AE Design Partnership

Remedial Action Plan: Proposed Commercial Subdivision, 1111 – 1141 Elizabeth Drive, Cecil Park NSW

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P1706121JR07V01
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General Abbreviations

AASS	Actual acid sulfate soil
ABC	Ambient background concentrations
ACM	Asbestos containing material
AEC	Area of environmental concern
AF	Asbestos fines
AMP	Asbestos Management Plan
ANZECC	Australia and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Governments
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure (2013)
ASS	Acid sulfate soil
ASSMAC	Acid Sulfate Soils Management Advisory Committee
AST	Above ground storage tank
BGL	Below ground level
BH	Borehole
BTEXN	Benzene, toluene, ethylbenzene, xylene, naphthalene
CEMP	Construction Environmental Management Plan
COC	Chain of custody
COPC	Contaminants of potential concern
DA	Development application
DBT	Dibutyltin
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DNAPL	Dense non aqueous phase liquid
DP	Deposited Plan
DPI	NSW Department of Primary Industry
DPIW	NSW Department of Primary Industry – Water
DQI	Data quality indicators
DQO	Data quality objectives
DSI	Detailed Site Investigation
EAC	Ecological assessment criteria
EIL	Ecological investigation level
EMP	Environmental Management Plan
EPA	NSW Environmental Protection Authority
EQL	Estimated quantitation limit (Interchangeable with PQL and LOR)
ESA	Environmental Site Assessment
ESL	Ecological screening level
FA	Fibrous asbestos
GIL	Groundwater investigation level
HIL	Health investigation level
HM	Heavy metals
HSL	Health screening level
IA	Investigation area
ISQG	Interim Sediment Quality Guideline
ITP	Inspection Testing Plan
LGA	Local government area
LNAPL	Light non aqueous phase liquid
LOR	Limit of reporting (Interchangeable with EQL and PQL)
MA	Martens & Associates Pty Ltd
mAHD	Metres, Australian Height Datum
mbgl	Metres below ground level

MBT	Monobutyltin
MNA	Monitored natural attenuation
MPE	Multi phase extraction
NAPL	Non aqueous phase liquid
NATA	National Association of Testing Authorities
ND	No data
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
OCP	Organochloride pesticides
OEH	NSW Office of Environment and Heritage
OPP	Organophosphorus pesticides
PACM	Potential asbestos containing material
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soil
PCB	Polychlorinated biphenyl
PCEMP	Post Construction Environmental Management Plan
PESA	Preliminary Environmental Site Assessment
PFAS	Per- and polyfluoroalkyl substances
PID	Photoionisation detector
ppb	Parts per billion
ppm	Parts per million
PQL	Practical quantitative limit (Interchangeable with EQL and LOR)
PSI	Preliminary Site Investigation
QA/QC	Quality assurance / quality control
RAC	Remediation acceptance criteria
RAP	Remedial Action Plan
HHRA	Human Health Risk Assessment
RPD	Relative percentage difference
SAC	Site assessment criteria
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environmental Planning Policy
SIL	Soil investigation level
SOP	Standard operating procedure
SWL	Standing water level
SWMS	Safe Work Method Statement
TB	Trip blank
TBT	Tributyl tin
TCLP	Toxicity characteristics leaching procedure
TEQ	Toxic equivalency factor
TP	Test pit
TPH	Total petroleum hydrocarbons
TRH	Total recoverable hydrocarbons
TS	Trip spike
UCL	Upper confidence limit
UPSS	Underground petroleum storage system
UST	Underground storage tank
VHC	Volatile halogenated compounds
VOC	Volatile organic compounds
WHS	Work health and safety
WHSP	Work Health and Safety Plan

1 Introduction

1.1 Overview

This Remedial Action Plan (RAP) has been prepared by Martens and Associates Pty Ltd (MA) for AE Design Partnership (the Client) to document remediation methodology and validation requirements as part of a development application (DA) for a proposed commercial subdivision at 1111 – 1141 Elizabeth Drive, Cecil Park, NSW (the site).

A Detailed Site Investigation (DSI) was previously prepared for the site (MA, 2020), which identified asbestos containing material (ACM) within fill material at the site, requiring remediation. A detailed summary of the DSI (MA, 2020) is provided in Section 3, and it is recommended the full DSI report be read in conjunction with this report.

This report has been prepared in general accordance with ASC NEPC (1999, amended 2013), NSW EPA (2017) and NSW EPA (2020).

This report has been prepared in response to the proposed acquisition of part of the site which will reduce the site area by 26,617 m^2. The acquisition of the area of the site proposed by TfNSW has required amendments to be made to the proposed development and development footprint which require a re-assessment of the impacts of the design which responds to the new development Site.

1.2 Proposed Development

Based on the development plans provided (AE Design Partnership, 2017), MA understands that the proposed development will include the subdivision of the site into 11 commercial lots and construction of internal roads and associated infrastructure.

All existing structures at the site are to be demolished as part of the proposed subdivision. The proposed subdivision layout is provided in Attachment B.

1.3 Objectives and Scope of the RAP

RAP objectives are:

- Provide details of data gaps and data gap closure methodology.
- Set remediation goals and criteria.
- Define the extent of areas requiring remediation.

- Review possible remedial options.
- Provide rationale for the preferred remedial option.
- Provide a remediation plan to implement and validate the preferred remediation option.
- Provide a site management plan for the remediation.
- Outline contingency plans.
- Outline regulatory compliance requirements.

2 Site Background Information

2.1 Location and Setting

Site information is summarised in Table 1. The site and surrounds are shown in Attachment A.

Table 1: Site background information.

Item	Description / Detail
Site address	1111 – 1141 Elizabeth Drive, Cecil Park NSW
Legal identifier	Lot 2 Sec 4 DP 2954
Surveyed area	7.38 ha (Project Surveyors, 2017)
Local Government Area	Fairfield City Council
Current zoning and land use	Site is not currently zoned (NSW Planning Portal, 2020). Site is currently used for rural purposes.
Site description	Rural property with cleared grazing land, dwelling, and multiple sheds and stockpiles.
Surrounding land uses	Low density residential to the north, cleared grazing land and tree cover to the east and the south.
Topography	Located in slightly to moderately undulating terrain, with grades up to approximately 10%. Site elevation ranges between approximately 116.5 mAHD at Elizabeth drive in the south, to approximately 100.5 mAHD at the northern site boundary (Project Surveyors, 2017).
Geology and soil mapping	The Penrith *1:100,000 Geological Series Sheet 9030* (1991) describes site geology as Bringelly Shale consisting of shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. The NSW Environment and Heritage eSPADE website identifies the site as having soils of the Luddenham variety consisting of shallow dark podzolic soils or massive earthy clays on crests; moderately deep red podzoic soils on upper slopes; moderately deep yellow podzoic soils and prairie soils on lower slopes and drainage lines.
Surface hydrology	Site drainage is via overland flow to a tributary of Ropes Creek along the north western site boundary. Ropes Creek is located approximately 3 km to the east of the site.

3 Previous Site Investigation

Site contamination has been assessed in the following documents:

- Martens and Associates (2018) *Preliminary Site Investigation: Lot 2 Sec 4 DP2954, 1111 – 1141 Elizabeth Drive, Cecil Park, NSW*. Ref. P1706121JR01V01.
- Martens and Associates (2020) *Detailed Site Investigation: Proposed Commercial Subdivision, 1111 – 1141 Elizabeth Drive, Cecil Park, NSW*. Ref. P1706121JR05V01.

3.1 Preliminary Site Investigation

A Preliminary Site Investigation (PSI) was completed (MA, 2018) which provided a review of historical land use and current activities that have the potential to cause contamination at the site. A summary of key findings from the PSI is provided in Table 2.

Table 2: PSI summary (MA, 2018).

Investigation Details	Investigation Task and Findings
Scope of works	o Desktop review of previous reports, aerial photographs, online databases and land title information. o Review of local geology, hydrogeology and topography maps. o Site walkover to review existing site conditions.
Key findings of historic site review and walkover	Historical aerials indicated that the site had been partially cleared and used as grazing land since before 1930, with a dwelling and multiple sheds constructed sometime between 1930 and 1955. The central portion of the site was used as market gardens from 1955 to sometime between 1970 and 1991. Multiple former dams were constructed on the site which were backfilled sometime between 1991 and 2004. The PSI site walkover identified the following: o An occupied two storey brick dwelling with tile roofing was located at the end of the main driveway from Elizabeth Drive, with an attached carport to the north. o A number of timber and corrugated metal sheds were located in the vicinity of the dwelling, typically storing scrap materials, farming equipment and vehicle parts. o Several piles of scrap metal, general refuse, excavated rock and plastic storage containers were observed to the north east of the large shed, along the south eastern site boundary. o A small animal enclosure constructed of timber and fibre cement board and with dirt flooring was located to the north of the brick dwelling. A dilapidated abandoned dwelling constructed of timber and fibre cement board (PACM) was located to the north of the animal enclosure. o An area to the north of the abandoned dwelling was used for the storage of a truck, multiple pieces of farming equipment, and stockpiles of metal and soil. o Two raised fill pads were observed on the site, to the east and the west of the brick dwelling.

Investigation Details	Investigation Task and Findings
	o A large dam with raised banks was located in the north of the site bordering the neighbouring property to the north. o A stockpile of soil and refuse (tyres, plastics, brick, concrete, steel drums) was located to the south east of the dam. o Two smaller dams were located in bushland in the north-western portion of the site. Both dams were partially backfilled with soil and general refuse including PACM.
Identified AEC and COPC	Identified AEC and COPC included: o Dwelling, with COPC consisting of heavy metals, pesticides and asbestos. o Sheds and abandoned dwelling, with COPC consisting of heavy metals, hydrocarbons, pesticides and asbestos. o Former market gardens, with COPC consisting of heavy metals and pesticides. o Fill from unknown sources within fill mounds, fill pads and dams, with COPC consisting of heavy metals, hydrocarbons, pesticides and asbestos. o Vehicle and farming equipment storage, with COPC consisting of heavy metals and hydrocarbons.
Recommendations	The PSI concluded that a DSI would be required incorporating soil sampling and analysis for COPC within the AEC identified at the site.

3.2 Detailed Site Investigation

A DSI was completed for the site by MA (2020). Key findings are outlined in Table 3.

Table 3: DSI summary (MA, 2020).

Investigation Details	Investigation Task and Findings
Scope of works	o Review of PSI (MA, 2018). o Site inspection and intrusive subsurface investigation and sampling of AECs as identified in the PSI (MA, 2018), where access was available. o Laboratory analyses of selected samples for identified COPC and assessment against site acceptance criteria (SAC). o Preparation of a report in general accordance with the relevant sections of ASC NEPM (1999, amended 2013), NSW EPA (2017) and NSW EPA (2020).
Field investigations	Field investigations undertaken on 3 and 6 June, 2020 included: o Excavation of 21 test pits (TP201 – TP221) across the site (primarily targeting areas where fill material was observed in the PSI) using a 5.5 t excavator to a maximum investigation depth of 1.55 m below ground level (mbgl). o Excavation of 11 boreholes (BH222 – BH233) adjacent to existing structures and across the site using a hand operated pushtube to a maximum investigation depth of 0.8 mbgl. o Collection of representative soil samples from test pits and boreholes for laboratory analysis. o Collection of 30 near surface soil samples (SS01 – SS30) from former market garden areas for laboratory analysis as triple composite samples. o Collection of 13 near surface soil samples (SS31 – SS43) from adjacent to existing structures for laboratory analysis.

Investigation Details	Investigation Task and Findings
	○ Collection of five potential asbestos containing material (PACM) samples for laboratory analysis. ○ Collection of QA / QC samples for laboratory analysis.
Key findings	DSI walkover and field investigations confirmed the presence of a number of fill pads, stockpiles and filled in dams at the site. Anthropogenic inclusions such as glass, brick and concrete were observed within fill profiles at the site. The following soil samples exceed the adopted site assessment criteria (SAC): ○ **Zinc in sample 6121/SS36 (950 mg/kg)** exceeded the adopted ecological assessment criteria (700 mg/kg). Statistical analysis of zinc concentrations for all soil samples collected during the DSI was undertaken in accordance with NEPM (2013) methodology. The 95% upper confidence limit (UCL), standard deviation and maximum zinc concentrations were found to be within acceptable limit for the proposed commercial land use. The DSI concluded that no further assessment or remediation of zinc is required. Five PACM material samples were collected during DSI investigations. All material samples analysed returned positive identification of asbestos: ○ **MS01** collected from **TP204** at **0.1 mbgl**. ○ **MS02** collected from **TP208** at **0.1 mbgl**. ○ **MS03** collected from ground surface of the main driveway. ○ **MS04** collected from ground surface in the westernmost former dam. ○ **MS05** collected from **SS16** at **0.05 mbgl**.
Data gaps	Due to access restrictions, sampling was limited to soils adjacent to existing site structures. The footprints of the structures were not assessed and have been identified as data gaps in the investigation. Additionally, the DSI recommended that additional delineation of fill areas be completed. Assessment for asbestos fines (AF) and fibrous asbestos (FA) will be required and further assessment should consider the sampling density requirements outlined in the *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Site in Western Australia* (WA DoH, 2009).
Conclusion	The DSI recommended that a RAP be prepared for the site, outlining remediation and management requirements to address identified asbestos contamination at the site. The DSI recommended further investigation of the identified data gap areas following demolition of structures.

Sampling locations and identified ACM are shown on the DSI sampling plan in Attachment A.

4 Data Gap Closure

4.1 Data Gap Extents

The following data gaps were identified in the DSI (MA, 2020) as requiring additional assessment:

1. Data Gap A (Existing dwelling and shed footprints) – Sampling beneath the existing dwelling and sheds at the site has not been undertaken at this stage. Further assessment is required to determine if any residual contamination exists beneath existing structures.

2. Data Gap B (Asbestos impacted fill) – The extent of asbestos contamination and depth / lateral extent of ACM impacted fill material has not been fully delineated. Further assessment is required to meet sampling density as recommended in WA DoH (2009) guidelines, assess fill material for asbestos fines and fibrous asbestos (AF/FA), and additional excavations to determine the extents of the impacted fill.

Prior to the commencement of other works under this RAP, data gap closure works are to be undertaken and the scope of the RAP is to be confirmed based on results of these works.

4.2 Data Gap Closure

4.2.1 Data Gap A

Following demolition of structures, the following works are required to address the data gaps noted above:

1. Walkover and inspection of structure footprints.

2. Visual assessment of structure footprints for obvious signs of contamination (i.e. PACM fragments, soil staining or odours).

3. Collection of near surface soil samples from each structure footprint in accordance with NSW EPA (1995) Sampling Design Guidelines. A minimum of 2 soil samples are to be collected from each structure footprint.

4. Collected soil samples to be laboratory analysed for heavy metals, TRH, BTEXN, PAH, OC and OP pesticides and asbestos.

5. Laboratory results are to be compared to site assessment criteria (SAC) adopted in the DSI (Section 6) to confirm contamination status.

4.2.2 Data Gap B

In order to better delineate the ACM impacted fill extent, the following works are to be undertaken:

1. Additional excavation and collection of representative soil samples in identified fill areas to meet sampling density as prescribed in WA DoH (2009) guidelines.

   At this stage, an additional 11 sampling locations (in addition to the testing locations completed during the DSI) will be required to meet the specified WA DoH sampling density for a 'known' asbestos in soil site scenario.

2. Collected soil samples are to be field screened using a 7 mm sieve to determine w/w% concentration of bonded asbestos. An additional sample is to be collected at each sampling location and laboratory analysed for AF/FA.

6. Laboratory results are to be compared to site assessment criteria (SAC) adopted from NEPM (2013) asbestos HSLs (Section 6).

4.3 Data Gap SAC

The SAC for data gap investigation (Table 4) are adopted from the DSI (MA, 2020).

Table 4: Site acceptance criteria (SAC) for data gaps.

Media	Adopted Guidelines	Applicability
Soil	ASC NEPM (2013)	Health investigation levels (HIL) HIL D – Commercial / industrial to based on the proposed land use. Health screening levels (HSL) HSL D – Commercial / industrial for clay based on the proposed land use and site soil conditions. Asbestos Health screening levels (HSL) HSL D – Commercial / industrial land use based on the proposed land use. Ecological Investigation Levels (EIL) Site specific EILs, derived using methodology outlined in NEPM (2013) for the protection of terrestrial ecosystems for commercial / industrial land use. The following physiochemical properties were applied based on laboratory testing results from onsite soils: o pH value of 6 o CEC value of 17 cmol/kg

Media	Adopted Guidelines	Applicability
		o Contamination is considered as "aged" (>2 years) o From an area of "low" traffic volumes. Ecological Screening Levels (ESL) Commercial / industrial use, fine soil. Management Limits Commercial / industrial land use, fine soil.

4.4 Reporting

Following completion of data gap closure investigations, findings are to be documented in the validation report. If any additional contamination is identified, this RAP may need to be amended to address additional areas of contamination.

5 Remediation Areas

5.1 Conceptual Site Model

The conceptual site model (CSM) developed in the DSI was assessed and refined based on the identified contamination, and shown in Table 5.

Table 5: Contamination sources and potential receptors.

Contamination Source	Contaminant Pathway	Receptors
Asbestos contaminated soil (fill)	Inhalation of contaminated dust particles	Future site workers both in the short term (construction workers) and long term as part of future commercial / industrial land use. Site occupants and visitors Nearby site occupants and visitors

5.2 Extent of Remediation Required

Based on DSI (MA, 2020) findings, site contamination was limited to ACM impacted fill material. Testing to date has identified areas of fill material, primarily located in former dams, soil stockpiles and in two fill pads located adjacent to the existing onsite dwelling. DSI testing identified five instances of ACM observations at separate testing locations as shown on the site testing plan in Attachment A. The plan also estimates current fill extents which have been nominated for further testing as part of the data gap closure investigations (Section 4.2).

For the purposes of this RAP, the extent of remediation is currently defined as site fill areas where asbestos has been identified. Current remediation areas include the fill pads adjacent to the existing dwelling, stockpiles to the north of the existing dwelling and the former dam in the north western corner of the site. Remediation areas are shown in Attachment A. Following the recommended data gap closure investigation (data gap B), the extent of asbestos impacted fill material can be better defined. This may see a reduction in the volume of asbestos impacted fill requiring remediation. The results of the data gap closure investigations are not, however expected to change the overall remediation approach outlined in the following Sections of the RAP.

6 Remediation Goals and Options

6.1 Remediation Goal

The remediation goal to minimise potential health impacts from asbestos in soils contamination during both the short term (during construction works) and long term commercial operation of the site.

6.2 Assessment of Remedial Options

6.2.1 Assessment of Remedial Options for Soil Remediation

A review of soil remedial technologies has been undertaken to establish which technology or combination of technologies is most suitable to meet the site remediation objectives. Soil remediation options were considered, with reference to NSW EPA (2017) and NEPM (2013), for the preferred hierarchy of options for site clean-up and / or management, as follows:

- On site treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level.
- Offsite 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, if required.
- Cap and contain material onsite with an appropriately designed barrier.
- 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 remediation options considered possible for the site is presented in Table 6.

Table 6: Review of soil remediation options.

Remediation Options	Advantages	Disadvantages	Comments
Capping and containment	o Excavation and removal of contaminated soils not required, reducing tipping costs. o Preliminary earthwork plans indicate that the site is a net fill site requiring the importation of material to achieve design levels. The imported material could be used as part of a site capping layer.	o Human health risk is mitigated by burying, but contamination remains onsite. o A long term Environmental Management Plan (EMP) required to manage remaining contamination. o Note on title indicating presence of contamination.	Containment and capping would be a suitable remediation technique to address ACM impacted fill. In consideration of the proposed development, construction of a containment cell and capping layer would be required to either relocate impacted fill to a location beneath hardstand or to provide an adequate depth of cover. Burial of contaminated fill onsite places future land use restrictions on the site with the requirement of an EMP and note on title. While technically feasible, the option of onsite burial is not considered to be the most suitable remediation method for the site due to the ongoing management requirements associated with retaining contamination onsite. The proposed development includes a commercial subdivision which may results in multiple lot owners and a variety of potential future commercial land uses. Retaining contamination may be restrictive of further development options and creates management requirements for the proposed subdivided future site.
Offsite disposal	o Provides the shortest timeframe for remediation. o Removes human and ecological risks and long term management requirements. o Meets redevelopment objectives. o Suitable to remove heavy metal and PAH contamination.	o Cost for material transport and disposal charges. o Cost associated with classifying wastes prior to offsite disposal. o Additional importation of material will be required to meet current design levels.	This proven and reliable technique for managing onsite contamination is suitable as it removes identified contamination and associated risk to humans and environment. Additionally, as demolition works are required for the proposed development at the site, excavation and offsite disposal of impacted material may be undertaken following demolition works. This remediation option is considered the most appropriate remediation technique to remove risk while not creating a long term management requirement.

6.2.2 *Preferred Soil Remediation Option*

In consideration of soil remediation technologies presented in Table 6, the proposed development and the Client's preference the excavation and offsite disposal of impacted soil is considered the most suitable remediation option.

Details of remediation and validation methodology are provided in Section 7.

7 Remediation Plan

7.1 Introduction

The following sections outline works required to remediate identified contamination such that the site is fit for the proposed development.

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

7.2 Stage 1 – Notifications

The following notifications are required:

- Council is to be notified 30 days before commencement of works if works are Category 2. If Category 1, a prior development consent is required for the remediation works.
- A notice of completion of remedial works must be given to Council within 30 days after completion of remedial works.
- The appointed remediation contractor will be required to lodge a notification of asbestos remediation works to SafeWork NSW.

7.3 Stage 2 – Appointment of Remediation Contractor / Environmental Consultant

Appointment of a suitability qualified environmental consultant and a suitably licensed remediation contractor is required prior to undertaking remediation works. The environmental consultant should be engaged to supervise all remediation and validation works including the excavation, assessment, waste classification and offsite disposal of asbestos impacted fill in accordance with the methodology outlined in this RAP.

Currently, only 'bonded' non friable asbestos contamination has been identified which requires a SafeWork NSW 'Class B' licensed remediation contractor to complete the works. If during the data gap closure works, asbestos material is identified that is deemed to be 'friable' by a suitably qualified person, then a 'Class A' licenced contractor will be required to complete asbestos remediation works.

7.4 Stage 3 – Site Establishment

Prior to any remediation / construction works, the site shall be prepared for the works. This will include:

- Establishment of site offices, work sheds and amenities for site workers.
- Appropriate decontamination facilities for personnel and plant / equipment.
- Appropriate physical barriers and site signage is to be erected surrounding site areas requiring remediation. Physical barriers are to be designed with consideration to potential health and safety risks which may arise from the handling of asbestos contaminated soil.
- Installation of appropriate dust control measures (i.e. dust screens and water sprays).
- Establishment of site holding areas for contaminated material. Site areas nominated to store material are to have appropriate environmental controls in place including storm water diversion, erosion and sedimentation controls and dust suppression.

7.5 Stage 4 – Remediation Work

The adopted remediation strategy is outlined in the following sections.

7.5.1 ACM Impacted Fill

Prior to commencement of remediation works, data gap closure investigations are to be undertaken (See Section 4).

The proposed works sequence to address ACM impacted fill shall be:

1. Excavate fill in the remediation area until underlying natural material is exposed. Residual clays are expected beneath fill material.

   Estimated extents of ACM impacted fill material is shown on the site plan in Attachment A, the final extents will be confirmed following data gap closure and excavation works.

2. Excavated material is to be placed either:

   i. Directly into trucks for offsite disposal if *insitu* waste classified; or

ii. In a designated contaminated material holding area set up during the Stage 3 – Site Establishment.

3. If not *insitu* waste classified, excavated material is to be sampled for waste classification purposes as outlined in Section 7.6.

4. The appointed environmental consultant shall validate remediation excavations, as outlined in Section 7.7.

7.6 Stage 5 - Waste Classification

7.6.1 Waste Classification

Prior to any soil being removed from site, a formal waste classification is to be prepared for the material in accordance with the NSW EPA (2014) Waste Classification Guidelines.

Final waste classification will be subject to data gap closure investigations outlined in Section 4.

7.6.2 Waste Disposal, Materials Tracking and Management

Any relocation or movement of contaminated spoil onsite shall be recorded on daily site logs by the appointed remediation contractor. These documents shall be updated daily and kept in the site office.

Offsite disposal will require material tracking for site validation. This shall entail recording of vehicle registration numbers, number of truck movements and approximate volumes of material transported. Materials tracking documentation is to be supplied to the environmental consultant upon disposal, along with tipping documents supplied by the receiving landfill.

Transportation of waste shall be, where applicable, undertaken by appropriately qualified and licensed contractor.

7.7 Stage 6 – Site Validation

Prior to the site being declared fit for the proposed land use, a validation report documenting the completed remediation works and results of site validation testing must be prepared by the appointed site environmental consultant. The following sections outline the site validation requirements.

7.7.1 Data Quality Objectives

The data quality objective (DQO) process is required to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of the site. Table 7 outlines the process used to

develop the DQO for the site post remediation and were developed with reference to NSW EPA (2017) and ASC NEPM (2013).

Table 7: Data quality objectives for the assessment of soil.

Step 1 **Stating the Problem**	Previous site investigations have identified the presence of ACM impacted fill material at the site, which requires appropriate remediation before the site can be deemed suitable for the intended commercial subdivision.
Step 2 **Identifying the Decision(s)**	To assess the suitability of the site for future commercial use, decisions are to be made based on the following questions: o Has the completed remediation works removed the identified risk to future site users? o Is the current soil quality suitable for the intended commercial land use? o Are there any aesthetic impacts remaining in the remediated areas? o Is any future management of site soils required?
Step 3 **Identification of Inputs to the Decision**	The inputs to the validation of the site will include: o Existing assessment data. o Results of data gap closure investigations / works. o Observations during remedial activities. o Soil sampling results from remediation and validation works. o Assessment of analytical results against site remediation acceptance criteria (RAC).
Step 4 **Study Boundary Definitions**	Study boundaries are as follows: o Lateral – Lateral boundary of the assessment is defined by the remediation area extents, site boundaries and proposed redevelopment areas. o Vertical – Vertical boundary will be governed by the maximum depth of impacted fill. o Temporal – The dates of site inspections, remediation and validation works.
Step 5 **Development of Decision Rules**	The decision rules for this remediation area are as follows: o If the concentration of contaminants in the soil data collected from a remediation area do not exceed the remediation acceptance criteria (RAC), then the area can be confirmed as validated. o If the concentration of contaminates in the soil data collected from a remediation area exceeds the RAC, then additional remediation or management strategies will be required for that remediation area. o If the concentration of contaminates in the soil data collected from a remediation area exceeds the RAC and the site boundary has been reached, further management is required in the area. o All material nominated for offsite disposal shall be classified in accordance with NSW EPA (2014) Waste Classification Guidelines. o Material tracking is to be appropriately documented and waste disposal dockets validated.

Step 6 **Specification of Limits on Decision Errors**	Asbestos data is to be interpreted on a strict compliance / noncompliance basis for each sample. For interpretation of waste classification data guidance found in ASC NEPM (1999 amended 2013) Schedule B2 regarding 95% upper confidence limit (UCL) may be applied. Schedule B2 states that the 95% UCL of the arithmetic mean provides a 95% confidence level that the true population mean will be less than or equal to this value. Therefore a decision can be made based on a probability that 95% of the data collected will satisfy the site acceptance criteria. A limit on decision error will be 5% that a conclusive statement may be incorrect.
Step 7 **Optimisation of Sampling Design**	Validation based on the remediation option, to ensure that all the necessary data is collected to confirm site suitability the proposed land use.

7.7.2 Validation Criteria

To ensure that site remediation works have rendered the site fit for the proposed commercial land use, asbestos health screening levels for commercial/industrial land use shall be adopted as site validation criteria. A summary of adopted criteria is presented in Table 8.

Table 8: Adopted asbestos screening criteria.

Form of Asbestos	Adopted Screening Level (w/w)
Bonded ACM	0.05%
FA and AF	0.001%
All forms of asbestos	No visible asbestos for surface soils

7.7.3 Validation Sampling Program

Following excavation of asbestos impacted fill, the following validation processes are to be completed:

- Visual validation – Visual validation of the area to confirm remediation excavation extend to natural material and no ACM remains.
- Sieve analysis – Bulk (10L) soil samples from walls and bases of remediation excavation to be collected at a rate of 1 per 25 m^2 (excavation base) and 1 per 10 linear meters for excavation walls. Bulk samples are to be sieved using a 7 mm sieve to confirm the absence of bonded ACM within the soils.
- Laboratory analysis – If the data gap closure investigation identifies any AF/FA as part of the proposed laboratory analysis, 500 mL soil samples, completed in conjunction with the ACM sieving works will be required as part of the validation testing program. Collected samples are to be analysed for AF/FA and compared to the adopted validation criteria outlined in Table 8.

7.7.4 Validation Test Failure

The following steps shall be taken should the remediation area fail validation:

- If visual inspection of the remedial excavation fails, addition excavation is to occur under the supervision of the environmental consultant.
- If sieving works identify ACM within a bulk sample, further excavation at the sample location is to occur and the material is to be resamples and sieved.
- If laboratory results are required for AF/FA validation (having been identified in the data gap closure investigation) and a sample is found to exceed the validation criteria, further excavation is to occur under the guidance of the environmental consultant and the area is to be resampled.

Any additional material excavated is to be disposed offsite with other remediation spoil and waste classified as per Section 7.6. The process is to be repeated until validation is successful.

7.7.5 Imported Fill Protocol

Where any fill is imported to the site during remediation or for further earthworks, the fill is to be documented and verified as ENM, VENM or other waste exempt material. Waste classification documentation is to be provided and reviewed by the appointed environmental consultant prior to material importation.

All imported material is to be tracked and inspected by the environmental consultant at initial importation.

7.7.6 Quality Control/Quality Assurance

Where samples are to be collected for waste classification purposes, the following field QA/QC measures will be used for sampling:

- Collection of one intra laboratory duplicate sample per ten primary samples or one per sampling event.
- Collection of one inter laboratory duplicate sample per twenty primary samples.
- Rinsate samples are to be collected from any non-single use sampling equipment used.

All samples will be analysed by a NATA accredited testing laboratory.

7.7.7 Data Assessment

Laboratory data will be reviewed by the environmental consultant and assessed by applying data validation guidelines. The data will be compared to the adopted validation criteria or waste classification guidelines. Adequacy of remediation shall be assessed on a strict compliance or noncompliance basis for each sample.

Where duplicate samples have been collected, analysis of data shall identify, then use for assessment, the highest result of either the primary or duplicate.

Statistical interpretation of both validation and or waste classification data may be required to establish remediation goals and material waste classification.

7.7.8 Validation Reporting

A site validation report is to be prepared by the environmental consultant at the completion of remediation works. This report shall document remediation and validation sequence, detail all sampling and results of the assessment, provide material tracking data for material taken from the site and document any imported material (and testing or supporting documentation for it).

The document shall include details regarding any remaining site contamination, and identify residual risks posed by remaining contaminants, and provide comment on whether remediation has been successful and suitability of the site for the proposed land use.

8 Site Management Plan for Remediation

8.1 Overview

A site specific Construction Environmental Management Plan (CEMP) and worker health and safety plan (WHSP) are to be prepared by the appointed Contractor prior to the commencement of site works. The following sections are intended as a guide to the information that should be included in these plans.

8.2 Construction Environmental Management Plan

A site specific CEMP shall be prepared to ensure the works do not negatively impact on potential receptors (humans and environment) and comply with applicable environmental legislation.

Based on the site condition and proposed remediation method, primary environmental hazards requiring management during remedial works may include:

- Soil management.
- Noise and odour controls.
- Air quality / dust control.
- Erosion and sediment control measures.

Additional onsite management issues that may be included in the CEMP include:

- Site access and security.
- Signage and contact Information.
- Traffic control.
- Hours of operation.
- Imported material.

Suggested requirements for these management points are discussed in the following subsections.

8.2.1 Soil and Stockpile Management

The following points should be addressed regarding soil and stockpile management:

- Detailed records of stockpile material, location and volume are to be prepared and kept onsite. Stockpile records are to be maintained and updated with any changes (i.e. offsite disposal).
- No placement of soil or other material on Council properties (footpaths / nature strips) unless prior approval is sought.
- All contaminated stockpiles are to be covered by appropriate weighted plastic liners to reduce the potential for air pollution.
- All stockpiles containing soil or material identified as contaminated shall be stored in clearly marked areas with appropriate signage.

8.2.2 Noise Control

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.

All works are to be undertaken with the designated working hours in Section 8.2.9.

8.2.3 Odour Control

Based on the identified site contaminants and site location relative to surrounding receptors, odour is not considered to be major environmental concern. Should odours be encountered contingency measures including the covering of temporary stockpiles should be implemented.

8.2.4 Air Quality / Dust Control

Currently, identified asbestos contamination has been limited to 'bonded' material and asbestos air monitoring is therefore not required during remediation works. If during the data gap closure works, material is identified that is deemed to be 'friable' by a suitably qualified person, asbestos fibre air monitoring will be required in accordance with SafeWork NSW regulations. If required, air monitoring locations are to be determined by a suitability qualified consultant.

Dust control procedures are to include:

- Cover of all soil loads entering or exiting the site.
- Use of water sprays across disturbed areas.

8.2.5 Site Access and Security

Prior to works commencing, barricades shall be erected to control access to the designated work area, along the proposed remediation area boundary. Site security and access controls must remain in place during all onsite construction works.

8.2.6 Signage and Contact Information

Security fencing and appropriate signage around all open excavations must be installed and maintained by the contractor.

A sign displaying the contact details of the contractor (including the onsite foreman or manager) shall be displayed for the duration of onsite works.

8.2.7 Traffic Control

Prior to exiting the site, vehicles shall have wheels washed at a designated 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 for subsequent offsite disposal.

8.2.8 Hours of Operation

Onsite works are only permitted during the following hours as outlined in NSW EPA Interim Construction Noise Guideline specifications:

- Monday – Friday: 7:30 am – 5:30 pm.
- Saturday: 7:30 am – 3:30 pm.
- Sunday and public holidays: No work permitted.

In certain instances, these hours may be modified when the contractor has the approval of Council.

8.3 Worker Health and Safety Plan (WHSP)

Worker health and safety of all onsite workers or visitors is the responsibility of the contractor. The purpose of a WHSP is to provide relevant health and safety information for all personnel working on or visiting the site.

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

- WHS legislative requirements.
- Hazardous materials identification (including fuel and chemical management).
- Induction requirements. All onsite personnel and visitors must be suitably inducted prior to entering the site.
- Location of worker facilities.
- Designation, delineation and control of access to various work zones.
- Community notification.
- Roles and responsibilities.
- Training and competency.
- Hazard identification and risk assessment.
- Control measures including personal protective equipment (PPE).
- Incident and emergency response.
- Safe work method statement(s).
- Toolbox meetings.
- Audits and inspections.

8.3.1 WHS Legislation and Standards

All onsite works should comply with the WHS act, regulations, codes of practice, and with relevant Australian Standards. As a minimum all work must comply with:

- Workplace Health and Safety Act (2011).
- Workplace Health and Safety Regulation (2017).

- AS 2436 (2010 R2016) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.
- Managing the Work Environment and Facilities Code of Practice (December 2018).
- Managing Noise and Preventing Hearing Loss at Work Code of Practice (October 2018).
- Hazardous Manual Tasks Code of Practice (October 2018).
- Safe Work Australia – How to Safely Remove Asbestos: Code of Practice (2019).
- Work Health and Safety Consultation, Co-operation and Co-ordination Code of Practice (May 2018).

8.3.2 Hazard Assessment

A WHS hazards assessment is to be completed by the contractor and incorporated into the WHSP. Key hazards may include:

- Asbestos containing material and asbestos fibres in air.
- Onsite chemical hazards (storage of fuels, contaminated soils).
- Heat exposure for workers.
- Buried services.
- Noise.
- Dust.
- Operation of heavy equipment.
- Operation of electrical equipment.

8.3.3 Site Inductions

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

Documented evidence of the safety induction must be available onsite. The contractor must supply site workers and subcontractors with appropriate PPE as outlined in Section 8.3.4.

8.3.4 Personal Protective Equipment

Table 9 below lists the personal protective equipment (PPE) required to prevent exposure to contaminants, in designated remediation areas.

Table 9: Personal protective equipment

Type	Description	When Required
Head protection	Hard hat	All site activities
Eye protection	Safety glasses	All site activities
Hand protection	Disposable nitrile gloves	Soil sampling activities
	Cut resistant gloves	Manual handling activities
Body protection	High visibly clothing	All site activities
	Sunhat, sunscreen	All site activities
Foot protection	Steel toed boots	All site activities
Hearing protection	Ear plugs or ear muffs	Site activities likely to generate potentially harmful noise levels
Respiratory protection	Minimum P2 rated particulate respirator	During asbestos remediation works

Site personnel should be aware that personal protective 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.

9 Environmental Regulatory Requirements

9.1 State Environmental Planning Policies

Compliance with all approved and notice requirements of State Environmental Planning Policy 55 - Remediation of Land (SEPP 55) is required.

9.2 Asbestos Licences

All asbestos removal shall be undertaken in accordance with relevant work health and safety regulation including but not limited to:

- Safework NSW – Applicant Guide for Asbestos Licences and Notifications (2019).
- Safe Work Australia – How to Safely Remove Asbestos: Code of Practice (2019).

9.3 Waste Disposal Requirements

All waste soil must be classified in accordance with EPA (2014) waste classification guidelines prior to offsite disposal to a suitably licenced waste receiving facility.

Waste classification documentation must be kept for validation of the remediation works.

10 Remediation Contacts

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

11 Contingency Plan for Remediation and Redevelopment

11.1 Overview

It is considered possible that unexpected situations may occur during remediation and site redevelopment works including the possibility to uncover unidentified contamination. A site contingency plan for managing unexpected situations should be prepared by the Contractor. Unexpected situations that may arise include:

1. Uncovering types of contamination that are not presently identified.
2. Generation of unacceptable levels of dust.
3. Generation of unacceptable asbestos fibres.
4. Generation of an unacceptable level of noise.
5. Excessive rainfall, and collection of excessive water in excavations.

The following sections outline contingency procedures for the events listed above.

11.2 Unexpected Finds

All site personnel are to be aware of their responsibilities under the unexpected finds protocol and are to report any potential signs of unexpected contamination to the site manager immediately.

In the event of uncovering unexpected finds during remedial works, the following steps are to be undertaken by the contractor:

- Cease all work in the area and notify site foreman / manager and environmental consultant.
- Notify any relevant authorities (e.g. fire brigade) if an emergency response is required.
- Construct temporary barricading to prevent worker / public access to any unexpected and / or unknown substances.
- Install appropriate stormwater diversion and sediment controls as required.
- Notify relevant authorities that the contractor is legally required to notify (e.g. NSW EPA and / or Council).

- Site foreman / manager is to arrange site inspection by the environmental consultant to assess the unexpected find and determine if any further investigation, management or remedial action is required in the area.

The environmental consultant is to prepare an assessment and, if required, validation of each unexpected find to the contractor prior to the recommencing of works ceased as a result of the unexpected find.

All unexpected finds are to be documented in the site Validation Report prepared by the environmental consultant at the end of remediation works.

11.3 Unacceptable Level of Dust

Contingency measures must be prepared to control unacceptable dust levels. Excessive dust may be identified by workers, dust monitoring equipment or community complaints. Actions to control excessive dust can include:

- Increased use of water sprays.
- Covering soil stockpiles.
- Changing work protocols (e.g. avoiding work on windy days).

11.4 Unacceptable Level of Noise

Contingency measures must be prepared to control unacceptable noise levels. Excessive noise may be identified by workers, noise monitoring equipment or community complaints. Actions to control excessive noise can include:

- Identification and isolation of the source of noise.
- Modification of the action of the source to reduce the noise.
- Erection of temporary noise barriers.

11.5 Excessive Rainfall

Contingency measures must be prepared to control the effects of excessive rainfall. Actions to control the effects of excessive rainfall can include:

- Construction of sediment and surface water controls.
- Diversion of surface water away from excavations, soil stockpiles and active work areas.
- Appropriate stockpile covers.

12 Conclusion

This RAP has outlined additional investigation, remediation and validation requirements to address data gaps and identified ACM contamination at 1111 – 1141 Elizabeth Drive, Cecil Park, NSW.

From review of DSI (MA, 2020) findings and the proposed development objectives, excavation and offsite disposal of ACM impacted fill material was considered the most appropriate remediation technique.

This RAP provides data gap closure, remediation and validation methodology to manage risk posed by contamination and render the site suitable for the proposed development.

Subject to the findings of the data gap assessment and validation assessment works to confirm the successful implementation of the remediation strategy outlined in the RAP, the site may be considered fit for the proposed commercial subdivision.

13 References

Landcom (2004) *4th Ed. Managing Urban Stormwater: Soils and Construction.*

Martens and Associates Pty Ltd (2018) *Preliminary Site Investigation: Lot 2 Sec 4 DP 2954, 1111 – 1141 Elizabeth Drive, Cecil Park, NSW*. Ref. P1706121JR01V01.

Martens and Associates (2020) *Detailed Site Investigation: Proposed Commercial Subdivision, 1111 - 1141 Elizabeth Drive, Cecil Park, NSW*. Ref. P1706121JR01V01.

NEPC (1999, amended 2013) *National Environmental Protection (Assessment of Site Contamination) Measure*. Referred to as NEPM (1999, amended 2013).

NSW Department of Environment & Heritage eSPADE, NSW soil and land information (www.environment.nsw.gov.au).

NSW Department of Mineral Resources (1991) *Penrith 1:100,000 Geological Sheet 9030.*

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

NSW EPA (2009) *Interim Construction Noise Guideline.*

NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste.*

NSW EPA (2017) *3rd Ed. Contaminated Sites: Guidelines for the NSW Site Auditor Scheme.*

NSW EPA (2020) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.*

State Environmental Planning Policy No 55 – *Remediation of Land.*

14 Attachment A – Figures

Map	Title
EN01	Site Overview
EN02	Fill Extents Plan
EN03	Remediation Areas
EN04	Data Gaps

0 50 100 150 200 250 m

1:5000 @ A3

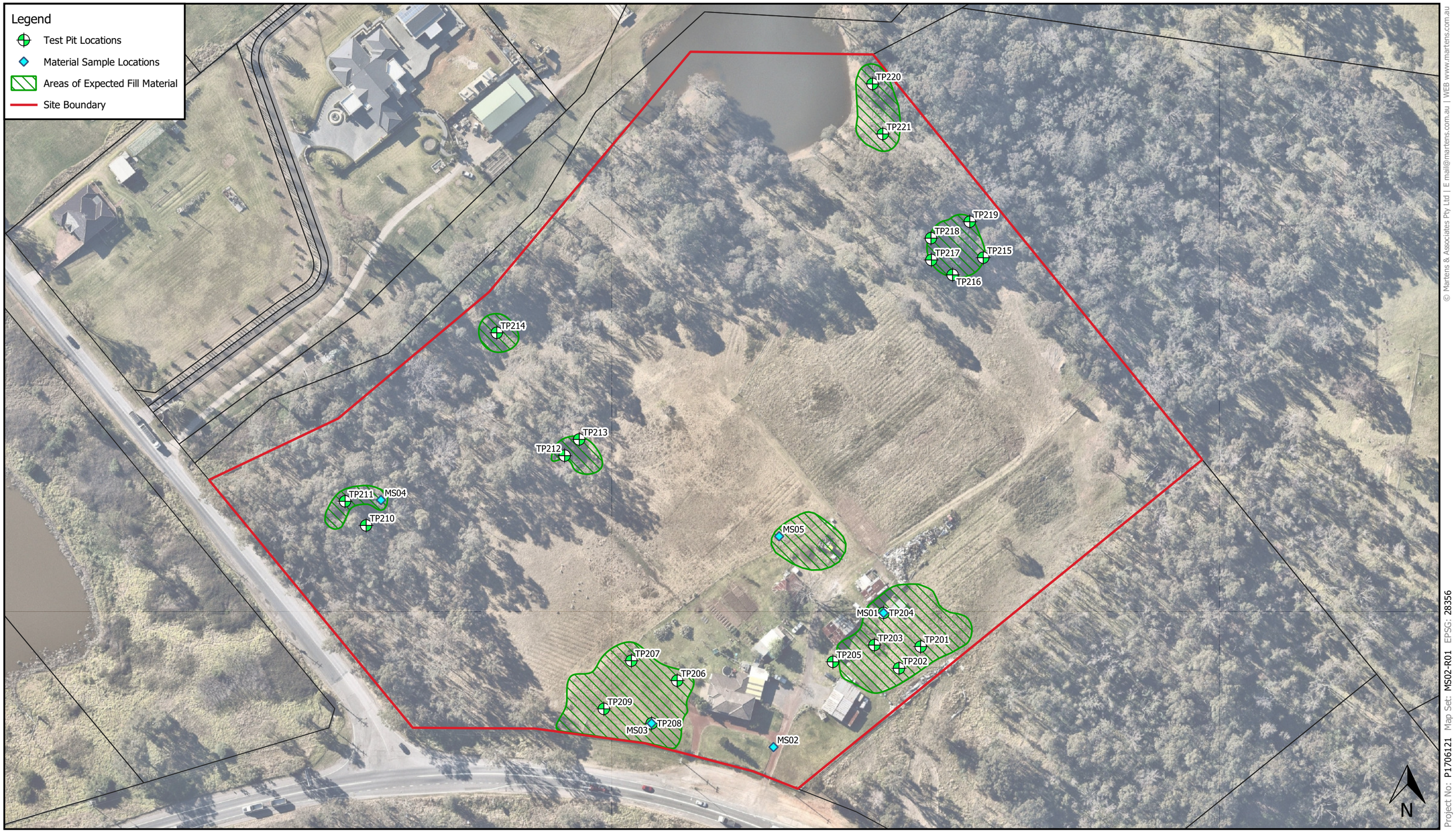
Map Title / Figure:

Site Overview

martens
Environment | Water | Geotechnics | Civil | Projects

EN01	Map
1111 - 1141 Elizabeth Drive, Cecil Park, NSW	Site
Proposed Commercial Subdivision	Project
Remedial Action Plan	Sub-Project
AE Design Partnership	Client
11/08/2020	Date

Project No: P1706121 Map Set: MS02-R01 EPSG: 28356



Project No: P1706121 Map Set: MS02-R01 EPSG: 28356

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1:1500 @ A3

Viewport A

Note: Based on MA (2020) findings

martens
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Map Title / Figure:

Fill Extents Plan

EN02	Map
1111 - 1141 Elizabeth Drive, Cecil Park, NSW	Site
Proposed Commercial Subdivision	Project
Remedial Action Plan	Sub-Project
AE Design Partnership	Client
11/08/2020	Date

Legend

- Current Remediation Areas
- Site Boundary

0 10 20 30 40 50 m

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Viewport A

Note: Subject to data gap closure findings.

N

Map Title / Figure:

Remediation Areas

EN03	Map
1111 - 1141 Elizabeth Drive, Cecil Park, NSW	Site
Proposed Commercial Subdivision	Project
Remedial Action Plan	Sub-Project
AE Design Partnership	Client
11/08/2020	Date

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Project No: P1706121 Map Set: MS02-R01 EPSG: 28356

Project No: P1706121 Map Set: MS02-R01 EPSG: 28356

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Viewport A

Map Title / Figure:

Data Gaps

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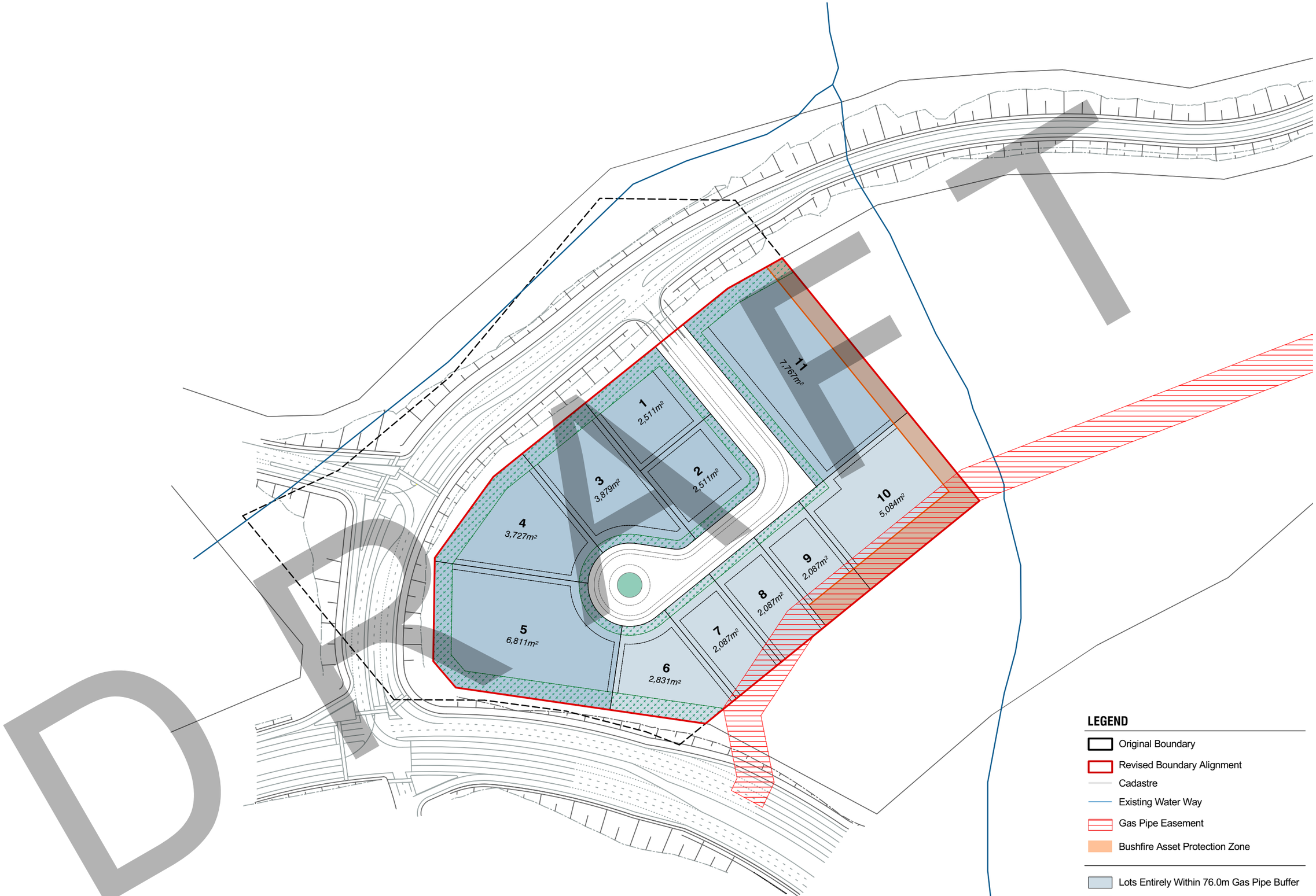
EN04	Map
1111 - 1141 Elizabeth Drive, Cecil Park, NSW	Site
Proposed Commercial Subdivision	Project
Remedial Action Plan	Sub-Project
AE Design Partnership	Client
11/08/2020	Date

15 Attachment B – Proposed Development Plans



LEGEND

- Original Boundary
- Revised Boundary Alignment
- Cadastre
- Existing Water Way
- Gas Pipe Easement
- Bushfire Asset Protection Zone
- Lots Entirely Within 76.0m Gas Pipe Buffer
- Lots Outside 76.0m Gas Pipe Buffer
- Landscaping Setback
- Built Form Setback

PROJECT
1111-1141 ELIZABETH DRIVE,
CECIL PARK

1:2,000 @ A3

TITLE
REVISED CONCEPT

DRAWN	CHECKED	DATE	ISSUE
SB		26/05/2020	A