Remedial Action Plan

Western Sydney Stadium Redevelopment
Confidential Privileged Communication

Prepared for:
Lend Lease Building Pty Ltd
L14, Tower Three, International Towers
300 Barangaroo Avenue, NSW, 2000

2 February 2017

Distribution

Remedial Action Plan,
Western Sydney Stadium Redevelopment

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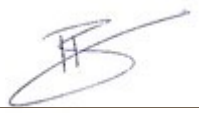
Primary Author	 **Ian Batterley** Senior Associate	**Project Manager**	 **Andrei Woinarski** Senior Associate
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List of Acronyms

Acronym	Definition
ABC	Ambient Background Concentration
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
AF	Asbestos Fines
AHD	Australian Height Datum
AMG	Australian Map Grid
AMP	Asbestos Management Plan
AS	Australian Standard
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CEMP	Construction Environmental Management Plan
COC	Chain of Custody
CoPC	Contaminant of Potential Concern
DA	Development Application
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Environmental Consultant
EPA	Environment Protection Authority
FA	Fibrous Asbestos
HASP	Health and Safety Plan
m	Metre
m^3	Cubic Metres
m AHD	Metres Australian Height Datum
m bgl	Metres Below Ground Level
mg/kg	Milligrams per Kilogram
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council

Acronym	Definition
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PID	Photo-Ionisation Detector
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RAP	Remedial Action Plan
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environment Protection Policy
SWMS	Safe Work Method Statements
TEQ	Toxicity Equivalent Quotient
TRH	Total Recoverable Hydrocarbons
VSAQP	Validation Sampling and Analysis Quality Plan
WSS	Western Sydney Stadium

1.0 Introduction and Background Information

Senversa Pty Ltd (Senversa) was engaged by Lendlease Building Pty Ltd (Lendlease) to prepare a Remedial Action Plan (RAP) for impacted fill materials identified within a portion of the Site to be redeveloped as part of the Western Sydney Stadium (WSS) project.

The WSS project comprises the demolition of the existing stadium infrastructure and redevelopment of a 30,000-seat stadium at 11-13 O'Connell St, Parramatta, NSW (the Site).

1.1 Site Identification

The Site identification information is presented within the table below:

Item	Description
Site Address	11-13 O'Connell St, Parramatta, NSW
Site Identification	Lot 951 in DP 42643 Lot 952 in DP 42643 Lot 953 in DP 42643 Lot 954 in DP 42643 Lot 955 in DP 42643 Lot 956 in DP 42643 Lot 957 in DP 42643 Lot 958 in DP 42643 Lot 959 in DP 42643 Lot 961 in DP 42643 Lot 962 in DP 42643 Lot 963 in DP 42643 Lot 964 in DP 42643 Part Crown Land Lot 80-3000
Geographical Coordinates (AMG)	33^0 48'29" S 150^0 59' 58" E
Site Elevation (m AHD)	Approximately 10 m
Site Location	**Figure 1**
Current Site Layout/Boundary	**Figure 2**
WSS Development	**Figure 3**

1.2 The Western Sydney Stadium Development

Senversa understands that the redeveloped site will be used primarily for recreational purposes with minor portions of the site outside the stadium facility envelope to be returned to Parramatta Park Trust for recreational (open space) use.

Information provided to Senversa indicates that the WSS project will occur in the following two stages:

- Stage 1: Demolition of above and below ground structures (the existing stadium, swimming pool complex and ancillary structures); and concept design.

- Stage 2: Planning application, detailed design and subsequent construction of the WSS and associated infrastructure. The majority of remedial works will occur at this stage.

Upon completion of the development the redeveloped site will be owned / operated by Venues NSW.

1.3 Guidelines

Development of the remediation and validation strategy was undertaken with reference to relevant parts of the following guidelines:

- National Environment Protection (Assessment of Site Contamination) Measure (National Environment Protection Council [NEPC], 1999) as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (NEPC, 2013) (here-in referred to as the ASC NEPM.
- NSW DEC, 2006. Guidelines for the NSW Site Auditor Scheme (2nd edition).
- NSW OEH, 2011. Guidelines for Consultants Reporting on Contaminated Sites.
- NSW WorkCover, 2014. Managing asbestos in or on soil.
- WA DoH, 2009. Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia.

1.4 Previous Investigations

In preparing this RAP Senversa undertook a review of the following previous investigations relating to site contamination:

- JBS&G (2016) Environmental Site Assessment, Western Sydney Stadium, O'Connell Street, Parramatta NSW, Rev 1, 12 July 2016, JBS&G Australia Pty Ltd. (JBS&G 2016a)
- JBS&G (2016) Additional Environmental Site Assessment, Western Sydney Stadium, O'Connell Street, Parramatta, NSW, Rev A, 15 November 2016, JBS&G Australia Pty Ltd. (JBS&G 2016b)

The following reports of previous investigations relating to site contamination were reviewed by JBS&G (2016a) in the development of sampling plans and undertaking the above site assessments.

- D.J Douglas and Partners Pty Ltd (1984) Report on Site Investigation Cumberland Oval Redevelopment, Parramatta., 31 July 1984, SSI/8502 (DP 1984);
- WSP (2007) Additional Soil Investigations at Parramatta Stadium Carpark. WSP Australia, 3 May 2007 (WSP 2007)
- Environmental Investigation Services (2014a) Report to Venues NSW on Preliminary Contamination Screening for Proposed Stadium Upgrade at Parramatta Stadium, O'Connell Street, Parramatta, Ref: E27070KHrpt dated 20 January 2014 (EIS 2014a);
- Environmental Investigation Services (2014b) Report to Venues NSW on Preliminary Contamination Screening for Proposed Stadium Upgrade at Parramatta Stadium, O'Connell Street, Parramatta. Ref: E27070KH2rpt dated 6 February 2014 (EIS 2014b);
- Environmental Investigation Services (2014c) Report to Venues NSW on Additional Asbestos Screening for Proposed Stadium Upgrade at Parramatta Stadium, O'Connell Street, Parramatta. Ref: E27070KH2rpt2 dated 10 April 2014 (EIS 2014c).
- JBS&G (2015) Pirtek Stadium Parramatta Proposed North and South Stand Upgrade Works, Excavation Envelope Material Characterisation Assessment Summary.22 April 2015 (JBS&G 2015a).
- JBS&G (2015) Pirtek Stadium Parramatta Proposed North and South Stand Upgrade Works, High Voltage Cable (HVC) Route Fill Material Characterisation Assessment. JBS&G Australia Pty Ltd, 21 April 2015 (JBS&G 2015b).
- JBS&G (2015) Pirtek Stadium Parramatta Proposed North and South Stand Upgrade Works, Additional Fill Material Characterisation Assessment – South Stand Excavation Zone. JBS&G Australia Pty Ltd, 18 May 2015 (JBS&G 2015c).

- JBS&G (2015) Pirtek Stadium Parramatta - West Carpark, Asbestos in Soil Preliminary Assessment. JBS&G Australia Pty Ltd, 18 May 2015 (JBS&G 2015d).
- JBS&G (2015) Pirtek Stadium Parramatta – Management of Subsurface Asbestos Impacts, Former Practice Field Area South of the Stadium. JBS&G Australia Pty Ltd, 21 May 2015 (JBS&G 2015e).

1.4.1 JBS&G (2016a)

JBS&G undertook an assessment of site contamination within the Site that included an initial review of historical site use information, government databases and other relevant desktop sources. JBS&G (2016a) also consolidated and reviewed relevant environmental data provided in the abovementioned references, including screening against current assessment criteria adopted by JBS&G.

The desktop assessment identified a range of potential Contaminants of Potential Concern (CoPC) associated with historical land use practices that may have impacted fill material, natural soils and to a lesser extent groundwater.

To assess the extent of potential contamination within the Site, JBS&G completed a detailed site investigation comprising sample collection from 57 soil bores across the Site and the installation of four groundwater wells to evaluate potential groundwater contamination.

JBS&G included the following key conclusions in relation to contamination conditions at the assessed areas of the site:

- Fill material has been identified in many areas extending to depths of between 0.1 m below current ground surface (bgs) to greater than 3 m bgs (including to 6 m bgs in the northern fill mound at the northern site boundary). In a number of locations, fill material below the ground surface was found to contain visible inclusions of asbestos containing material (ACM) in bonded and friable forms (fibrous asbestos - FA).
- Laboratory analysis of representative soil samples also identified the presence of asbestos fines (AF) within in fill material at a range of locations.
- The soil/fill identified as impacted with AF/FA/ACM was considered to represent a potentially unacceptable risk to future site receptors.
- Chemical contaminants in soils were not considered to pose an unacceptable risk to identified receptors.
- Groundwater was not considered to represent an unacceptable risk to human and/or ecological receptors within or downgradient of the site.

JBS&G 2016a considered that the site could be made suitable for the WSS development subject to the implementation of an appropriate remediation/management strategy to address the identified asbestos impacts.

Senversa notes that areas of the Site not investigated within this assessment including the swimming pool complex, northwest carpark, underlying stadium seating and Lot 957 ‘exclusion zone’ in the northwest. These areas were subsequently investigated by JBS&G (2016b) as detailed below.

1.4.2 JBS&G (2016b)

JBS&G undertook an additional assessment of contamination within portions of the Site identified within JBS&G (2016a) as requiring further investigation, including: the Parramatta Swimming Centre (PSC), the lower spectator terraces and portions of the northern and western carparks.

To assess the extent of potential contamination within the Site, JBS&G conducted an initial desktop review of historical site use information, government databases and other relevant desktop sources, and completed a detailed site investigation comprising sample collection from 68 soil bores across the Site and the installation of 2 groundwater wells to evaluate potential groundwater contamination.

JBS&G included the following key conclusions in relation to contamination conditions at the assessed areas of the site:

- Fill material was identified in many areas extending to depths below current ground surface (bgs) of between 0.1 m to greater than 3 m bgs. In a number of locations, fill material was found to contain visible inclusions of asbestos in bonded (ACM) and friable (FA) form.
- Chemical contaminants (PAH and copper) exceeding the adopted health based criteria in soils were identified within shallow soils at BH39 and HA07 located within the north east and south east portion of the Site.
- Laboratory analysis of representative soil samples also identified the presence of AF in fill at a range of locations.
- The fill identified as impacted with ACM/AF/FA was considered to represent a potentially unacceptable risk to future Site receptors.
- Groundwater was not considered to represent an unacceptable risk to human and/or ecological receptors within or downgradient of the Site.

JBS&G (2016b) considered the Site could be made suitable for the WSS development subject to the implementation of an appropriate remediation/management strategy to address the identified asbestos and chemical COPC impacts.

1.5 Identified Data Gaps

Following a review of the previous investigations outlined above within Section 1.4, the following data gaps and suggested mitigations were identified.

Data Gap	Suggested Mitigation
Uncertainty of fill conditions within the north-eastern portion (Lot 957) of the Site.	• Fill conditions have not been assessed within a portion of the north-west part of the Site (Lot 957) as indicated in Figure 5. An additional investigation will be conducted as detailed within Section 4.3.
Vertical extent of fill material within minor portions of the Site has not been delineated.	• During previous investigations, the vertical extent of fill materials within several areas of the Site was not fully characterised, in particular, within the 'mound' to the north of the existing stadium. Where residual fill materials remain in areas where the vertical extent has not been delineated by JBS&G (2016a/b) within the Site following excavation to required construction RLs, the fill will be considered as potentially asbestos impacted and managed in accordance with the recommendations specified in Section 3.4 unless validated as otherwise.
Potential limitations with the use of boreholes to delineate asbestos containing materials during previous investigations	• All fill materials within Remediation Areas are to be treated as asbestos impacted unless additional assessment confirms the material to be satisfactorily asbestos free. • The actual lateral extent of excavation of Remediation Areas will be defined by validation (Section 4.6) and may differ from the extent provided in this RAP. • An Unexpected Finds protocol will be implemented in case asbestos containing materials are identified during works in all Site areas.
Potential additional impacted fill materials not identified within previous investigations	• The actual lateral extent of impacted fill will be confirmed during remediation and subsequent validation works. The specific approach to validation will be documented within the Site validation SAQP as detailed within Section 4.6. A contingency for greater volumes of impacted fill materials requiring placement and cover is discussed in **Section 7**.
Leachable concentrations of contaminants within Remediation Area B	• All materials excavated from Remediation Area B will be analysed for leachable concentrations of CoPCs to determine appropriate disposal / re-use / placement options.

1.6 Conceptual Site Model

A Conceptual Site Model (CSM) was developed and presented by JBS&G (2016a/b). Based on the findings the previous investigations summarised within **Section 1.4** and potential pollutant linkages (i.e. the likelihood of a source-pathway-receptor linkage to be complete) a summary CSM is presented below.

Potential Sources	Pathways	Potential Receptors	Risk of Potentially Complete Pollutant Linkage
Asbestos impacted fill materials	Inhalation of contaminated dust.	• Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Moderate - High
	Dermal contact and / or incidental ingestion with contaminated soils.	• Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Low
	Transport of contamination through windblown emissions.	• Adjacent sensitive receptors. • Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Moderate - High
	Transport of contamination to underlying groundwater aquifers.	• Adjacent sensitive receptors.	• Low
	Transport of contaminants through mechanical transport.	• Workers carrying out installation or maintenance works within the Site.	• Moderate - High
Chemical CoPC impacted fill materials	Inhalation of vapour (from soil and / or groundwater) and contaminated dust	• Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Low
	Dermal contact and / or incidental ingestion with contaminated soils.	• Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Low
	Transport of contamination through surface water flows.	• Adjacent sensitive receptors. • Current and future Site users. • Workers carrying demolition / construction works within the Site.	• Low
	Transport of contamination to underlying groundwater aquifers.	• Adjacent sensitive receptors.	• Low
	Transport of contaminants through mechanical transport.	• Workers carrying out installation or maintenance works within the Site.	• Low

2.0 Key Project Stakeholders

The stakeholders involved within the remediation project are as follows:

Role	Organisation	Contact Name	Contact Number
Client	Lendlease	Paul Jerogin	0413 026 954
Site Auditor	Ramboll	Graeme Nyland	0408 556 629
Site Superintendent	TBC	TBC	TBC
Remediation Contractor	TBC	TBC	TBC
Environmental Consultant	Senversa	Ian Batterley	0466 649 992

3.0 Remediation Strategy

3.1 Remedial Objective

Based on results of previous investigations outlined within **Section 1.4**, the remedial objectives are as follows:

- Develop and implement strategy to ensure the Site is suitable for the use as a recreational sports facility.
- Mitigate risks to human health during and following the remedial works.
- Manage potential environmental impacts during and following the remedial works.
- Validate the completed remedial works as satisfactorily allowing the WSS development.
- Meeting regulatory requirements prescribed by relevant regulatory agencies to carry out the remedial works and for site use.

3.2 Extent of Required Remediation

On the basis of JBS&G (2016a/b) and our understanding of the WSS redevelopment, the required remediation comprises the management of the following:

- Asbestos contaminated fill materials present within large portions of the Site (**Remediation Area A**). The vertical extent of remediation is the vertical extent of fill within these areas.
- Minor contamination of fill/soil materials with chemical CoPCs located within areas in the north east and south eastern portions of the Site (**Remediation Area B**). Fill materials within the north-east area of Remediation Area B are also impacted by asbestos. The vertical extent of remediation is the vertical extent of fill or chemical COPC exceeding Remediation Acceptance Criteria (RAC).

Senversa notes that previous investigations undertaken at the Site included use of boreholes and it can be difficult to identify asbestos containing material in the limited volume of material returned from a borehole. As such, the lateral extent of the Remediation Areas is considered an indicative minimum extent that may be subject to change based on conditions encountered during remediation and validation works.

The location of these areas is illustrated within **Figure 5**.

Lend Lease has estimated that the volume of impacted fill materials in assessed areas at the Site requiring excavation and remediation is in the order of 25,000 m3.

No development works are planned within the Lot 957 ‘exclusion zone’ in the northwest. However, further assessment in this area will be required to determine whether management of contamination (if present) is required.

- It is the opinion of Senversa that to enable additional investigating works to be undertaken a Sampling and Analysis Quality Plan (SAQP) detailing the required Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be developed and approved by the Site Auditor.
- The remediation extent in areas requiring further assessment may change based on the findings of the additional investigation.

3.3 Remediation Options Analysis

Based on information provided within the JBS&G (2016a/b) assessments it is understood that asbestos contaminated fill materials are present within Remediation Area A and the northern Remediation Area B.

3.3.1 Remediation Options

Remedial Option	Indicative Cost Estimate	Comments
Onsite Containment	• Incorporated into construction costs	• **Below ground, partial enclosure** - Remediation would involve excavation of asbestos impacted fill materials and placement within a location identified to require filling for construction purposes. Where a suitable location can be identified within the Site a single placement location may be excavated to contain all asbestos impacted fill material. Placement locations should be selected within areas that would undergo minor future disturbance such as under site car parking or stadium concourse areas, with impacted a cover comprising a constructed capping layer placed over impacted fill with no requirement for a liner at base of waste material. Where residual fill material remains in situ upon reaching construction RLs, fill material should be treated as potentially impacted and covered with a capping layer as per placed materials. This method is viewed as suitable due to proposed construction methodology and low likelihood of contact with contaminated materials following placement and capping within the Site. • **Below ground, complete encapsulation** - A below ground HDPE and integrated clay/soil cap and base liners used to encapsulate all contaminated material within the site. This method is viewed as unsuitable due to no leachable contaminants being identified within previous investigations requiring complete encapsulation. • **Above ground encapsulation** - Remediation would involve construction of an above ground mound with HDPE cap and soil/clay cover, no base liner. This method is viewed as unsuitable due to restrictions on available space and the potential for creating increased surface water runoff to low lying areas within the site. • **Above ground complete encapsulation** - Above ground cell would be comprised of a HDPE cap with soil/clay cover and an HDPE base liner. This method is viewed as being unsuitable due to restrictions on space within the site and the potential for creating increased surface water runoff to low lying areas within the site. • Onsite partial containment (placement with a compacted soil capping layer) is viewed as being suitable due to proposed construction methodology / site layout and subsequent low likelihood of contact with contaminated materials following placement and capping within the Site. • All the above methods would require a stakeholder agreed long-term Site Management Plan being in place.
Offsite Beneficial Reuse	• No estimate provided, see comments	• Due to presence of asbestos within the contaminated waste material, it is not suitable for offsite re-use within developable sites in the NSW. Once leaving the site, asbestos contaminated material would become waste and would need to be disposed of at a suitably licensed landfill.
Offsite disposal to a licensed landfill facility	• $300 / tonne (GSW / asbestos)	• Offsite disposal of materials is not required as onsite placement within selected areas of the site can mitigate the risk to human health. • Offsite disposal of materials will involve significant truck movements of asbestos contaminated waste materials through residential areas • Offsite disposal is viewed as prohibitively expensive.

3.4 Preferred Remediation Strategy

Based on a review of information presented within JBS&G (2016a/b) and in consideration of the benefits and disadvantages of the presented options, Senversa considers that excavation and on-Site containment of contaminated fill materials with partial encapsulation under a constructed soil capping layer to be the most pragmatic and cost-effective approach to mitigating potential environmental and human health risks.

A long-term Environment Management Plan (LTEMP) will be required to document residual impacts and control works that have the potential to disturb managed material.

The preferred remediation strategy is also considered appropriate for remediation of chemical COPC impacted materials within Remediation Area B as the material will be assessed to determine the potential suitability for onsite containment or (where necessary) offsite disposal.

Based on the proposed construction methodology, it is the opinion of Senversa that the following range of remedial approaches will be implemented:

Remediation Area	Remediation Approach	Comments
Remediation Area A	Excavation of asbestos impacted fill and placement in consolidated placement location(s)	Asbestos impacted fill materials will be excavated to achieve development design site levels. Lendlease to identify suitable consolidated placement location(s). Upon completion of preparation of the placement location, excavated asbestos impacted materials are to be placed within the consolidated location.
	Cover of asbestos impacted fill materials and management under a LTEMP.	Asbestos impacted fill materials within the consolidated placement location(s), and if there are residual fill materials within the Remediation Area below the excavation extent, are to be covered to provide physical separation between impacted materials and future site users. Cover will comprise capping with a minimum of approximately 0.5 m of clean material, with a marker layer in potentially accessible areas, and managed under a LTEMP. Where material is to be placed / retained within landscaped areas, the contractor is to ensure that the root zone of all trees / shrubs and other ornamental plantings is free from asbestos impacted materials.
Remediation Area B	Excavation and placement within designated placement area	Where additional sampling determines that material within Remediation Area B poses no risk to receptors, the material will be placed within a consolidated location as for Remediation Area A impacted materials.
	Offsite disposal	Where additional sampling determines that material within Remediation Area B poses an unacceptable risk to receptors, the material will be disposed offsite.

The Contaminated Sites Guidelines for the NSW Auditor Scheme (DEC 2006) lists the following order of preference for soil remediation and management:

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

In addition, it is also a requirement that remediation should not proceed if it is likely to cause a greater adverse effect than leaving the site undisturbed. And, where there are large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed (DEC 2006). The preferred strategy is considered consistent with this guidance based on:

- Asbestos impacts cannot be destroyed or treated.
- Removal of asbestos impacted soil is possible; however, this is not consistent with waste minimisation (e.g. Waste Avoidance and Resource Recovery Strategy) and sustainability goals, and the large volume (and relatively low level of asbestos contamination based on relatively few investigation locations reporting asbestos) of materials warrants on-site management per DEC (2006).

The benefits of this remedial strategy include the following factors:

- Onsite reuse of material is a more sustainable approach than offsite disposal and meets the principles of waste minimisation and sustainable development.
- Material can be placed under constructed concourse / playing / car-parking surfaces resulting in a low potential for human contact.
- Where material is placed under constructed concourse / playing / car parking surfaces, the Site may be used for the approved uses with the need for minimal long-term management.
- Offsite disposal of materials will involve significant truck movements of asbestos contaminated waste materials through residential areas.
- Offsite disposal is considered prohibitively expensive.

4.0 Proposed Remediation Works

The proposed remediation works will be undertaken in a staged manner and will comprise:

- preliminaries and approvals;
- engagement of an environmental consultant (EC);
- address data gaps and prepare a Work Plan;
- establishment of environmental controls;
- preparation of placement areas and (where necessary) excavation of designated placement locations;
- excavation and (where necessary) temporary stockpiling of contaminated fill materials from Remediation Areas;
- collection and analysis of samples from stockpiled materials (Remediation Area B only) to ensure suitability for placement within the Site;
- placement of contaminated materials within designated locations within the Site'
- construction of a cover layer over impacted materials;
- validation of excavations, and cover and marker layers;
- classification of waste materials (if generated) prior to off-Site disposal and assessment of imported materials to Site.

These stages are described in more detail below.

4.1 Stage 1 – Preliminaries and Approvals

A person or persons who has/have management or control of the Site shall prepare the following prior to commencement of the remediation and validation works:

- Site-Specific Health and Safety Plan (HASP), including Safe Work Method Statements (SWMS).
- Construction Environmental Management Plan (CEMP) (including a sediment and erosion control plan).
- Asbestos Management Plan (AMP) meeting NSW regulatory requirements in relation to work with asbestos (including *Code of Practice: How to Safely Remove Asbestos* (SafeWork NSW, 2016)). The AMP may form part of the CEMP.

These documents are further described in **Section 6**.

It is anticipated that as remedial works will be covered by a development application (DA), either as a variation to the existing DA or the second detailed design DA SEPP 55 notification for the proposed works will not be required.

Due to the presence of fibrous asbestos, consideration should be given to the notification of SafeWork NSW prior to the commencement of site works.

It is envisaged that typical hours of operation would be:

- Monday to Friday: 7 am to 6 pm; and
- Saturday: 8 am to 1 pm.

4.2 Stage 2 – Engagement of Environmental Consultant

A suitably qualified and experienced Environmental Consultant (EC) is to be engaged to advise, provide oversight and undertake all validation requirements specified within this RAP. The EC is to undertake the following:

- oversight of all remediation requirements specified within this RAP;
- conduct remediation validation, including observations of the materials encountered, undertake sampling and analysis of materials as deemed necessary;
- make an evaluation of potential risks to human health and the environment posed by the materials and ensure the risk to health and the environment are acceptable (if required); and
- provide guidance to assist with the appropriate re-use and/or disposal of material.

4.3 Stage 3 – Address Data Gaps and Work Plan

The specific strategy for the required additional investigation within Lot 957 is to be documented in an Additional Investigation SAQP. The SAQP is to be prepared by a suitably qualified environmental professional in accordance with NSW EPA made or approved guidance and reviewed / endorsed by the Site Auditor.

The investigation methodology is to be developed with consideration of all CoPCs identified within previous investigations undertaken within the Site, with specific consideration of the most appropriate investigation methods to characterise potential asbestos impacts and site accessibility.

Prior to commencing excavation works, a Work Plan shall be prepared for review/endorsement by the Site Auditor to:

- present final development plans;
- document planned placement locations and estimated volumes;
- revise the Remediation Areas (if required, based on the outcomes of addressing data gaps); and
- validation SAQP (**Section 4.6**).

4.4 Stage 4 – Establishment of Environmental Controls

Prior to the commencement of remedial works the environmental and asbestos management controls documented in the CEMP and AMP are to be implemented. These are further described in Section 6.

Controls should include, but are not limited to, the following:

- asbestos works notification and management controls;
- sediment/erosion management;
- identification of temporary stockpiling locations;
- dust and fugitive fibre emission controls;
- reference to health and safety management including provisions for personal protective equipment;
- excavation water (groundwater and storm water runoff) management;
- stockpile management;
- material tracking and disposal;
- site access;
- noise, odour and vibration controls; and
- monitoring requirements.

4.5 Stage 5 – Excavation, Placement and Cover of On-Site Impacted Fill Materials

4.5.1 Pre-excavation works

Prior to the commencement of remedial works, the EC personnel will mark the boundaries of the proposed remediation excavation areas as detailed within **Figure 5**.

The following air monitoring and other health and safety / environmental controls as specified within the HASP, CEMP and AMP shall be prepared for the works:

- Background air monitoring will be conducted to determine levels of airborne asbestos fibres and dust prior to any soil disturbing works or asbestos removal activities at the Site to determine the concentration of background airborne asbestos and dust.
- Control air monitoring will be conducted to determine the effectiveness of controls adopted at the Site to prevent the liberation of asbestos and dust into the air during soil disturbing works and asbestos removal activities.
- Asbestos air monitoring will be carried out in accordance with Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003 (2005)].

4.5.2 Excavation Works

The following should be undertaken during excavation works:

- Carefully excavate impacted materials using appropriate equipment (e.g. excavators / backhoes) from Remediation Areas. Works are to be conducted in accordance with the HASP and CEMP. Asbestos works are to be conducted in accordance with the AMP.
- The EC shall observe the excavation and excavated materials for indicators of contamination with chemical COPC, including visual (staining, discolouration) and olfactory (odours). If indicators of chemical COPC contamination in Remediation Areas A, or inconsistent with identified impacts in Remediation Area B, are observed the Unexpected Finds protocol shall be implemented.
- Regular field screening of the materials from the excavation surfaces within Remediation Area B will be undertaken using a calibrated PID to help ensure no additional contamination is present within fill materials.
- To reduce the area of disturbed material, the number of areas subject to excavation works at any one time should be minimised.
- Materials should be excavated and placed in temporary stockpiles or placed directly into a truck for transport to the placement area for cover (**Section 4.4.5** and **4.4.6**).

If residual impacted fill materials are present underlying the extent of excavation, these shall be subject to cover (**Section 4.4.5** and **4.4.6**).

4.5.3 Temporary Stockpiling and Characterisation

All asbestos impacted fill materials excavated from Remediation Area A and northern Remediation Area B requiring temporary stockpiling are to be managed in accordance with the requirements of the AMP as detailed within **Section 5.1**.

Remediation Area B

To determine the suitably for consolidated placement, or offsite disposal requirements, materials excavated from Remediation Area B will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment.

Samples will be collected from stockpiled materials to determine the suitability for onsite consolidated placement. Specific sampling densities and stockpile validation processes will be documented within the validation VSAQP (**Section 4.6**), however, the following should be considered:

- Samples will be analysed for total and leachable (TCLP) concentrations as a minimum the following CoPCs: semi-volatile TRH fractions, PAH, zinc, copper and asbestos.
- Where material is found to be suitable for onsite retention it should be placed within the designated placement location(s).
- Material found to be unsuitable for onsite containment should be classified and disposed offsite in accordance with the requirements specified within **Section 4.4.8**.

To ensure cross contamination of surface materials has not occurred, following removal of stockpiled impacted materials, the footprint of the stockpile location is to be validated.

The results of collected stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report (**Section 8**).

4.5.4 Excavated Material Placement

Based on the preferred remediation strategy specified in **Section 3**, excavated contaminated materials will be placed within the following locations:

- Designated consolidated impacted fill material placement location or locations.
- Within areas scheduled for redevelopment such as under future playing surfaces, stadium, concourse areas and car parking locations.

Senversa notes that where materials are to be placed in locations such as landscaping areas additional measures (including the installation of marker barrier liners) may be required (**Section 4.5.6**) and the root zone of all trees / shrubs and other ornamental plantings is free from asbestos impacted materials.

Excavated impacted fill materials will be transported from the excavation area via truck to the designated placement location.

Following placement of the fill material by truck within the designated placement area, the material should be immediately wet down, spread and compacted to reduce the area of disturbed (uncompacted) material and seal the placed material. Placed impacted material will require compaction or other controls to reduce the potential for dust and airborne fibre generation.

Following completion of placement works, the surface of the placement area should be surveyed by a registered surveyor. The survey will provide details of the location of the impacted materials for documentation in the LTEMP.

4.5.5 Construction of Capping layer

Impacted fill materials within designated placement locations and residual asbestos impacted fill materials (if present) in Remediation Area A will be covered by a capping layer. The capping layer will comprise a layer of clean material with a minimum thickness of 0.5 m appropriate to provide physical separation between future site users and impacted materials and facilitate long-term management under a LTEMP with minimal management requirements.

- Senversa notes that road / building slabs or pavement subgrade and / or construction materials are also appropriate as capping material providing a minimum 0.5 m thickness is maintained.
- Due to the potential for ongoing and regular maintenance of playing surfaces and underlying subgrade materials / services, where asbestos impacted material is to be placed / retained underlying constructed playing surfaces, the playing surface, underlying subgrade / service layer should not be considered a capping layer. An additional 0.5 m clean fill capping layer and marker layer are to be constructed above all placed / retained asbestos impacted fill materials underlying playing surfaces.
- Where material is to be placed / retained within landscaped areas, a cover layer of sufficient thickness must be used so that the root zone of all trees / shrubs and other ornamental plantings

are free from impacted materials. All material utilised within the root zone of plantings is to be certified clean and validated in accordance with the requirements specified within the VSAQP. Targeted cover thicknesses are 1 m for areas of planted shrubs and up to 2 m for planted tree wells (depending on root depth).

It should be noted that all capping materials are to meet any engineering /geotechnical requirements to facilitate the WSS development.

The material to be utilised as capping material will be required to be environmentally suitable material for human and/or ecological exposure (as appropriate), including virgin excavated natural material (VENM) sourced either from Site or certified as VENM from another location, uncontaminated Site-won material, Excavated Natural Material (ENM) or material certified in accordance with an exemption issued by the NSW EPA.

Prior to and following tipping of capping material, the material should be inspected for any visual or olfactory indicators of contamination, foreign materials or variation in material type to that expected from the onsite source. This may include (but not limited to):

- building waste materials;
- staining and/or discoloration;
- potential ACM containing materials; and/or
- odours.

Any material exhibiting signs of contamination is to be dealt with as an unexpected find as per **Section 7.1**.

Upon completion of capping construction, the area should be inspected to ensure no visual indications of impacted fill materials are visible on the surface of the Site area.

Following construction of the capping layer, a survey of the surface of the capping layer should be undertaken by a registered surveyor to confirm the required thicknesses have been maintained.

4.5.6 Construction of Marker Layer

A marker layer shall be placed to ensure that, should future intrusive works occur, workers can be made aware of the potential underlying asbestos impacted materials. A marker layer shall be placed within the Site overlying impacted materials (i.e. overlying impacted material consolidated placement areas and if there are residual fill materials outside the excavation extent within Remediation Area A). Concrete slabs underlying buildings or other permanent structures that are not reasonably expected to require excavation/maintenance in the future shall not require a marker layer.

The marker layer shall comprise a distinct coloured (e.g. red) geotextile placed over the impacted material and underlying the capping layer.

While there is no specific Australian Standard for geotextile membranes, consideration should be given to international guidelines (AASHTOM228-96) when selecting the appropriate geotextile membrane.

4.5.7 Services

It is understood that it is the intention to ensure that underground services that may be routinely accessed by future maintenance workers are constructed in (VENM) / engineered uncontaminated backfill to the extent practicable.

To ensure the presence / location of asbestos impacted fil materials is known to all future maintenance workers, a marker layer, as detailed within **Section 4.5.6,** is to be utilised to the extent practicable within all service conduits / and underlying playing surfaces areas identified to contain asbestos impacted fill.

4.5.8 Waste

If offsite disposal of excavated materials is required, this will be undertaken in accordance with the *NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste*.

- The EC should prepare a Waste Classification Letter for any soils requiring offsite disposal indicating the waste classification and volumes of the relevant excavated materials.
- Disposal dockets from the landfill facility should be obtained and provided in the site validation report as evidence of appropriate disposal.

  A material tracking register would be maintained to ensure an audit trail for the movement of materials around the Site and offsite.

The specific sampling and analysis requirements will be documented in the VSAQP.

4.5.9 Imported Materials

Where imported fill is required at the Site for reinstatement of excavations, only material certified to be Virgin Excavated Natural Material (VENM) and suitable for the WSS development will be imported on to the Site for this purpose. If VENM is brought to the Site accompanied by an appropriate VENM certificate, sampling will not be required. The EC should also observe materials as they are imported and placed onsite.

It should be noted that the excavation should not be backfilled until validation samples confirm the successful removal of asbestos impacted fill.

The VENM certificate should include a summary of the site history of the source site, the findings of any environmental site investigations undertaken at that site and the results of any soil analysis undertaken. If the VENM certificate does not meet these requirements or if fill material other than VENM (i.e. clean fill) is brought to the site, it will require and NSW EPA mandated Resource Recovery Exemption certificate, the source site may be visited by the EC for inspection and to enable collection and analysis of samples if required.

The specific sampling and analysis requirements will be documented in the VSAQP.

4.5.10 Material Tracking

During proposed remediation works, materials will be handled during excavation and placement of impacted materials, offsite waste disposal, and importation (where necessary) of cover materials.

A Material Tracking Register will be maintained onsite which will provide information regarding the source, characteristics, destination and quantities of material placed within containment locations, disposed offsite or imported to the site for capping / backfilling purposes.

4.6 Stage 6 – Validation

The specific validation strategy is to be documented in a Site Validation Sampling and Analysis Quality Plan (VSAQP). The VSAQP is to be prepared by a suitably qualified environmental professional in accordance with NSW EPA made or approved guidance and reviewed / endorsed by the Site Auditor.

While the specifics of the validation strategy (including specific validation tasks, validation sampling rates, analyses, sampling methods, etc.) will be detailed within the VSAQP, the following validation approaches will be followed.

Area / Material	Remediation Approach	Validation Approach	Required Analysis
Remediation Area A	Complete excavation exposing natural materials	Visual assessment of excavation surface on a systematic basis for asbestos by suitably experienced and trained environmental scientist/engineer. Validation sampling from excavation walls and floors (if the presence of natural materials cannot be confirmed).	Asbestos
	Excavation with residual fill remaining in-situ	Residual fill materials assumed to be impacted by asbestos unless validated as otherwise, and shall be covered. Visual assessment and survey of location of residual fill materials prior to cover. No sampling required of areas to be covered and managed under a LTEMP.	-
Remediation Area B	Complete excavation exposing natural materials	Validation sampling from excavation walls and floors	TRH, PAH, copper, zinc, asbestos
	Partial excavation with residual fill remaining in-situ	Validation sampling from excavation walls and floors	TRH, PAH, copper, zinc, asbestos
	Placement within onsite containment cell	Prior to placement soil material is to be validated as suitable for placement within an on-site containment cell	TRH, PAH, copper, zinc, asbestos and TCLP TRH, TCLP PAH, TCLP copper, TCLP zinc
Cover	-	Survey of placed materials and cover surface	-
Imported Materials	-	VENM shall be as defined under the Protection of the Environment Operations (POEO) Act 1997.	As required.
Waste	-	If offsite disposal of excavated materials is required, this will be undertaken in accordance with the NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste.	As required
All excavated and placed impacted materials, imported materials, and waste	-	Material Tracking Register	-

4.6.1 Validation Reporting

The site validation report (SVR) will be compiled by the EC on completion of the remediation and validation works. The SVR will include the scope, methods, results and conclusions of the remedial works.

This report will contain an overview of the remediation activities conducted at the site and the details of the following:

- Material tracking:
  - Volumes of excavated material and location of excavations.
  - Volumes and locations of stockpiled material.
  - Volumes of soil reinstated into excavations and disposed offsite.
- Plan of sampling locations for each analyte.
- Analytical results of validation soil samples.
- Survey details.
- Plan drawings of placed impacted materials and cover.
- A statement that the remediated areas have been rendered suitable for the WSS development.

Supporting factual evidence will be included in the report inclusive of illustrative figures. This will include NATA-registered laboratory analysis certificates, landfill disposal certificates (if material transported offsite), interpretative summary tables and an overview of the works carried out during the remediation process.

The SVR will be prepared in accordance with NSW OEH (2011).

4.7 Stage 6 – Demobilisation

Following completion of remediation and validation works, all plant, machinery and amenities that were constructed for the purposes of the remediation and validation works will be removed. Environmental controls such as silt fencing and any other general rubbish will also be removed from the Site.

The EC will inspect the Site following completion of the remediation and validation works and subsequent demobilisation.

5.0 Remediation Acceptance Criteria

To assist with assessing whether the remediation goal has been achieved, Remediation Acceptance Criteria (RAC) will be adopted for the works. These RAC were developed, giving consideration to the potential future land use scenarios, using the following guidance documents:

- National Environment Protection Council (NEPC) 1999 (as amended 2013), Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM), ISBN 0 642 32312 7.
- NSW DEC 2006, Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition), ISBN 1 74137 859 1
- WA DoH, 2009. Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia.

Selection of RAC is discussed in the following sections.

The RAC development will also be documented in the VSAQP.

5.1.1 Soil Remediation Criteria – Chemical CoPCs

The soil RAC values for Remediation Area B were selected using the following guidelines:

- National Environment Protection Council, 1999 (as amended 2013). National Environmental Protection (Assessment of Site Contamination) Measure, Health Investigation Level C (recreational).
- Friebel, E & Nadebaum (2011). HSLs for petroleum hydrocarbons in soil and groundwater: summary for NEPC consultation, Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Collected soil samples will be assessed against the following ASC NEPM (as amended 2013) endorsed DoH soil asbestos assessment criteria:

CoPC	RAC (mg/kg)	Reference Document
Copper	17,000	ASC NEPM HIL C
Zinc	30,000	ASC NEPM HIL C
Benzo(a)Pyrene (TEQ)	3	ASC NEPM HIL C
Total PAH	300	ASC NEPM HIL C
TRH C6-C10 (minus BTEX)	260	ASC NEPM Soil HSL C is NL ('not limiting') therefore HIL D used for Sand
TRH C6-C10	5100	Friebel & Nadebaum (2011) HSL-C Recreational; / Open Space
TRH C10-C16	3800	Friebel & Nadebaum (2011) HSL-C Recreational; / Open Space
TRH C16-C34	5300	Friebel & Nadebaum (2011) HSL-C Recreational; / Open Space
TRH C34-C40	7400	Friebel & Nadebaum (2011) HSL-C Recreational; / Open Space

5.1.2 Soil Remediation Acceptance Criteria - Asbestos

Due to the nature of the identified contamination within the Site, the primary criteria for determination of a defined remediation end-point for soils is ensuring that the final location of impacted fill materials is surveyed and covered.

Upon removal of fill materials from areas identified to contain asbestos impacted fill material, the surface of the excavation area will be inspected by a suitably experience and trained environmental scientist/engineer to determine if the site is visually cleared of fill materials (and asbestos).

If soil samples are required to be collected for validation purposes in accordance with the VSAQP, following visual clearance, collected soil samples are to be analysed in accordance with the ASC NEPM 2013 and WA DOH (2009) guidelines to provide confirmation of successful removal.

Collected soil samples will be assessed against the following ASC NEPM / WA DoH soil asbestos criteria:

Land Use	Asbestos Group	% w/w asbestos
All land uses	FA and AF	0.001
Parks, public open space, playing fields etc.	ACM	0.02

5.1.3 Soils – Aesthetic Criteria

It is noted that Section 3.5 of NEPC (2013) requires that “soils should not be discoloured, malodorous (including when dug over or wet) nor of abnormal consistency”, and that “the natural state of the soil should be considered”.

Olfactory or visual evidence of contamination was not identified during the recent ground investigation. As such, discoloured or odorous materials are not expected during the works. An unexpected finds protocol is presented in Section 7.1 should aesthetically limited materials be encountered during remediation works.

5.1.4 Offsite Disposal Criteria

If offsite disposal of excavated materials is required, this will be undertaken in accordance with the *NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste*.

5.1.5 Imported Material Criteria

Imported material assessment criteria will be in accordance with the appropriate NSW EPA approved exemptions, *NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste* (for VENM) or the NSW EPA (2014) Excavated Natural Material Order 2014.

6.0 Site Management Provisions

This section discusses the site management provisions to be implemented during remediation and validation works.

- Senversa notes that prior to the commencement of works a review of contractor prepared site / Environmental Management Plans should be undertaken to ensure they consider the presence and subsequent management processes for contaminated materials.

6.1 Asbestos Management Plan

Prior to the commencement of works an Asbestos Management Plan (AMP) is to be prepared by a suitably qualified environmental professional and reviewed / endorse by the Site Auditor. The AMP shall meet requirements of NSW SafeWork codes of practice for working with and removing asbestos.

The AMP should be developed in consideration of site specific risks and proposed development works but should consider the following:

- The location and extent of asbestos within the Site.
- Asbestos register.
- Site specific risks.
- Site specific control measures and safe work method statements.
- Procedures for stockpiling, transport and handling of asbestos impacted materials.
- Monitoring requirements.
- Roles and responsibilities.
- Emergency response procedures.
- Training requirements.

6.2 Occupational Health and Safety and Environment

Prior to the commencement of site remediation, a Health and Safety Plan (HASP) will be developed by the onsite contractor / EC outlining the required safety procedures to be adopted during remedial works.

The remediation works at the Site will be undertaken in accordance with the requirements specified within the HASP. All personnel undertaking work on the site will have undergone training relevant to the handling and management of contaminated materials including asbestos.

6.2.1 Personal Protective Equipment

During remediation works the following Personal Protective Equipment (PPE) should be considered for all works:

- all workers involved in excavation activities are required to wear long sleeve shirts and trousers whilst onsite;
- gloves and safety glasses shall be worn by all workers involved in handling of excavated materials;
- all workers involved in excavation activities should be attired with hard hats, protective footwear, safety vests and hearing protection (when working in the vicinity of heavy plant/machinery); and

- due to the presence of asbestos fragments within the waste material, asbestos rated dust masks and appropriate decontamination procedures will be required during all works within areas identified as containing asbestos product.

Senversa notes that the above list should not be considered exhaustive and additional PPE requirements may be identified during preparation of the HASP.

6.2.2 Hazard Controls

Prior to remediation works commencing the following hazard controls should be noted within the HASP and enforced for all areas requiring remediation:

- Areas identified as containing asbestos should be wetted down during excavation works to minimise the potential for airborne fibres.
- Undertake underground and overhead services location for the area in the immediate vicinity of the proposed excavation areas.
- Limit unauthorised access by ensuring that site security gates at the site entrance are locked at the completion of each day's work or sufficient temporary fencing is erected around the works site.
- All open excavations to be barricaded in accordance with SafeWork NSW requirements.
- Consideration should be given to restricting access to open excavations.

6.2.3 Site Access

All heavy vehicle access and egress from the Site should follow a designated heavy vehicle route specified by the Site Contractor. As a minimum, the following traffic control measures will be implemented:

- All streets along the designated heavy vehicle route will be kept free from detritus material sourced from the Site during the course of the project. A representative of the Remediation Contractor will, on a daily basis, monitor the roadways leading to and from the Site, and take steps to clean any adversely impacted pavements.
- Materials such as soil, mud, earth or similar tracked onto the driveways will be removed by means such as sweeping and shovelling, but not washing.
- Vehicles travelling along the designated heavy vehicle route shall have covered loads and adhere to the relevant speed limits.

6.2.4 Dust Control

All practicable measures will be taken to ensure that dust emanating from the Site is minimised. Measures to minimise the potential for dust generation may include:

- Where practicable minimising the excavation area and total number of stockpiles of impacted materials present within the Site.
- Any asbestos material which may be encountered during the excavation works will be kept wetted at all times or otherwise covered.
- Use of water sprays over unsealed or bare surfaces, which are generating unacceptable amounts of dust.
- Covering of excavation faces and stockpiles, where necessary (if unacceptable amounts of dust are generated or if weather forecasts predict strong winds).
- Establishing dust screens consisting of a minimum of 2-metre-high shade cloth or similar material secured to a chain wire fence where dust is noted to be escaping the site boundary.

- Maintenance of all dust control measures to ensure good operating condition.
- All vehicles having had access to unpaved areas of the Site shall exit via a wheel wash facility to prevent mud and sediment from being deposited on public roadways.

6.2.5 Odour Control

While odour is not considered to be a significant risk, all activities conducted at the Site will be controlled such that all equipment used is designed and operated to control the emission of smoke, fumes and vapour into the atmosphere and any possible odours arising from the excavation or stockpiled material is controlled.

Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the relevant NSW legislation.
- Use of covers (if required, i.e. HDPE).

6.2.6 Soil Erosion and Surface Water Runoff

During construction works, sediment and surface water controls should be implemented. While the specific controls to be implemented will be documented within contractor site management plans the following should be considered:

- sediment control;
- clean water diversions; and
- stormwater drain protection.

Sediment and clean water diversion control measures (i.e. silt fencing, hay bales, gravel bags etc.) should be strategically placed at the following locations:

- down-gradient of temporary stockpiles;
- up-gradient of temporary stockpiles to redirect water; and
- down-gradient of any surrounding stormwater channels that flow within / through the Site as a contingency against overflow into bunded stockpile locations.

Stormwater drain protection may comprise:

- installation of sediment controls in any identified stormwater drains located down-gradient of any temporary stockpile areas.

During remediation works all sediment and surface water controls will be routinely inspected. Should any control measure be damaged or defective, the issue will be reported to the Site superintendent to arrange for repair or modification.

6.2.7 Site Signage

A sign displaying the contact details of Contractor will be displayed on the Site adjacent to the works area.

The sign/s will be displayed throughout the duration of the remediation works in accordance with NSW regulatory requirements.

6.2.8 Site Security

The Site shall be secured by means of an appropriate fence to guard against unauthorised access if required.

6.3 Reporting

6.3.1 Non-conformance and corrective action reports

Non-conformances will be recorded within the Remediation Contractor's Non-Conformance and Corrective Action Report (or equivalent).

Details of the non-conformance, including any immediate corrective actions undertaken, are to be recorded by the onsite project team.

It is the responsibility of the project team to immediately initiate corrective actions, if required. Once completed, the project team will provide details of the actions undertaken on the Non-Conformance Report and sign, date and file the report.

6.3.2 Incident Management Reports

Reporting of environmental incidents will be undertaken in accordance with the EC's incident reporting procedures and timelines.

Records will be kept of any environmental incidents, accidents, hazardous situations, unusual events and unsafe health exposures and the corrective action taken.

The project team will investigate the cause of any emergency so that necessary changes in work practices can be made to prevent the incident recurring.

6.3.3 Complaint Reporting

The project team will maintain a register of complaints, which will include a record of any action taken with respect to the complaints.

If a complaint identifies a non-conformance, a Non-Conformance & Corrective Action report is to be initiated as per Section 6.2.1.

Nature of the complaint is to be documented in the Site's Complaints and Environmental Incidences Register (or equivalent).

7.0 Contingency Plans

The purpose of the contingency plan is to identify unexpected situations that could occur, to specify procedures that can be implemented to manage such situations and to prevent adverse impacts to the environment and human health should these situations occur.

The conditions that may be encountered when excavating are uncertain. As unknown and variable sub-surface conditions impose a degree of uncertainty for the project, a set of anticipated conditions has been assumed in developing the excavation plan. However, because field conditions may vary, flexibility has been built into the excavation plan to adapt to differing conditions.

The conditions that can reasonably be expected, the resulting problems they may cause, and how these problems may be resolved within the context of the excavation program have been summarised below:

Anticipated Potential Problems	Corrective Action
Increased volumes of contaminated material	The site has a number of areas requiring fill material that can be utilised for placement of additional contaminated materials.
Volume of impacted material exceeding site containment capacity	It is noted that the development approach incorporates flexibility in design such that increases in volumes of placed material can be accommodated due to filling requirements to achieve design levels underlying the stadium and pavement areas and/or via over-excavation of natural materials. On this basis, while considered unlikely, where the volume of contaminated materials is found to exceed the site containment capacity the following contingency options are available: • Over-excavation of placement area(s) to account for additional volumes. • Offsite disposal of contaminated materials to a suitably licenced waste receiving facility in accordance with NSW EPA waste classification requirements.
Chemical spill / exposure	Stop work, refer to Health and Safety Plan and immediately contact the Site Supervisor.
Excessive rain	Cover those working areas not located under cover, where possible, with plastic during off-shifts. Inspect and maintain sediment controls and filter fences.
Excessive drainage	Minimise active/contaminated work area; or improve diversion of clean run-on; or maintain sufficient onsite wastewater storage capacity; or mobilise additional storage and/or treatment systems as needed.
Excessive dust	Use water sprays, biodegradable dust sprays, cease dust-generating activity until better dust control is achieved, or apply interim capping systems. If necessary, install dust deposition gauges prior to and during works to monitor the effectiveness of dust controls implemented onsite.
Excessively wet materials	Stockpile and dewater onsite or add absorbents.
Equipment failures	Maintain spare equipment or parts, maintain alternative rental options; or shut down affected operations until repairs are made.
Release of fuel/oil from machinery	Remove source, use absorbent booms to remove oil and make any repairs and clean-up as required. If necessary, implement temporary measures until booms can be deployed; (e.g. earth embankments) to prevent movement of spill into water courses.
Silt fence fails	Stop work and repair fence to specifications.
Excessive noise	Identify source and review noise attenuation equipment and as necessary provide silencers on noisy equipment.

7.1 Unexpected Finds

In addition to the above listed contingencies, the following steps may need to be undertaken should unexpected finds such as stained or odorous materials, buried drums or tanks, or suspect impacted materials (other than identified impacts) be discovered during the remediation works:

In the event that unexpected finds of impacted materials or items such as odorous and stained materials etc., are encountered, the following protocol will be adopted:

- All excavation works in the affected area will cease, the EC Project Manager and Lendlease will be contacted.
- The area of concern will be suitably barricaded.
- The nature of the contamination will be characterised visually and, if required, appropriate sampling and analysis will be completed, by the Environmental Consultant.
- The requirement for any additional remediation works will then be assessed.
- Records will be kept in relation to the nature, location and management of the particular material.

Additional environmental and occupational safety controls may include:

- upgrade of personal protective equipment (PPE), for workers within the active work zone, in accordance with the HASP;
- segregation and bunding of discovered material;
- use of odour suppressants (where appropriate);
- cover the discovered material with plastic sheeting (where appropriate/possible);
- appropriate sampling and analysis to assess potential contaminants; and
- appropriate treatment and/or disposal of the materials following receipt of analytical results and any associated regulatory approvals required.

8.0 Long Term Environmental Management Plan

Residual impacted materials will require long-term management. Following the completion of remedial and validation works, a long term Environmental Management Plan (LTEMP) will be prepared. The LTEMP needs to be practical and legally enforceable.

The LTEMP will document: the expected limitations on Site use; relevant environmental and health and safety processes and procedures; management processes, procedures and responsibilities to be adopted by future site users within the Site; and, include details on the location and extent of placed or residual asbestos contaminated fill materials, capping layers and marker barriers within the Site boundary.

Senversa notes that the EMP must be prepared by a suitably qualified EC and approved by a NSW EPA endorsed Site Auditor.

9.0 Conclusion

This RAP was developed to provide a conceptual working plan detailing the excavation, soil stockpiling, validation and occupational health and safety and environment management strategies associated with the remediation of impacted fill material at the Site.

Based on the data currently available, Senversa considers the impacted portion of the Site identified within previous site investigations could be rendered suitable for the WSS development.

10.0 Technical Limitations and Uncertainty

The following principles are an integral part of site contamination assessment practices and are intended to be referred to in resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Elimination of Uncertainty

Some uncertainty is inherent in all site investigations and /or remediation works. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.

Failure to Detect

Even when site investigation work is executed competently and in accordance with the appropriate Australian guidance, such as the National Environmental Protection (Assessment of Site Contamination) Amendment Measure ('the NEPM'), it must be recognised that certain conditions present especially difficult target analyte detection problems. Such conditions may include, but are not limited to, complex geological settings, unusual or generally poorly understood behaviour and fate characteristics of certain substances, complex, discontinuous, random, or heterogeneous distributions of existing target analytes, physical impediments to investigation imposed by the location of services, structures and other man-made objects, and the inherent limitations of assessment technologies.

Limitations of Information

The effectiveness of any site investigation / remediation works may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.

Chemical Analysis Error

Chemical testing methods have inherent uncertainties and limitations. Senversa routinely seeks to require the laboratory to report any potential or actual problems experienced, or non-routine events which may have occurred during the testing, so that such problems can be considered in evaluating the data.

Level of Remediation

The remediation methodology specified within this RAP is based on information provided within previous reports. Amendments to actual remediation and / or validation processes may be required where site conditions are found to vary from those outlined within previous investigations.

Comparison with Subsequent Inquiry

The justification and adequacy of the investigation findings in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.

11.0 References

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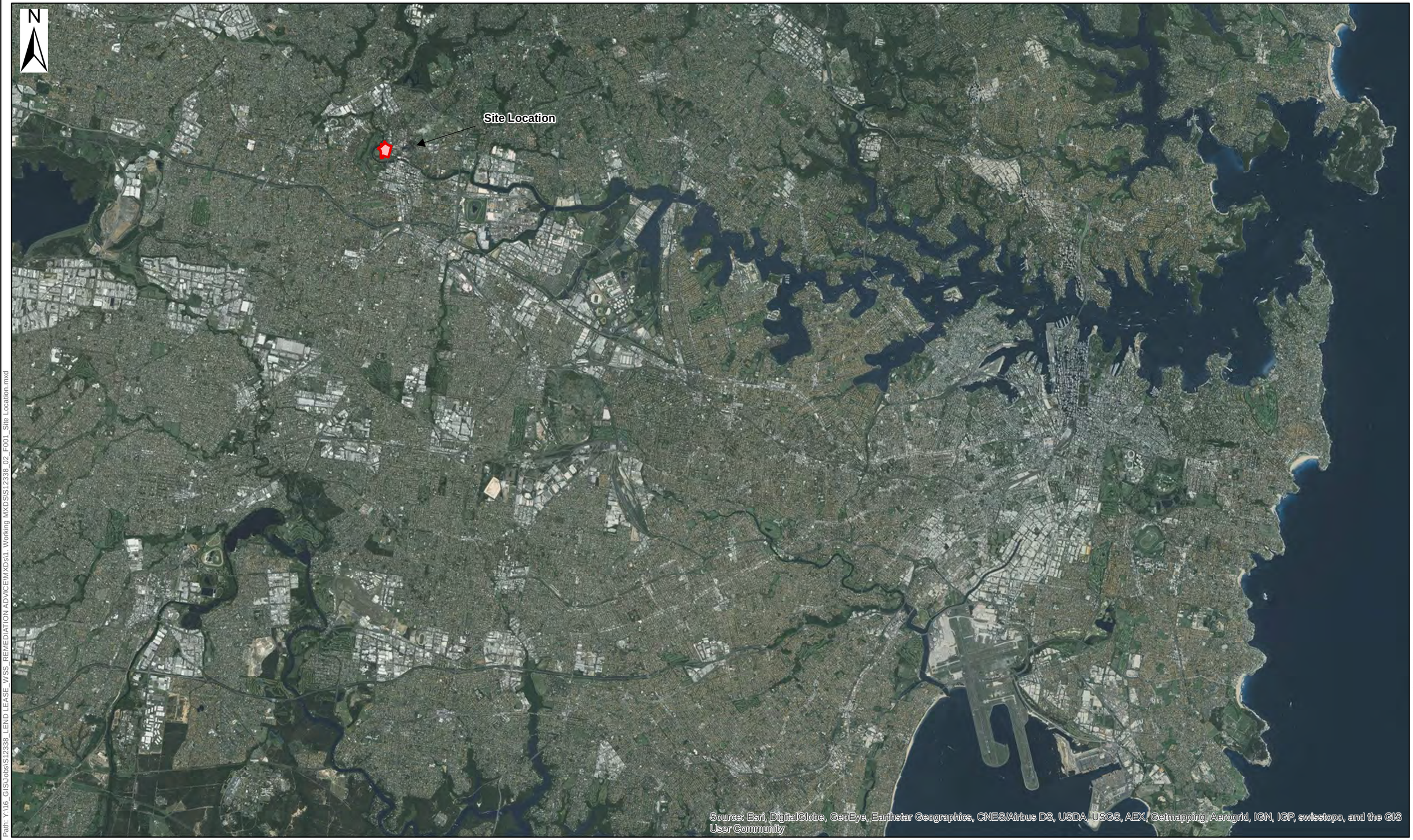
Figures



Path: Y:\16_GIS\Jobs\S12338_LEND LEASE_WSS_REMEDIATION ADVICE\MXDs\1. Working MXDS\S12338_02_F001_Site Location.mxd

senversa
Address: Level 14, 309 Kent Street, Sydney NSW 2000
Phone: (02) 9994 8016
Fax: (03) 9606 0074
Website: www.senversa.com.au

Legend

Site Boundary

Designed:	I. Batterley	Date:	11/01/2017
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:100,000 (A3)
File:	S12338_02_F001_Site Location		

0 1,000 2,000 4,000 6,000 8,000 Metres

Datum GDA 1994, Projection MGA Zone 56

Figure No: 1

Title: Site Location

Project: Western Sydney Stadium Redevelopment

Location: Western Sydney, NSW

Client: Lend Lease Building Pty Ltd

Path: Y:\16_GIS\Jobs\S12338_LEND LEASE_WSS_REMEDIATION ADVICE\MXDs\1. Working MXDs\S12338_02_F002_Site Boundary.mxd

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Legend

Site Boundary

Lot Boundary

Lot Number

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	I. Batterley	Date:	2/02/2017
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:2,501 (A3)
File:	S12338_02_F002_Site Boundary		

0 20 40 80 120 160 Metres

Datum GDA 1994, Projection MGA Zone 56

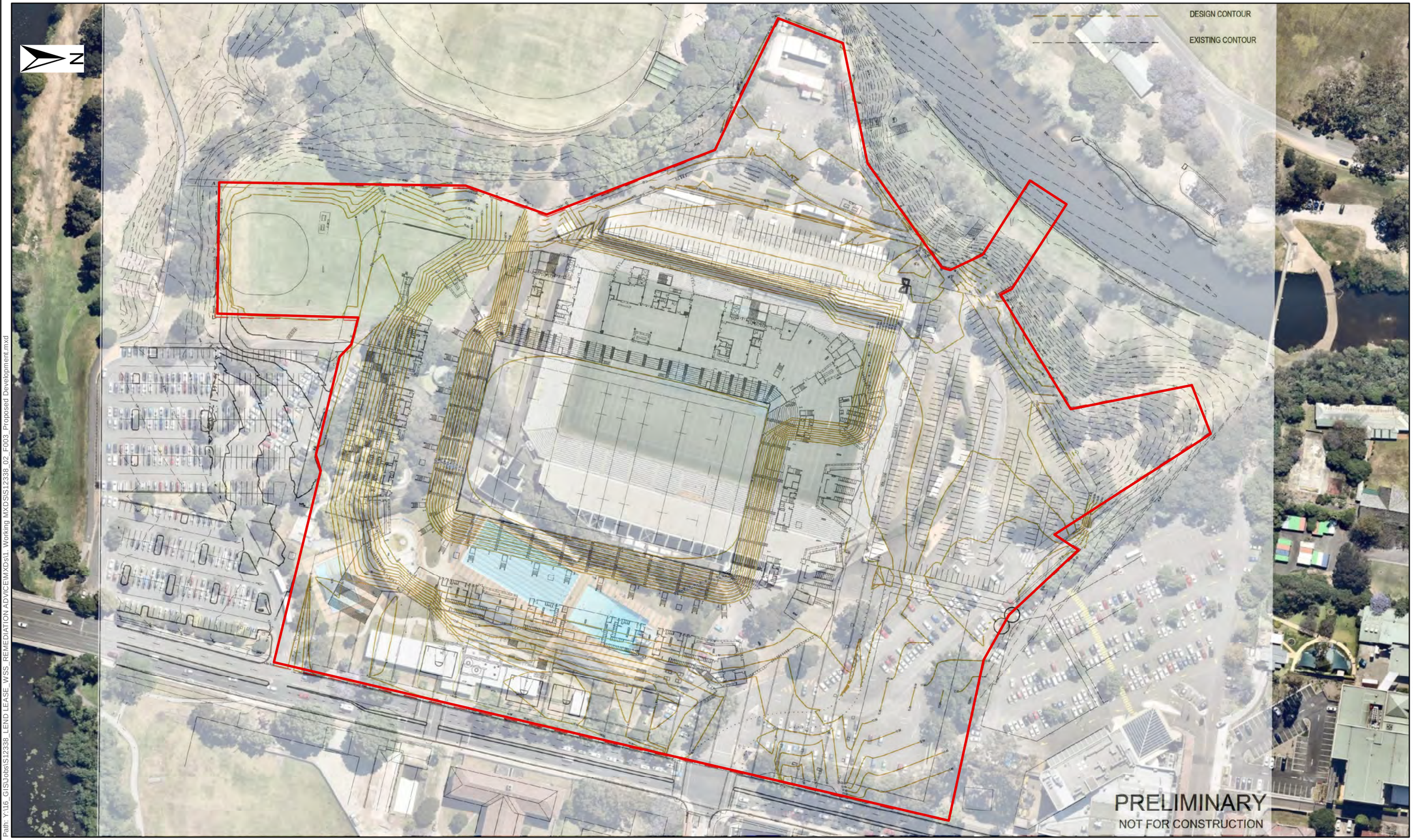
Figure No: 2

Title: Site Boundary

Project: Western Sydney Stadium Redevelopment

Location: Western Sydney, NSW

Client: Lend Lease Building Pty Ltd



Path: Y:\16_GIS\Jobs\S12338_LEND LEASE_WSS_REMEDIATION ADVICE\MXDs\1. Working MXDs\S12338_02_F003_Proposed Development.mxd

senversa

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Fax: (03) 9606 0074
Website: www.senversa.com.au

Legend

Site Boundary

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	I. Batterley	Date:	2/02/2017
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:1,650 (A3)
File:	S12338_02_F003_Proposed Development		

0 15 30 60 90 120 Metres

Datum GDA 1994, Projection MGA Zone 56

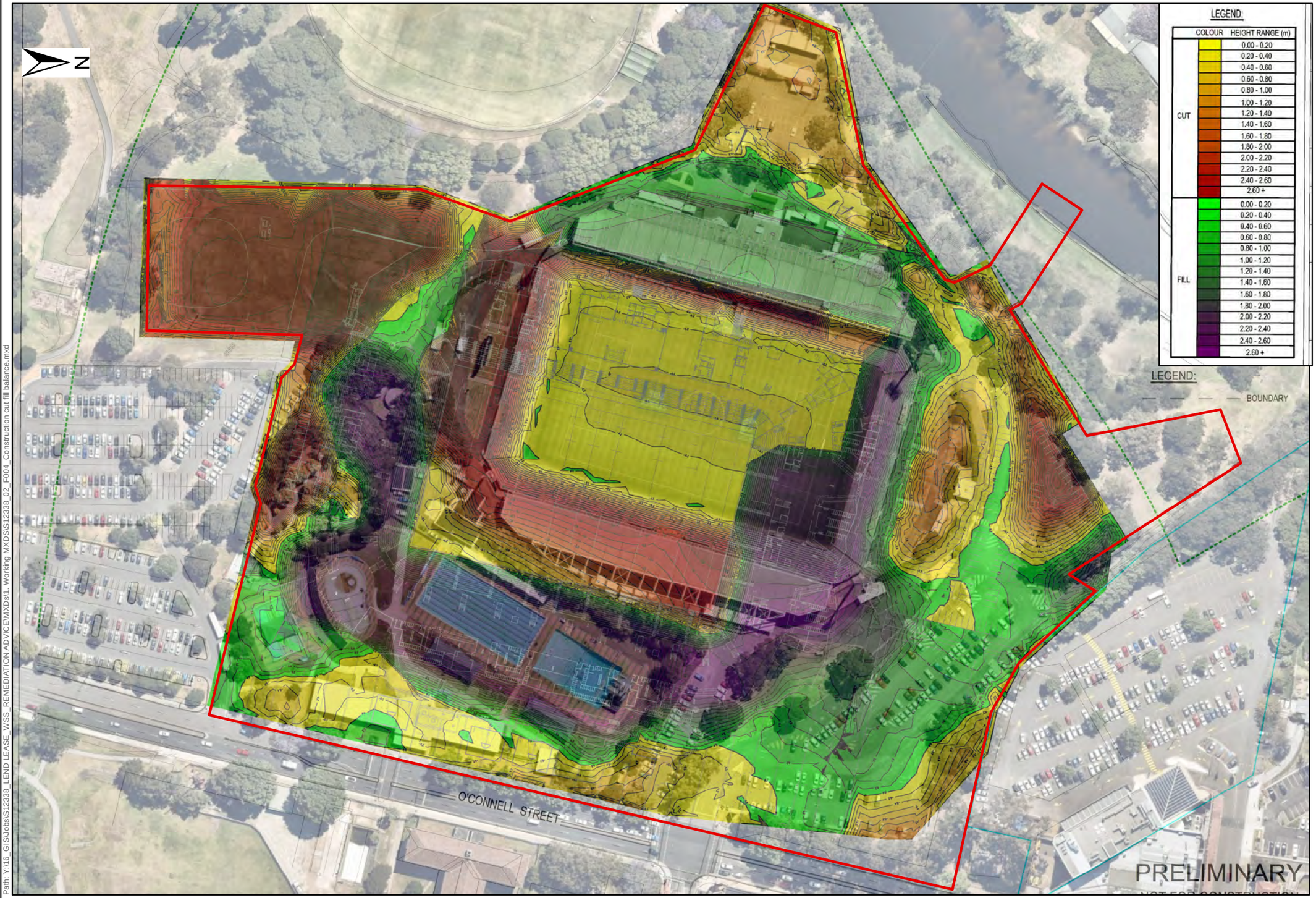
Figure No: 3

Title: Proposed Development

Project: Western Sydney Stadium Redevelopment

Location: Western Sydney, NSW

Client: Lend Lease Building Pty Ltd



Path: Y:\16_GIS\Jobs\S12338_LEND LEASE_WSS_REMEDIATION ADVICE\MXDs\1. Working MXDS\S12338_02_F004_Construction cut fill balance.mxd

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Site Boundary

Source: Drawing 017, Earthworks Plan - Overall Plan, Populous, 2016

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	I. Batterley	Date:	2/02/2017
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:1,600 (A3)
File:	S12338_02_F004_Construction cut fill balance		

0 15 30 60 90 120 Metres

Datum GDA 1994, Projection MGA Zone 56

Figure No: 4

Title: Construction Cut/Fill Balance

Project: Western Sydney Stadium Redevelopment

Location: Western Sydney, NSW

Client: Lend Lease Building Pty Ltd

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Legend

- Site Boundary
- Additional Investigation Area
- Remediation Area A Asbestos in Soil Remediation Extent
- Remediation Area B Chemical CoPC Remediation Extent

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	I. Batterley	Date:	2/02/2017
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:2,000 (A3)
File:	S12338_02_F005_Areas Requiring Remediation		

0 15 30 60 90 120 Metres

Datum GDA 1994, Projection MGA Zone 56

Figure No: 5

Title: Areas Requiring Remediation

Project: Western Sydney Stadium Redevelopment

Location: Western Sydney, NSW

Client: Lend Lease Building Pty Ltd

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