Shoalhaven City Council
C-/ Set Consulting Pty Ltd

Remedial Action Plan
Lot 1, DP1021332 and Part Lot458, DP1063107
George Evans Rd, Mundamia, NSW

martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P1002863JR04V01
April 2013

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All enquiries regarding this project are to be directed to the Project Manager.

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1 Introduction

1.1 Overview

This Remedial Action Plan (RAP) has been prepared by Martens and Associates Pty Ltd (MA) on behalf of Shoalhaven City Council (SCC) for the purpose of addressing observed land contamination identified at 'the site' being Lot 1, DP1021332 and part Lot 458, DP1063107, Mundamia, NSW. It provides remediation and validation specifications and implementation of the RAP in full shall render the site fit for the proposed residential use.

The RAP has been prepared in general accordance with NSW EPA (1994), NSW EPA (1995), NEPC (1999), NSW DEC (2006) and NSW OEH (2011).

1.2 Scope and Format of the RAP

The scope of the RAP is:

- Set the remediation goals.
- Review the available remedial options.
- Provide details of remedial options.
- Select the preferred remedial option.
- Outline procedures and activities for implementation and validation of the preferred remediation option.
- Outline requirements for contractors to prepare environmental and occupational health and safety plans for the remediation.
- Outline requirements for contingency planning.
- Outline the regulatory compliance requirements.
- Provide details of contacts for the period of remediation works.
- Provide a framework for environmental management for the site during remediation.

The format of this RAP is:

- Outline of previous MA reports (Section 1.4).

- Extent of proposed remediation (Section 3).
- Outline of the remediation goals, objectives, remediation criteria (Section 4).
- Review of applicable remediation technologies (Section 5).
- Detail of remediation planning, remediation, waste and validation requirements, waste management, and reporting requirements (Section 6).
- A guide for site control during remediation and site specific health and safety for remediation and validation (Section 7).
- Remediation contacts (Section 8) and contingency plan (Section 9).

1.3 Abbreviations

ACM – Asbestos containing material

AEC – Area of environmental concern

AMP – Asbestos management plan

BTEX – Benzene, toluene, ethyl benzene, xylene

COC – Chemical of concern

CT – Contaminant threshold

DEC – NSW Department of Environment and Conservation (previous name of NSW OEH)

DP – Deposited Plan

EPA – NSW Environmental Protection Authority (previous name of NSW OEH)

ESA – Environmental site assessment

HIL – Health investigation level

HSP – Health and safety plan

LGA – Local government area

LOR – Limit of reporting

MA – Martens and Associates

mBGL – Metres below ground level

NATA – National Association of Testing Authorities

NEPC – National environmental protection commission

NEPM – National environmental protection measure

OEH – NSW Office of Environment and Heritage

OPP – Organophosphorous pesticides

PAH – Polycyclic aromatic hydrocarbons

PCB – Polychlorinated biphenyl

PID – Photo ionisation detector

PPE - Personal protective equipment

RAP – Remedial action plan

SCC – Shoalhaven City Council

SIL – Soil investigation level

SMP – Site management plan

SOP – Standard operating procedure

SWMS – Safe Work Method Statement

TCLP – Toxicity characteristics leaching procedure

TPH – Total petroleum hydrocarbons

TRH – Total recoverable hydrocarbons

1.4 Previous investigations

The following investigations have been undertaken in relation to contamination at the subject site:

- Martens and Associates (2012a) *Stage 1 and 2 Contamination Assessment, 1, DP1021332 and Lot 458, DP1063107, Mundamia, NSW,* ref: 1002863JR01V01.

Additional site investigations (geotechnical and hydrological) have been documented in the following reports:

- Martens and Associates (2012b) *Geotechnical Assessment, 1, DP1021332 and Lot 458, DP1063107, Mundamia, NSW,* ref: 1002863JR01V01.

- Martens & Associates Pty Ltd (2011) *Hydrogeological Assessment: Proposed Sub-division, Mundamia Release Area, Mundamia NSW*, document reference P1002761JR01V02.

These reports are to be read in conjunction with this document.

2 Site Identification

2.1 Location and Setting

Site information is summarised in Table 1.

Table 1: Site background information

Site address	George Evans Rd, Mundamia, NSW.
Lot and DP (Title Information)	Lot 1, DP1021332 and part Lot 458, DP1063107.
Zoning	Current zoning: 1(d) Rural "D" (General Rural). Draft LEP zoning: R1 (General Residential).
Local government area (LGA)	Shoalhaven City Council.
Current land use	Rural / Industrial.
Proposed land use	Residential.
Surrounding land uses	Predominantly underdeveloped bushland and rural land to the east, the University of Wollongong's Shoalhaven campus to the southwest.
Geology and soil landscapes	Nowra Sandstone, a subgroup of the Megalong Conglomerate Group geology. Nowra Landscape consisting of moderately deep (50 – 100cm) brown podzolic soils on crests/upper slopes, with yellow earths or yellow podzolic soils on mid slopes, lower slopes and drainage depressions.
Topography and drainage	Previous site use as a quarry / gravel pit has reshaped the natural site surface. The site falls to its centre which consists of a flat (slopes <5%) exposed sandstone surface as a result of previous quarrying. Drainage is facilitated by a manmade channel that runs north and exits the site beneath Jonsson Rd.
Sensitive receptors	Shoalhaven River located approximately 400m to the north.

Site location is shown in Figure 1 and site features relevant to the investigation are shown Attachment A.

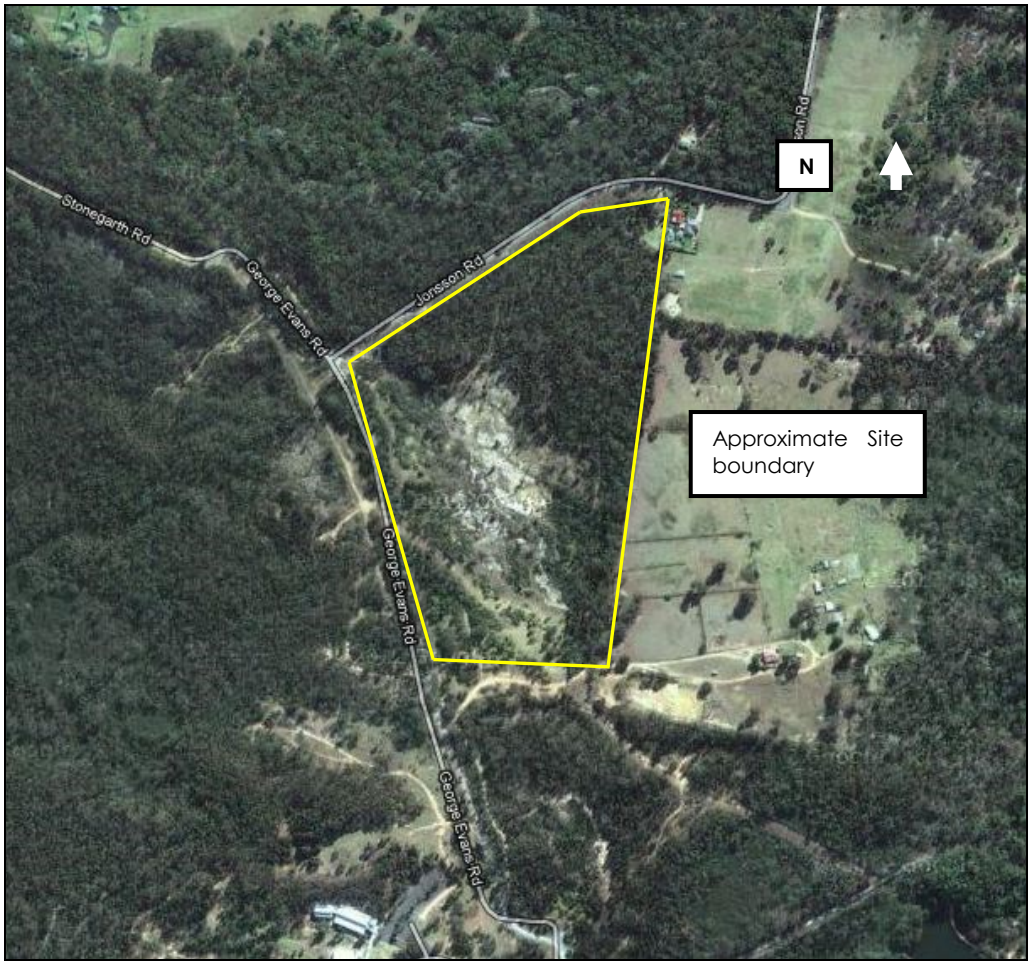

Figure 1: Subject site location (outlined in yellow) (www.googlemaps.com).

2.2 Groundwater

Site groundwater conditions have been previously described as part of a geotechnical assessment (MA, 2012 b) and are summarised as follows:

- Groundwater was observed in one test pit (TP108) and moist soil conditions reported in test pits located in the site's south.
- All other boreholes and test pits provided no indication of groundwater prior to termination depth.

A hydrogelocial assessment for the site was previously completed (MA, 2011). Two groundwater monitoring wells GMB2 (south) and GMB4 (north) were installed on the site as part of this study and the following is summarised from the 4 month well monitoring period:

- GMB2 was saturated above the soil/rock interface for the whole of the monitoring perid.

- GMB4 remained dry above the soil/rock interface throughout the whole of the monitoring period. This is expected given that the silty gravely layer above the rock is likley to be highly permeable.

Given the site geological characteristics, ephemeral (temporary) groundwater is likely to occur in regions of the site's south in less permeable soils (sandy clay fill). No aquifers are anticipated on site within 2 – 5 m of the surface, an aquifer being a formation or geological unit able to yield economic beneficial quantities of groundwater.

3 Extent of Remediation Required

3.1 Contamination Identified

Previous reports have identified contamination in excess of adopted project SILs. Samples are summarised in Table 2 and locations are shown in Attachment A.

Table 2: Summary of identified contamination

Sample ID	Contaminant	Value (mg/kg)	SIL (mg/kg)
2863/103/1.2	Benzon(a)pyrene	4.7	1
2863/138/0.5	Benzon(a)pyrene	2.0	1
2863/103/1.2	Total PAH	53.7	20
2863/1038/0.5	Total PAH	25.2	20
2863/105/0.2	Lead	310	300
2863/ASB101	Asbestos (material)	Positive	Non detect
2863/ASB102	Asbestos (material)	Positive	Non detect
2863/ASB103	Asbestos (material)	Positive	Non detect

3.2 Remediation Required

The following is a summary of remediation requirements to render the site fit for intended land use (residential with access to soil):

1. Remediation of PAH, TPH, lead and asbestos impacted fill in the southern and western site as identified in TP102 -105, TP108, BH120 and BH138.

Areas requiring remediation will include test locations identified above and be extended until validation demonstrates the outer limit of filling has been reached. Approximate extent of the remediation area is identified in Attachment A.

4 Remediation Programme

4.1 General

The following sections present a plan for remediation and management of PAH, lead and asbestos impacted soils identified on the site.

4.2 Remediation Goal

The goal of remediation is to remediate onsite soils to an extent to allow use of the site for residential purposes. In addition, the RAP shall provide a strategy for management of waste spoil generated by the remediation process.

4.3 Remediation Objectives

To address the remediation goal; removal of contaminated soils impacted by TRH, PAH, lead and asbestos is required to remove risk to future site users.

4.4 Remediation Criteria

4.4.1 Soil Remediation Criteria

Remediation criteria for soil are established based on the following references:

- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).
- NSW DEC (2006) Guidelines for the NSW Auditor Scheme (Second Edition).
- NSW EPA (1994) Guidelines for Assessing Service Station Sites.

Human health based soil investigation levels (HIL) for residential land use, provided in Column A of Table 11-A in the NEPC (1999) *Guidelines on Health-Based Investigation Levels* (and reproduced in NSW DEC, 2006) have been adopted. Adopted HIL for BTEX and TRH is derived from NSW EPA (1994). Adopted criteria are summarised in Table 3.

There are currently no national or NSW OEH endorsed guidelines relating to human health of environmental investigation of material containing asbestos on sites. The NSW DEC previously provided interim advice that "no asbestos in the soil at the surface is permitted". MA has adopted an asbestos investigation level of "non-detect" for this site.

Table 3: Adopted soil remediation and typical laboratory detection levels (LOR)

Contaminant of Concern	Soil Remediation Criteria (mg/kg)	LOR (mg/kg)
TRH (C_6-C_9)	65	25
TRH (C_{10}-C_{36})	1,000	250
TPH(C_{16}-C_{35}) Aliphatic	5,600	100
TPH(>C_{35}) Aliphatic	56,000	100
TPH(C_{16}-C_{35}) Aromatic	90	50
Benzene	1.0	0.2
Toluene	1.4	0.5
Ethyl benzene	3.1	1
Xylene (total)	14	3
Total PAH	20	1.55
Benzo(a)pyrene	1	0.05
Total Phenols	8,500	0.05
Arsenic (total)	100	4
Cadmium	20	0.5
Chromium (VI)	100	1
Copper	1,000	1
Lead	300	1
Mercury	15	0.1
Nickel	600	1
Zinc	7,000	1
Asbestos	Non detect	0.1

4.4.2 Waste Classification

The procedures for classifying waste are detailed in the NSW DECC (2009): *Waste Classification Guidelines.* Part 1: *Classifying Waste* requires that wastes be classified in a step wise manner. It is noted that under NSW DECCW (2009), the steps for waste classification in that guideline must be applied in the order stated.

Part 2 of the Waste Guidelines, *Immobilisation of Waste*, apply to wastes classified as hazardous in accordance with Part 1 of the Waste Guidelines because of the high levels of contaminant(s). Currently, there is no licensed landfill which can accept hazardous waste. Soil classified as hazardous waste must be treated prior to disposal. In some cases the contaminants are able to be immobilised so that they will not be released into the landfill leachate at levels of concern.

Part 3 of the Waste Guidelines, *Waste Containing Radioactive Material* is considered not to apply to this project as risks of the wastes identified containing radioactive material is considered very low.

Part 4 of the Waste Guidelines, *Acid Sulfate Soils* applies to acid sulfate soils which are required to be disposed to landfill.

Preliminary classification of identified fill in the western fill area (BH120, BH138) is general solid waste (non putrescible). Further leachability testing of southern fill material will be required to determine waste classification due to benzo(a)pyrene exceeding the contaminant thresholds (CT1 and CT2) outlined in DECC (2009).

5 Assessment of Remedial Options

5.1.1 Assessment of Remedial Options for Soil Remediation

Soil remedial technologies have been reviewed to determine technologies most suitable to meet the site remediation objectives. NSW DEC (2006) provides a preferred hierarchy of options for site clean-up and/or management, which was originally developed in NEPC (1999). The hierarchy is outlined as:

- On-site treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level.
- Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which the soil is returned to the site.
- Removal of contaminated material to an approved facility, followed (where necessary) by replacement with appropriate material.
- Cap and contain material onsite with an appropriately designed barrier.
- Do nothing.

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

Review of available soil remediation strategies and technologies is considered on the basis of:

- Effectiveness at achieving remediation objectives.
- Suitability in light of the proposed development.
- Anticipated costs.
- Ongoing environmental and public health adequacy.

A review of treatment options is presented in Table 4.

Table 4: Review of soil remediation technologies

NEPM (1999) Remediation Hierarchy	Advantages	Disadvantage	Comments
Capping / Containing	o Likely to be low cost approach compared to offsite disposal.	o Contaminated soils remain onsite. o EMP required for ongoing management of material.	Capping shall be an unsuitable remedial technique as unacceptable levels of lead and PAH contamination will remain onsite which will have potential to pose future contamination risk. Capping also places future land use restrictions on the site with the requirement of an ongoing EMP. Capping is not considered appropriate for the site.
Onsite *ex-situ* treatment and reuse	o Treated soils are made suitable reuse onsite or offsite disposal at lower COC concentrations. o Minimal costs associated with offsite disposal.	o Requires establishment of onsite remediation area. o Remediation area would significantly increase development timeframes and may add cost (pending COC concentrations and type). o Treatment method ineffective for treating all COC identified.	This technique is not considered suitable for long chain hydrocarbons such as PAH compounds as remediation is likely to be prolonged or unachievable. Lead cannot be easily and reliably removed by *ex-situ* treatment. Asbestos cannot be reliably removed by *ex-situ* treatment.
Offsite disposal	o Provides the shortest timeframe for remediation. o Removes risks to human health and long term management requirements. o Removes groundwater pollution source(s). o Allow reuse for residential (access to soil) purposes.	o High cost for material transport and disposal charges. o Additional cost associated with classifying wastes prior to offsite disposal.	This treatment option is the most suitable for site development. Impacted soil shall be removed from site minimising risks to human health and long term site management responsibilities.
Do Nothing	o No works required.	o Will not remove contaminants. o PAH and lead contamination combined with asbestos present unacceptable human-health risks. o Site unable to be developed for residential (access to soil) purposes.	This approach will preclude future redevelopment for residential (access to soil) purposes. Human-health risks will remain.

5.1.2 Preferred Soil Remediation Option

In consideration of soil remediation technologies presented in Table 4, excavation and offsite disposal is considered the most suitable technology. This is considered suitable for remediation of contaminated soils for potential future site use for residential purposes (access to soil).

Methods outlining the process of soil remediation are detailed in Section 6.

6 Remediation and Validation Planning

6.1 Remediation Plan

6.1.1 Overview

The following sections outline works required to remediate identified contaminated soils such that the site is fit for intended use.

Unless otherwise identified, activities discussed below will be the responsibility of the contractor or its representative.

6.1.2 Remediation Sequence

The following site remediation sequence is proposed.

1. Notify Council in accordance with SEPP 55.
2. Preparation of a safety and environmental management plan for the remediation by the contractor.
3. Site establishment.
4. Remediation of PAH and lead contaminated soils and identified ACM fibre sheeting via excavation; to be followed by validation of resulting excavations.
5. Waste classification assessment of remedial spoil for offsite disposal.
6. Preparation of validation report.
7. Execute contingency plans if and when required.

6.2 Approval of Consent Authority

In accordance with SEPP55 - Remediation of Land (1998) the remediation works are considered to be Category 1 due to the site being in a coastal protection zone. As such, development consent is required for these works.

6.3 Site Establishment

Prior to remediation of the site the nominated site supervisor or remediation contractor will ensure that the necessary environmental management and safety controls are in place. These will include but are not limited to:

- Site Specific Health and Safety Plan and site induction.
- Necessary environmental controls and safety measures.

Site establishment is to be undertaken in accordance with the above documents as prepared by the contractor.

Adequate water supply will be required for dust control purposes.

Requirements for environmental management and occupational health and safety are discussed in Section 7.

6.4 Soil Remediation Strategy

6.4.1 Soil Remediation

Full time supervision of remediation and validation will be undertaken by MA and will be completed in general accordance with NSW EPA (1995). A photographic record of works shall be compiled as part of remediation procedures.

1. Remedial Excavation

   Remedial excavation will target and excavate contaminatied fill areas identified in MA (2012 a) and outlined in Attachment A. Remediation procedures include:

   i. Remedial excavations completed by contractor under supervision and guidance of an experienced MA environmental engineer.

   ii. An isobutylene calibrated photo-ionisation detector (PID) will be utilised for field screening for volatile organic compounds (VOC) in soil prior to sampling. Soil samples will be placed in "zip-lock" bags and allowed to equilibrate prior to screening of head-space VOC. PID readings, locations, and depths will be documented and used to direct remedial excavation.

   iii. Validation shall be conducted as outlined in Section 6.5.

2. Stockpiling Contaminated Soils

Excavated spoil from each remedial excavation shall be stockpiled separately for waste classification assessment. Stockpile location and volume shall be recorded by MA. This procedure shall be adopted to eliminate mixing of wastes between stockpiles and minimise cost of disposal.

3. Site Surveying

Site survey shall be required to identify validation extents and quantify volumes of remediated spoil and fill excavated from site. We recommend a survey is completed at completion of remedial excavation, once excavation extents are validated.

6.5 Soil Validation Procedures

Soil validation procedure is:

i. Samples will be collected from excavation walls at rate of 1 per 10 lineal metres for each identified contaminated soil zone or layer.

ii. Samples collected from excavation floors. Final sampling rate to be determined following site inspection. Where soil excavation base typical sampling rates are 1 per 25 m^2. Where rock excavation base, visual inspection may be adopted.

iii. As a minimum, one floor sample and one sample per wall section will be collected from each excavation.

iv. Sample depth and location within excavation will be documented.

v. Validation samples collected for laboratory analysis will be preferably taken directly from surface being sampled. Where sampling utilises excavation machinery, samples shall be taken from the centre of the excavator bucket from undisturbed bulk soil material.

vi. Validation samples will be analysed by a NATA accredited testing laboratory, for criteria listed in Table 3 and compared against remediation criteria provided.

vii. Where validation samples exceed adopted remediation criteria, further remedial excavation shall be completed followed by further validation testing until validation is complete.

6.6 Waste Management

6.6.1 Waste Classification Assessment

All excavated spoil to be removed from site is to be assessed in accordance with NSW DECC (2009) waste classification guidelines. Spoil excavated from each known fill area and contamination point, shall be placed into separate stockpiles for waste classification. Sampling and analytical requirements are as follows:

- Stockpiles shall be sampled at a rate of 1 per 25 m^3.
- Analysed for TRH/BTEX, PAH, OC/OP pesticides, PCB, heavy metals, and asbestos.
- Where concentrations exceed contamination thresholds (CT1 or CT2) in NSW DECC (2009) TCLP analysis shall be undertaken to assess leachable concentrations.
- Preparation of a waste classification document for offsite disposal of spoil to licensed landfill.

6.6.2 Waste Disposal, Materials Tracking and Management

Stockpiled contaminated spoil shall be recorded on a site diagram and daily site logs by the remediation contractor and supervising MA engineer. These documents shall be updated daily and kept in the site office. The daily site log shall record the area in which work was conducted for that day, general description of the works completed, onsite movement of materials, etc.

Material being disposed of offsite will require tracking. This shall entail recording of vehicle registration numbers, number of truck movements, approximate volumes of materials transported. Materials tracking documentation is to be supplied to MA upon completion of remediation works, along with tipping documents supplied by the accepting landfill.

Contaminated spoil should be disposed of to a landfill suitably licensed to accept the specified waste. The disposal of contaminated material to landfill should be undertaken by appropriately qualified and licensed (where applicable) contractor.

6.7 Quality Control/Quality Assurance

The following field QA/QC measures will be completed and reported for all material sampled:

- Collection of intra-laboratory duplicate samples at a rate of 1 per 10 primary samples (minimum 1 per day of sampling) to assess sampling analytical process and laboratory replication of results.
- Collection of daily equipment rinsate samples to assess decontamination procedures.
- Daily trip spikes and trip blanks to assess VOC cross-contamination and losses.

All samples will be analysed by a NATA accredited testing laboratory. The analytical laboratory will be required to perform internal quality control procedures specific to analytical methods and guidance documents. These include, but not limited to the following:

- Laboratory blanks - Analysed with each set of samples to assess analytical accuracy.
- Duplicate - Complete duplicate analysis of a sample from the process batch to assess reproducibility of results.
- Matrix Spike – Used to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
- Surrogate Spike – Assessment of matrix effects and sample preparation losses.

6.8 Data Assessment

Laboratory data will be reviewed by MA and assessed by applying data validation guidelines. The data will be compared to the remediation criteria. Statistical interpretation of validation data may be required to establish that the remediation goals have been met. Based on comparison, areas that have under gone satisfactory remediation will be identified and will be designated by MA as "No Further Action Required." Where the remediation criteria have not been met, MA will communicate to the client which parts of the site require further remediation and repeat remediation and validation processes.

6.9 Reporting

6.9.1 Validation Reporting

A site validation report will be prepared at the completion of remediation works. This report shall document the remediation and validation sequence, detail all validation sampling and results of assessment. The document shall also include details regarding any remaining site contamination, and identify residual risks posed by remaining contaminants.

7 Site Management Plan for Remediation

7.1 Site Management Plan

A site management plan (SMP) for the remediation to be prepared by the Civil Contractor prior to commencing remediation works. The objectives of the site management plan will be to:

- Protect the health of site workers and the general public during the remediation works.
- Ensure the works do not negatively impact on potentially sensitive environmental receptors and comply with applicable environmental legislation.

The SMP should include (but not necessarily be limited to):

- Site access and security.
- Worker facilities.
- Surface water and groundwater management.
- Soil management.
- Stockpile management.
- Noise and vibration control.
- Air quality.
- Traffic management.
- Hazardous materials (including potential asbestos contaminated materials, fuel and chemical management).
- Control of spillages and vehicular tracking of impacted soils off site.
- Transport and disposal of contaminated soil.
- Waste management.
- Site signage and contact numbers.
- Material tracking and documentation.

- Designation, delineation and control of access to various work zones.
- Community consultation.
- Occupational health and safety (including risks posed by contamination).
- Inductions and awareness of personnel accessing the site during remediation.
- Contingency management.
- Monitoring requirements.

A Health and Safety Plan (HSP) for the remediation will be prepared by the contractor in accordance with relevant legislation, codes of practice and guidelines. The HSP will address (but not necessarily be limited to):

- Roles and responsibilities.
- Training and Competency.
- Hazard Identification and Risk Assessment (including asbestos).
- Control Measures including Personal Protective Equipment (PPE).
- Site Access and Signage.
- Incident and Emergency Response.
- SWMS.
- Audits.

Health and safety and environmental control measures will be as per the approved plans prepared by the Contractor. Some potential measures that could be adopted to protect from hazards posed by contamination are discussed in the following sections. Note that these are provided as guidance only. All parties involved in the remediation and validation of the site are responsible for assessing the risks posed by their activities and adopted appropriate control measures.

7.2 Monitoring Requirements

During excavation and movement of fill materials onsite it is recommended that an MA engineer is present on site during this process to observe and record the condition of the fill material. This is additional to ACM matters covered in Section 7.3 and project contingency plan arrangements (Section 9). Such recorded observations will be included in a Validation Report, to be completed at the conclusion of remediation.

7.3 Asbestos Management Plan

Prior to the commencement of remediation works onsite, an Asbestos Management Plan (AMP) shall be produced outlining:

- Occupation health and safety requirements.
- Personnel responsibilities.
- Purpose of the remediation.
- Description of works.
- Decontamination processes.
- Waste disposal.
- Contingency plans.

The appropriately licenced contractor undertaking the asbestos works may, in addition to the AMP, required a NATA Accredited Air Monitoring Consultant / Occupational Hygienist to conduct asbestos air monitoring to determine and report on airborne asbestos fibre generated during normal operations and activities, as per Enhealth (2005) guidelines.

7.4 Site Access

It is recommended that a fence is constructed along the remediation areas, with signage erected. A gate should be installed to allow access, access controls must remain in place during site. During asbestos works, signs identifying "No unauthorised access" asbestos removal works in progress are required.

7.5 Traffic Management

Prior to exiting the site, vehicles shall be required to pass through a stabilised exit point to remove potentially contaminated soil that may

have accumulated while onsite. Prior to leaving the site, during the decontamination phase, earthworks machinery are required to decontaminate upon plastic sheeting laid beneath vehicles, with all accumulated potentially contaminated soil removed. Plastic sheeting and contaminated soils collected should be disposed of with classified waste, or placed in plastic bags marked "Asbestos Waste" for subsequent offsite disposal.

7.6 Worker Facilities

Facilities for workers at the site must be supplied in accordance with the NSW Work Health and Safety Regulation 2011 including the relevant Codes of Practice.

During asbestos works a decontamination area will be required to be established for workers immediately adjacent to the designated work area. Disposable coveralls and respiratory mask, once removed will be disposed of in bags marked "Asbestos Waste" for subsequent offsite disposal. Footwear will also be decontaminated in this area.

Lunch rooms and toilet/washing facilities shall be separate from decontamination areas and designated work areas.

7.7 Site Inductions

Prior to starting works, site workers involved in the project shall attend a site-specific safety induction.

Documented evidence of the safety induction/s must be readily available on site and will be recorded on forms. The contractor should supply site workers including visitors to the site with appropriate PPE as outlined in Section 7.11.

7.8 Stormwater and Soil Management

The contractor will put in place adequate stormwater runoff, run-on and sediment control measures for the remedial works to avoid sediment discharge to adjacent areas and the storm water system (if present) and degradation of the water quality in nearby waterways.

7.9 Noise

To mitigate noise impacts which may arise as a result of remedial works, the contractor will undertake works in accordance with state and local noise regulations. The contractor's machinery, including machinery hired by the contractor, should be in good working order so that abnormal machine noise is avoided.

7.10 Dust Control

Site personnel, the public, adjacent neighbours and the environment need to be protected from the effects of dust created during the works. The works shall be conducted, and dust suppression techniques shall be employed, such that there shall be no visible generation of dust. The site and open working areas used by machinery will be dampened down periodically to reduce dust generation. The factors that contribute to dust generation include:

- Wind blowing across a cleared surface of the ground.
- Loose stockpiled material.
- The movement of machinery over the loose unsealed surface of the working site.
- Moisture content of the soil.

During the remediation works, the following methods must be employed to minimise dust generation and distribution:

- Dampening the surface of the site and working area with a water cart or similar control.
- Protecting stockpile materials by wind brakes and / or wetting down the surface of the stockpile.
- Ceasing work in strong winds.
- Undertaking the loading or unloading of soil as close as possible to the stockpiles to prevent the spread of loose material around the site.
- Covering over the excavation and stockpiled materials overnight or at weekends, as necessary.

7.11 Personal Protective Equipment

To reduce short and long term health risks associated with the potential exposure to the chemicals of concern, the minimum level of PPE required for people, depending on the site activity, are listed below. Specific requirements for works with ACM are to be provided in the site AMP.

Body Protection: High visibility disposable coverall should be worn by personnel entering and/or working within the designated work area, with high visibility clothing/vest requisite for the remainder of the site.

Eye Protection: Eye protection may be required to prevent eye injuries resulting from contact with contaminated soil or liquid. Safety glasses are required to be worn by site personnel during handling of soil and liquid.

Foot Protection: Steel toed boots will be worn by all on-site personnel.

Skin Protection: Long sleeves and trousers must be worn at all times. Skin protection will be required to prevent absorption of contaminated soil into the body. Gloves should be worn by personnel involved in site activities which will come into contact with contaminated soil or liquid. Sunscreen (SPF +30) shall also be worn to protect exposed skin areas not covered by PPE from the sun.

Hearing Protection: Personnel who are likely to be exposed to potentially harmful noise levels on site will wear hearing protection (ear plugs or ear muffs).

Respiratory Protection: Where works involve ACM, respiratory protection will be required to prevent inhalation of asbestos fibres. Final requirement for respiratory protection shall change as works progress and are to be assessed and determined by the principal contractor as works proceed.

Site personnel should be aware that personal protection equipment required to be worn may limit manual dexterity, hearing, visibility and may increase the difficulty of performing tasks. PPE places an additional strain on the user when performing work that requires physical activity.

Eating, drinking, chewing gum or tobacco, smoking or any practice that involves hand to mouth transfer increases the probability of ingestion of foreign matter into the body. Hands must be thoroughly washed before eating, drinking or smoking. Clothing which becomes dirty from onsite work should be washed separately from other clothing.

8 Remediation Contacts

Names and phone numbers of appropriate personnel for contact during the remediation will be provided prior to commencement of remediation work.

9 Contingency Plan for Remediation and Redevelopment

9.1 Contingency for Unidentified Contamination

It is considered possible that as yet unidentified contamination could be present on the site. To contend with unexpected contamination, site contingency planning shall be required.

If material is encountered which appears contaminated and different from previously identified contaminated material, or if additional point sources of contamination (e.g. buried drums, ACM conduits, oily or odorous materials) are encountered, the following procedures should apply:

1. Suspicious material/soil to be excavated and separately stockpiled on bunded, strong, impermeable plastic sheeting, protected from erosion, with seepage retained.

2. Excavation works in vicinity to cease until inspection completed by MA.

3. Based on initial inspection, MA will provide interim advice on construction health and safety, soil storage and soil disposal to allow works to proceed.

4. Sampling and analysis of the material to assess human health, potential environmental impacts and waste disposal requirements.

5. Assess implications of newly identified material for RAP and amend as required.

10 References

Australian Standards 2601 (1991) - *Demolition of Structures*

Australian Standard 1940 (1993) *Storage and Handling of Flammable and Combustible Liquids*.

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Martens and Associates (2012a) *Stage1 and 2 Contamination Assessment, 1, DP1021332 and Lot 458, DP1063107, Mundamia, NSW*, ref: 1002863JR01V01.

Martens and Associates (2012b) *Geotechnical Assessment, 1, DP1021332 and Lot 458, DP1063107, Mundamia, NSW*, ref: 1002863JR01V01.

NEPC (1999) *National Environmental Protection (Assessment of Site Contamination) Measure*

NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* (Second Edition).

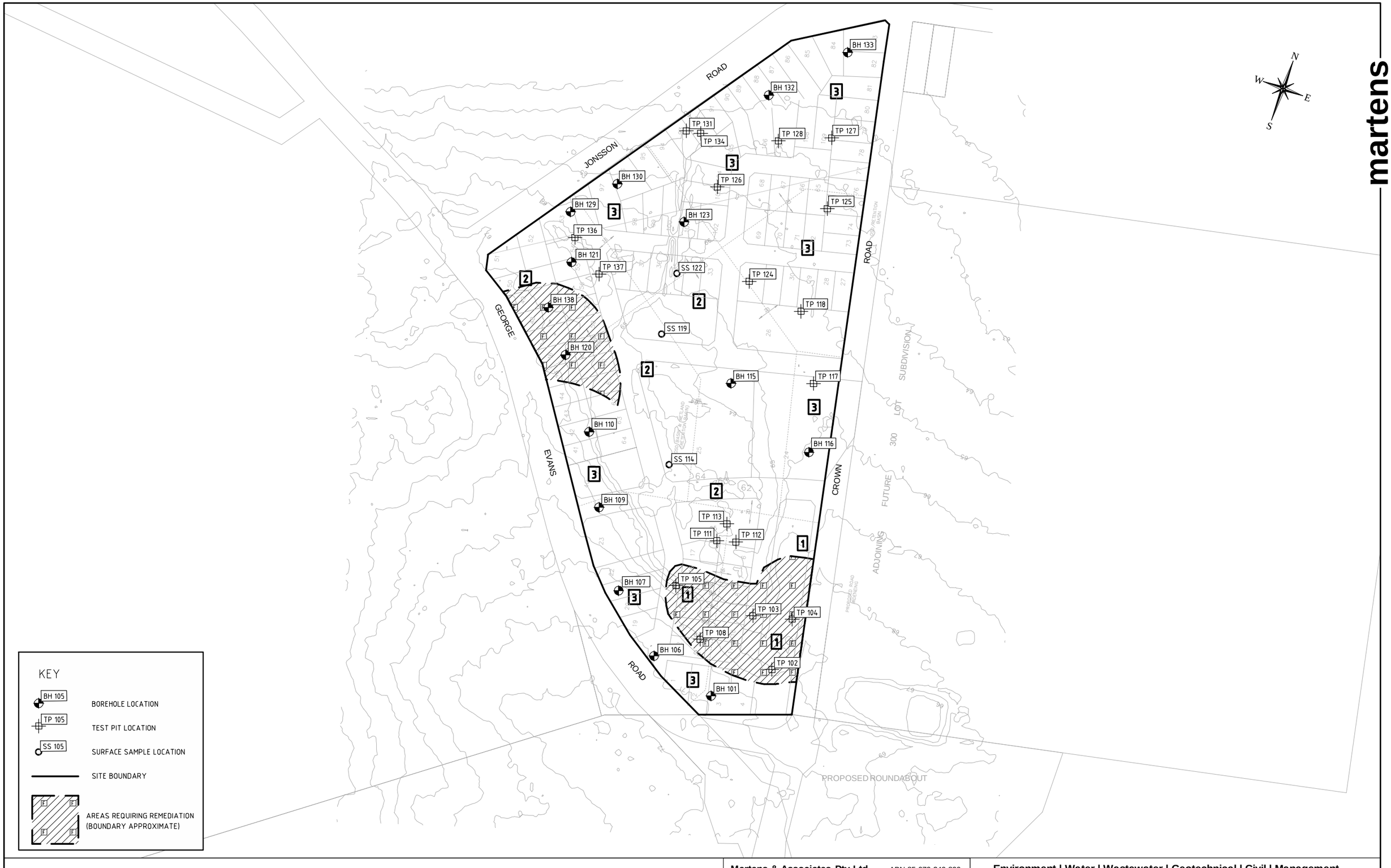
NSW DECC (2009) *Waste Classification Guidelines.*

NSW EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites.*

NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines*.

NSW OEH (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.*

11 Attachment A – Site Plan and Remediation Outline



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KEY

- BH 105 — BOREHOLE LOCATION
- TP 105 — TEST PIT LOCATION
- SS 105 — SURFACE SAMPLE LOCATION
- SITE BOUNDARY
- AREAS REQUIRING REMEDIATION (BOUNDARY APPROXIMATE)

PAGE BAR SCALE

0 30 60 90 120 150

UNITS – METRES

SCALE – 1:1500 @ A1 1:3000 @ A3

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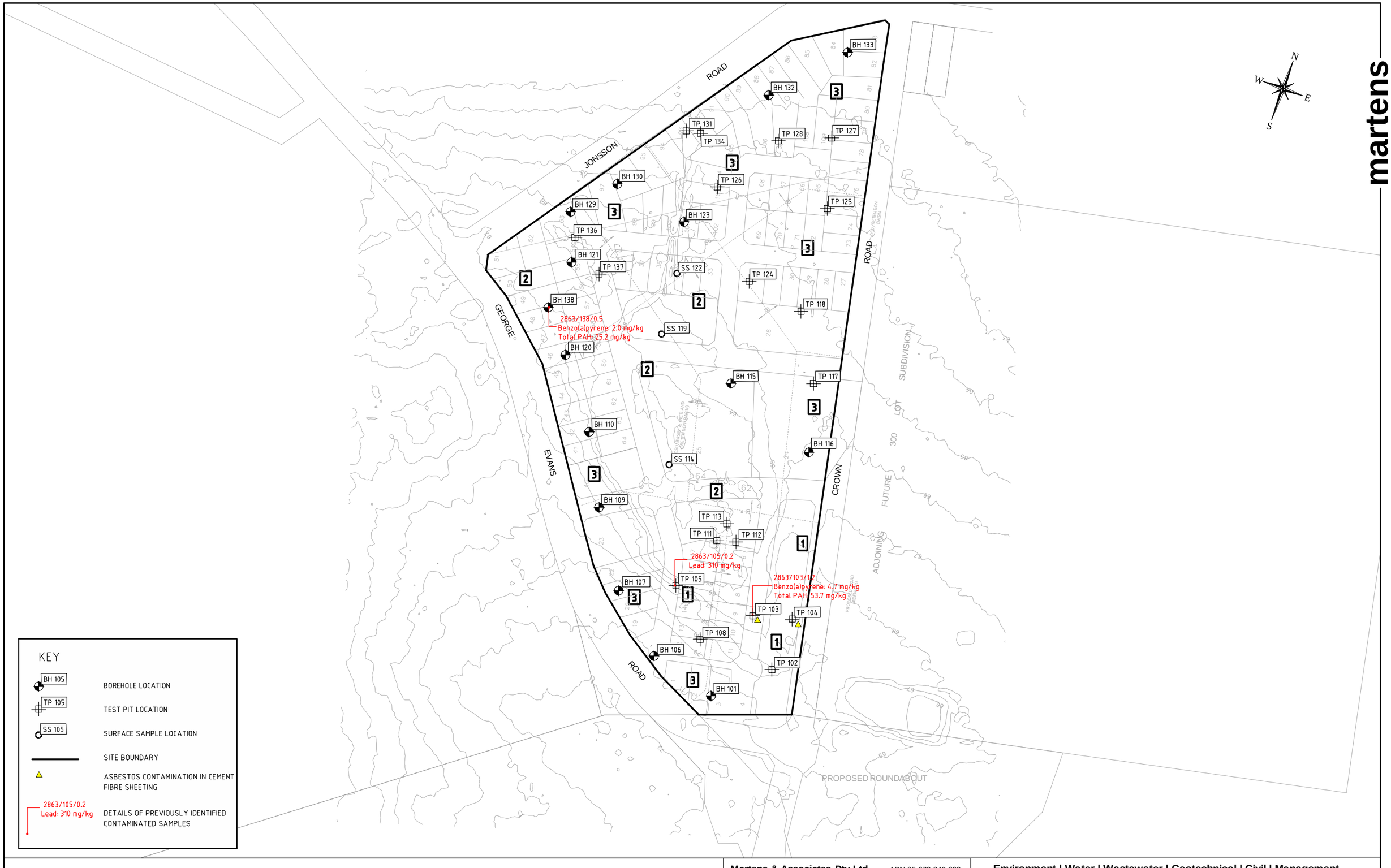
Drawn:	BM	**PRELIMINARY OUTLINE OF REMEDIATION AREAS**	Drawing No./ID: **DA002**
Approved:	AN		
Date:	27.03.13		
Scale @A3:	1:3000	6/37 Leighton Place, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767 Email: mail@martens.com.au Internet: http://www.martens.com.au	Project: P1002863 / File: JD01V01 / Revision: A



KEY

BH 105	BOREHOLE LOCATION
TP 105	TEST PIT LOCATION
SS 105	SURFACE SAMPLE LOCATION
	SITE BOUNDARY
	ASBESTOS CONTAMINATION IN CEMENT FIBRE SHEETING
2863/105/0.2 Lead: 310 mg/kg	DETAILS OF PREVIOUSLY IDENTIFIED CONTAMINATED SAMPLES

PAGE BAR SCALE

0 30 60 90 120 150

UNITS - METRES

SCALE - 1:1500 @ A1 1:3000 @ A3

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TESTING PLAN

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Project:	File:	Revision:
P1002863	JD01V01	A