.3 Identify Inputs to the Decision

The inputs to the decisions are:

- Physical observations, including visual, olfactory and PID screening results during site activities;
- Documentation to verify appropriate removal and disposal of waste;
- Soil analytical data from samples collected from the base and walls of excavations formed by the removal of impacted soils; and
- Survey plans to verify appropriate cap and containment of any remaining impacted soils and excavation areas and site boundaries.
- The soil validation acceptance criteria adopted for the landuses.

7.1.4 Define the Boundary of Impact

The individual identified remedial areas are shown on **Figures 8a-8e**.

The vertical extent of the remediation will be determined during the excavation works but further investigation works could be completed prior to ascertain the full extent of impacts, based on observations made by the environmental consultant.

7.1.5 Develop a Decision Rule

Soil analytical data will be assessed against EPA published / endorsed criteria for constituents:

- National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 2013 (2013).
- Guidelines for the NSW Site Auditor Scheme 2nd Edition, April 2006 (NSW DEC 2006);
- Waste Classification Guidelines. Part 1: Classifying Waste, NSW EPA, November 2014 (EPA 2014).

7.1.6 Summarise Decision Rules

The decision rules adopted to answer the decisions identified in **Section 7.1.2** are summarised in **Table 7.1**.

Table 7.1 Summary of Decision Rules

Decision Required to be made	Decision Rule
1. Are there any unacceptable risks to future on-Site receptors from any residual soil contamination following the remediation of contaminated soil and within former buildings footprints and/or retained buildings??	<p>Soil analytical data will be compared against EPA endorsed criteria. Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions. The following criterion will be adopted with respect to soils:</p> <p>the reported concentrations are all below the Site criteria depending on landuse;</p> <p>If the criterion stated above is satisfied, the decision is No. If the criterion stated above is not satisfied, the decision is Yes.</p> <p>Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions. The following statistical criteria will be adopted with respect to soils:</p> <p><u>Either</u>: the reported concentrations are all below the site criteria;</p> <p><u>Or</u>: the average site concentration for each analyte must be below the adopted site criterion; no single analyte</p>

Decision Required to be made	Decision Rule
	<p>concentration exceeds 250% of the adopted site criterion; and the standard deviation of the results must be less than 50% of the site criteria.</p> <p><u>And:</u> the 95% upper confidence limit (UCL) ⁶ of the average concentration for each analyte must be below the adopted site criterion.</p> <p>If the statistical criteria stated above are satisfied, and an assessment of risk indicates no unacceptable risks, the decision is No.</p> <p>Otherwise, the decision is Yes.</p>
2. Are there any aesthetic (stains/odours etc.) issues at the site?	<p>If there are any unacceptable odours and/or discolouration (or other aesthetic indicators) the answer to the decision is Yes.</p> <p>Otherwise, the answer to the decision is No.</p>
3. Have all data gaps been addressed?	As per decision rule 1.
4. Has material disposed of offsite been classified in accordance with the EPA 2014 and been transported to an appropriately licensed facility?	<p>Soil analytical data will be compared against EPA endorsed criteria. Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions (as detailed above). Appropriate waste classification and disposal documents to be obtained.</p> <p>If the statistical criteria stated above are satisfied, the decision is Yes, or if receipts are provided recording the disposal of material to an off-site licensed facility, the decision is Yes.</p> <p>If criteria or statistical assessment or no disposal receipts are provided, the answer is No.</p>
5. Has any impacted material been retained at the site and has it been suitably managed in accordance with the requirements of the RAP?	<p>Material placed in the containment cells will be documented, with the capping layer material tracking documentation to be provided</p> <p>If the documentation is not provided then the answer is No.</p> <p>If the documentation is provided and is suitable then the answer is yes.</p>
6. Did the material imported on to site as backfill meet the requirements of the RAP?	<p>Soil material characterisation reports will be reviewed or if no material characterisation provided, soil analytical data will be compared against the EPA endorsed criteria. If material characterisation reports detail the imported material as VENM, ENM or other material covered by a NSW EPA waste exemption, or if the soil analytical data meets the above criteria, the answer is Yes.</p> <p>If the material is classified as anything other than VENM ENM or other material covered by a NSW EPA waste exemption in provided documentation, or it fails the specified criteria, the answer is No.</p>
7. Is there any potential migration from the site?	<p>Soil contaminant data was evaluated with the consideration of the potential for migration of contaminants via bulk disturbance of soils (ie. Dust, surface water, etc) and the potential mobility of contaminants in soil and groundwater.</p> <p>In the event that significant contaminant concentrations was identified and there is the potential for migration of these contaminants from the site via either bulk movement and/or migration in soil and/or groundwater, the answer to the decision was Yes.</p> <p>Otherwise, the answer to the decision was No..</p>

⁶ *Sampling Design Guidelines.* (NSW EPA,1995)

Decision Required to be made	Decision Rule
10. Is ongoing management of residual contamination necessary?	Was the answer to any of the above decisions Yes? If yes, a site management strategy may be required. If no, a site management strategy was not required.

7.1.7 Specify Limits of Decision Error

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013), DEC (2007), appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined Data Quality Indicators (DQIs) for completeness, comparability, representativeness, precision and accuracy. The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined Data Quality Indicators (DQIs) established for the project are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters), and are shown in **Table 7.2**.

Precision – measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples for chemical COPCs. For asbestos precision is assessed by whether the identification results for duplicate samples were in agreement with the original sample.

Accuracy – measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the ‘true’ value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Note only applied to chemical COPC.

Representativeness – expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the Site, and by using an adequate number of sample locations to characterise the Site to the required accuracy.

Comparability – expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.

Completeness – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

Sensitivity – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted Site assessment criteria.

Table 7.2 Summary of Data Quality Objectives for Soil Validation Program

Data Quality Indicator	Frequency	Data Quality Criteria
Precision		
Blind duplicates (intra laboratory) Chemical analysis	1 / 20 samples	70-130%
Blind duplicates (inter laboratory) Chemical analysis	1 / 20 samples	70-130%
Asbestos Duplicates		Asbestos analysis in agreement
Accuracy		
Laboratory control samples	1 per lab batch	<LOR
Surrogate spikes	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	All samples	All samples
Samples extracted and analysed within holding times – asbestos	All samples	No holding time
Rinsate	1 per sample batch	<LOR
Trip spike	1 per sample batch	70-130%
Trip blank	1 per sample batch	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All samples
Standard analytical methods used for all analyses	All Samples	All samples
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples
Limits of reporting appropriate and consistent	All Samples	All samples
Completeness		
Soil description and COCs completed and appropriate	All Samples	All samples
Appropriate documentation	All Samples	All samples
Satisfactory frequency and result for QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted Site assessment criteria	All samples	LOR<= Site assessment criteria

Notes: 1 – If the RPD between duplicates is greater than the pre-determined data quality criteria, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

7.1.8 Optimise the Design for Obtaining Data

The purpose of this step is to identify a resource-effective field investigation sampling design that generates data that are expected to satisfy the Site manager's decision performance criteria, as specified in the preceding steps of the DQO Process. The output of this step is the sampling design that will guide development of the field sampling and analysis plan. This step provides a general description of the activities necessary to generate and select data collection designs that satisfy decision performance criteria.

Validation will be undertaken as per the following sections.

7.2 Soil Validation Methodology

7.2.1 Soil Sampling

A suitably qualified person trained and experienced in the identification of asbestos, will be required to undertake the sampling. It should be noted that a licensed asbestos assessor will be required for the validation of any friable asbestos impacted soils.

Soil samples are proposed to be collected from the walls and base of the excavation generated by the removal of the impacted soils.

Impacted soils, where they are identified either visually, from olfactory detection or through the use of a PID, shall be 'chased' out. This will be conducted under the direction and supervision of an environmental consultant. The procedure for undertaking this excavation activity will be as follows:

- Observation of excavations and identification of impacted soils;
- Excavation of impacted soils to lateral and vertical extent of physically identifiable impact, with additional removal of soils where impact extends laterally and vertically; and
- Impacted soils transferred to a soil stockpiling area on the site or directly loaded into a truck for offsite disposal or movement for placement beneath road reserves/less sensitive land uses.

Samples should be targeted at the original exceedance depths. New nitrile gloves will be used to collect each sample. Soil samples will be immediately transferred to sample containers of appropriate composition, which are supplied by the testing laboratory. All sample containers will be clearly labelled with a sample number, sample location, sample depth, sample date and samplers initials. The sample containers will then transferred under chain-of-custody conditions to the testing laboratory. The samples will be analysed at a laboratory NATA accredited for the required analyses. Additionally, asbestos samples will be collected in accordance with current NEPM 2013 guidelines, with 500 mL samples collected.

As per the requirements of each of the remediation areas outlined in **Section 5.2**, a square around each of the remediation areas will be excavated to the target depth, as required in the previous RAP. The excavation will be inspected prior to sampling of the walls and base of each of the excavations for the relevant COPCs.

Soil samples will be screened on Site during works using a photo-ionisation detector (PID) to assess the presence of volatile organic compounds (VOCs) including petroleum hydrocarbons. Samples collected from locations targeting heavy metal impact will be screened using an x-ray fluorescence (XRF) unit.

7.3 Asbestos 'Sparrow Picking'

As discussed in **Section 6**, Where asbestos fragments have been reported within the surface soils (<0.1 m) and/or subsurface soils (>0.1 m), within stockpiles and farm dams, there is potential that asbestos 'sparrow' picking can be completed to allow for the material to be retained at the site without the need for placement under road reserves or other less sensitive areas.

It should be noted that the quantification of the amount of asbestos within the subsurface soil areas and stockpiles identified to contain asbestos fragments will need to be completed to confirm whether the picking method is appropriate. The asbestos quantification methodology is provided in **Section 7.3.3**.

7.3.1 Surface Pick

Where visible asbestos has been reported in the surface soils (<0.1 m) only, a surface pick will be completed. Prior to the surface pick, vegetation clearance should be completed for the inspections to be completed.

This will involve the walking of a designated area in 1 m perpendicular transects by suitably trained and experienced competent persons, with raking of the top 0.1 m completed. All ACM will be bagged and double sealed for disposal offsite in accordance with the EPA 2014.

Once completed an environmental consultant will inspect the area for visible asbestos with the process being repeated should visible asbestos be reported. Should the environmental consultant continue to observe visible ACM, after the third failure the surface material will be deemed unsuitable and will need to be excavated and either placed under road reserves/less sensitive landuses or disposed of offsite.

7.3.2 Subsurface

Where non-friable impacts extend deeper than the surface soils, the material can be excavated and ACM picked to acceptable levels for retention at the site under road reserves and/or less sensitive landuses.

The material would need to be excavated, followed by placement and spreading of material on approximately 10 m x 10 m pads in layers, approximately 0.1 m thick.

The material placed in pads will be hand raked and inspected for the presence of ACM by a team of labourers trained in asbestos identification. Any ACM collected will be removed for off-site disposal at a suitably licensed facility. Each pad will be raked and inspected individually, with material for each pad tracked.

Once raked and following the removal of any ACM for disposal offsite, an inspection will be completed by an experienced and suitably trained environmental consultant. If non-friable ACM is identified at levels that exceed the relevant criteria by the environmental consultant then the process will be repeated until validation criteria are achieved, or a decision is made to remove the material for on-site containment or off-site disposal on the basis the process is deemed unlikely to achieve validation.

The material will be sampled at a rate of one 500 mL sample per 10 m³, prior to being cleared for reuse. The 500 mL sample will be collected by the environmental consultant and analysed at NATA accredited laboratory for the presence/absence of asbestos.

Should the consultant determine the soil is grossly impacted by ACM (such that it is not practicable to reduce ACM to acceptable levels by picking), or if asbestos fibres (AF/FA) are detected above the limit of reporting of 0.1g/kg in the analysed soil sample(s), and/or if friable asbestos is observed at any time during the inspection process, the materials will be removed to a separate stockpile area for offsite disposal at a suitably licensed facility to accept the waste or contained appropriately on site. This material must be kept separate from non-asbestos impacted soils and will be tracked on-site.

Where the environmental consultant verifies ACM content is below the criteria in subsurface soils and no asbestos fibres (AF/FA above criterion) are detected in the collected soil samples, the material will be considered suitable for reuse on-site. It is noted that subsurface ACM impacted soils that have been validated following this process must be placed at depths greater than 0.1 m bgs where visible ACM is still present albeit at acceptable levels meeting validation criteria.

7.3.2.1 Asbestos Picking Pad Footprints

Subsequent to the picking process for subsurface soils, the pads will require validation. An inspection for visible ACM and collection of validation samples will be required to ensure no impacts remain in the pads. Samples will be collected on 10 m grid from each pad area. Should the samples contain friable asbestos the material will be excavated and disposed of offsite or placed in an area designated for containment. Should visible ACM be observed, the surface will be picked as per **Section 7.3.1**.

7.3.3 Asbestos Quantification

As discussed in **Section 7.3.1**, asbestos quantification is required to assess the concentration of visible ACM that will require ‘sparrow picking’. The methodology for asbestos quantification, in accordance with the NEPC 2013 guidelines, is outlined below:

- Test Pits excavated on a 10 m grid across the impacted area of an individual lot or where ACM impacts are detected in stockpiles or dam materials. Test pits to be completed by trained and experienced environmental consultant;
- Material will be inspected for visual bonded ACM fragments;
- A 100 L sample will be collected of the representative materials observed within each test pit;
- Where more than one distinct material type is observed, separate asbestos calculations must be completed for each material type;
- The 100 L sample will be weighed using a calibrated balanced scale and the weight in kilograms (kgs) recorded; and
- The 100 L sample will be sieved using a 7 mm sieve and any ACM fragments retained in the sieve will be collected, photographed, double bagged and then weighed using the calibrated scales.

Based on the NEPC 2013 guidelines the quantity of asbestos in soil may be estimated using the following equation:

- $\%w/w \text{ asbestos in soil} = \% \text{ asbestos content} \times \text{bonded ACM (kg)} / \text{soil volume (L)} \times \text{soil density (kg/L)}$.

The results of the equations for each strata will be compared with the adopted criteria in **Section 8**.

7.4 Additional Assessment

To close the data gaps outlined in **Section 4**, there are several areas that require further sampling and assessment.

Soil samples will be collected as per **Section 7.2** and compared against the relevant guidelines outlined in **Section 8**.

7.5 Stockpile Sampling

As discussed in **Section 5**, should the material in stockpiles be potentially suitable for re-use at the site from an environmental perspective, including aesthetic impacts, then the material will be assessed in accordance with the criteria in **Section 8**.

If stockpiles are to be removed for offsite disposal then they will require sampling and classification in accordance with the EPA 2014 waste guidelines.

The known stockpile locations are shown on **Figure 9**. Should further stockpiles be identified subsequent to this RAP or if waste classification sampling is required, sampling is to be completed as per **Table 7.3**.

7.6 ASTs

Petroleum infrastructure identified must be removed and validated.

Prior to the removal of the ASTs, any liquid within the AST must be pumped out by a licensed contractor and disposed of off-site as “liquid waste” in accordance with EPA (2014).

Known AST locations are shown on **Figure 10**.

The environmental consultant will provide supervision and validation during any petroleum infrastructure removal process. Where removal is required, the following process is to be followed:

- Observation of AST and associated fuel infrastructure excavations and identification of impacted soils;
- Observation of excavation of impacted soils to lateral and vertical extent of physically identifiable impact, with additional removal of soils where impact extends laterally and vertically; and
- Observation of impacted soils transferred to a soil stockpiling area on the site.

Following the removal of the AST and infrastructure, the following validation works are proposed to be completed by the environmental consultant:

- Inspection, collection and screening (by PID) of validation samples taken from the base and walls of the excavation and any fuel lines following removal of AST; and
- Assessment by collection and screening (by PID) of validation samples of excavated material for off-site disposal.

Where stained and/or odorous soil around the ASTs are observed, then further assessment is required to assess potential for leaks. Test pits will be completed using an excavator with samples collected within and below the identified impacts. Further validation will be required for delineation sampling.

Test pit samples will be analysed for heavy metals, TPH/BTEX, volatile organic compounds (VOCs) and PAHs.

Samples will be collected as outlined in **Section 7.2** and analysed as per **Table 7.3**.

7.7 Management of Landscaped Areas

Where future landscaping is to occur, it is assumed that growing media will be imported to the site that meets the VENM requirement or any other exemption provided by the NSW EPA, i.e. ENM. The importation of growing media will reduce the risk to plant life in the landscaped areas.

Material tracking must be completed to ensure that ecological impacts are not placed within the top 2 m within the landscaped areas. Material tracking is to be completed by the appointed environmental consultant, with no ecological impacts identified, as per **Section 7**, being placed within landscaped areas. The identified areas of ecological impacts must be either placed under 2 m of validated material or beneath roadways/footpaths to restrict access to flora and fauna.

7.8 Cap and Containment

Materials above adopted site criteria for landuse scenarios or have not been treated may be placed within a designated area identified during development that will require ongoing long term management through an EMP. The cap and containment will be completed as per requirements in **Section 6.8**.

Materials to be contained within a containment cell must have TCLP analysis completed to ensure protection of groundwater.

Material tracking is to be completed by the appointed remediation contractor, with the environmental consultant to validate the source and placement.

7.9 Less Sensitive Land uses

Materials that contain concentrations of COPCs that meet the landuse scenario are suitable to be placed without the need for future management. Materials to be potentially placed in areas of less conservation land uses or within road reserves, with TCLP analysis required to ensure protection of groundwater.

Material tracking is to be completed by the appointed remediation contractor, with the environmental consultant to validate the source and placement.

7.10 Hazardous Building Materials and Asbestos Clearance

Prior to demolition a hazardous building materials assessment will be required for each building. An assessment will also be required on the heritage listed buildings remaining at the Site.

The survey must be completed by an experienced hazardous material survey auditor and the following materials included in the survey:

- asbestos;
- synthetic mineral fibres;
- lead based paint; and
- polychlorinated biphenyls.

The asbestos survey will take the form of a visual inspection by experienced staff of the building. Samples will be taken as appropriate and analysed for asbestos using stereobinocular microscopy and polarised light microscopy with dispersion staining by a laboratory that is accredited with the National Association of Testing Authorities.

The presence of lead paint will be assessed through visual inspection of painted surfaces during the inspection as required and using XRF equipment. No allowance has been made for laboratory analysis of lead paint.

Electrical appliances that may have PCB-containing capacitors will be identified by visual inspection. Representative samples of each type of light fitting or electrical appliance will be inspected and the make and model of the capacitor compared with the ones listed in the Australian and New Zealand Environment and Conservation Council (ANZECC) document Identification of PCB-Containing Capacitors.

Hazardous building footprints were assessed within the previous assessment (JBS 2012), however, further assessment after demolition will be completed. Soil samples of the former building footprints are proposed to be collected on a 20 m linear grid, with visual assessment of ACM included.

Footprint samples of the former buildings will be collected as per the requirements in **Table 7.3**.

7.11 Debris and Anthropogenic Materials

During construction works there is potential for anthropogenic materials to be identified throughout the site. Should extensive anthropogenic materials, including animal remains, be reported then assessment, including visual inspection and validation sampling, by the environmental consultant in accordance with the criteria in **Section 8** will be required.

If the material meets the adopted landuse criteria then there is potential that the material and debris can be separated for disposal offsite and/ or recycled, as appropriate.

Vegetation removed, if not impacted with asbestos, can be re-used on site as composting material and placed where required.

If material does not meet the adopted criteria then the material remediation strategy will be completed as per **Section 5**.

7.12 Laboratory Analyses

All laboratories engaged for the project will need to be NATA accredited for the required analyses.

In addition, each laboratory is required to meet internal QA/QC requirements consistent with NEPM. Laboratory analysis of samples will be conducted with reference to COPCs listed in **Table 7.3**.

The proposed soil validation sampling and analytical program for impacted soils is outlined in **Table 7.3**.

Table 7.3 Sampling and Analytical Schedule

Validation Area	Sampling Frequency	Analytes
Excavations formed by the removal asbestos impacted soils	1 validation sample per 10 m linear of walls and 1 base validation sample per 25 m ² (at least 1 sample per wall and base required)	Asbestos (500 mL)
Asbestos Surface ACM	NA	Inspection for ACM
Subsurface ACM picking and Pads	1 sample per 10 m ³ pads	Asbestos (500 mL)
Excavations formed by the removal heavy metal impacted soils	1 validation sample per 10 m linear of walls and 1 base validation sample per 25 m ² (at least 1 sample per wall and base required)	Heavy metals including As, Cr, Cu, Cd, Pb, Ni, Hg and Zn
Excavations formed by the removal of hydrocarbon impacted soils	1 validation sample per 10 m linear of walls and 1 base validation sample per 25 m ² (at least 1 sample per wall and base required)	PAHs, TPH
Cap and Containment	1 sample per 100 m ³	TCLP – PAHs, metals
Further Stockpile Sampling (for additional stockpiles generated)	1 sample per 25 m ³ up to 200 m ³ (i.e. min 8 samples in 200 m ³) 1 sample per 100 m ³ and inspection for aesthetic impacts	Asbestos (500 mL), 8 metals, PAHs, metals, TPH/BTEX
Footprints of all stockpiles	1 sample per 10 m (or 100 m ²) and inspection for the presence of ACM	8 metals/TPH/BTEX PAH, Asbestos (500 mL)
Imported Soils (VENM)	Minimum of 3 samples per source Site (and inspection, consistent with Sections 6.8.4 and 6.8.6)	8 metals/TPH/BTEX PAHs/OCs/PCBs Asbestos (500 mL)
Imported Soils (ENM)	Consistent with ENM Exemption 2012 (or subsequent revisions) for characterisation	8 metals, TPH, PAHs, chlorinated hydrocarbons, Ph, RTA T276 foreign materials*, asbestos (500 mL)
Hydroponic Footprint (assumed 500 m ²)	5 samples	Asbestos (500 mL), 8 metals, OCs, herbicides
ASTs	1 validation sample per 10 m linear of walls (if excavation required >0.1 m) and 1 base validation sample per 25 m ² (minimum of 5 samples per)	PAHs, TPH/BTEX, VOCs, 8 metals
Building footprints (after demolition)	1 sample per 20 m and inspection for the presence of ACM	OCs, Asbestos (500 mL), lead, PCB
Farm Dams	1 sample per 50 m for wall and inspection for the presence of ACM. 1 sample per 2500 m ² for base. At least 1 sample per wall and base required	TPH, OCs, asbestos (500 mL), 8 metals, biologicals, ammonia, Ph
Surface Debris	Visual Inspection of removal of materials including metal, machinery and animal remains	-
Dog Kennels	As per Section 4	
Animal Remains	As per Section 4	
6 Lots	As per Section 4	
Groundwater	None Proposed	-

*NSW Roads & Traffic Authority Test Method T276 Foreign Materials includes rubber, plastic, bitumen, paper, cloth, paint and wood.

8. Validation Criteria

Given the intention to develop the site for mixed land use, including residential, commercial and open space, soil results will be compared against the validation criteria stipulated in **Table 8.1**. The validation criteria are based upon the guidelines provided in NEPC (2013).

The remaining criteria are based on EPA endorsed investigation levels which, while being used as clean-up levels instead of site-specific criteria derived through a process of risk assessment, are considered adequately conservative for the purposes of validating the site.

Validation within lots will be based upon the landuses as per the development plans of the Precincts, as per **Figure 3**.

Table 8.1 Adopted Site Criteria

	Limit of Reporting	Laboratory Method	Health Investigation/ Screening Levels			
			Residential – Access HIL-A	Residential – Minimal Access HIL-B	Recreational/ Open Space HIL-C	Commercial/Industrial HIL-D
METALS						
Arsenic	4.0	ICP-AES (USEPA 200.7)	100	500	300	3000
Cadmium	0.4	ICP-AES (USEPA 200.7)	20	150	90	900
Chromium	1.0	ICP-AES (USEPA 200.7)	100 ¹	500 ¹	300 ¹	3600
Copper	1.0	ICP-AES (USEPA 200.7)	6000	30 000	17 000	240 000
Nickel	1.0	ICP-AES (USEPA 200.7)	400	1200	1200	6000
Lead	1.0	ICP-AES (USEPA 200.7)	300	1200	600	1500
Zinc	1.0	ICP-AES (USEPA 200.7)	7400	60 000	30 000	400 000
Mercury (inorganic)	0.1	Cold Vapour ASS (USEPA 7471A)	40 ²	120 ²	80 ²	730
POLYCYCLIC AROMATIC HYDROCARBONS						
Carcinogenic PAHs (as B(a)P TPE) ³	0.028	GCMS (USEPA8270)	3	4	3	40
Naphthalene	0.5	Purge Trap-GCMS (USEPA8260)	3	3	NL	NL
Total PAHs ⁴	0.4	GCMS (USEPA8270)	300	400	300	4000
BTEX						
Benzene	1.0	Purge Trap-GCMS (USEPA8260)	0.5 ⁵	0.5 ⁵	NL ⁵	3
Toluene	1.0	Purge Trap-GCMS (USEPA8260)	160 ⁵	160 ⁵	NL ⁵	NL
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)	55 ⁵	55 ⁵	NL ⁵	NL
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)	40	40 ⁵	NL ⁵	230
TOTAL RECOVERABLE HYDROCARBONS						
F1 C ₆ -C ₁₀	10	TPH Purge Trap-GCMS (USEPA8260)	45 ⁶	45 ⁶	NL ⁶	260
F2 >C ₁₀ -C ₁₆	50	TPH Purge Trap-GCMS (USEPA8260)	110 ⁶	110 ⁶	NL ⁶	NL
F3 >C ₁₆ -C ₃₄	100	Purge Trap-GCFID (USEPA8000)	-	-	-	-
F4 >C ₃₄ -C ₄₀	100	Purge Trap-GCFID (USEPA8000)	-	-	-	-
ORGANOCHLORINE PESTICIDES						
DDT + DDD + DDE	0.3	GCECD (USEPA8140,8080)	240	600	400	3600
Aldrin + Dieldrin	0.2	GCECD (USEPA8140,8080)	6	10	10	45
Chlordane	0.1	GCECD (USEPA8140,8080)	50	90	70	530
Endosulfan	0.3	GCECD (USEPA8140,8080)	270	400	340	2000
Endrin	0.1	GCECD (USEPA8140,8080)	10	20	20	100
Heptachlor	0.1	GCECD (USEPA8140,8080)	6	10	10	50
HCB	0.1	GCECD (USEPA8140,8080)	10	15	10	80
Methoxychlor	0.1	GCECD (USEPA8140,8080)	300	500	400	2500
PCBs						
Total PCBs	0.7	GCECD (USEPA8140,8080)	1	1	1	7
OTHER						
Bonded Asbestos	Presence	PLM / Dispersion Staining	0.01%	0.04%	0.02%	0.05%
AF/FA	Presence	PLM / Dispersion Staining	0.001%			
All forms of asbestos	Presence	PLM / Dispersion Staining	No visible ACM for surface soil (0 – 0.1 m bgs).			

Notes:

- Guideline values presented are for Chromium (VI) in absence of total Chromium values. Where total Chromium results are elevated, representative samples will be analysed for Chromium (VI).
- Guideline values are for inorganic mercury. Where elevated mercury concentrations are encountered and/or site information suggests the potential presence of elemental mercury and/or methyl mercury, consideration of applicability would be needed.
- Carcinogenic PAHs calculated as per Benzo(a)pyrene Toxicity Equivalent Factor requirements presented in NEPC (2013)
- Total PAHs calculated as per requirements presented in NEPC (2013).
- Soil Health Screening Levels for Vapour Intrusion: Clay Soils. Values presented are those for 0 to <1 m bgs as the most conservative level.
- Values for F1 C₆-C₉ are obtained by subtracting BTEX (Sum) from laboratory result for C₆-C₉ TRH.

The ecological guidelines adopted for the site are shown in **Table 8.2**. The ecological criteria are based on site-specific soil properties including pH, cation exchange capacity (CEC) and clay content reported in the DSI (JBS&G 2014), consistent with NEPC (2013) guidance.

Table 8.2 Ecological based criteria

	Limit of Reporting	Laboratory Method	ESLs	
			Urban Residential and public open space	Commercial and industrial
Metals				
Arsenic	4.0	ICP-AES (USEPA 200.7)	100	160
Cadmium	0.4	ICP-AES (USEPA 200.7)	-	-
Chromium	1.0	ICP-AES (USEPA 200.7)	190	310
Chromium (VI)	1.0	Alkali leach colorimetric (APHA3500-Cr/USEAP3060A)	-	-
Copper	1.0	ICP-AES (USEPA 200.7)	130	190
Nickel	1.0	ICP-AES (USEPA 200.7)	30	55
Lead	1.0	ICP-AES (USEPA 200.7)	1100	1800
Zinc	1.0	ICP-AES (USEPA 200.7)	180	280
Mercury (inorganic)	0.1	Cold Vapour ASS (USEPA 7471A)	-	-
PAHs				
Benzo(a)pyrene	0.5	GCMS (USEPA8270)	0.7	1.4
Naphthalene	0.1	GCMS (USEPA8270)	170	370
BTEX				
Benzene	1.0	Purge Trap-GCMS (USEPA8260)	50	75
Toluene	1.0	Purge Trap-GCMS (USEPA8260)	85	135
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)	70	165
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)	105	180
TPH				
F1 C ₆ -C ₁₀	10	TPH Purge Trap-GCMS (USEPA8260)	180 ¹	215 ¹
F2 >C ₁₀ -C ₁₆	50	TPH Purge Trap-GCMS (USEPA8260)	120 ²	170
F3 >C ₁₆ -C ₃₄	100	Purge Trap-GCFID (USEPA8000)	300	1700
F4 >C ₃₄ -C ₄₀	100	Purge Trap-GCFID (USEPA8000)	2800	3300
OCPs				
DDT	0.1	GCECD (USEPA8140,8080)	180	640

1. Values for F1 C₆-C₉ are obtained by subtracting BTEX (Sum) from laboratory result for C₆-C₉ TRH.
2. Value for Chromium (III) adopted for evaluation of total Chromium in the absence of known Chromium (VI) source.

Biological data collected during the assessment, where required, will be compared against the NSW EPA (1997⁷). The criteria is in **Table 8.3** below:

Table 8.3 Biosolids Based Criteria

Parameter	Standard
E.Coli	<100 MPN per g (dry weight)
Faecal Coliforms	<1,000 MPN per g (dry weight)

⁷ Use and Disposal of Biosolids Products "Stabilisation Grade A Product", NSW EPA (1997).

After consideration of the ESLs and HSLs, the Management Limits for TPH fractions (F1-F4) in soil can be reviewed and applied if required. The management limits are shown in **Table 8.4** below:

Table 8.4 Management Limits Criteria

TPH Fraction	Soil Texture	Management Limit (mg/kg dry soil)	
		Residential, parkland and public open space	Commercial and Industrial
F1 C ₆ -C ₁₀	Coarse	700	700
	Fine	800	800
F2 >C ₁₀ -C ₁₆	Coarse	1000	1000
	Fine	1000	1000
F3 >C ₁₆ -C ₃₄	Coarse	2500	3500
	Fine	3500	5000
F4 >C ₃₄ -C ₄₀	Coarse	10000	10000
	Fine	10000	10000

During redevelopment of the site any soil to be removed off-site shall require a waste classification in accordance with EPA (2014) 'Waste Classification Guidelines Part 1: Classifying Waste'. The potential presence of asbestos in fill materials must be noted in the preparation of the waste classification. The waste classification guidelines are in **Table 8.5** following:

Table 8.5 Waste Classification Guidelines based on SCC without TCLP

	Limit of Reporting	General Solid Waste	Restricted Solid Waste
METALS			
Arsenic	2.0	100	400
Cadmium	0.4	20	80
Chromium (VI)	5.0	100	400
Copper	5.0	-	-
Lead	5.0	100	400
Mercury	5.0	4	16
Nickel	1.0	40	160
Zinc	0.05	-	-
PETROLEUM HYDROCARBONS			
C6-C9 Fraction	20	650	2600
C10 – C36 Fraction	50	10000	40000
BTEX COMPOUNDS			
Benzene	0.1	10	40
Toluene	0.1	288	1152
Ethylbenzene	0.1	600	2400
Xylenes	0.3	1000	4000
POLYCYCLIC AROMATIC HYDROCARBONS			
Benzo(a)pyrene	0.5	0.8	3.2
Total PAHs	0.5	200	800
ORGANOCHLORINE PESTICIDES			
Aldrin + Dieldrin	0.1	< 50 (Scheduled waste)	< 50 (Scheduled waste)
Chlordane	0.1		
Heptachlor	0.05		
DDT + DDD + DDE	0.175		
POLYCHLORINATED BIPHENYLS			
Total PCBs	0.5	<50 (Scheduled waste)	<50 (Scheduled waste)

Note: Concentrations in **Table 8.4** are contaminant threshold values (CT1 & CT2 or SCC1 & SCC2 values where CT1 & CT2 are not used) for classifying waste by chemical assessment without the leaching (TCLP) test (EPA 2014).

8.1 Application of Soil Criteria

For soil to be considered as validated (i.e., not posing an unacceptable risk) all reported concentrations must be below the Site remediation criteria. Should results be found to be able the adopted criteria, then statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate. If the statistical results are below the site criteria then the results will be considered acceptable.

In addition, consideration shall be given to the presence of odorous or discoloured soils (caused by contamination), and other aesthetic issues.

8.2 Validation Reporting

The development of the site is likely to be a staged approach, with the remediation likely to be completed in conjunction with the construction stages. In the event that the remedial works are required to be reported in a staged manner, the Validations Reports shall be stand-alone documents relating to particular stages (areas) of the site.

At the completion of the remedial works for each stage, each Validation Report will be prepared in general accordance with the NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011), documenting the works as completed. Each report will contain information including:

- Confirmation that hazardous materials formerly within the buildings have been appropriately removed and disposed offsite;
- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined data quality objectives and the remediation acceptance (validation) criteria;
- Information demonstrating compliance with appropriate regulations and guidelines;
- Any variations to the strategy undertaken during the implementation of the remedial works;
- Cap and containment details, where relevant, including survey data;
- Hazardous building material surveys for all buildings prior to demolition;
- Details of impacts associated with building structures being remediated;
- Waste tracking documentation from the receiving facility;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents; and
- Other information as appropriate, including requirements (if any) for ongoing monitoring / management.

The report will serve to document the remediation works for future reference.

Should the works not be staged, then a single Validation Report will be prepared documenting all of the above.

9. Contingency Plan

A review of remediation works has been undertaken to identify potential risks to meeting the site validation criteria. A number of potential risks have been identified. These are listed following with contingencies that will be implemented to ensure that validation criteria are met.

9.1 Changing/Staged Development Requirements

As noted in Section 4, development may need to adjust the remedial approaches as development designs change and final site requirements adjust as development progresses. As such contingency remediation approaches may be required, consistent with **Table 5.4**.

9.2 Unexpected Finds

The possibility exists for hazards other than those identified and expected based on previous investigations, to be present at the Site.

Environmental sampling is based on chemical analytes identified as a potential concern during a documented process of reviewing historical Site activities. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations. The nature of any additional hazards which may be present at the Site are generally detectable through visual or olfactory means, for example:

- Previously unidentified asbestos fibre impacted soils and ACM;
- Drums or underground tanks;
- Chemical bottles;
- Odorous or unusual coloured soils; and
- Buried animal remains.

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned potential hazards be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Flowchart 9.1** and detailed in the following sections is to be followed.

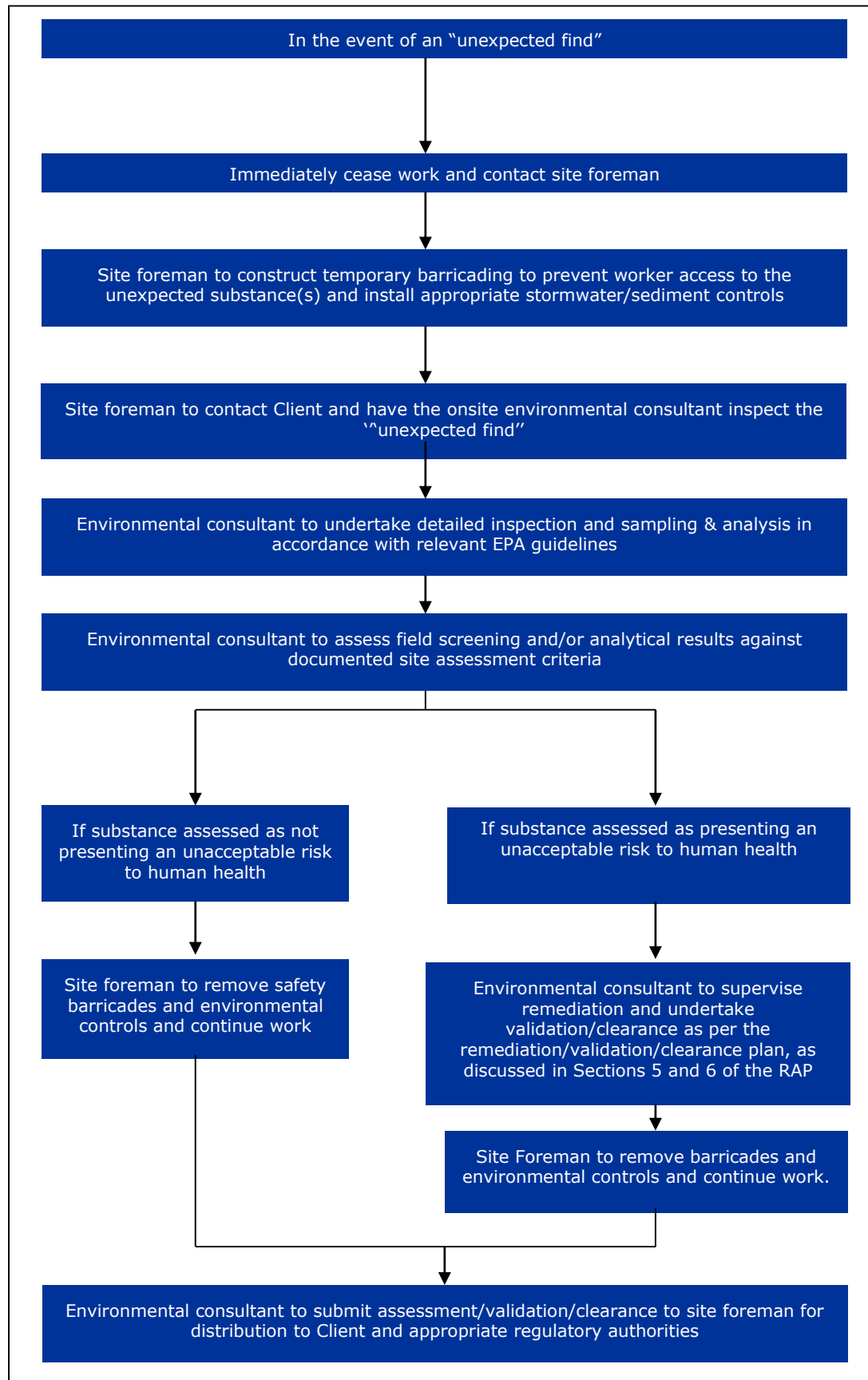
An enlarged version of the unexpected finds protocol, suitable for use on Site, should be posted in the Site Office and referred to during the Site Specific Induction by the Principal Contractor.

The sampling strategy for each 'unexpected find' shall be designed by a suitably qualified environmental consultant, in accordance with guidelines made or endorsed by EPA. The strategy will, however, be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance / materials shall meet the requirements the NSW EPA Sampling Design Guidelines (1995).

Should any unexpected finds require remediation and validation, the works will be conducted in general accordance with Sections 5 and 6 of this RAP, and with appropriate measures based on the nature of the unexpected find. The Auditor should be advised and discussions held to confirm the appropriate remedial strategy for the unexpected find.

Flowchart 9.1 Unexpected Find Protocol



10. Site Management Plan

Hours of Operation

Remediation works shall only be permitted during the following hours:

Monday to Friday: 7:00 am to 3:00 pm

Saturdays: 8:00 am to 1:00 pm

Sundays and Public Holidays: No work permitted.

Emergency work is permitted to be completed outside of these hours. The works schedule will require confirmation with Council.

10.1 Soil and Water Management

All works shall be conducted in strict accordance with the soil and water management measures outlined in this section.

To prevent the migration of impacted soil/sediment off site, silt fences shall be constructed at the down-gradient work area boundaries, as per the specifications contained in *Managing Urban Stormwater – Soil and Construction Volume 1, 4th Edition, NSW Government, March 2004*. Any material which is collected behind the sediment controls shall be treated as potentially contaminated and will be suitably managed.

In a storm event, the sediment controls located on-site will need to be monitored and replaced or altered if necessary. Collected material will need to be suitably managed in accordance with remediation works.

10.2 Site Access

During remediation works, perimeter fencing will be maintained to restrict access to the works area. Only authorised persons will be able to enter the works area.

Vehicle access to the works area shall be stabilised to prevent the tracking of soil around the site and the adjoining driveway/access point to the road will be swept or cleaned on an as-needed basis. Any collected materials shall be treated as potentially contaminated and will be suitably managed.

10.3 Stockpiles

The following procedures will be implemented:

- No stockpiles or other materials shall be placed on footpaths or roadways and will be away from all stormwater infrastructure (including drainage lines, stormwater pits, gutters, etc) where possible. Where this is not possible, sediment controls will be placed over stormwater grates to prevent ingress of sediment to stormwater drainage lines;
- Stockpiles shall be formed with sediment control structures placed immediately down slope to protect other lands and waters from sediment pollution;
- All stockpiles likely to generate substantial dusts or potential asbestos fibres shall be covered and, if left for more than 24 hours, be stored in a secure area; and
- All stockpiles will be placed on a level area as a low elongated mound.

10.4 Dam & Excavation Pump-out

The farm dams and excavation pump out water (if any) shall be pumped from the excavation by a licensed contractor and disposed of off-Site as 'liquid waste' in accordance with DECC (2009).

10.5 Noise

The remediation works shall comply with the NSW EPA's Environmental Noise Control Manual for the control of noise from construction sites.

All machinery and equipment used on site will be in good working order and with the fitted with appropriate silencers when necessary.

10.6 Vibration

The use of plant and machinery shall not cause vibrations to be felt or capable to be measured at the neighbouring premises.

10.7 Air Quality

10.7.1 Dust Control

During the remediation of the impacted areas, dust levels will be monitored and minimised by using mist sprays as necessary.

During the removal of the asbestos impacted materials from the site, the excavation area will be wetted down using a water spray to minimise the potential for dust to be generated. In addition to these controls, air sampling will be conducted during the asbestos remediation works to monitor the amount of airborne asbestos fibres released. The monitoring results will be used to adjust the work technique, in particular the amount of water used to wet the excavation.

Dust shall also be controlled by ensuring vehicles leave via the designated (stabilised) site access and all equipment has dust suppressors fitted.

10.7.2 Asbestos Air Monitoring

Asbestos air monitoring will be completed in accordance with **Section 11.4**.

10.8 Material Transporting

Trucks will be loaded in a designated area away from the contaminated material excavations. The transporting contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

All appropriate road rules shall be observed and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

Where material is to be imported, controls are to be implemented to maintain separation between contaminated and non-contaminated materials.

10.9 Hazardous Materials

All hazardous and/or intractable wastes (if any) shall be removed and disposed of in accordance with the relevant regulatory requirements. In particular, any hazardous wastes will be transported by an EPA licensed transporter.

10.10 Disposal of Contaminated Soil

All soil will be classified, managed and disposed in accordance with the Waste Classification Guidelines Part 1: Classifying Waste (DECC 2009a).

10.11 Imported Fill

If any materials are required to be imported on site to re-establish existing ground levels, then only material meeting the requirements outlined in **Section 6.8.4** will be accepted onto the site.

10.12 Site Signage and Contact Numbers

A sign shall be displayed throughout the duration of the works with the contact details of the remediation contractor and project manager. Council shall also be notified of these details at least 14 days prior to commencing works.

10.13 Complaint Reporting and Resolution

Complaints from adjoining site occupants or workers on site will be directed initially to the civil contractor on site. Following that, discussion with the environmental consultant and the complainant will investigate the issue and remedy it as required or applicable.

11. Health and Safety

The objectives of the health and safety plan are:

- to apply standard procedures that reduce risks resulting from the above works;
- to ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- to have procedures to protect other Site workers and the general public.

These objectives will be achieved by:

- assignment of responsibilities;
- an evaluation of hazards;
- establishment of personal protection standards and mandatory safety practices and procedures; and
- provision for contingencies that may arise while operations are being conducted at the Site.

This health and safety section does not provide safety information specific to construction and other demolition or excavation activities carried out by contractors, such as the safe operation, maintenance and inspection of plant, etc. Contractors will be required to prepare their own Safe Work Method Statements for their work activities. All parties working on the Site shall comply with all applicable Health and Safety legislation, regulations, codes and guidelines.

Health and safety requirements while working with asbestos will be decided by the asbestos removal contractor and will be based on the requirement of their licence. Measures implemented by the licensed asbestos removal contractor will take precedence over the advice provided herein.

11.1 Responsibilities

11.1.1 Remediation Supervisor

The remediation supervisor is responsible for ensuring that the work is carried out in accordance with the health and safety plan. This will include:

Ensuring a copy of the health and safety plan is available at the Site during the remediation/validation activities;

Confirming individuals are competent in performing allotted tasks;

Liaison with the contractor representatives, as appropriate, regarding safety matters; and

Investigation and reporting of incidents and accidents.

The remediation supervisor will be designated by the nominated contractors prior to the commencement of Site remediation works.

11.1.2 Other Members of the Site Workforce

Every individual worker is responsible for conducting their allocated tasks in a safe manner and in accordance with their training and experience. They must give due consideration to the safety of all others in their proximity and cooperate in matters of health and safety. All workers must leave their work areas in such a condition that the location will not be hazardous to others at any time.

11.2 Hazards

The known or potential hazards associated with the work activities are listed below:

Inhalation hazards associated with the presence of asbestos containing materials.

- Chemical hazards associated with the presence of contaminated soil;
- Physical hazards, including:
 - work in or near excavations;
 - operating machinery;
 - heat stress and UV exposure;
 - underground or overhead services;
 - manual handling; and
 - noise.

In the event of the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated, or of any new hazard that could potentially cause serious harm to personnel or the environment, work will be suspended until the Remediation Supervisor has been notified and appropriate instructions have been provided to field personnel.

11.2.1 Inhalation Hazards

The main inhalation hazards from the remediation/validation works are consequent of the presence of asbestos, hydrocarbons and heavy metals.

Measures require to be put in place to prevent/ minimise the generation of airborne fibres and odours. These have been described in the environmental controls for the works. Where airborne emissions are generated, PPE shall be required to be worn to prevent potential exposure.

11.2.2 Physical Hazards

Operating Machinery

Heavy plant and equipment operating in the vicinity of field personnel presents a risk of physical injury. Personnel should be cognisant of their position in relation to operating machinery at all times. Personnel must wear high visibility clothing when onsite.

Never walk behind or to the side of any operating equipment without the operator's knowledge. Do not assume that the operator knows your position. Personnel should stay at least 1 m from the operational area of heavy equipment and should not stand directly below any load or piece of equipment (e.g. backhoes, excavators, vehicles).

Work In or Near Excavations

No Site personnel are to stand closer than 0.5 m to the edge of an excavation. No Site personnel are to enter excavation greater than 1 m deep. Additionally, at the end of each day excavations are to be barricaded to prevent access.

Cuts and Abrasions

The manual work associated with the remediation works gives rise to the risk of cuts and abrasions to personnel working in the area. As well as the direct consequences of any cut or abrasion, such injuries can lead to the possibility of exposure to contaminants through the wound as well as diseases such as tetanus. To minimise the risk of direct or indirect injury, personnel will wear the personal protective equipment described.

Heat Stress and UV Exposure

Site personnel may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the type of work and the time of year.

In addition to heat stress, overexposure to UV radiation in sunlight can result in sunburn to exposed skin. The use of a high protection sunscreen (SPF15 or greater) on all exposed skin is recommended. Hats (including hard hats in specified areas) will also provide additional sun protection during the peak (i.e. 10:00 am to 3:00 pm) sun period. Sunglasses should be worn (where appropriate) to protect eyes from effects of UV exposure.

Underground Services

There is the potential for underground services (electricity, natural gas lines, water, telephone, sewer, and stormwater) to be present beneath the work area. The remediation contractor shall ensure that appropriate procedures will be taken to minimise the risk associated with excavation near services.

Aboveground Electrical Hazards

All electrical plant and equipment must comply with the requirements of Australian Standard AS 3000. Hand held portable tools shall comply with AS/NZS 3160 "hand-held portable electric tools" and shall be double insulated. Cord connected portable hand lamps shall comply with AS/NZS 3118. A Residual Current Device (RCD) shall protect plug-in portable equipment, which is connected to a supply above Extra Low Voltage - 12-24volts (including equipment supplied from a generator or welding set). RCD protection shall be provided during maintenance of portable electrical equipment at all times while the equipment is connected to a power supply above Extra Low Voltage, irrespective of whether power is switched ON or OFF. RCD's shall comply with AS 3190 and shall be type II units, rated to trip at or below 30 milliamps within 40 milliseconds.

In the vicinity of overhead power lines, the WorkCover NSW 'Guidelines for Working Near Overhead Power Lines' (2006) should be consulted to determine the appropriate 'approach distance' specific to the line voltage present and tasks under completion. No excavator, drill rig or crane may work within the nominated 'approach distance', unless specifically approved by the Remediation Supervisor and/or the asset owner if required.

Manual Handling

When lifting or handling heavy objects, use correct lifting techniques, bending the knees not the back. If the item to be lifted is too heavy or awkward for one person to lift, seek assistance from other company employees or use mechanical help.

Noise

Long-term exposure to high levels of noise is unlikely. However, operating machinery may cause significant noise exposures for short periods. Earplugs or earmuffs should be worn in any situation where noise levels make normal conversation difficult.

11.3 Personal Protective Equipment

All workers who may come into direct contact with contaminated soil will wear the following personal protective equipment:

- Overalls or long sleeved collared shirt;
- Heavy duty outer gloves (e.g. leather) where there is a risk of cuts or abrasions, otherwise PVC outer gloves if in direct contact with contaminated soil;

- Steel capped boots;
- Safety glasses;
- High visibility vest or jacket; and
- Hard hat.

In addition to the above, the following personal protective equipment will be worn by the licensed personnel responsible for removing the asbestos impacted soils, or potentially exposed to airborne emissions:

- During any work in the asbestos impacted area prior to final clearance, overalls worn should be made from either 100% synthetic material or a mixed natural/synthetic fabric capable of providing adequate protection against fibre penetration. Gloves, rubber soled work shoes or gum boots should be provided for personnel involved in the wet work. These shoes will remain inside the work area for the duration of the work.
- Approved respirators shall be worn in the asbestos impacted area at all times to provide respiratory protection. The minimum protection is an approved properly fitting disposable respirator or half faced respirator fitted with a particulate cartridge. However it is expected that the contractor will conduct a risk assessment in relation to the works and should consider the requirement for positive pressure, hood or full-face powered air-purifying respirator fitted with an approved Class M filter.
- The contractor shall supply and keep in good order, two complete sets of protective clothing and respirators for authorised inspection personnel. These will remain the property of the contractor at the end of the contract.
- Respirators should be issued for personal use only and shall be kept in a clean condition. Alcohol based antiseptic swabs should be made available for the cleaning of respirators.
- Any respirator defects should be reported for subsequent repair. They should be maintained in a clean and safe working condition.
- Employees must receive instruction in the correct method of using the respirator and on the importance of correct facial fit and maintenance. No person with a beard shall be allowed within the asbestos work area except using an approved positive pressure continuous airflow hood.

It is further noted that additional PPE may be required as part of the WorkCover permitting process. If this occurs, then the above PPE requirements will be upgraded to reflect WorkCover's requirements.

- In the event that workers will be exposed to highly odorous soil conditions during remediation works, the following additional PPE should be adopted:
- Impermeable disposable overalls; and
- Half or full face respirator with organic vapour cartridge.

11.4 Monitoring procedures

It is prudent practice to conduct monitoring for airborne asbestos fibres during asbestos works. The results of air monitoring can be used:

- To identify failures in containment;
- To identify poor work practices; and

- To provide proof of containment for occupiers and regulatory authorities and to provide evidence of good work practices for both present and future needs.

Monitoring will be conducted in accordance with the National Occupational Health & Safety Commission (NOHSC) membrane filter method as approved by the National Association of Testing Authorities (NATA).

The appropriate TWA (NOHSC) levels are:

- AmoSite - 0.1 fibre/mL;
- Chrysotile – 0.1 fibre/mL;
- Crocidolite - 0.1 fibre/mL;
- Other forms of asbestos - 0.1 fibre/mL; and
- Any mixture of these, or where the composition is unknown - 0.1 fibre/mL.

With consideration to these levels the following trigger levels have been developed:

- If airborne fibre levels reach 0.01 fibres/mL the source of fibre release is to be found and rectified. Work in the affected area does not have to stop; and
- If airborne fibre levels reach 0.02 fibres/mL work in the work area should stop and additional controls measures employed. This will involve additional water spraying during excavations.

Proposed air monitoring locations will be located in areas where asbestos impacted material has been identified.

Air monitoring results will be obtained within 24 hours of sample collection. While this precludes “real time” monitoring, visual indications will be made during all excavation works and, if there is any visible dusts, light water sprays will be used to wet the excavation and prevent the release of any airborne asbestos fibres.

11.5 Decontamination Procedures

The decontamination procedures specified below will be followed whenever personnel, plant or equipment leave the Site.

Personnel

The following steps should be taken to ensure personnel do not leave the Site with potentially contaminated clothing:

- Wash boots in clean water
- Remove outer gloves and store for reuse
- Remove overalls and store for reuse (during the day) or place in the skip for the asbestos wastes for disposal.
- Remove respirator and goggles (if used) and store clean for reuse or decontamination, as appropriate.
- Thoroughly wash hands and face.

If any part of a worker's body comes into direct contact with any potentially contaminated material, the affected part(s) should be immediately washed with clean water.

Vehicle, Plant and Equipment

All equipment, including personal protective equipment, will be washed or otherwise cleaned to ensure that contaminated soil, water or dust is removed before it leaves the Site. All plant and equipment will have their outer bodies thoroughly cleaned of soil and sediment before moving off the Site.

11.6 Emergency Response

The remediation contractor will be responsible for preparing an emergency response plan, which will provide details on appropriate action and evacuation procedures in the event of an emergency.

In the event of an emergency arising on the Site, appropriate action should be taken. Site evacuation procedures should be followed, as necessary.

In the event of an accident: evaluate the seriousness of the injury, and contact emergency services, if necessary; provide first aid, as appropriate, and if safe to do so evacuate the injured person; make the area as safe as possible without jeopardising safety.

If a serious accident occurs, do not disturb the scene, except to make safe and prevent further injury or damage, and keep all unauthorised people out, and report all accidents to the Remediation Supervisor.

12. Post Remediation Site Management Plan

12.1 Long Term Management Plan

Subsequent to implementation of the preferred remediation strategy, and demonstration of successful validation of the site in accordance with the requirements of this RAP, a long term Environmental Management Plan (EMP) may be required for the management of any impacted materials exceeding criteria retained at the site.

Due to the various Precincts having different landuse scenarios, implementation of an EMP will only be required where impacted materials are retained that exceed specific landuse criteria.

Should all impacted material be remediated, either through offsite disposal or placement within road reserves or less sensitive landuse scenario locations then an EMP will not be required subject to auditor sign off and approval.

13. Regulatory Approvals/Licensing

State Environment Planning Policy Number 55 (SEPP55) Remediation of Land

The proposed remediation works are considered to be classified as 'Category 1' Remediation Works – i.e. requiring consent based on more than 3 ha of area is to be disturbed during the development and likely to be ancillary to the development and therefore part of the overall development process. The notification requirements of SEPP 55 include notification to Council 30 days before Category 1 remediation works commence. The notification will provide Council with the information needed to verify the work.

Protection of the Environment Operations Act 1997

In relation to the licensing requirements under the Protection of the Environment Operation Act 1997:

- The works do not fall within the licensing requirements for Contaminated Soil Treatment Works; and
- The works do not fall within the licensing requirements for Crushing, Grinding or Separating Works.

All material to be excavated and removed from the Site (including associated activities such as classification) will be undertaken in strict accordance with the requirements of the POEO Act 1997. Such requirements include:

- Ensuring waste is classified appropriately and in accordance with relevant guidelines;
- Waste materials are disposed of to appropriately licensed facilities;
- Other materials are removed to facilities lawfully able to accept such materials.

Waste Classification Guidelines, Part 1: Classifying Waste

All wastes generated shall be classified and managed in accordance with the NSW DECC Waste Classification Guidelines Part 1: (2009).

Asbestos Removal Regulations and Code of Practice

The removal and disposal of asbestos will be managed in accordance with the National Occupational Health & Safety Commission (NOHSC) Asbestos: Code of Practice and Guidance Notes, the Work Health and Safety Act 2011, WorkCover Guidelines and the NSW EPA Waste Classification Guidelines 2009. Friable asbestos works must be completed by a licensed Class A asbestos removalist. Non-friable asbestos remediation works can be completed by a Class B licensed contractor.

Before starting the affected works, a Site-specific permit approving the asbestos works must be obtained from NSW WorkCover. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

Work Health and Safety Act 2011

The overarching Act for NSW setting law relating to employee health and safety and employer responsibilities.

Work Health and Safety Regulation, 2011

Sets Regulations and details the duties for employers to achieve required employee health and safety performance.

Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act provides a framework for the development of land within NSW, including division of planning responsibilities between tiers of government and requirements for assessment in relation to development of sites for specific uses. This act provides for the enforcement of conditions upon use of the land via planning instruments including state environmental planning policies such as SEPP 55.

Contaminated Land Management Act 1997 (CLM Act)

The CLM Act controls the assessment of contamination and management of contaminated soils and groundwater. The Act also contains guidance for the determination of whether a site is considered to be a Significantly Contaminated Site and allows for accreditation of Site Auditors.

Protection of the Environment Operations Act 1997 (POEO 1997)

The POEO Act provides a regulatory framework for matters affecting the environment including environmental protection measures. The act provides for the licensing of activities with the potential to cause harm to human health and/or degradation of the environment, including waste disposal.

14. Site Suitability

Subject to the successful implementation of the measures detailed in this RAP and subject to the limitations in **Section 15**, it is considered that the identified impacted soils can be remediated and validated without the need for further management.

However, as discussed in **Section 12**, should material above the adopted land use scenario criteria be retained in specific areas of the site, then an environmental management plan will be required to manage the potential risk to future site users for the particular containment area of the site.

15. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

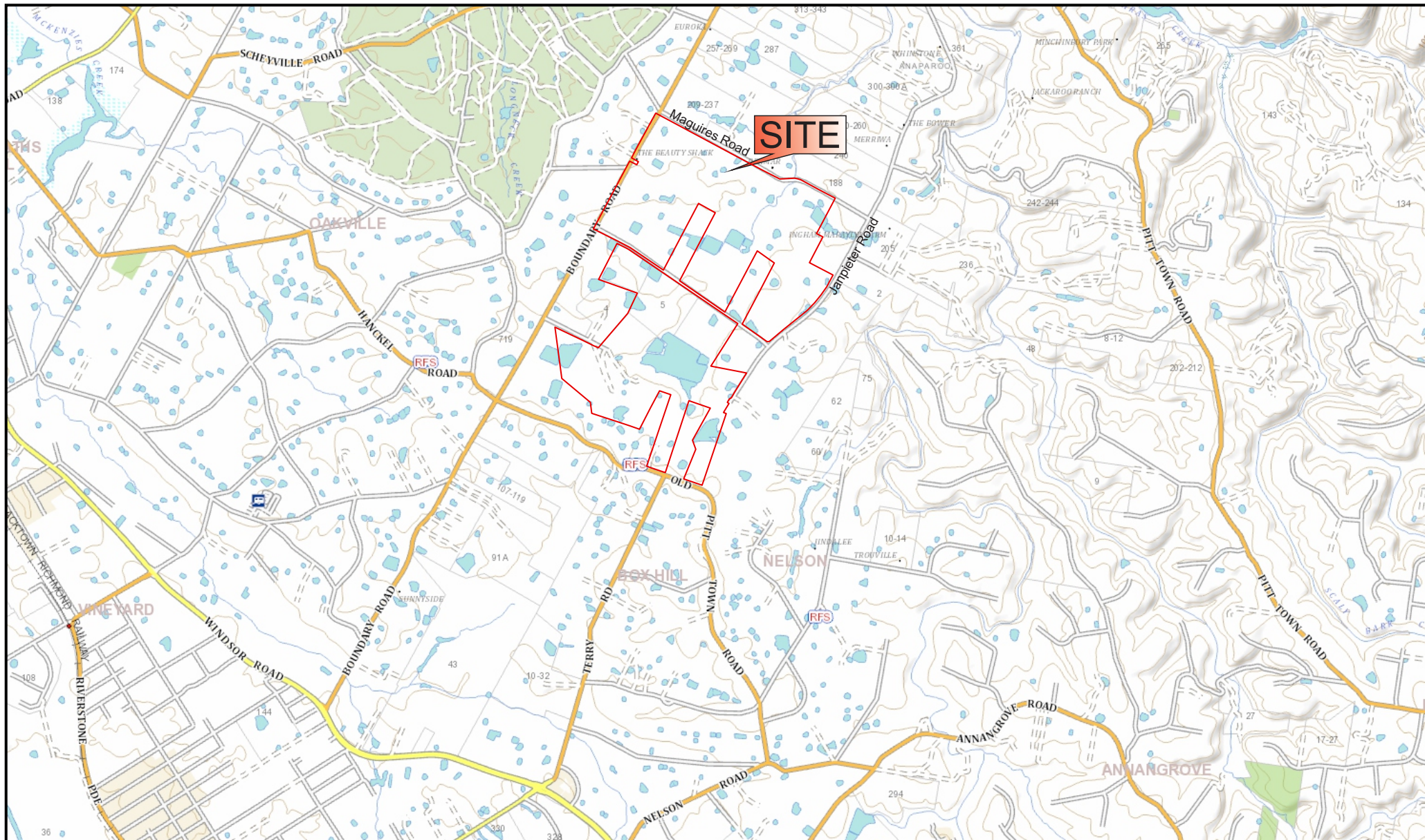
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, accessed 12-04-2013

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0 750 1500 Scale: Approximate Datum: MGA94 Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Drn.	Date

Legend:

— Approximate Site Boundary



Figure 1: Site Location

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376_01

File Name: 43376_01





Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 13-04-2011, accessed 12-04-2013

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0 125 250 500 m			
Scale: 1:13,500			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Dm.	Date:

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Electrical Transmission Line
- Site Identification Number

JBS&G Figure 2: Site Layout

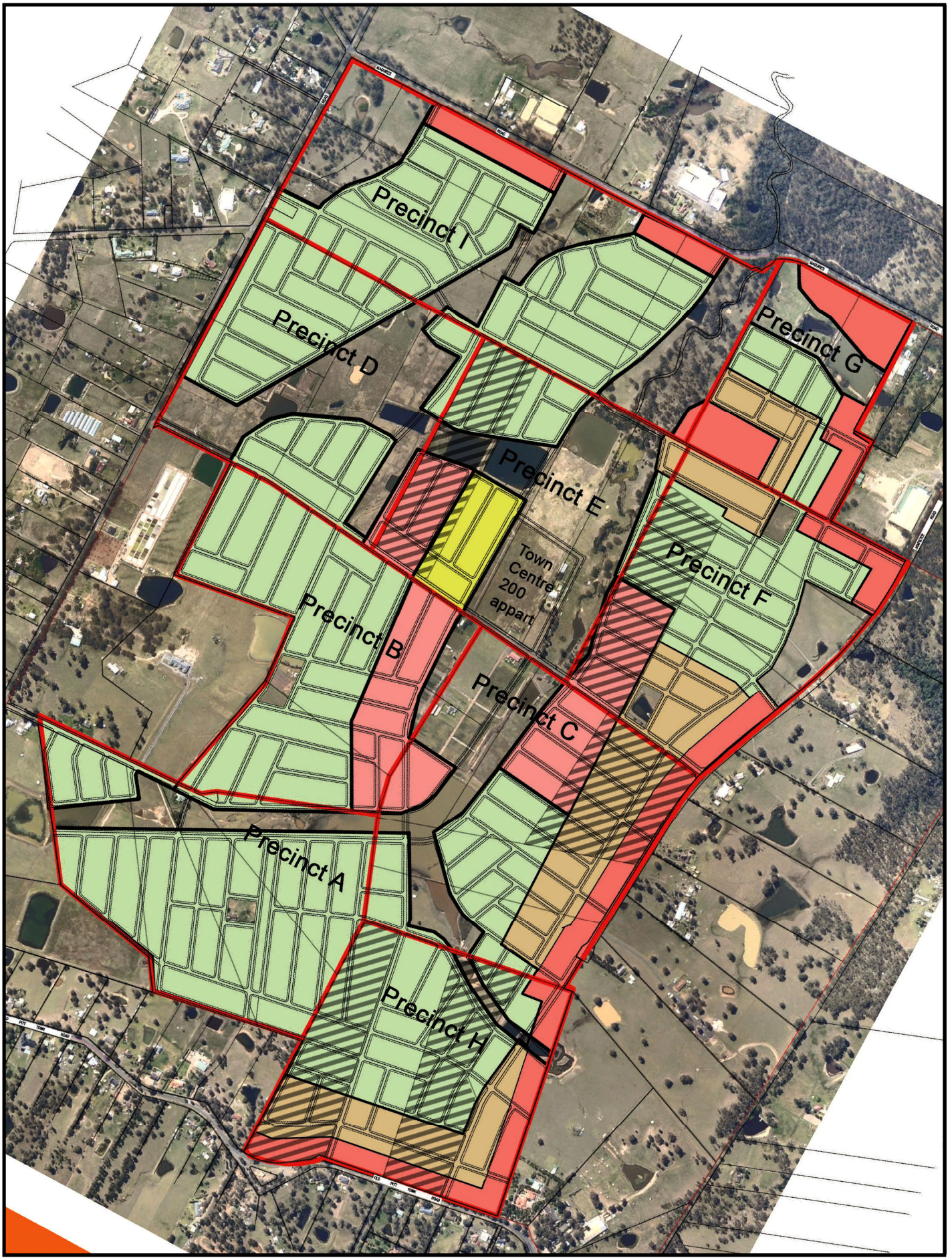
Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_02





Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 13-04-2011, accessed 12-04-2013

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0 125 250 500 m			
Scale: 1:13,500			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	24-10-2014
Rev	Description	Dn.	Date:

Legend:	
	Low/Medium Density Residential
	Medium Density Residential
	Medium/High Density Residential
	High Density Residential
	Large Lot Residential
	Privately Owned Lots



Figure 3: Precincts Layout

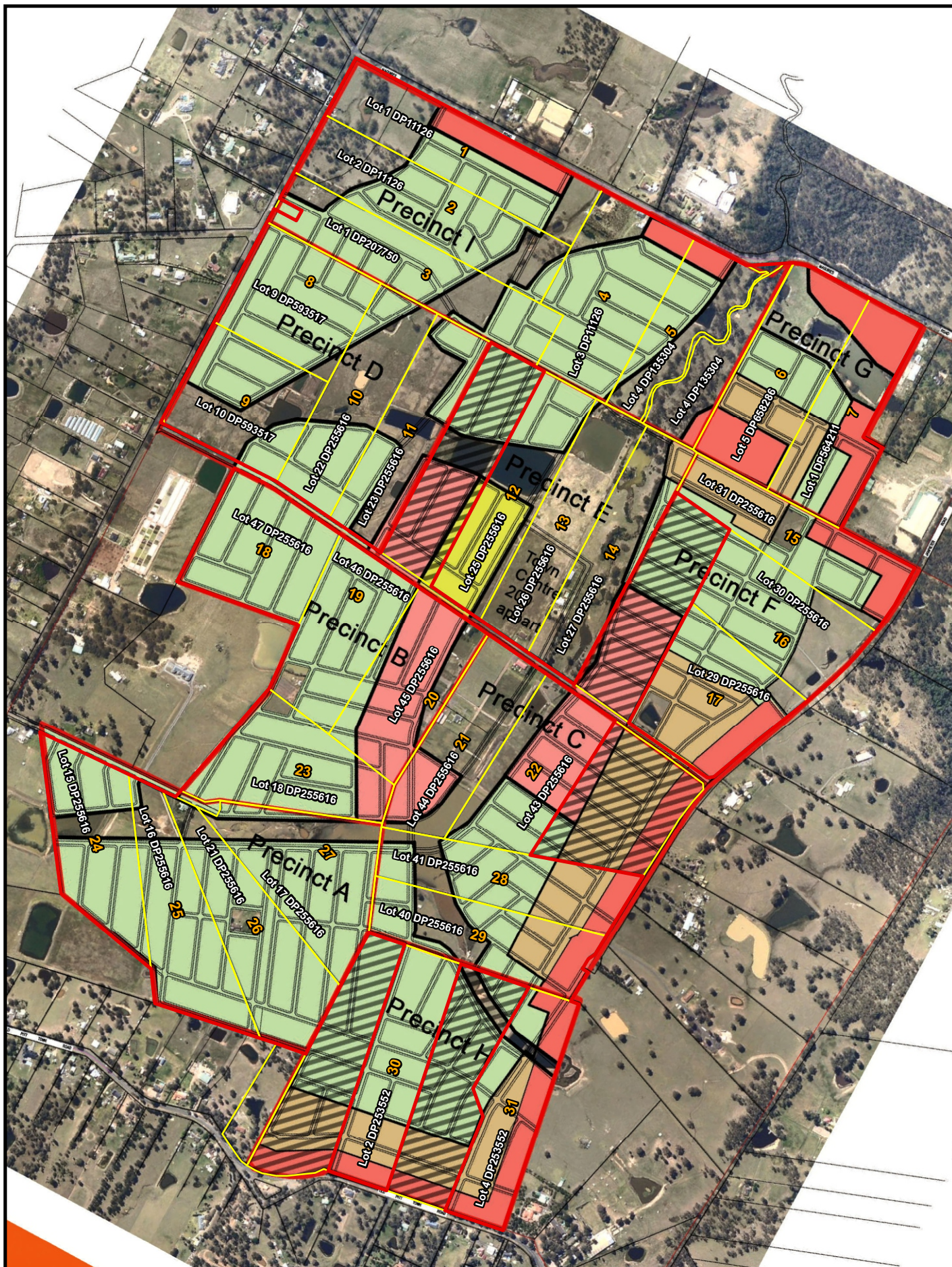
Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_03





Source: Box Hill North - Cadastral and Precinct Boundaries Overlay Plan. Design IQ: shaping the urban canvas.

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0 125 250 500 m			
Scale: 1:13,500			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	24-10-2014
Rev	Description	Drm.	Date:

Legend:

- ▬ Approximate Site Boundary
- ▬ Approximate Lot Boundary



Figure 4: Precincts With Current Lot Boundaries

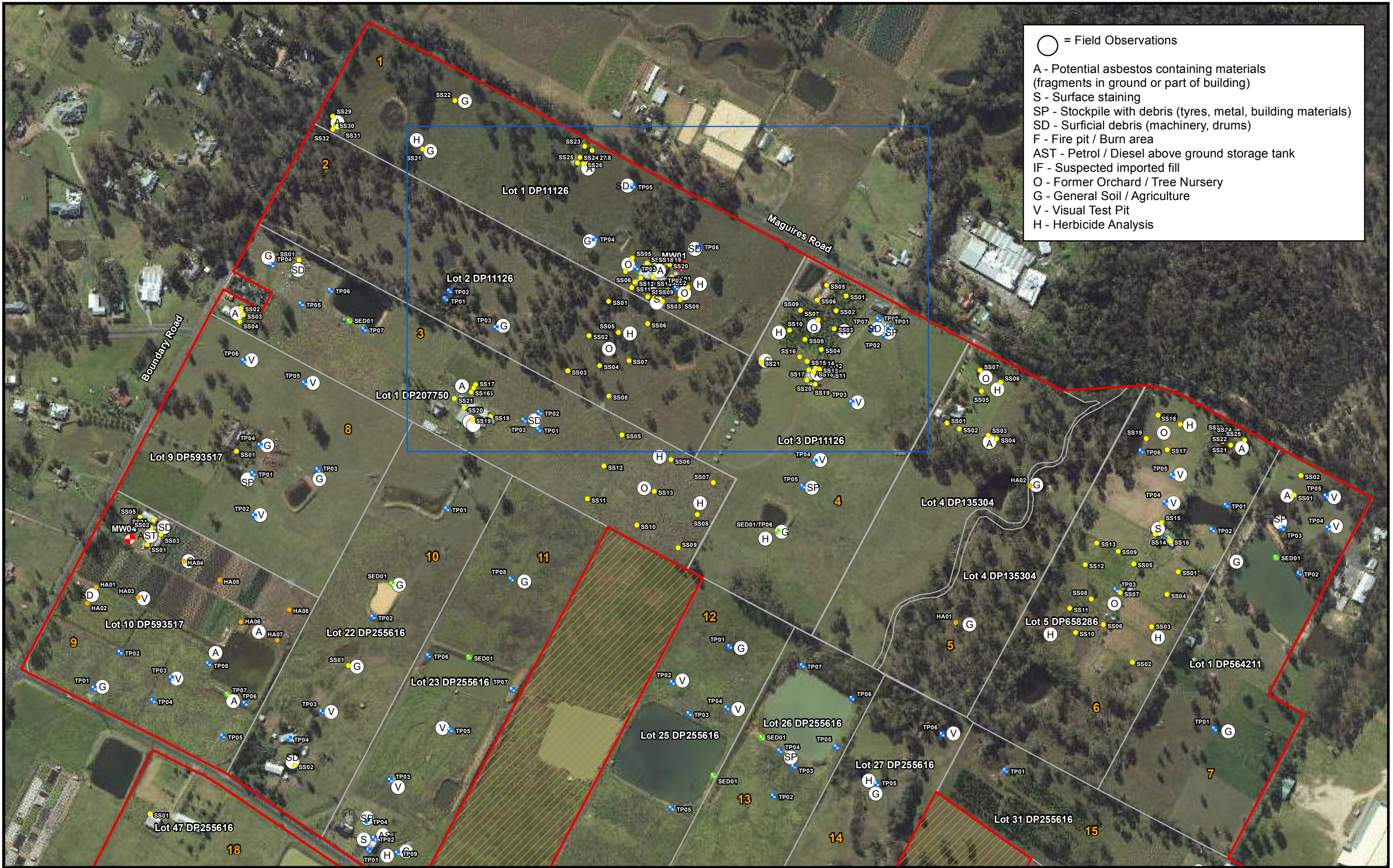
Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_04





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Scale: 1:5,200		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date











Legend:			
	Approximate Site Boundary		
	Approximate Lot Boundary		
	Monitoring Well Locations		
	Additional Properties Not Included in PSI		
Sampling Locations			
	Grab Sample/Trowel		Site Identification Number
	Hand Auger		Extent of Figure 5b
	Sediment Sample		
	Test Pit		

Figure 5a: Previous Soil Sample Locations - Northern Lots

Client: APP Corporation	
Project: Box Hill North, NSW - RAP	
Job No: 43376	File Name: 43376_05a



- = Field Observations
- A - Potential asbestos containing materials (fragments in ground or part of building)
- S - Surface staining
- SP - Stockpile with debris (tyres, metal, building materials)
- SD - Surficial debris (machinery, drums)
- F - Fire pit / Burn area
- AST - Petrol / Diesel above ground storage tank
- IF - Suspected imported fill
- O - Former Orchard / Tree Nursery
- G - General Soil / Agriculture
- V - Visual Test Pit
- H - Herbicide Analysis

Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed 12/04/2013

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0 20 40 80 m			
Scale: 1:2,000			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Drm.	Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

Site Identification Number

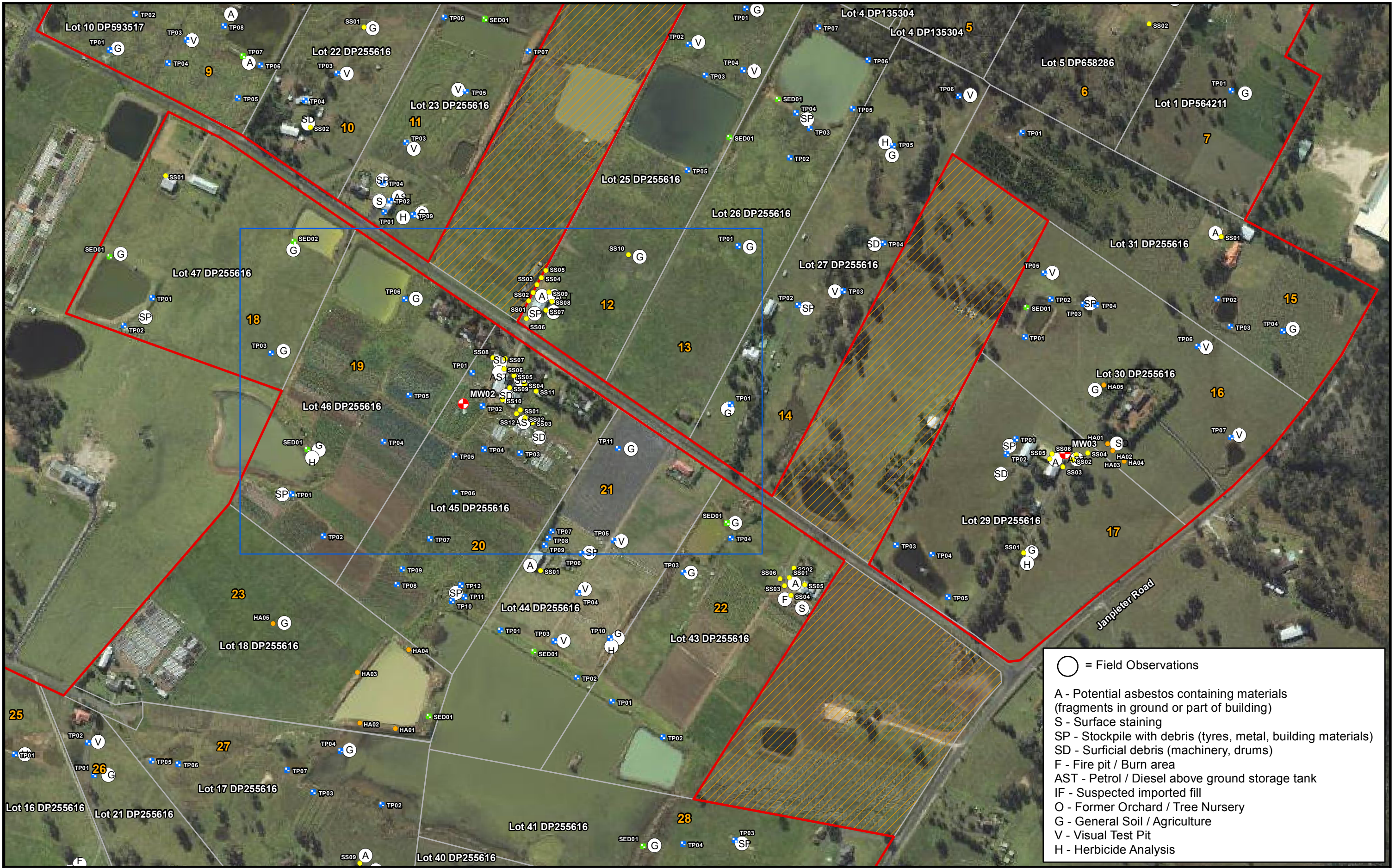
Figure 5b: Northern Surface Previous Soil Sample Locations

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_05b



- = Field Observations
- A - Potential asbestos containing materials (fragments in ground or part of building)
 - S - Surface staining
 - SP - Stockpile with debris (tyres, metal, building materials)
 - SD - Surficial debris (machinery, drums)
 - F - Fire pit / Burn area
 - AST - Petrol / Diesel above ground storage tank
 - IF - Suspected imported fill
 - O - Former Orchard / Tree Nursery
 - G - General Soil / Agriculture
 - V - Visual Test Pit
 - H - Herbicide Analysis

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0 55 110 220 m		
Scale: 1:5,200		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

- Site Identification Number
- Extent of Figure 5d



Figure 5c: Previous Soil Sample Locations - Central Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

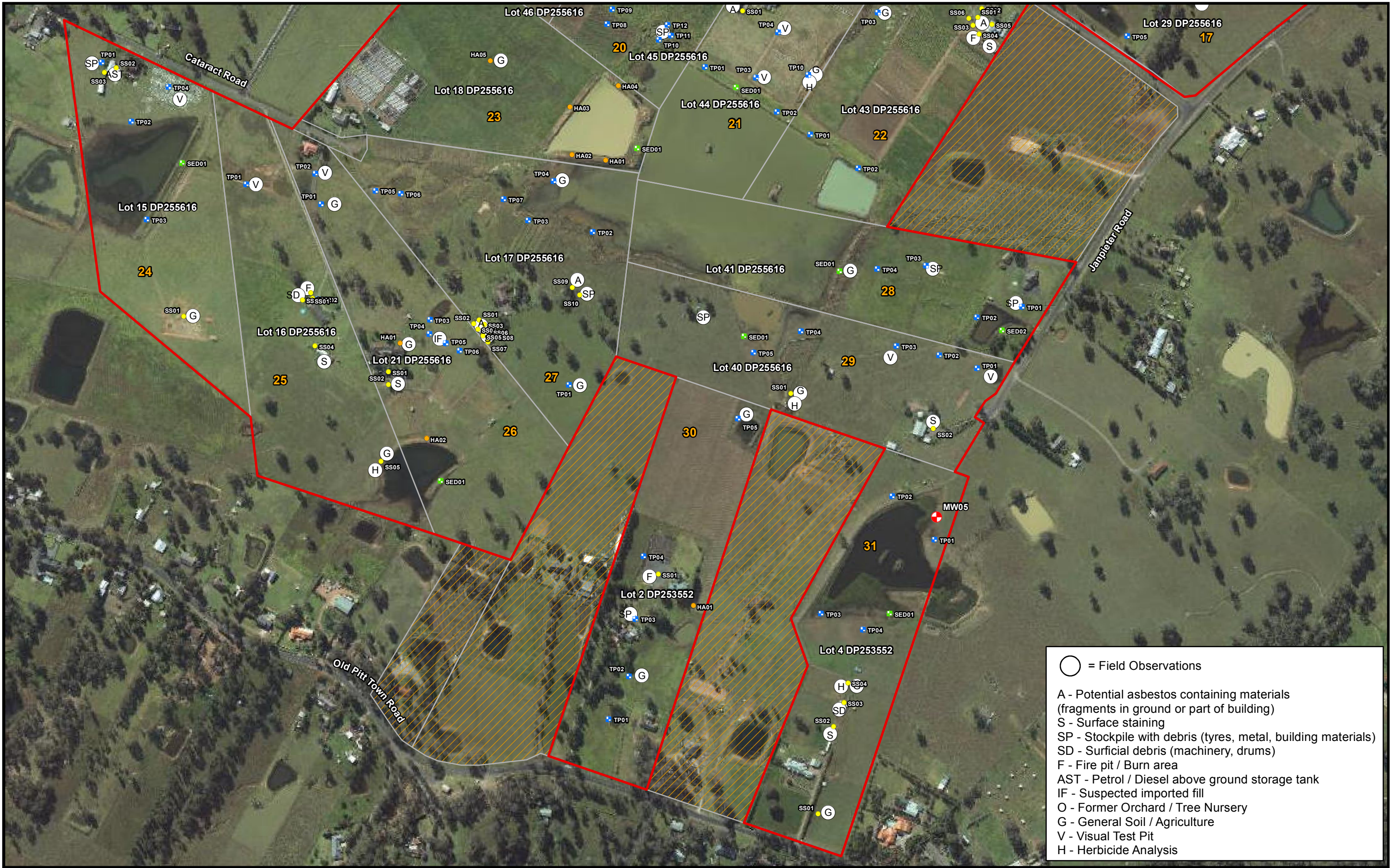
Job No: 43376

File Name: 43376_05c



○ = Field Observations

A - Potential asbestos containing materials (fragments in ground or part of building)
S - Surface staining
SP - Stockpile with debris (tyres, metal, building materials)
SD - Surficial debris (machinery, drums)
F - Fire pit / Burn area
AST - Petrol / Diesel above ground storage tank
IF - Suspected imported fill
O - Former Orchard / Tree Nursery
G - General Soil / Agriculture
V - Visual Test Pit
H - Herbicide Analysis



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0 55 110 220 m		
Scale: 1:5,500		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

Site Identification Number

○ = Field Observations

A - Potential asbestos containing materials (fragments in ground or part of building)
S - Surface staining
SP - Stockpile with debris (tyres, metal, building materials)
SD - Surficial debris (machinery, drums)
F - Fire pit / Burn area
AST - Petrol / Diesel above ground storage tank
IF - Suspected imported fill
O - Former Orchard / Tree Nursery
G - General Soil / Agriculture
V - Visual Test Pit
H - Herbicide Analysis

Figure 5e: Previous Soil Sample Locations - Southern Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_05e



Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed: 12/04/2014

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0 137.5 275 550 m			
Scale: 1:13,000			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Dm.	Date:

Legend:

- Approximate Lot Boundary
- Groundwater Monitoring Well Locations
- Approximate Site Boundary
- Additional Properties Not Included in PSI



Figure 6: Previous Groundwater Sample Locations

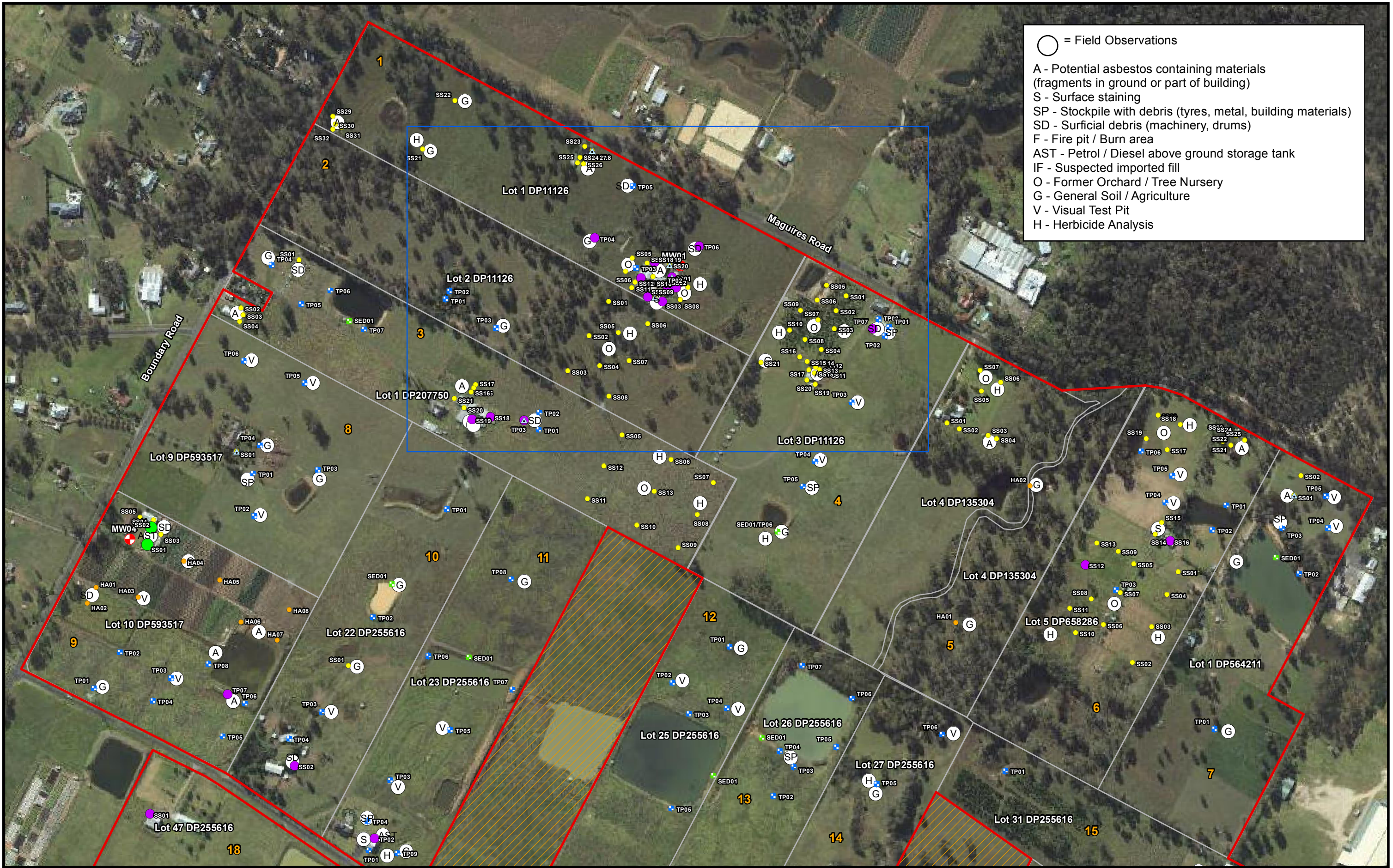
Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_06





○ = Field Observations

A - Potential asbestos containing materials (fragments in ground or part of building)

S - Surface staining

SP - Stockpile with debris (tyres, metal, building materials)

SD - Surficial debris (machinery, drums)

F - Fire pit / Burn area

AST - Petrol / Diesel above ground storage tank

IF - Suspected imported fill

O - Former Orchard / Tree Nursery

G - General Soil / Agriculture

V - Visual Test Pit

H - Herbicide Analysis

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0 55 110 220 m		
Scale: 1:5,200		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

Legend:		Sampling Locations	
	Approximate Site Boundary		Grab Sample/Trowel
	Approximate Lot Boundary		Hand Auger
	Monitoring Well Locations		Sediment Sample
	Additional Properties Not Included in PSI		Test Pit
	Asbestos in Soil		ESL/EIL Exceedances - Metals
	ESL/EIL Exceedances - PAH & TRH		Extent of Figure 7b

Figure 7a: Previous Soil Exceedances - Northern Lots

Client: APP Corporation	
Project: Box Hill North, NSW - RAP	
Job No: 43376	File Name: 43376_07a



- = Field Observations
- A - Potential asbestos containing materials (fragments in ground or part of building)
- S - Surface staining
- SP - Stockpile with debris (tyres, metal, building materials)
- SD - Surficial debris (machinery, drums)
- F - Fire pit / Burn area
- AST - Petrol / Diesel above ground storage tank
- IF - Suspected imported fill
- O - Former Orchard / Tree Nursery
- G - General Soil / Agriculture
- V - Visual Test Pit
- H - Herbicide Analysis

Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed 12/04/2013

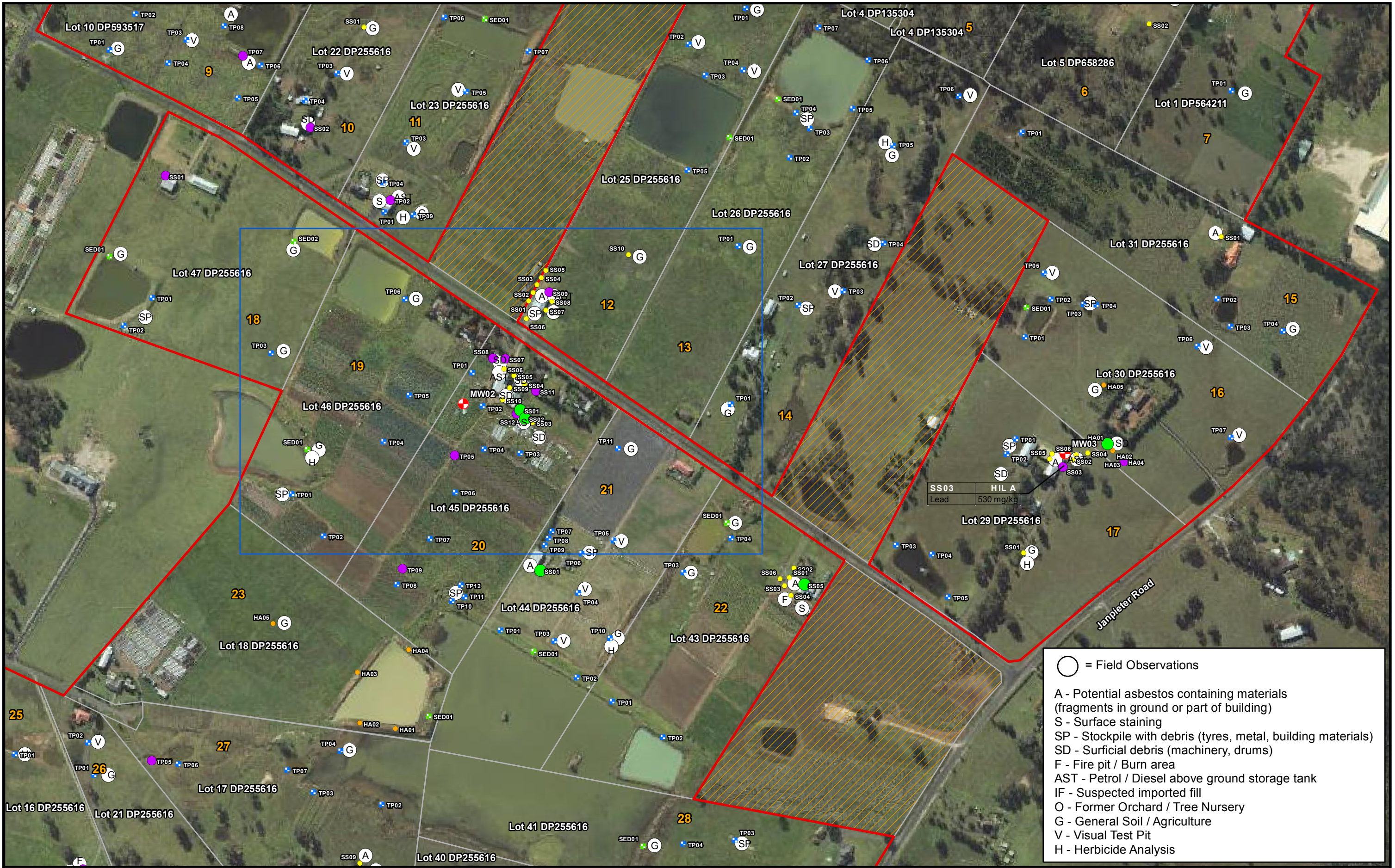
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0 20 40 80 m			
Scale: 1:2,000			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Drm.	Date

Legend:		Sampling Locations	
	Approximate Site Boundary		Grab Sample/Trowel
	Approximate Lot Boundary		Hand Auger
	Monitoring Well Locations		Sediment Sample
	Additional Properties Not Included in PSI		Test Pit
			Asbestos in Soil
			ESL/EIL Exceedances - Metals
			ESL/EIL Exceedances - PAH & TRH
			Site Identification Number

Figure 7b: Previous Soil Exceedances - Northern Lots (Detail Map)

Client: APP Corporation	
Project: Box Hill North, NSW - RAP	
Job No: 43376	File Name: 43376_07b



○ = Field Observations

A - Potential asbestos containing materials (fragments in ground or part of building)

S - Surface staining

SP - Stockpile with debris (tyres, metal, building materials)

SD - Surficial debris (machinery, drums)

F - Fire pit / Burn area

AST - Petrol / Diesel above ground storage tank

IF - Suspected imported fill

O - Former Orchard / Tree Nursery

G - General Soil / Agriculture

V - Visual Test Pit

H - Herbicide Analysis

Scale: 1:5,200		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

- Legend:
- Approximate Site Boundary
 - Approximate Lot Boundary
 - Monitoring Well Locations
 - Additional Properties Not Included in PSI

- Sampling Locations
- Grab Sample/Trowel
 - Hand Auger
 - Sediment Sample
 - Test Pit
 - Asbestos in Soil
 - ESL/EIL Exceedances - Metals
 - ESL/EIL Exceedances - PAH & TRH
 - Site Identification Number
 - Extent of Figure 7d

JBS&G Figure 7c: Previous Soil Exceedances - Central Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_07c



Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed 12/04/2013

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0 20 40 80m			
Scale: 1:1,965			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Dm.	Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit
- Asbestos in Soil
- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH

Site Identification Number



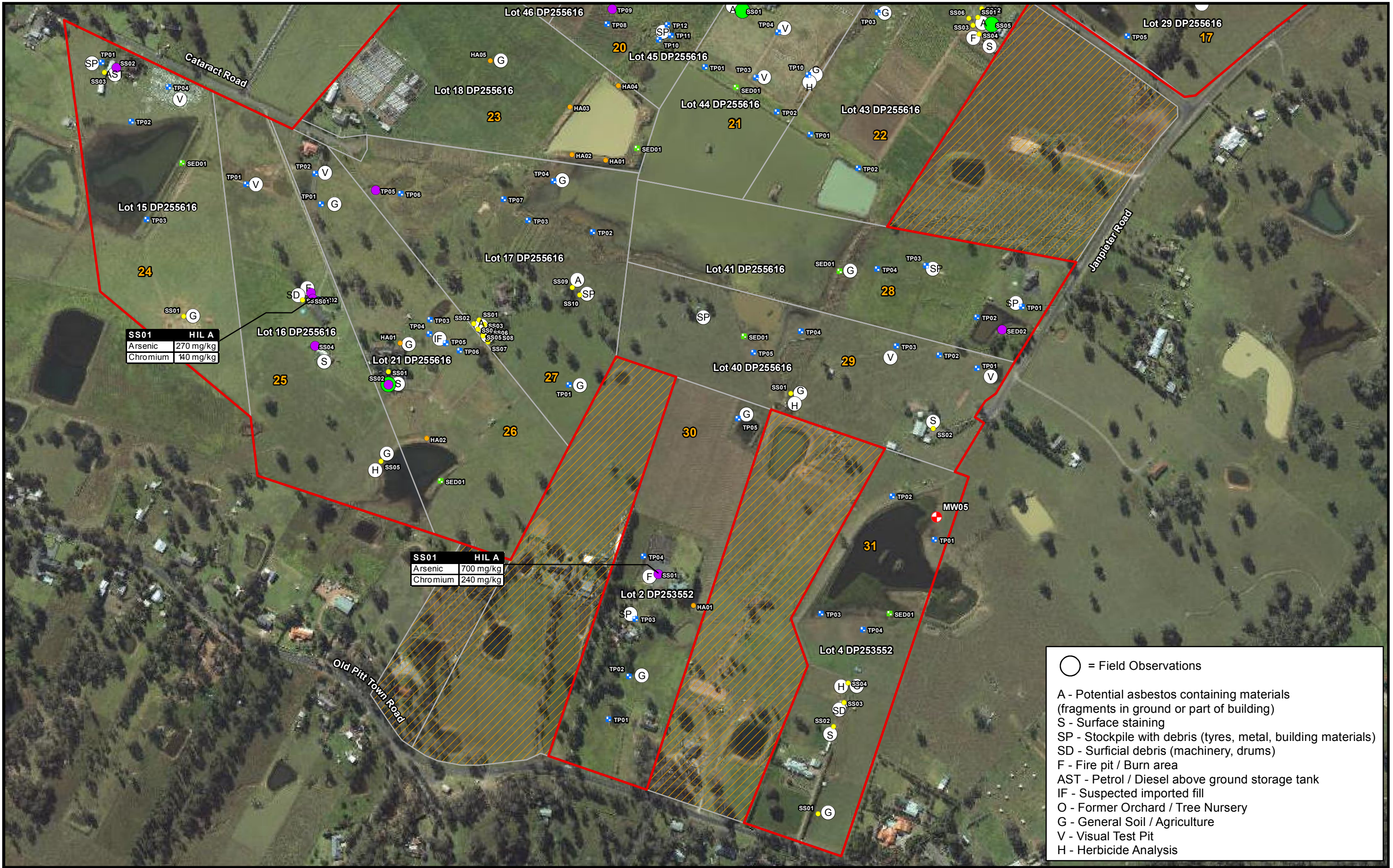
Figure 7d: Previous Soil Exceedances- Central Lots (Detail Map)

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_07d



○ = Field Observations

A - Potential asbestos containing materials (fragments in ground or part of building)
S - Surface staining
SP - Stockpile with debris (tyres, metal, building materials)
SD - Surficial debris (machinery, drums)
F - Fire pit / Burn area
AST - Petrol / Diesel above ground storage tank
IF - Suspected imported fill
O - Former Orchard / Tree Nursery
G - General Soil / Agriculture
V - Visual Test Pit
H - Herbicide Analysis

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0 55 110 220 m		
Scale: 1:5,500		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

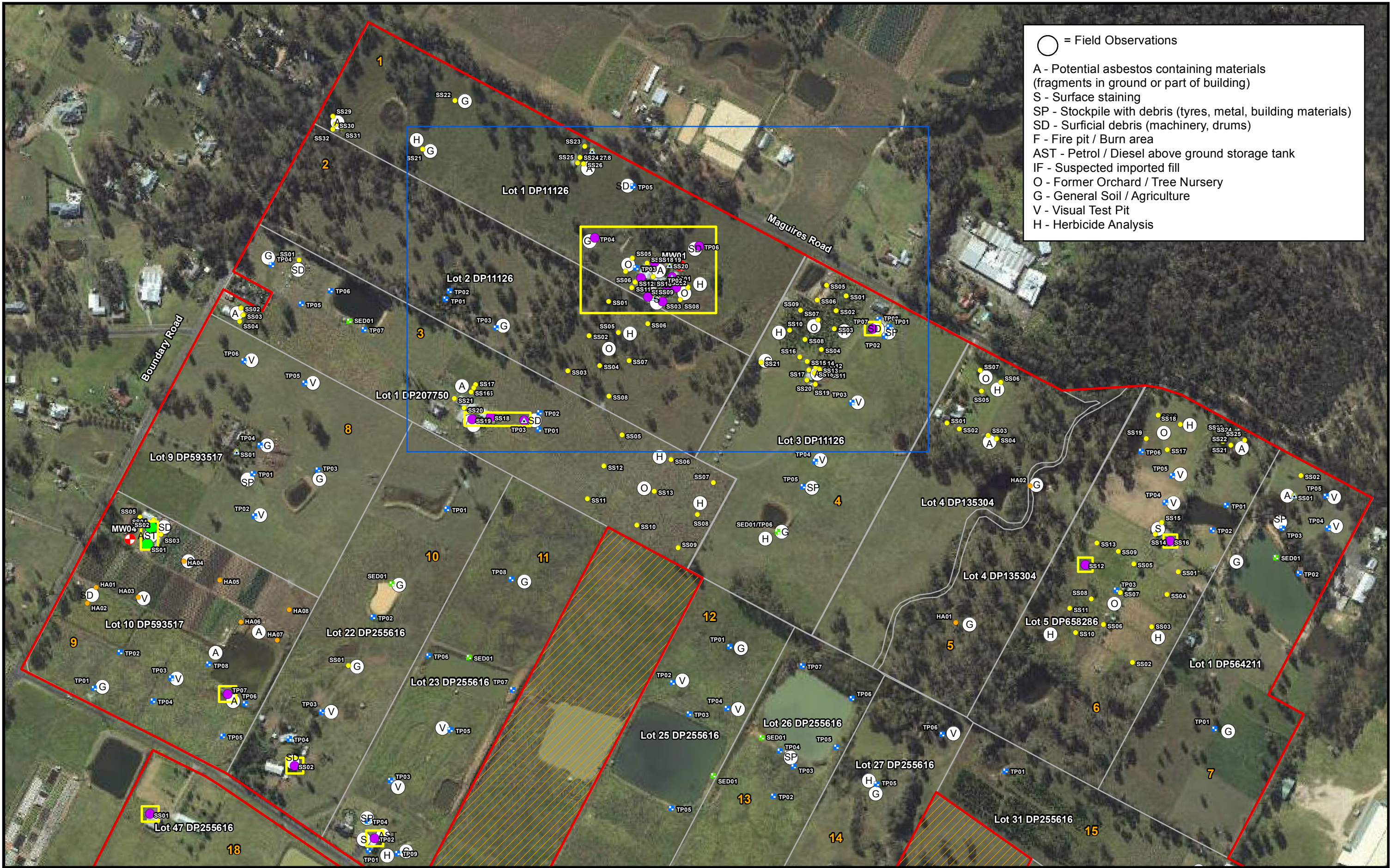
Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit
- Asbestos in Soil
- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH

Site Identification Number

JBS&G Figure 7e: Previous Soil Exceedances - Southern Lots

Client: APP Corporation	
Project: Box Hill North, NSW - RAP	
Job No: 43376	File Name: 43376_07e



- = Field Observations
- A - Potential asbestos containing materials (fragments in ground or part of building)
 - S - Surface staining
 - SP - Stockpile with debris (tyres, metal, building materials)
 - SD - Surficial debris (machinery, drums)
 - F - Fire pit / Burn area
 - AST - Petrol / Diesel above ground storage tank
 - IF - Suspected imported fill
 - O - Former Orchard / Tree Nursery
 - G - General Soil / Agriculture
 - V - Visual Test Pit
 - H - Herbicide Analysis

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Scale: 1:5,200

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Dm.	Date
A	Original Issue - R04	LL	17-10-2014

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

Asbestos in Soil

- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH

Remedial Areas

- Extent of Figure 8b

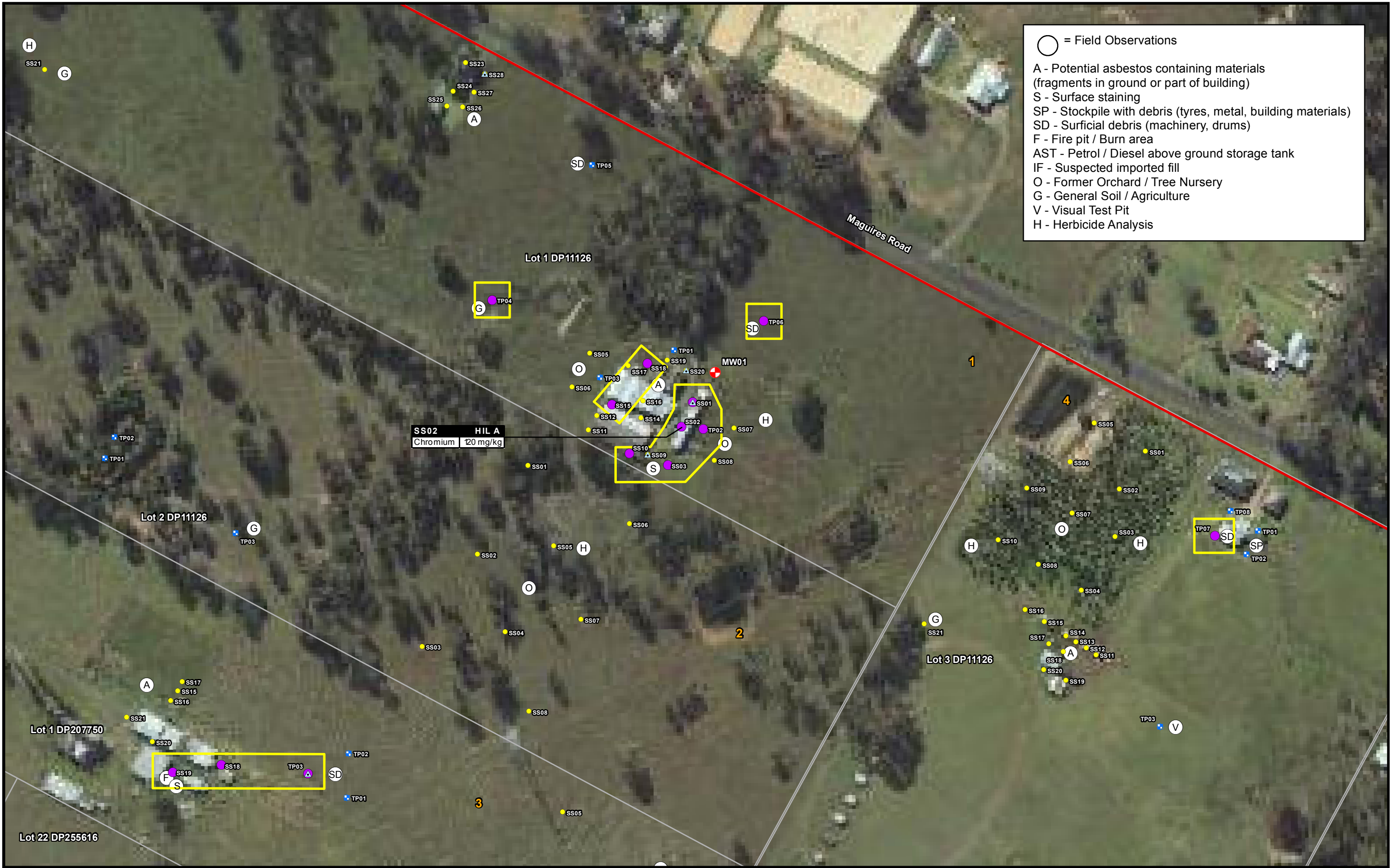
JBS&G Figure 8a: Remedial Areas - Northern Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_08a



- = Field Observations
- A - Potential asbestos containing materials (fragments in ground or part of building)
 - S - Surface staining
 - SP - Stockpile with debris (tyres, metal, building materials)
 - SD - Surficial debris (machinery, drums)
 - F - Fire pit / Burn area
 - AST - Petrol / Diesel above ground storage tank
 - IF - Suspected imported fill
 - O - Former Orchard / Tree Nursery
 - G - General Soil / Agriculture
 - V - Visual Test Pit
 - H - Herbicide Analysis

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Scale: 1:2,000			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	RF	21-10-2014
Rev	Description	Drm.	Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

Site Identification Number

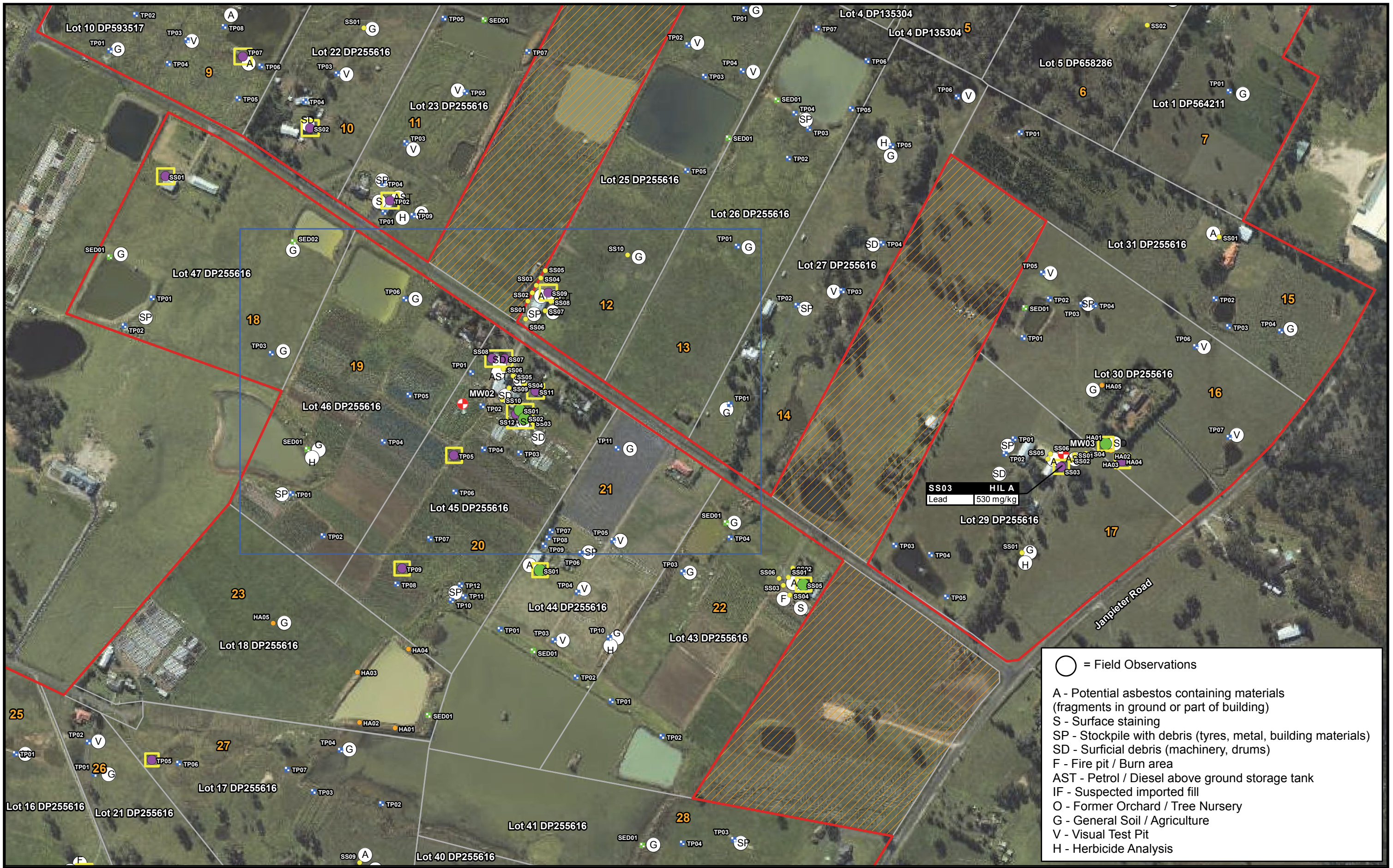
- Asbestos in Soil
- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH
- Remedial Areas

JBS&G Figure 8b: Remedial Areas - Northern Lots (Detail Map)

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376 File Name: 43376_08b



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Scale: 1:5,200			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	LL	21-10-2014
Rev	Description	Dm.	Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

- Asbestos in Soil
- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH
- Remedial Areas

- Site Identification Number
- Extent of Figure 8d

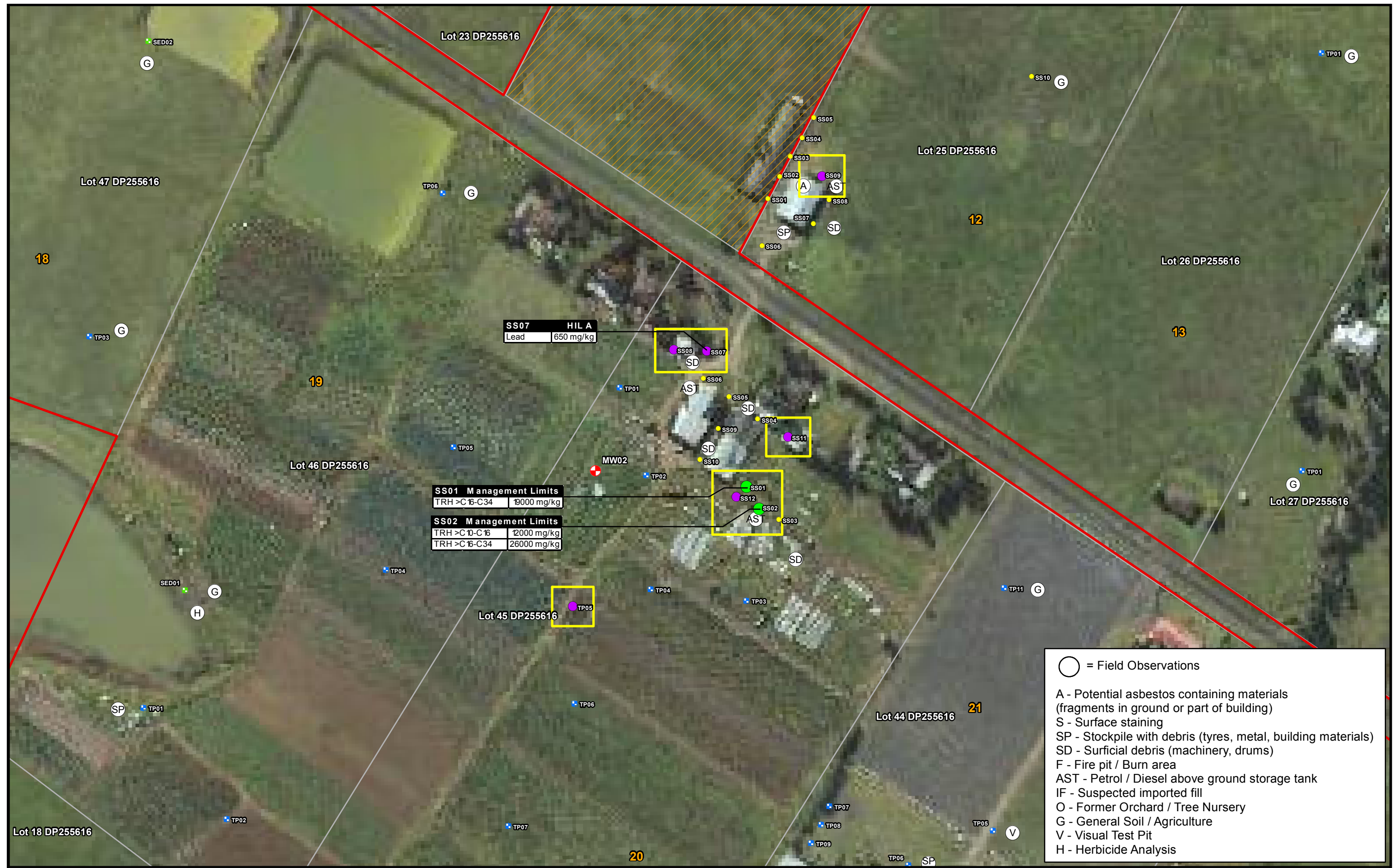
Figure 8c: Remedial Areas - Central Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_08c



Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed 12/04/2013

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Scale: 1:1,965			
Datum: GDA 1994 MGA Zone 56 - AHD			
A3			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Dm.	Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

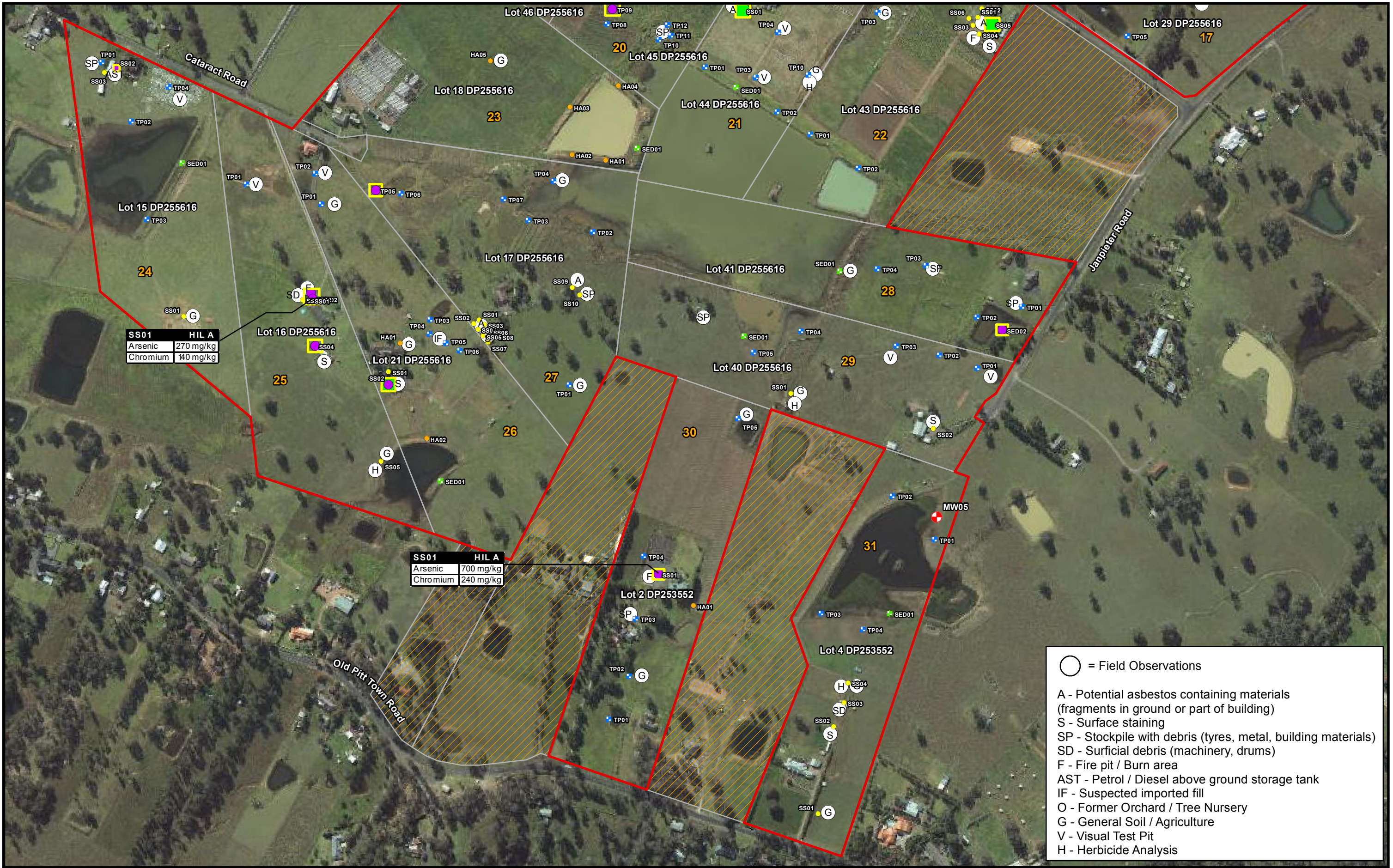
- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

- Asbestos in Soil
- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH
- Remedial Areas

- Site Identification Number

Figure 8d: Remedial Areas - Central Lots (Detail Map)

Client: APP Corporation	
Project: Box Hill North, NSW - RAP	
Job No: 43376	File Name: 43376_08d



Source: Base Image - © Six Maps www.maps.six.nsw.gov.au, imagery date: 13/04/2011, accessed 12/04/2013

© 2014 JBS&G

0 55 110 220 m		
Scale: 1:5,500		
Datum: GDA 1994 MGA Zone 56 - AHD		
A3		
A	Original Issue - R04	LL 17-10-2014
Rev	Description	Dm. Date

Legend:

- Approximate Site Boundary
- Approximate Lot Boundary
- Monitoring Well Locations
- Additional Properties Not Included in PSI

Sampling Locations

- Grab Sample/Trowel
- Hand Auger
- Sediment Sample
- Test Pit

Asbestos in Soil

- ESL/EIL Exceedances - Metals
- ESL/EIL Exceedances - PAH & TRH

Site Identification Number

- Remedial Areas

Figure 8e: Remedial Areas - Southern Lots

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_08e



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 13-04-2011, accessed 12-04-2013

© 2014 JBS&G

0 125 250 500 m			
Scale: 1:13,500			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	LL	17-10-2014
Rev	Description	Dm.	Date:

Legend:

□ Approximate Lot Boundary

LA Limited Access

SP Stockpile with debris (tyres, metal, building materials)



Figure 9: Known Stockpile Locations

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_09





Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 13-04-2011, accessed 12-04-2013

© 2014 JBS&G

0 125 250 500 m			
Scale: 1:13,500			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R04	RF	21-10-2014
Rev	Description	Drn.	Date:

Legend:

Approximate Lot Boundary

Limited Access

Above Ground Storage Tank Location



Figure 10: Above Ground Storage Tank Locations

Client: APP Corporation

Project: Box Hill North, NSW - RAP

Job No: 43376

File Name: 43376_10



Appendix A: Development Plans

Box Hill North Precinct

Indicative Layout Plan

Key

Precinct Boundary

Retail / Mixed Use

School

Community Facilities

Large Lot Residential

Low/Medium Density Residential

High Density Residential

Environmental Living

Environmental Conservation

Open Space

Sports Fields

Creeks / Drainage

Transmission Easement

Future Link Roads

Scale

0

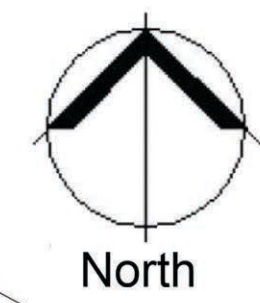
100

200

300

400

500



Appendix B: GPS Coordinates of sample locations

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
TP	TP03	305978.5934	6278535.776
TP	TP01	306020.9268	6278551.652
TP	TP02	306037.8602	6278506.143
G	SS23	305901.7318	6278715.958
G	SS24	305894.7203	6278699.818
G	SS25	305891.1484	6278691.352
G	SS26	305900.1443	6278690.558
G	SS27	305906.6266	6278699.157
G	SS28	305912.8443	6278709.74
G	SS11	305972.1111	6278505.746
G	SS12	305976.9397	6278513.816
G	SS09	306006.0439	6278491.723
G	SS16	306003.3981	6278522.217
G	SS29	305526.6841	6278761.202
G	SS03	306017.6255	6278485.542
G	SS14	306002.2736	6278512.625
G	SS15	305985.6048	6278520.166
G	SS18	306005.9778	6278543.582
G	SS02	306025.3586	6278507.466
G	SS01	306031.907	6278521.621
G	SS19	306017.2226	6278545.831
G	SS20	306028.1367	6278539.944
G	SS30	305530.6529	6278749.031
G	SS31	305539.9133	6278744.533
G	SS32	305526.8164	6278741.623
TP	TP01	305695.0862	6278489.678
TP	TP02	305700.6425	6278501.585
G	SS03	305876.8554	6278381.728
G	SS08	305937.9742	6278344.422
G	SS05	305952.2618	6278439.275
G	SS04	305924.4805	6278390.062
G	SS01	305937.5774	6278485.313
G	SS07	305967.7399	6278397.206
G	SS02	305908.6054	6278434.513
G	SS06	305995.5212	6278451.975
TP	TP02	305834.7492	6278320.487
TP	TP01	305833.6581	6278295.228
TP	TP03	305811.4247	6278308.795
G	SS19	305734.0991	6278309.669
G	SS20	305722.3913	6278327.065
G	SS18	305761.8143	6278313.637
G	SS01	305476.5267	6278546.934
G	SS17	305739.5893	6278361.501
G	SS15	305736.9434	6278356.407
G	SS16	305732.9085	6278350.52
G	SS21	305707.773	6278341.062
TP	TP06	305523.3581	6278502.325
S	SED01	305551.5363	6278456.817
G	SS12	305930.5262	6278240.043
G	SS05	305957.3815	6278286.875
G	SS13	306005.4034	6278202.605
G	SS06	306030.6183	6278249.701
G	SS08	306069.4592	6278167.838
G	SS07	306093.4173	6278215.424
G	SS09	306040.8841	6278118.52
G	SS11	305905.6818	6278191.069
G	SS10	305979.58	6278152.016
G	SS01	305383.4285	6278262.11

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
TP	TP01	305408.471	6278229.708
G	SS02	305259.7348	6278159.938
G	SS04	305256.4275	6278148.694
G	SS01	305250.7389	6278123.294
G	SS03	305270.8473	6278138.507
G	SS05	305239.4949	6278164.081
TP	TP08	305342.0211	6277945.8
HA	HA06	305390.3077	6278007.977
HA	HA02	305161.4426	6278035.758
HA	HA01	305174.6718	6278059.571
TP	TP06	305396.5254	6277886.93
S	TP07	305369.9347	6277900.82
HA	HA07	305444.1505	6277980.592
TP	TP01	305696.8501	6278176.566
TP	TP02	305586.7833	6278015.699
TP	TP04	305461.8997	6277834.724
TP	TP01	305580.3009	6277668.565
TP	TP02	305589.0322	6277686.028
TP	TP04	305578.7134	6277712.222
TP	TP07	305794.6139	6277908.278
S	SED01	305729.5262	6277955.903
TP	TP06	305669.598	6277958.285
G	SS01	305254.7966	6277722.342
TP	TP02	305192.884	6277499.959
TP	TP01	305234.9529	6277541.234
G	SS09	305824.9749	6277548.907
G	SS08	305828.9436	6277535.414
G	SS07	305820.2124	6277521.92
S	SED01	306093.2629	6277779.889
TP	TP03	306057.5441	6277871.964
TP	TP05	306031.0857	6277730.941
TP	TP04	306192.4819	6277816.402
S	SED01	306165.4943	6277836.245
TP	TP05	306276.6195	6277822.752
TP	TP06	306299.9029	6277894.983
TP	TP07	306225.8194	6277943.402
TP	TP02	306182.9568	6277749.726
TP	TP03	306213.1194	6277793.383
TP	TP02	306195.3923	6277529.91
G	SS01	306824.6962	6277631.687
TP	TP02	306818.3462	6277539.612
TP	TP03	306838.4545	6277498.337
TP	TP01	306528.3623	6277787.262
G	SS01	306958.1787	6278197.058
G	SS15	306760.9976	6278156.445
G	SS14	306751.4726	6278138.982
G	SS16	306773.6976	6278128.664
G	SS25	306884.8229	6278278.683
G	SS24	306871.3291	6278285.033
G	SS22	306864.1853	6278271.539
G	SS21	306852.279	6278277.095
G	SS23	306858.6291	6278289.001
G	SS17	306769.5304	6278264.66
G	SS18	306788.5143	6278302.429
G	SS08	306656.2389	6278042.34
G	SS12	306647.1692	6278093.52
G	SS11	306624.0067	6278028.224
G	SS05	306719.48	6278094.593

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
G	SS03	306746.0707	6278001.062
G	SS02	306717.3633	6277947.749
G	SS04	306768.9572	6278048.82
G	SS10	306632.7904	6277992.176
G	SS19	306738.045	6278281.064
G	SS20	306755.5736	6278315.724
TP	TP06	306730.4272	6278263.02
TP	TP03	306693.1208	6278056.181
TP	TP01	306857.4274	6278182.322
G	SS03	306502.5543	6278285.959
G	SS07	306490.648	6278382.797
G	SS06	306521.6043	6278365.334
G	SS01	306441.4354	6278304.215
G	SS02	306459.6917	6278295.484
G	SS04	306515.2543	6278280.667
G	SS05	306492.7647	6278351.841
G	SS16	306222.2012	6278402.786
G	SS15	306233.1153	6278395.973
G	SS14	306245.6169	6278387.705
G	SS12	306257.1925	6278380.826
TP	TP07	306330.9452	6278444.921
G	SS09	306223.1934	6278472.372
G	SS02	306276.2425	6278471.776
TP	TP02	306348.9369	6278434.602
TP	TP01	306355.4313	6278448.168
TP	TP08	306339.6765	6278459.473
G	SS19	306245.4846	6278362.239
G	SS20	306232.7846	6278368.324
G	SS13	306251.3055	6278384.265
G	SS11	306262.8149	6278376.989
G	SS18	306244.0956	6278378.643
G	SS17	306235.695	6278383.273
G	SS06	306247.9982	6278487.387
G	SS10	306206.8554	6278442.672
G	SS08	306229.8742	6278428.649
G	SS07	306249.1226	6278458.15
G	SS05	306261.8888	6278509.546
G	SS04	306254.3482	6278413.965
G	SS03	306273.7289	6278444.59
G	SS01	306291.1915	6278493.538
TP	TP03	306619.8708	6277531.445
TP	TP04	306638.9208	6277530.652
HA	HA03	306672.3025	6277304.712
HA	HA04	306680.398	6277297.711
HA	HA02	306663.2221	6277313.142
HA	HA01	306655.5896	6277323.482
S	SED01	306534.9394	6277526.683
TP	TP01	306532.5581	6277482.233
TP	TP02	306571.4519	6277539.383
TP	TP02	306505.5706	6277308.454
TP	TP01	306519.0643	6277331.473
G	SS02	306603.7312	6277299.194
TP	TP03	306341.264	6277172.723
TP	TP04	306394.4453	6277159.229
TP	TP05	306418.2579	6277095.729
G	SS04	306626.1547	6277309.579
G	SS06	306572.9733	6277308.454
G	SS05	306569.1368	6277300.847

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
G	SS01	306609.0228	6277307.396
G	SS03	306589.2452	6277289.139
G	SS05	306205.0959	6277113.773
G	SS02	306189.2209	6277138.38
G	SS01	306182.474	6277124.621
G	SS03	306175.1979	6277112.318
G	SS04	306184.8552	6277098.163
TP	TP01	305918.9484	6276940.735
TP	TP04	306095.9551	6277183.623
TP	TP02	305994.3548	6276887.554
TP	TP07	305829.2545	6277193.942
TP	TP06	305873.7046	6277160.605
TP	TP09	305818.9357	6277173.305
TP	TP08	305824.492	6277183.623
G	SS01	305812.5857	6277135.205
TP	TP01	305753.0544	6277047.098
S	SED01	305802.267	6277015.348
TP	TP02	305866.5608	6276976.454
TP	TP11	305699.873	6277096.311
TP	TP10	305680.823	6277089.961
TP	TP12	305694.3167	6277113.773
TP	TP01	305442.6975	6277249.505
TP	TP01	305710.9855	6277429.686
TP	TP03	305782.4232	6277309.83
TP	TP02	305726.0668	6277380.474
G	SS06	305758.0815	6277434.978
G	SS10	305756.2294	6277389.205
G	SS09	305766.5481	6277406.668
G	SS04	305788.7732	6277411.959
G	SS05	305772.6336	6277424.659
G	SS08	305741.4127	6277451.118
G	SS07	305760.1981	6277450.324
TP	TP05	305617.3228	6277396.349
TP	TP08	305599.0666	6277114.567
TP	TP07	305648.2792	6277182.83
TP	TP06	305685.5855	6277251.886
TP	TP04	305728.4481	6277316.18
TP	TP04	305579.2228	6277327.292
TP	TP02	305489.5288	6277186.798
HA	HA02	305543.6362	6276908.39
HA	HA01	305596.553	6276899.923
S	SED01	305646.2948	6276918.973
HA	HA04	305616.6614	6277017.399
HA	HA03	305540.4612	6276983.532
G	SS03	304807.5375	6277037.745
TP	TP01	304803.0395	6277054.678
G	SS02	304826.1906	6277045.021
TP	TP03	304873.948	6276807.028
S	SED01	304930.0398	6276895.928
TP	TP02	304849.6063	6276961.545
G	SS01	305132.3142	6276690.611
G	SS03	305119.3496	6276679.763
G	SS04	305139.0611	6276607.532
TP	TP04	305319.031	6276626.846
S	SED01	305337.0227	6276395.071
HA	HA02	305314.7977	6276461.746
TP	TP03	305320.0893	6276649.071
G	SS01	305254.4725	6276566.521

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
TP	TP05	305345.4894	6276612.03
TP	TP06	305366.6561	6276600.388
G	SS02	305254.4725	6276546.413
TP	TP03	305474.8709	6276805.705
TP	TP07	305435.9771	6276839.043
TP	TP05	305234.3642	6276852.536
TP	TP06	305274.0517	6276847.774
TP	TP02	305576.4711	6276787.449
G	SS08	305421.6895	6276621.555
G	SS07	305411.3708	6276613.617
G	SS09	305543.9273	6276699.342
G	SS10	305555.8336	6276687.436
G	SS05	305403.4332	6276623.142
G	SS06	305413.3551	6276630.286
G	SS04	305395.4296	6276633.395
G	SS03	305405.7484	6276641.002
G	SS02	305389.0796	6276641.663
G	SS01	305397.6124	6276648.41
TP	TP01	306252.6769	6276669.109
TP	TP03	306101.0703	6276734.197
S	SED02	306220.9268	6276632.597
TP	TP02	306181.2392	6276653.234
S	SED01	305965.3388	6276725.466
G	SS02	306112.9766	6276477.021
TP	TP04	305904.2199	6276631.009
S	SED01	305814.526	6276623.072
TP	TP05	305829.6073	6276597.672
G	SS03	305971.9534	6276045.485
G	SS02	305956.0784	6276007.385
TP	TP03	305935.97	6276186.244
TP	TP04	306001.8514	6276161.373
S	SED01	306043.9202	6276186.244
TP	TP01	306114.8287	6276302.661
TP	TP02	306048.1536	6276371.452
G	SS01	305679.8528	6276247.627
TP	TP03	305643.8694	6276177.777
TP	TP04	305656.5694	6276276.202
TP	TP01	305601.536	6276020.085
HA	HA01	305734.8863	6276197.885
HA	HA08	305462.0472	6278026.193
TP	TP05	305363.0691	6277838.476
TP	TP04	305258.9714	6277890.809
HA	HA05	305358.7044	6278070.114
TP	TP02	305210.0512	6277963.62
G	SS07	306055.5914	6278506.726
G	SS08	306044.2143	6278488.205
G	SS17	305994.8694	6278542.445
G	SS06	305962.7224	6278530.274
G	SS21	305660.7396	6278712.083
G	SS02	305390.2026	6278475.677
G	SS03	305393.5099	6278464.961
G	SS04	305387.9537	6278455.436
G	SS21	306164.5073	6278394.582
TP	TP03	306299.4451	6278335.844
TP	TP04	306244.9408	6278247.473
S	SED01/TP0	306188.849	6278143.227
HA	HA02	306565.2196	6278210.432
G	SS07	306699.4959	6278051.681

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
G	SS06	306674.3604	6278004.056
TP	TP05	307005.884	6278196.144
TP	TP04	307009.059	6278148.519
TP	TP02	306965.6672	6278080.785
TP	TP03	306940.3995	6278147.857
S	SED01	306931.5359	6278104.73
TP	TP06	305394.0391	6278397.228
TP	TP05	305485.056	6278364.419
TP	TP04	305418.3808	6278271.286
TP	TP02	305409.9141	6278166.511
TP	TP03	305504.6352	6278235.302
HA	HA04	305304.9405	6278098.38
HA	HA03	305237.207	6278044.934
TP	TP03	305286.4196	6277925.342
TP	TP01	305171.5902	6277909.997
S	SED01	305614.971	6278065.51
G	SS01	305550.148	6277943.14
TP	TP03	305510.4604	6277875.01
TP	TP05	305702.0191	6277847.89
TP	TP09	305623.3054	6277664.401
S	SED01	305171.5946	6277602.092
S	SED02	305445.4389	6277625.11
S	SED01	305466.0765	6277315.547
TP	TP06	305611.333	6277539.385
G	SS10	305943.1212	6277604.949
TP	TP02	306032.8151	6277918.481
TP	TP04	306113.7778	6277880.381
TP	TP01	306117.7465	6277971.662
TP	TP06	306434.4534	6277840.693
TP	TP05	306336.822	6277767.668
TP	TP04	306322.5344	6277622.412
TP	TP03	306263.0031	6277551.768
TP	TP05	306561.1891	6277578.094
TP	TP06	306789.3927	6277468.953
TP	TP07	306839.0021	6277333.354
HA	HA05	306649.8247	6277410.744
G	SS01	306530.7619	6277161.043
S	SED01	306089.9652	6277206.023
TP	TP03	306025.1422	6277132.601
TP	TP10	305916.0013	6277034.705
TP	TP05	305921.293	6277180.226
TP	TP04	305868.3762	6277102.174
TP	TP03	305833.3189	6277030.736
HA	HA05	305415.0118	6277056.136
TP	TP04	305515.0245	6276867.223
HA	HA01	305272.9302	6276611.635
G	SS05	305242.7677	6276425.103
TP	TP02	305139.58	6276879.129
TP	TP01	305030.836	6276862.461
TP	TP02	305143.5487	6276681.485
TP	TP04	304908.5983	6277015.655
G	SS01	304932.4108	6276653.704
TP	TP03	306054.7756	6276607.666
TP	TP01	306181.7758	6276572.741
G	SS01	305888.0877	6276532.26
TP	TP05	305804.7438	6276493.366
G	SS04	305978.5754	6276076.647
G	SS01	305930.9503	6275870.271

Appendix B

GPS Codes for Sample Locations



Method	Code	Easting	Northing
G	SS22	305708.473	6278784.547
TP	TP04	305436.2162	6278540.072
TP	TP05	305480.0386	6278481.912
TP	TP05	306776.8912	6278226.227
TP	TP04	306766.5724	6278186.539
TP	TP03	305769.9332	6278446.707
TP	TP08	305792.5191	6278072.02
HA	HA01	306454.6666	6278007.092
TP	TP01	306839.6361	6277849.135
TP	TP03	305412.2062	6277458.662
TP	TP01	306106.4743	6277618.471
TP	TP01	306095.6263	6277382.991
TP	TP11	305927.6156	6277316.845
TP	TP04	306916.1009	6277491.471
TP	TP01	305148.6807	6276831.069
TP	TP01	305539.2065	6276546.377
TP	TP02	305633.3983	6276087.059
TP	TP05	305974.0462	6278657.679
TP	TP06	306072.4714	6278568.093
TP	TP02	306836.4573	6278145.781
G	SS09	306696.0282	6278113.519
G	SS01	306785.6572	6278083.075
G	SS01	305794.6142	6277536.003
G	SS05	305820.4112	6277581.644
G	SS02	305801.2288	6277548.571
G	SS04	305813.7966	6277570.399
G	SS03	305807.182	6277559.816
TP	TP04	305916.9976	6278580.105
G	SS02	305470.1154	6277794.159
TP	TP03	305612.5938	6277772.816
TP	TP07	305573.4354	6278444.33
TP	TP05	306226.8473	6278210.173
G	SS02	306968.542	6278225.883
TP	TP05	305684.5165	6277306.374
TP	TP09	305607.1257	6277137.702
TP	TP02	306122.039	6276593.202
G	SS05	305972.8997	6278549.728
G	SS10	305995.5216	6278492.181
G	SS06	305791.2099	6277509.675
G	SS02	305135.0287	6276681.792
G	SS06	306168.7358	6277122.895
G	SS11	305805.9362	6277401.888
G	SS01	305782.6529	6277373.842
G	SS12	305776.832	6277368.021
G	SS02	305789.532	6277361.671
G	SS03	305800.6446	6277355.321
G	SS13	306664.5899	6278125.53
TP	TP04	306024.5092	6276729.03




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