

Alliance Geotechnical

Engineering | Environmental | Testing

**Remedial Action Plan for
Lot 1 and 2 in DP1232692, Lot 810, Portion of Lot 811, Lot
839, Lot 840, Lot 841, and Lot 842 in DP2475**

**135-165 Tenth Avenue and Portion of 140, 160 and 170
Eleventh Avenue, Austral, NSW**

Prepared for: Sydney Catholic Schools

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We give you the right information to make the right decisions

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EXECUTIVE SUMMARY

Alliance Geotechnical Pty Ltd (AG) was engaged by Sydney Catholic Schools (the client), to prepare a remedial action plan (RAP) for 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW.

AG has the following project appreciation:

- the site is proposed for redevelopment, comprising child care centre, primary school, secondary school, and associated infrastructure (including car parking, paved areas and playing fields);
- Contamination reports have been submitted for the site by EIS in 2016 (a & b) & AG in 2018;
- A remedial action plan (RAP) is required to address recommendations in the contamination assessments and NSW Department of Planning and Environment Secretary's environmental assessment requirements (SEARs); and
- The client's preferred remedial strategy for unacceptable contamination risks on site, is removal and offsite disposal.

The objective of this project is to:

- prepare a remedial action plan to address potentially unacceptable contamination exposure risks identified in previous contamination assessments for the site, including addressing identified data gaps in the contamination status of the site.

The scope of works undertaken to address the investigation objectives, included:

- a desktop review; and
- reporting.

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure risk, based on the proposed land use setting. AG notes that the client would prefer that the remedial works be undertaken in a manner that does not result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long term environmental management plan (EMP).

The extent of remediation on the site is considered to be the following:

- AEC05 to AEC18

Further assessment of AEC02, AEC03 and AEC04 is required to assess whether remedial works are required in these AEC.

Based on the extent of the remediation identified in **Section 6.2**, and the proposed site redevelopment works, remedial options considered appropriate for this site include:

- In-situ containment by capping;
- Ex-situ containment by capping;
- Excavation and removal off site.

Taking into consideration the client's objectives for the site, and the nature and extent of the proposed site redevelopment works, and the client's preference of removal of contamination risks from the site, the preferred remedial option for the site is excavation and offsite disposal (with consideration given to further assessment works to refine the extent of remedial works required).

Based on the information presented in previous contamination assessment reports, and observations made by on site, AG concludes that the remedial goal can be achieved and the site made suitable for the proposed land use setting, subject to:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan; and

- Preparation of a site validation report.

AG recommends that waste classification, remediation monitoring and validation works should be undertaken by a suitably experienced environmental consultant.

This report must be read in conjunction with the limitations set out in **Section 11**.

1. INTRODUCTION

1.1. Background

Alliance Geotechnical Pty Ltd (AG) was engaged by Sydney Catholic Schools (the client), to prepare a remedial action plan (RAP) for 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW.

AG has the following project appreciation:

- the site is proposed for redevelopment, comprising child care centre, primary school, secondary school, and associated infrastructure (including car parking, paved areas and playing fields);
- Contamination reports have been submitted for the site by EIS in 2016 (a & b) & AG in 2018;
- A remedial action plan (RAP) is required to address recommendations in the contamination assessments and NSW Department of Planning and Environment Secretary's environmental assessment requirements (SEARs); and
- The client's preferred remedial strategy for unacceptable contamination risks on site, is removal and offsite disposal.

1.2. Objectives

The objective of this project is to:

- prepare a remedial action plan to address potentially unacceptable contamination exposure risks identified in previous contamination assessments for the site, including addressing identified data gaps in the contamination status of the site.

1.3. Scope of Work

The scope of works undertaken to address the investigation objectives, included:

- a desktop review; and
- reporting.

2. SITE IDENTIFICATION

The site is registered as Lot 1 and 2 in DP1232692, Lot 810, Portion of Lot 811, Lot 839, Lot 840, Lot 841, and Lot 842 in DP2475.

The approximate geographic coordinates of the middle of the site, inferred from Google Earth were 33°55'51.71"S and 150°48'28.44"E.

The locality of the site is set out in **Figure 1**.

The general layout of the site is set out in **Figure 2**.

The site covers an area of approximately 10.95 hectares.

A copy of a detail and level survey plan of the site is presented in **Appendix A**.

3. GEOLOGY, ACID SULFATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

3.1. Geology

AG (2018) reported the site was likely to be underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

3.2. Topography

The regional topography is characterised by a hill slope that generally falls to the south and south-west towards Kemps Creek. The natural site topography has been altered to accommodate the existing residential building. The overall topography of the site falls to the north at slopes between 3-4°.

3.3. Hydrogeology

AG (2018) reported that the stratigraphy of the site is expected to consist of residual clayey soils overlying relatively shallow bedrock. Based on these conditions and the results of the groundwater bore search, groundwater is not considered to be a significant resource for abstraction purposes in the immediate vicinity of the site. A perched aquifer located in the shallow subsurface is not considered to be a resource due to high salinity, poor water quality and low yield.

4. PREVIOUS CONTAMINATION ASSESSMENTS

The following reports were considered during the undertaking of this project:

- Environmental Investigation Services (EIS) 2016a, 'Stage 1 Environmental Site Assessment, for Proposed School, 135, 135A, 145, 155, 165 Tenth and 140, 160, 170 Eleventh Avenue, Austral, NSW', dated 21 April 2016, ref: E27556KrptRev3
- Environmental Investigation Services (EIS) 2016b, 'Remediation Action Plan, for Proposed School, 135, 135A, 145, 155, 165 Tenth and 140, 160, 170 Eleventh Avenue, Austral, NSW', dated 12 May 2016, ref: E27556KDrpt-RAP
- Alliance Geotechnical (AG) 2018a, 'Preliminary Salinity Assessment, 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW', dated 9 April 2018, ref: 6930-ER-1-2
- Alliance Geotechnical (AG) 2018b, 'DRAFT Supplementary Asbestos Contamination Assessment, 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW', dated 11 May 2018, ref: 6930-ER-1-1 DRAFT

A summary of these reports is presented in **Section 4.1 to 4.4**.

The inferred locations of exceedances of adopted site assessment criteria nominated in those reports, are presented in **Figures 3a** and **Figure 3b**.

4.1. Environmental Investigation Services (2016a)

The objectives of this project were to:

- Assess the potential risk for widespread soil contamination at the site;
- Assess the potential for dam water contamination at 140 Eleventh Avenue, Austral;
- Assess the potential risk to human health and the environment posed by the contaminants;
- Provide a preliminary waste classification for the off-site disposal of soil that may need to be excavated for the development; and
- Comment on the suitability of the site for the proposed land use.

The scope of works undertaken to address the project objectives, included:

- Preparation of site specific Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs);
- A review of site information and site history documents;
- A site inspection to identify areas of environmental concern (AEC);
- Preparation of a Preliminary Conceptual Site Model (CSM) to outline the AEC, Potential Contaminants of Concern (PCC) and potential receptors;
- Design and implementation of a field sampling and laboratory analysis program;
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC); and
- Preparation of a report presenting the results of the assessment.

Asbestos was detected during sampling and analysis, at eight¹ locations on the site, including in:

- A fill soil sample at EIS sampling point TP4/0.0-0.2;
- A fill soil sample at EIS sampling point TP29/0.1;
- A surface sample at EIS sampling point SS1;

¹ AG notes that EIS (2016a) reported that asbestos was detected in a sample collected from TP30/0.2, however, Table A in EIS (2016a) reported asbestos was not detected in that sample, and corresponding Envirolab certificate of analysis (batch E27556K) also reported asbestos was not detected at the reporting limit of 0.1g/kg.

- A building sample at EIS sampling point B1;
- A surface sample at EIS sampling point SS2;
- A surface sample at EIS sampling point FJS1;
- A fill soil sample at EIS sampling point TP57/0.15; and
- A fill soil sample at EIS sampling point TP60/0.2

Based on the scope of works undertaken, EIS were of the opinion that the contamination encountered at the site poses a risk to the receptors. EIS considered that the site can be made suitable for the proposed land use/development provided that the following recommendations are implemented to address the data gaps and to better characterise the risks:

- A Hazardous Materials Assessment (Hazmat) is undertaken for the existing buildings prior to the commencement of demolition works;
- The issue of asbestos cement fragments in the soil is resolved by either removing all of the topsoil/fill or identifying the extent of the problem and undertaking targeted remediation;
- A Remediation Action Plan (RAP) is prepared. The RAP will include remedial measures to be implemented to render the site suitable for the proposed land use;
- A Validation Assessment (VA) is prepared. The VA will document the success of the remediation works;
- An Asbestos Management Plan (AMP) is prepared for the site and the proposed construction works; and
- Inspections during demolition and excavation work are undertaken to assess any unexpected conditions or subsurface facilities that may be discovered between investigation locations. This should facilitate appropriate adjustment of the works programme and schedule in relation to the changed site conditions. Inspections should be undertaken by experienced environmental personnel.

4.2. Environmental Investigation Services (2016b)

The objectives of this investigation were to:

- Summarise the site contamination issue;
- Identify remediation and management measures to minimise potential risk to site receptors;
- Outline the remediation and management procedures for the site;
- Prepare a validation plan to be implemented in conjunction with the remediation work;
- Prepare a contingency plan for the remediation works; and
- Outline site management procedures to be implemented during remediation work.

The scope of works undertaken to address the project included:

- A review of background information;
- Identify potential remediation options;
- Outline the remediation procedures;
- Outline the validation sampling and analysis plan for the remediation work; and
- Preparation of the RAP report.

EIS concluded that the site could be made suitable for the proposed development provided the remediation in the RAP were successfully implemented, including a validation report.

4.3. Alliance Geotechnical (2018a)

The objective of AG (2018a) was to provide assessment and advice on salinity hazards for the site.

AG (2018b) made the following conclusions:

- Soils assessed onsite (to a depth of 1.5m below ground surface) are considered to be:
 - non-saline;
 - non-aggressive to concrete piles;
 - moderately aggressive to steel piles in the vicinity of sampling points BH5 and BH9;

- mildly aggressive to steel piles in the vicinity of sampling points BH1, BH2, BH4, BH5, BH6, BH7, BH10, BH11, BH12, BH13 and BH14; and
- non-aggressive to steel piles in the vicinity of sampling points BH3 and BH8.

4.4. Alliance Geotechnical (2018b)

The objective of AG (2018b) was to assess the nature and extent of asbestos in soils across the site, provide advice on whether the site would be suitable for the proposed redevelopment, provide advice on salinity hazards and the presence of hazardous building materials on the site and provide recommendations for further investigation, management and/or remediation (if warranted)

AG (2018b) concluded that:

- the concentrations of bonded asbestos containing materials detected in the soils at sampling points TP015, TP043, TP072, TP104, TP116, TP120, TP121, TP129, TP132, may present an unacceptable human health exposure risk;
- the concentrations of asbestos fines / friable asbestos detected in the soils at sampling points TP072, TP104, TP116, TP121, TP129, may present an unacceptable human health exposure risk;
- the detection of asbestos in soils at EIS (2016b) sampling points TP4, TP29, SS1, SS2, FJS1, TP57 and TP60, may present an unacceptable human health exposure risk;
- there is a potential for unacceptable asbestos-related human health exposure risks in soils to be present:
 - in the eastern, western and southern curtilage of the residential dwelling located on Lot 811;
 - in the soil stockpile located to the south of the residential dwelling in Lot 811; and
 - across the southern portion of Lot 811 in the vicinity of the sewage reticulation system and associated network of subsurface pipes; and
- the site could be made suitable for the proposed land use setting, subject to further assessment of the identified asbestos in soil data gaps, and the management and/or remediation of unacceptable asbestos-related human health exposure risks in soils on site.

AG (2018b) concluded that the site can be made suitable for the proposed development, provided that:

- A remedial action plan (RAP) should be prepared for the site, to address potentially unacceptable asbestos in soil related human health exposure risks at the site;
- the RAP should be prepared by a suitably experience environmental consultant with reference to NSW OEH (2011) and include (but not be limited to) the following:
 - a remedial goal for the site;
 - a strategy for addressing the identified data gaps in Lot 811;
 - an assessment of remedial options available to address the identified asbestos risks. These options may include removal offsite, in-situ containment, ex-situ containment, or a combination of these;
 - the proposed testing to validate the site after remediation;
 - a contingency plan to address unexpected finds or if the selected remedial strategy fails; and
 - a site management plan (for the remediation works).
- Consideration should be given to undertaking delineation assessment works around detected asbestos contamination, should there be a need to obtain further certainty around the nature and extent of remedial works required. The delineation work could be undertaken
 - prior to preparation of the RAP; or
 - following preparation of the RAP, with a RAP addendum issued incorporating the findings of the delineation assessment;
- Prior to demolition of the existing structures on the site, clearance certificates should be obtained from a suitably competent person, following removal of hazardous building materials (if any) from the structures; and

- Records of the lawful transport and disposal of asbestos containing materials and any other wastes removed from site, should be retained.

5. CONCEPTUAL SITE MODEL

5.1. Areas of Environmental Concern and Contaminants of Potential Concern

The site history data collected and site walkover observations made were assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AEC) and contaminants of potential concern (COPC) which have the potential to be present on site. The AEC identified are presented in attached **Figure 4a, Figure 4b and Figure 4c** and associated COPC are presented in **Table 5.1**.

Table 5.1: AEC and COPC

ID ²	Areas of Environmental Concern	Land Use Activity	Contaminants of Potential Concern
AEC02 ³	Southern and central western portion of Lot 811 (asbestos in soil data gap)	Potential uncontrolled fill / waste dumping	Asbestos
AEC03	Stockpile in Lot 811 (contamination risk data gap)	Potential uncontrolled fill / waste dumping	Hydrocarbons, pesticides, metals, asbestos
AEC04	Lot 839 (contamination risk data gap)	Potential uncontrolled fill / waste dumping and potential commercial / light industrial land use	Hydrocarbons, pesticides, metals, asbestos
AEC05	FJS1	Uncontrolled fill / waste dumping	Asbestos
AEC06	SS1	Uncontrolled fill / waste dumping	Asbestos
AEC07	SS2	Uncontrolled fill / waste dumping	Asbestos
AEC08	TP015	Uncontrolled fill / waste dumping	Asbestos
AEC09	TP043	Uncontrolled fill / waste dumping	Asbestos
AEC10	TP072	Uncontrolled fill / waste dumping	Asbestos
AEC11	TP104	Uncontrolled fill / waste dumping	Asbestos
AEC12	TP116, TP120 and TP121	Uncontrolled fill / waste dumping	Asbestos
AEC13	TP129	Uncontrolled fill / waste dumping	Asbestos
AEC14	TP132	Uncontrolled fill / waste dumping	Asbestos
AEC15	TP29	Uncontrolled fill / waste dumping	Asbestos
AEC16	TP4	Uncontrolled fill / waste dumping	Asbestos
AEC17	TP57	Uncontrolled fill / waste dumping	Asbestos
AEC18	TP60	Uncontrolled fill / waste dumping	Asbestos

5.2. Land Use Setting

AG understands that the proposed development works includes redevelopment of the site, comprising child care centre, primary school, secondary school, and associated infrastructure (including car parking, paved areas and playing fields).

² AEC01 not used as it was used in AG (2018b)

³ Previously inaccessible due to fencing and construction constraints, and presence of subsurface sewage infrastructure

Based on the proposed development works and guidance provided in Section 2.2 of NEPC (1999a), AG considers it reasonable to adopt the 'HIL A – residential with garden/accessible soil, including children's day care centres, preschools and primary schools' land use setting, for the purpose of assessing land contamination exposure risks.

5.3. Direct Contact – Human Health

The proposed land use setting is likely to include unsealed playground, garden/softscape and open space areas. It is considered that a direct contact exposure pathway (asbestos inhalation) may be complete.

5.4. Aesthetics – Human Health

Section 3.6.3 of NEPC (1999a) advises that there are no specific numeric aesthetic guidelines, however site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

The historical evidence indicated potential land use activities being undertaken on the site which have the potential to result in unacceptable aesthetic impacts.

AG notes that the proposed development includes hardstand pavement across the majority of the site, which would act as a barrier between potential aesthetic impacts and onsite receptors. On that basis, it is considered that an aesthetics exposure pathway would likely be incomplete at the site.

6. REMEDIAL ACTION PLAN

6.1. Remedial Goal

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure risk, based on the proposed land use setting. AG notes that the client would prefer that the remedial works be undertaken in a manner that does not result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long term environmental management plan (EMP).

6.2. Remediation Extent

The extent of remediation on the site is considered to be the following:

- AEC05 to AEC18

Further assessment of AEC02, AEC03 and AEC04 is required to assess whether remedial works are required in these AEC.

6.3. Remediation Options

Based on the extent of the remediation identified in **Section 6.2**, and the proposed site redevelopment works, remedial options considered appropriate for this site include:

- In-situ containment by capping;
- Ex-situ containment by capping;
- Excavation and removal off site.

6.4. Preferred Remediation Option

Taking into consideration the client's objectives for the site, and the nature and extent of the proposed site redevelopment works, and the client's preference of removal of contamination risks from the site, the preferred remedial option for the site is excavation and offsite disposal (with consideration given to further assessment works to refine the extent of remedial works required).

6.5. Sequence of Works for Remediation

6.5.1. Remediation Schedule

The timeframe for remediation works will be dependent on the staging of redevelopment of the site, the results of further supplementary contamination assessment works, and the remediation contractor's methodology for undertaking the remediation works. It is expected that remediation timeframes will be refined following appointment of the remediation contractor, and the staging of the remediation tasks in the contractor's works program.

6.5.2. Notifications and Approvals

Notification of an intention to undertake remediation works on the site, will be submitted to the relevant planning consent authority, 30 days prior to remediation works commencing. The proposed remediation works would likely be classed as Category 2 under SEPP55, which do not require consent from the planning authority.

The following information will also be provided to the planning consent authority, 14 days prior to the commencement of remediation works.

- copies of the contamination assessment reports and this RAP; and

- contact details of the contractor appointed to undertake the remediation works
- contact details of the parties responsible (if not the remediation contractor) for ensuring remediation works comply with relevant regulatory requirements.

A notification will be submitted to SafeWork NSW prior to undertaking asbestos removal works (where applicable). The removal works will be undertaken by a suitably licensed contractor.

It is noted that:

- where remedial works requires demolition, excavation or shoring, development consent or a construction certificate may be required from the planning consent authority; and
- where remedial works occur adjacent to Roads and Maritime Services (RMS) controlled assets, further approvals may be needed to address RMS requirements. It is expected that any such requirements would be identified by Council during the 30 day notification period.

Within one month of completion of remediation and validation works, a notification will be submitted to the planning consent authority.

6.5.3. Structural Stability

The structural stability of walls, footings and other structures, which may be affected by the remedial works, will be assessed by a suitably experienced consultant, prior to remedial works commencing, and the structural consultant's recommendations considered during execution of remedial works.

6.5.4. Demolition

A hazardous building materials survey will be undertaken of the structures on site, to identify the potential for hazardous materials (e.g. asbestos, lead paint, PCBs) to be present in those structures. If found, hazardous materials will be stabilised and/or removed from site, and a clearance certificate obtained from a suitably experienced occupational hygienist, prior to demolition works of the structures commencing. The remediation contractor will retain transport and disposal records for all hazardous materials removed off site.

Above ground structures and hardstand pavements will be demolished by a suitably licensed contractor, and associated wastes removed from site for recycling and/or disposal. The remediation contractor will retain transport and disposal records for all demolition wastes removed off site.

6.5.5. Remediation Works

6.5.5.1. AEC02 (Southern and central western portion of Lot 811)

Intrusive soil sampling will be undertaken across AEC02, to assess for the presence of asbestos in soil.

If the results of the intrusive investigation indicate that asbestos in soil concentrations in this AEC are less than the adopted human health screening levels, the results of the investigation will be presented in a site validation report.

If the concentration of asbestos in soil is found to be greater than the adopted human health screening levels, remediation of unacceptable asbestos in soil impacts will be undertaken via an addendum to this RAP, using excavation and offsite disposal techniques, via an addendum to this RAP. Consideration will also be given to onsite treatment⁴ of asbestos impacted soils, where asbestos containing materials are classed as bonded and not friable.

⁴ Refer to section 5.2.2 of WA DOH (2009)

As waste classification will be required for soils proposed for offsite disposal.

6.5.5.2. AEC03 (Stockpile in Lot 811)

Intrusive soil sampling will be undertaken across AEC02, to assess for the presence of chemical contamination and asbestos in soil.

If the results of the intrusive investigation indicate that chemical and/or asbestos in soil concentrations in this AEC are less than the relevant adopted assessment criteria, the results of the investigation will be presented in a site validation report.

If the concentration of chemical and/or asbestos in soil concentrations in soil is found to be greater than the adopted assessment criteria, remediation of unacceptable contamination risks in soil will be undertaken via an addendum to this RAP. The likely preferred remedial strategy will be excavation and offsite disposal techniques. Consideration will also be given to onsite treatment⁵ of asbestos impacted soils, where asbestos containing materials are classed as bonded and not friable.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

6.5.5.3. AEC04 (Lot 839)

A stage 1 preliminary site investigation (PSI) will be undertaken for this AEC. Subject to the findings of the stage 1 PSI, a stage 2 detailed site investigation (DSI) including intrusive sampling may be required.

If the results of the intrusive investigation indicate that chemical and/or asbestos in soil concentrations in this AEC are less than the relevant adopted assessment criteria, the results of the investigation will be presented in a site validation report.

If the concentration of chemical and/or asbestos in soil concentrations in soil is found to be greater than the adopted assessment criteria, remediation of unacceptable contamination risks in soil will be undertaken via an addendum to this RAP. The likely preferred remedial strategy will be excavation and offsite disposal techniques. Consideration will also be given to onsite treatment⁶ of asbestos impacted soils, where asbestos containing materials are classed as bonded and not friable.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

6.5.5.4. AEC05 to AEC11 (FJS1, SS1, SS2, TP015), TP043, TP072 and TP104)

Consideration will be given to undertaken delineation sampling in each of these AEC, to refine the extent of asbestos impacts in these AEC.

Remediation of fill material in these AEC will be undertaken, using excavation and offsite disposal techniques. Excavation works will extend to the base of the fill in each of these AEC, in a nominal radius of 12m around the relevant sampling point⁷ (unless refined with delineation sampling). In the event that proposed fill excavation

⁵ Refer to section 5.2.2 of WA DOH (2009)

⁶ Refer to section 5.2.2 of WA DOH (2009)

⁷ Based on a nominal 23m lateral distance between sampling points

works intersect a site boundary before reaching the nominated radius, then the remedial excavation will cease at the site boundary.

Consideration will also be given to onsite treatment⁸ of asbestos impacted soils, where asbestos containing materials are classed as bonded and not friable.

In the event onsite treatment is being considered for AEC05 to AEC07, further asbestos in soils assessment will be undertaken in the immediate vicinity of sampling points FJS1, SS1 and SS2, to establish whether the asbestos detections reported in the EIS contamination assessments are limited to bonded asbestos, or include friable forms of asbestos.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 7.7**.

6.5.5.5. AEC12 (TP116, TP120 and TP121)

Remediation of fill material in these AEC will be undertaken, using excavation and offsite disposal techniques. Excavation works will extend to the base of the fill in each of these AEC, in a nominal radius of 12m around the relevant sampling point⁹ (unless refined with delineation sampling). In the event that proposed fill excavation works intersect a site boundary before reaching the nominated radius, then the remedial excavation will cease at the site boundary.

Consideration will not be given to onsite treatment of asbestos impacted soils in this AEC, as two of the three sampling points in this AEC reported detections of friable asbestos in soil.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 7.7**.

6.5.5.6. AEC13 to AEC14 (TP129 and TP132)

Consideration will be given to undertaken delineation sampling in each of these AEC, to refine the extent of asbestos impacts in these AEC.

Remediation of fill material in these AEC will be undertaken, using excavation and offsite disposal techniques. Excavation works will extend to the base of the fill in each of these AEC, in a nominal radius of 12m around the relevant sampling point¹⁰ (unless refined with delineation sampling). In the event that proposed fill excavation works intersect a site boundary before reaching the nominated radius, then the remedial excavation will cease at the site boundary.

Consideration will also be given to onsite treatment¹¹ of asbestos impacted soils in AEC14, where detected asbestos containing materials were limited to bonded.

⁸ Refer to section 5.2.2 of WA DOH (2009)

⁹ Based on a nominal 23m lateral distance between sampling points

¹⁰ Based on a nominal 23m lateral distance between sampling points

¹¹ Refer to section 5.2.2 of WA DOH (2009)

Consideration will not be given to onsite treatment of asbestos impacted soils in this AEC13, as soil sampling and analysis in this AEC reported detections of friable asbestos in soil.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 7.7**.

6.5.5.7. AEC15 to AEC18 (TP4, TP29, TP57, and TP60)

Consideration will be given to undertaken delineation sampling in each of these AEC, to refine the extent of asbestos impacts in these AEC.

Remediation of fill material in these AEC will be undertaken, using excavation and offsite disposal techniques. Excavation works will extend to the base of the fill in each of these AEC, in a nominal radius of 11.5m around the relevant sampling point¹² (unless refined with delineation sampling). In the event that proposed fill excavation works intersect a site boundary before reaching the nominated radius, then the remedial excavation will cease at the site boundary.

Consideration will also be given to onsite treatment¹³ of asbestos impacted soils, where asbestos containing materials are classed as bonded and not friable.

In the event onsite treatment is being considered for AEC05 to AEC07, further asbestos in soils assessment will be undertaken in the immediate vicinity of sampling points TP4, TP29, TP57 and TP60, to establish whether the asbestos detections reported in the EIS contamination assessments are limited to the bonded or friable.

As waste classification will be required for soils proposed for offsite disposal.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 7.7**.

6.5.6. Backfilling

Should remedial excavations require backfilling, then backfill soils will be limited to:

- Virgin excavated natural material (VENM);
- Excavated natural material (ENM); or
- Other material that is the subject of a resource recovery exemption and the placement of that material is within the lawful constraints of the resource recovery exemption (and does not present an unacceptable exposure risk to human health or the environment, within the context of the proposed land use setting).

Consideration will be given to geotechnical engineering requirements associated with backfilling, however, those requirements will be specified by others elsewhere.

6.5.7. Remediation Contingency Plan

Remediation works have an inherent degree of uncertainty. Based on the site history information made available, and AG's experience with comparable projects, AG considers the situations set out in **Table 6.5.7** may

¹² Based on a nominal 23m lateral distance between sampling points

¹³ Refer to section 5.2.2 of WA DOH (2009)

be encountered during remediation works. Contingency plans for those situations are also presented in **Table 6.5.7**.

Table 6.5.7 Remediation Contingency Plan

Situation	Contingency Plan
Unexpected potential contamination or underground structures encountered during remediation (e.g. underground storage tank, underground pit).	Consider excavation of test pits / trenches to assess potential for contamination to be present. Remove underground structures (if required) and associated soil contamination (if required). Consider groundwater assessment, subject to nature and extent of identified soil contamination. Amendment to the preferred remedial strategy (if required), pending the outcomes of the assessment of the unidentified contamination.
Potential asbestos containing materials (ACM) observed in fill material.	Stop work. Analyse sample/s of potential ACM. Subject to results, commence relevant SafeWork NSW notifications, engage an occupational hygienist, amend soil waste classification/s, and implement asbestos validation for retained fill material.

7. VALIDATION DATA QUALITY OBJECTIVES

Appendix B of NEPC (1999b) provides guidance on the development of data quality objectives (DQO) using a seven-step process.

The DQO for this project are set out in **Sections 7.1 to 7.7** of this report.

7.1. Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- the site is the subject of redevelopment works; and
- historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health exposure risk in the context of the proposed land use setting.

The project team identified for this project includes Alliance Geotechnical Pty Ltd, the developer and the planning consent authority.

The regulatory authorities identified for this investigation include NSW EPA and the local Council.

7.2. Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the environmental data collected for the project, suitable for assessing relevant land contamination exposure risks?
- Do the concentrations of identified contaminants of potential concern (COPC) present an unacceptable exposure risk to identified receptors, for the proposed land use setting?
- Is the site suitable for the proposed land use setting, in the context of land contamination?

7.3. Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 7.2** for this investigation, will include:

- data obtained during searches of the site's history;
- the nature and extent of sampling at the site, including both density and distribution;
- samples of relevant site media;
- the measured physical and/or chemical parameters of the site media samples (including field screening and laboratory analysis, where relevant); and
- assessment criteria adopted for each of the media sampled.

Taking into consideration the objectives of this project, the proposed land use setting for the site, the following assessment criteria relevant to the proposed land use setting have been adopted for this investigation:

- Human health direct contact – HILs in Table 1A (1) in NEPC (1999a) and HSLs in Table B4 of Friebe, E & Nadebaum, P (2011);
- Human health inhalation/vapour intrusion – HSLs in Table 1 (A) in NEPC (1999a);
- Human health (asbestos) – HSLs in Table 7 of NEPC (1999a);
- Petroleum hydrocarbon compounds (management limits) – Table 1 B(7) of NEPC (1999a);
- Aesthetics – no highly malodorous site media (e.g. strong residual petroleum hydrocarbon odours, hydrogen sulphide in site media, organosulfur compounds), no hydrocarbon sheen on surface water, no discoloured chemical deposits or soil staining with chemical waste other than of a very minor nature, no large monolithic deposits of otherwise low risk material (e.g. gypsum as powder or plasterboard, cement kiln dust), no presence of putrescible refuse including material that may generate hazardous levels of methane such as a deep-fill profile of green waste or large quantities of timber waste, and no soils containing residue from animal burial (e.g. former abattoir sites); and
- NSW EPA 2014, 'Waste Classification Guidelines, Part 1: Classifying Waste'.

7.4. Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC) and/or the relevant site boundaries.

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model and the project scope, is limited to base of fill material within the identified AEC.

The temporal boundaries of the project include:

- the project timeframes presented in the AG proposal for this project, and subsequent remediation contractor works program;
- unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- access availability of the site (to be defined by the site owner/representative); and
- availability of AG field staff (typically normal daylight working hours, Monday to Friday).

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this project may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

7.5. Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

7.5.1. Rinsate Blanks

One rinsate blank will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable sampling equipment was used on that day. The rinsate blank will be analysed for at least one of the analytes the sample/s collected that day are being scheduled for analysis for (with the exception of asbestos).

7.5.2. Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C₆-C₁₀).

7.5.3. Field Duplicates and Field Triplicates

Field duplicate and Field triplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates and triplicates collected will be analysed for at least one of the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relevant percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate/triplicate will be calculated.

7.5.4. Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

7.5.5. If/Then Decision Rules

AG has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and
- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer Section 7.3), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then AG will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 7.3**), AG will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

7.6. Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and
- Contamination exposure risks for a specific land use setting are not acceptable when they are.

AG will mitigate the risk of decision error by:

- Calculation of the 95% upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern;
- Assignment of fieldwork tasks to suitably experienced AG consulting staff, and suitably experienced contractors;
- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories;
- Assignment of data interpretation tasks to suitably experienced AG consulting staff, and outsourcing to technical experts where required.

AG will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Completeness			
Field Considerations	Assessment Criterion	Laboratory Considerations	Assessment Criterion
Critical locations sampled	Refer Section 7.7.1	Critical samples analysed according to DQO	Refer Section 7.7.7
Critical samples collected	Refer Section 7.7.1	Analytes analysed according to DQO	Refer Section 7.7.7
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer Section 7.7.7
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis
		Sample extraction and holding times complied with	Refer Section 0
Comparability			
Field Considerations	Assessment Criterion	Laboratory Considerations	Assessment Criterion
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer Section 0
Climatic conditions	Samples stored in insulated containers with ice, immediately after collection	Same LORs at primary laboratory	Refer Section 0
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in insulated containers with ice	Same laboratory for primary sample analysis	All primary samples to SGS Environmental
		Same analytical measurement units	Refer Section 0
Representativeness			
Field Considerations	Assessment Criterion	Laboratory Considerations	Assessment Criterion
Appropriate media sampled according to SAQP	Refer Section 7	Samples analysed according to SAQP	Refer Section 7.7.7
Media identified in SAQP sampled	Refer Section 7		
Precision			
Field Considerations	Assessment Criterion	Laboratory Considerations	Assessment Criterion

Field duplicate / triplicate RPD	Minimum 5% duplicates and triplicates No limit for analytical results <10 times LOR 50% for analytical results 10-20 times LOR 30% for analytical results >10 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%		
Accuracy (bias)			
Field Considerations	Assessment Criterion	Laboratory Considerations	Assessment Criterion
Rinsate blanks	Less than laboratory limit of reporting	Laboratory method blank	No exceedances of laboratory acceptance criteria
Field trip spikes	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of laboratory acceptance criteria
Field trip blanks	Analyte concentration <LOR	Surrogate spike recovery	No exceedances of laboratory acceptance criteria
		Laboratory control sample recovery	No exceedances of laboratory acceptance criteria

7.7. Step 7: Develop the plan for obtaining data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

7.7.1. Further Assessment and Validation Sampling

Table A in NSW EPA (1995) provides guidance on minimum sampling point densities required for site characterisation, based on detecting circular hot spots by using a systematic sampling pattern. This guidance assumes the investigator has little knowledge about the probable locations of the contamination, the distribution of the contamination is expected to be random (e.g. land fill sites) or the distribution of the contamination is expected to be fairly homogenous (e.g. agricultural lands).

However, Section 3.1 of NSW EPA (1995) states that a judgemental sampling pattern can be used where there is enough information on the probable locations of contamination. Further to this, Section 6.2.1 of NEPC (1999b) states that the number and location of sampling points is based on knowledge of the site and professional judgement. Sampling should be localised to known or potentially contaminated areas identified from knowledge of the site either from site history or an earlier phase of site investigation. Judgemental sampling can be used to investigate sub-surface contamination issues in site assessment.

As this project has included gathering data which provides a reasonable understanding of site history (in the context of potential areas of environmental concern on the site) and taking into consideration Table 4 in NEPC (1999b), Table 1 in WA DOH (2009), and Section 4.3 of WA DOH (2009), it is considered reasonable to adopt a combination of systematic and targeted/judgemental sampling pattern, where necessary, for each relevant AEC.

The supplementary assessment / delineation sampling arrangements for this project are presented in **Table 7.7.1.1**.

Table 7.7.1.1 Assessment / Delineation Sampling

ID	Area of Environmental Concern	Supplementary Assessment / Delineation Sampling
AEC02	Southern and central western portion of Lot 811 (asbestos in soil data gap)	Up to 16 test pits to a target depth of 1.0m below ground level, 0.3m into inferred natural material, or practical refusal, whichever occurs first
AEC03	Stockpile in Lot 811 (contamination risk data gap)	Estimate stockpile volume and apply sampling density set out in Section 7.5.2 of NEPC (1999b) and/or Table 7 of WA DOH (2009), whichever is greater.
AEC04	Lot 839 (contamination risk data gap)	Subject to the findings of the stage 1 PSI, refer to guidance in Section 6.2.1 of NEPC (1999b) and Table 1 of WA DOH (2009).
AEC05	FJS1	Up to 4 test pits in a 5m radius around the sampling point
AEC06	SS1	Up to 4 test pits in a 5m radius around the sampling point
AEC07	SS2	Up to 4 test pits in a 5m radius around the sampling point
AEC08	TP015	Up to 4 test pits in a 5m radius around the sampling point
AEC09	TP043	Up to 4 test pits in a 5m radius around the sampling point
AEC10	TP072	Up to 4 test pits in a 5m radius around the sampling point
AEC11	TP104	Up to 4 test pits in a 5m radius around the sampling point
AEC12	TP116, TP120 and TP121	Up to 7 test pits (in total) in a 5m radius around the sampling point
AEC13	TP129	Up to 4 test pits in a 5m radius around the sampling point

ID	Area of Environmental Concern	Supplementary Assessment / Delineation Sampling
AEC14	TP132	Up to 4 test pits in a 5m radius around the sampling point
AEC15	TP29	Up to 4 test pits in a 5m radius around the sampling point
AEC16	TP4	Up to 4 test pits in a 5m radius around the sampling point
AEC17	TP57	Up to 4 test pits in a 5m radius around the sampling point
AEC18	TP60	Up to 4 test pits in a 5m radius around the sampling point

The asbestos in soil validation sampling arrangements for this project are presented in **Table 7.7.1.2**.

Table 7.7.1.2 Validation Sampling

Nature of Remediation	Validation Sampling
Excavation	At least one sample from each excavation wall per 5m length of strata of interest (or per 1m depth, with additional discretionary samples if necessary). Floor of excavation should be visually inspected and if suspect, may need to be sampled at twice the minimum density outlined in Table A of NSW EPA (1995).
Screened Material	Sampling should be over the whole stockpile surface at a minimum rate of 14 locations per 1000m ³ (pro-rata for <1000m ³).

Classification of soils for offsite disposal is not technically a validation task for assessing site suitability. However, for the purpose of planning, fill soil waste classification sampling is quantity dependent, and reference should be made to Section 7.5.2 in Schedule B2 of NEPC (1999) and VIC EPA (2009) as appropriate.

If visual or olfactory observations indicated a potential for soil contamination to be present, then collection of additional validation samples will be considered.

The location of each sampling point will be marked on a site plan.

7.7.2. Sampling Methodology

The sampling point methodology presented in **Table 7.7.2** will be used for this project. The methodology is based on a range of factors considered relevant to this investigation, including:

- the identified contaminants of potential concern;
- the suspected laydown mechanisms for those contaminants of concern; and
- the suspected likely depth of contamination.

Table 7.7.2 Sampling Methodology

AEC	Method	Target Depth of Sampling Point (m bgs)
AEC02	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC03	Test pit excavation	Base of stockpile
AEC04	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC05	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC06	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC07	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC08	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC09	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC10	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC11	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC12	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC13	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC14	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC15	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC16	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC17	Test pit excavation	1.0m or 0.3m into inferred natural material
AEC18	Test pit excavation	1.0m or 0.3m into inferred natural material

7.7.3. Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the sampling point number and the depth/interval the sample was collected from, e.g. a sample collected from test pit TP03 at a depth of 0.2m to 0.4m below ground level, would be identified as TP03/0.2-0.4.

Project samples will be stored in laboratory prepared glass jars (and zip lock bags if collected for asbestos or acid sulfate soil assessment).

Soil samples in glass jars (and acid sulfate soil samples) will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

AG project identification number

- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

7.7.4. Headspace Screening

Where the contaminants of potential concern include volatiles (e.g. TRH, BTEX), project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on sampling point log.

7.7.5. Decontamination

In the event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

7.7.6. Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

7.7.7. Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;
- Headspace screening results (where available);
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on site history, AG has adopted the laboratory analytical schedule presented in **Table 7.7.7** for this project.

Table 7.7.7 Laboratory Analytical Schedule (Further Assessment / Delineation Samples)

AEC	Analytical Suite
AEC02	Asbestos (ACM and AF/FA)
AEC03	TRH, BTEX, PAH, OCP, metals, asbestos (ACM and AF/FA)
AEC04 ¹⁴	TRH, BTEX, PAH, OCP, metals, asbestos (ACM and AF/FA)
AEC05	Asbestos (ACM and AF/FA)

¹⁴ If analysis is required, based on findings of stage 1 PSI

AEC	Analytical Suite
AEC06	Asbestos (ACM and AF/FA)
AEC07	Asbestos (ACM and AF/FA)
AEC08	Asbestos (ACM), and TRH, BTEX, PAH, metals for waste classification
AEC09	Asbestos (ACM), and TRH, BTEX, PAH, metals for waste classification
AEC10	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC11	Asbestos (AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC12	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC13	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC14	Asbestos (ACM), and TRH, BTEX, PAH, metals for waste classification
AEC15	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC16	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC17	Asbestos (ACM and AF/FA), and TRH, BTEX, PAH, metals for waste classification
AEC18	Asbestos (ACM and FA/FA), and TRH, BTEX, PAH, metals for waste classification

Laboratory analysis for validation samples will be based on the specific contaminant/s of concern identified for the location being remediated.

7.7.8. Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented in **Table 0**.

Table 0 Laboratory Holding Times, Analytical Methods and Limits of Reporting

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
BTEX and TRH C ₆ -C ₁₀	14 days	USEPA 5030, 8260B and 8020	0.2-0.5
TRH >C ₁₀ -C ₄₀	14 days	USEPA 8015B & C	20-100
PAH	14 days	USEPA 8270	0.1-0.5
OCP	14 days	USEPA 3500C and 8270D	0.1-0.2
Metals	14 days	USEPA 8015B & C	0.05 – 2
Asbestos	No limit	AS4964:2004	Absence / presence
Asbestos	No limit	Inhouse Method	0.001% w/w

8. SITE VALIDATION REPORTING

At the completion of remediation works, a site validation report will be prepared with reference to the relevant sections of NSW (OEH). The site validation report will include:

- An executive summary;
- The scope of reporting work undertaken;
- Site identification details;
- A summary of site history;
- A summary of site condition and the surrounding environment;
- A summary of geology and hydrogeology;
- Information on supplementary contamination assessment works undertaken;
- Information on the remediation works undertaken;
- The results of field and laboratory work;
- An assessment of field and laboratory quality assurance / quality control data;
- A discussion on site validation;
- Information on ongoing site monitoring requirements (if any); and
- Conclusions and recommendations

9. SITE MANAGEMENT PLAN

The following site management plan will apply during undertaking of the remediation tasks.

9.1. Soil and Stormwater Management

9.1.1. Site Access/Egress

Vehicle access and egress to the site will be stabilised to prevent tracking of sediment onto roads and footpaths. Soil, mud and other similar materials will be removed from the roadway adjacent the access/egress point by sweeping, shovelling or a means other than washing, on a daily basis, or as required.

Trucks will be loaded adjacent to the remediation excavation (where practical). Spills of excavated soil will be scraped / swept up and combined with the soil being disposed offsite.

Soil and sediment will be broomed or washed off vehicle/plant tyres and tracks, prior to vehicles/plant leaving the remediation works zone. This soil and sediment will be scraped / swept up and managed onsite or disposed of, depending on its contamination status.

A site specific sediment and erosion control plan will be prepared and maintained by the remediation contractor, to suit staging of the remediation works. Erosion and sediment control measures will be maintained in a functional condition. Sediment laden stormwater runoff will be controlled using measures outlined in Landcom 2004, 'Managing Urban Stormwater - Soils and Construction' (the Blue Book).

9.1.2. Stockpiles

Stockpiles of soil or other materials:

- will not be placed on footpaths or nature strips, unless approved by Council;
- will be placed away from gutters, stormwater pits and other drainage lines;
- will be stored in a secure area and be covered if remaining on site for more than 24 hours; and
- will generally be constructed as low elongated mounds on level surfaces.

9.1.3. Excavation Pump Out

Should excavations require pumping out, water will be analysed for total suspended solids, pH, metals and petroleum hydrocarbons. Should analytical results be less than relevant marine ecosystem groundwater investigation levels in ANZECC (2000), excavation water may be discharged to stormwater.

Should analytical results exceed ANZECC (2000) criteria, other options for disposal will be considered, including:

- discharge to sewer (with prior approval from Sydney Water with a Trade Waste Agreement);
- removal and offsite disposal by a liquid waste contractor.

9.1.4. Rehabilitation and Landscaping

Stabilisation of exposed areas on the site, where required, will be undertaken in a progressive manner, as stages of remediation works are completed. Stabilisation will be maintained until such time as site redevelopment works commence.

As site redevelopment works are expected to be undertaken in conjunction with remediation works, revegetation of the site is considered unlikely to be required.

9.2. Waste Management

Removal of materials from site for recycling and/or disposal, will be undertaken with reference to the relevant provisions of the Protection of the Environment Operations Act (1997) and NSW EPA (2014).

The remediation contractor will maintain detailed records of materials removed from the site, including date/time of removal, quantities of materials, transport company details and vehicle registration details.

The remediation contractor will retain records verifying lawful disposal of the materials, including weighbridge / tipping dockets from the waste receiver.

9.3. Groundwater Management

Should dewatering of the site be required, development consent may be required from the planning consent authority. Dewatering may also require approvals from the NSW Department of Planning and Infrastructure, and the NSW Office of Water.

9.4. Noise Control

Noise levels from the site during the project will not exceed the limits indicated in AS2436-1981.

No 'offensive noise' as defined under the Protection of the Environment Operations Act 1997 will be created during remediation works/activities.

Plant and equipment will be fitted with noise attenuation devices (e.g. mufflers on exhausts). Consideration will be given to use of reversing alarms other than the standard pulsed tonal alarms.

Vehicle access roads will be designed in such a way to minimise the need for plant and vehicles to reverse (e.g. provision of a turning circle adjacent to the remediation works zone).

9.5. Dust Control

Dust may be generated during remediation works and associated tasks. To mitigate risk of dust emissions migrating beyond the site boundary, consideration will be given to implementing the following procedures:

- erection of dust screens around the perimeter of the site (e.g. fencing with shade cloth attached);
- securely covering all loads entering or exiting the site;
- use of water sprays across the site to suppress dust;
- covering stockpiles of contaminated soil remaining on site for more than 24 hours;
- keeping excavation surfaces moist;
- wetting down of placed fill material during spreading;
- sweeping of hardstand surfaces;
- minimising soil disturbance works during windy days; and
- retaining stabilised site access/egress points for vehicles.

9.6. Odour Control

Generation of significant odours during the remediation works is considered to be unlikely.

If odours are generated, odours will be monitored at the site boundary. Should unacceptable odours be detected at the site boundary, consideration will be given to implementing the following procedures:

- use of appropriate covering techniques such as plastic sheeting to cover excavation faces or stockpiles;
- use of fine mist sprays (which may incorporate deodorizing agents);
- use of hydrocarbon mitigating agents on impacted areas/materials; and

- adequate maintenance of equipment and machinery to minimise exhaust emissions.

A record of unacceptable odours and corrective/preventative action taken, will be maintained by the remediation contractor.

9.7. Traffic Management

Haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site will be selected by the remediation contractor and will meet the following objectives:

- compliance with all traffic road rules;
- minimisation of noise, vibration and odour to adjacent premises; and
- utilisation of state roads and minimisation of use of local roads.

The remediation contractor will ensure that site vehicles:

- conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work identified in **Section 9.13**;
- securely cover all loads to prevent dust or odour emissions during transportation;
- exit the site in a forward direction; and
- do not track soil, mud or sediment onto the road.

9.8. Vibration Management

Vibration emissions during remediation works will be controlled to mitigate risk of potential damage to assets on adjacent properties, and to mitigate unreasonable loss of amenity to nearby residents.

9.9. Fill Importation

Material proposed to be imported to site as engineered fill, will be limited to materials certified as:

- Virgin Excavated Natural Material (VENM); or
- Excavated Natural Material (ENM).

VENM certification will be undertaken with reference to NSW EPA (1995). ENM certification will be undertaken with reference to NSW EPA Excavated Natural Material Exemption.

The concentrations of potential contaminants in VENM and ENM proposed to be imported to site, will be less than the human health assessment criteria adopted for the site.

Imported fill will be compatible with existing soil characteristics for site drainage purposes.

The remediation contractor will maintain detailed records of all fill imported to the site, including details of the supplier, the source of the fill, the quantities of the fill, vehicle registration numbers and the dates/times the fill was received on site.

9.10. Work Health and Safety

9.10.1. Safe Work Method Statement

Each contractor and sub-contractor undertaking remediation works, or working within a remediation works zone, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:

- the tasks to be undertaken;
- hazards identified for each of the tasks to be undertaken;
- an assessment of risk for each hazard, considering likelihood and consequence;
- control measures to eliminate or mitigate risks associated with each identified hazard.

9.10.2. Personal Protective Equipment

The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:

- long sleeves and long pants
- high visibility vests (or clothing);
- safety boots;
- hard hats
- gloves; and
- eye protection (e.g. safety glasses).

Additional PPE may be required in accordance with task specific control measures in SWMS (refer Section 9.10.1).

9.10.3. Decontamination of Personnel

Personnel undertaking remediation tasks, or entering the remediation works zone, be required to decontaminate upon exiting the remediation works zone. Decontamination procedures will include:

- cleaning down of protective footwear (including removal of soil from the soles); and
- washing of hands.

The following minimum personal protective equipment (PPE) should be worn by any persons the remediation works zone:

- gloves;
- safety boots;
- hard hats;
- high visibility vests or clothing; and
- safety glasses.

9.11. Site Signage

A sign will be posted on the boundary of the site, adjacent to the site access point, which will include 24 hour contact details of the remediation contractor. This sign will be maintained onsite until all remediation works are complete.

9.12. Site Security

Site security will be maintained throughout the duration of the remediation works, with appropriate boundary fencing and gate locks. Other security measures may be implemented, if the need arises.

9.13. Site Hours of Operation

Remediation works will be undertaken on Monday to Friday between the hours of 7:00am to 5:00pm, and Saturday between the hours of 8:00am and 1:00pm.

Remediation works will not be undertaken outside the hours stated above, or on Sundays or public holidays.

9.14. Community Relations and Complaints

Owners, occupants and tenants of properties adjoining the site and across the road from the site, will be provided with notification of remediation works, at least two days prior to those works commencing.

Personnel undertaking remediation works on the site, will direct all third party communications and/or complaints to the Project Manager. The Project Manager will arrange for the communication/complaint to be assessed, a response prepared, corrective/preventative actions implemented (if necessary).

A register will be maintained on site for the recording of communications / complaints from third parties, including but not limited to, local residents and local businesses.

9.15. Emergency Preparedness

An emergency assembly point will be established at the site egress point. This point will be communicated to all site workers and visitors, during relevant site induction processes.

In the event of an emergency, site workers and visitors will assemble here and await further instructions from the site supervisor, project manager or emergency services.

Spill control kits and fire extinguishers will be located on site, as and where required.

Contact details to be used in the event of an emergency, are presented in **Section 9.16**.

9.16. Register of Contacts

A register of contacts for the project is presented in **Table 9.16**.

Table 9.16 Register of Contacts

Project Role	Person	Organisation	Contact
Emergency Services	-	Fire / Police / Ambulance	000
Site Owner	-	Sydney Catholic Schools	02 9569 6111
Project Manager	Elizabeth D'Olier	Pepper	0438 985 198
Planning Consent Authority	-	Department of Planning and Environment	1300 305 695
WHS Regulatory Authority	-	SafeWork NSW	131 050
Environmental Regulatory Authority	-	NSW EPA	131 500
Remediation Contractor	-	To be advised	To be advised
Environmental Consultant	Craig Cowper	Alliance Geotechnical	0407 989 885

10. CONCLUSIONS

Based on the information presented in previous contamination assessment reports, and observations made by on site, AG concludes that the remedial goal can be achieved and the site made suitable for the proposed land use setting, subject to:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan; and
- Preparation of a site validation report.

AG recommends that waste classification, remediation monitoring and validation works should be undertaken by a suitably experienced environmental consultant.

This report must be read in conjunction with the limitations set out in **Section 11**.

11. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Alliance Geotechnical Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, AG reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to AG's engagement. The report must not be used for any purpose other than the purpose specified at the time AG was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual AG consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, AG reserves the right to review and amend this report.

12. REFERENCES

Environmental Investigation Services (EIS) 2016a, 'Stage 1 Environmental Site Assessment, for Proposed School, 135, 135A, 145, 155, 165 Tenth and 140, 160, 170 Eleventh Avenue, Austral, NSW', dated 21 April 2016, ref: E27556KrptRev3

Environmental Investigation Services (EIS) 2016b, 'Remediation Action Plan, for Proposed School, 135, 135A, 145, 155, 165 Tenth and 140, 160, 170 Eleventh Avenue, Austral, NSW', dated 12 May 2016, ref: E27556KDrpt-RAP

Alliance Geotechnical (AG) 2018a, 'Supplementary Asbestos Contamination Assessment, 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW', dated 11 May 2018, ref: 6930-ER-1-1 DRAFT

Alliance Geotechnical (AG) 2018b, 'Preliminary Salinity Assessment, 135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW', dated 9 April 2018, ref: 6930-ER-1-2

National Environment Protection Council (NEPC) 1999a, 'Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

National Environment Protection Council (NEPC) 1999b, 'Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

NSW EPA (2017) Contaminated Sites: *Guidelines for the NSW Site Auditor Scheme 3rd Edition (including the Soil Investigation Levels for Urban Development Sites in NSW)*.

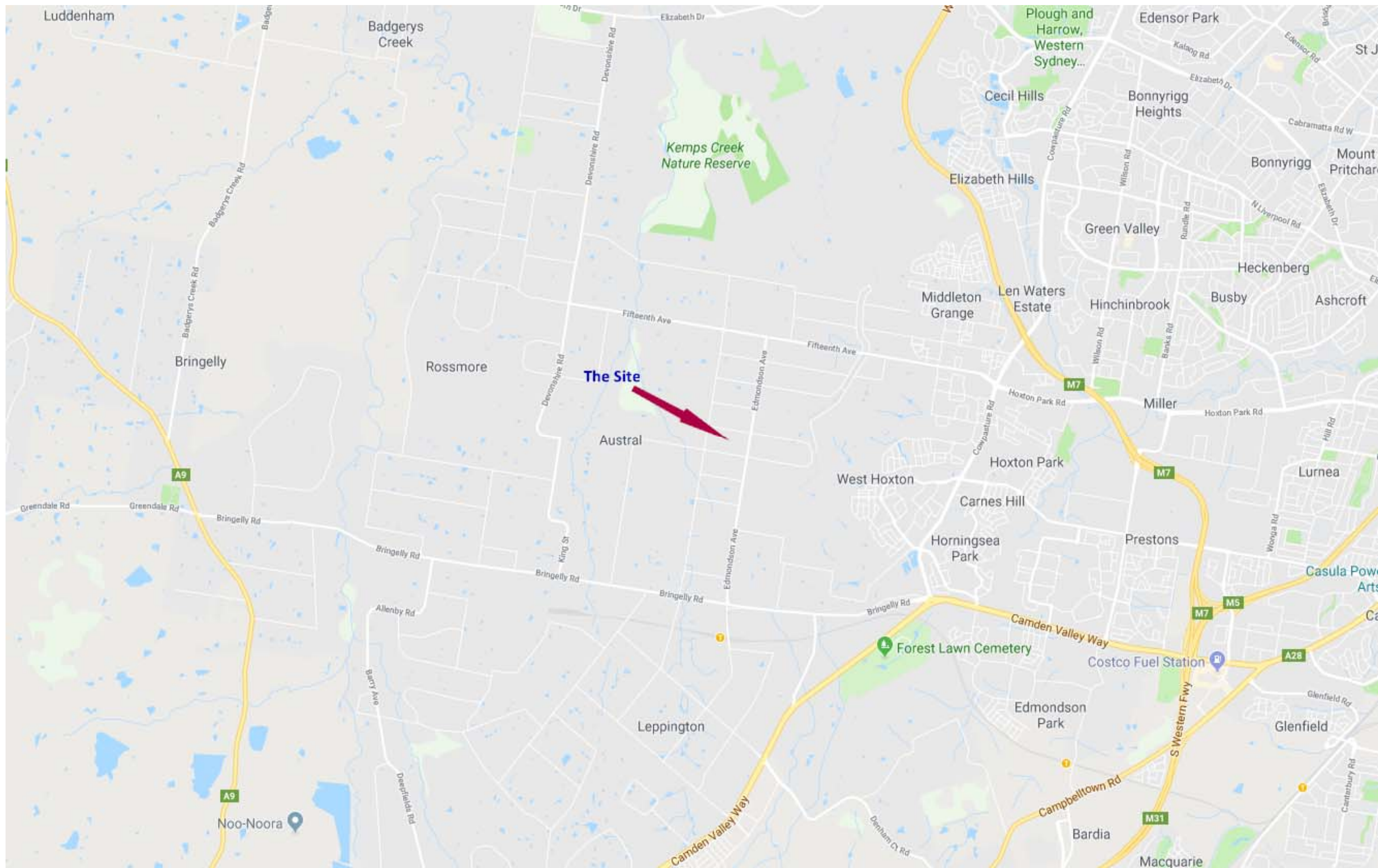
NSW EPA 1995, 'Contaminated Sites: Sampling Design Guidelines'.

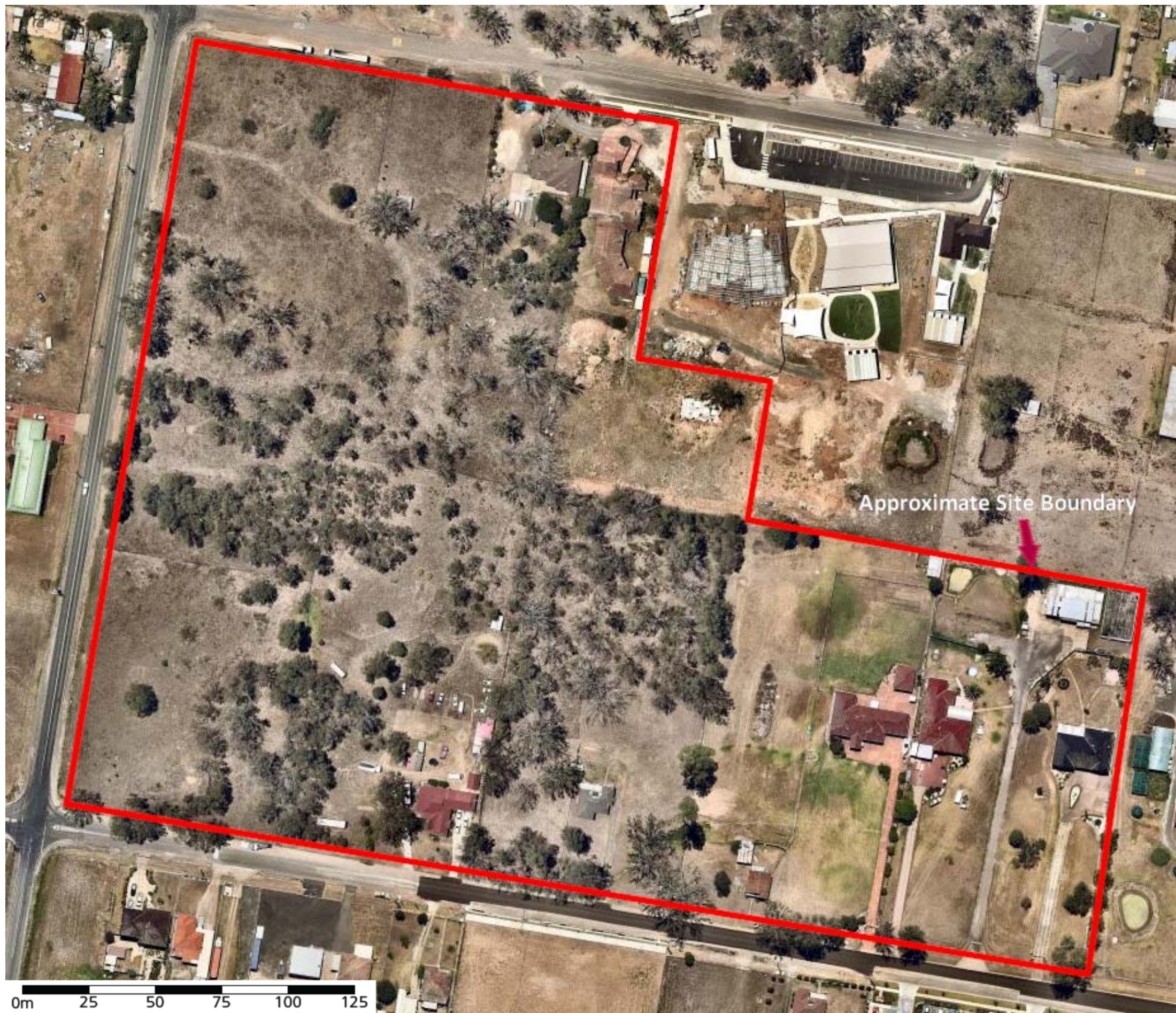
NSW OEH 2011, 'Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'.

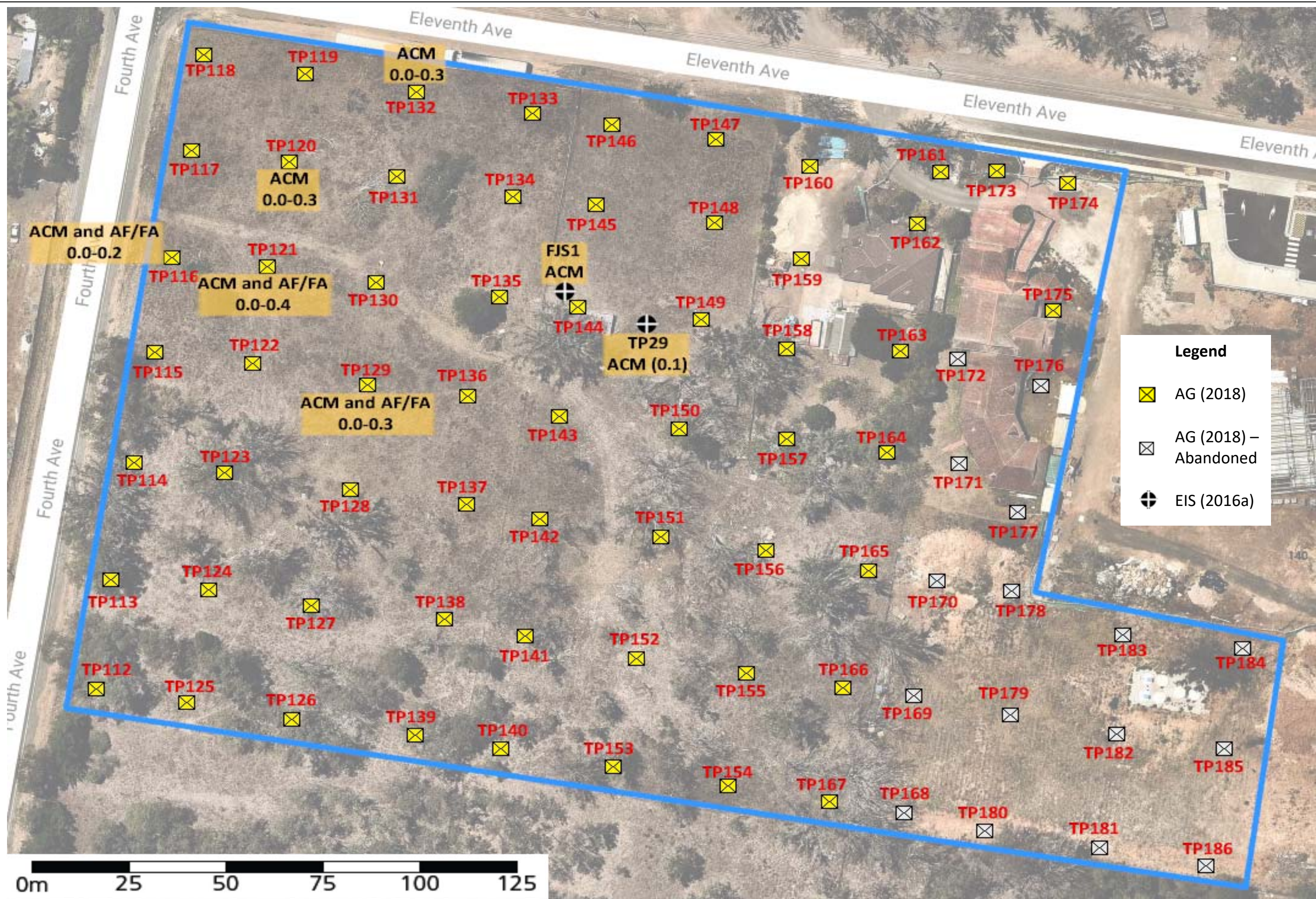
VIC EPA 2009, 'Industrial Waste Resource Guidelines, Soil Sampling' dated June 2009, ref: IWRG702

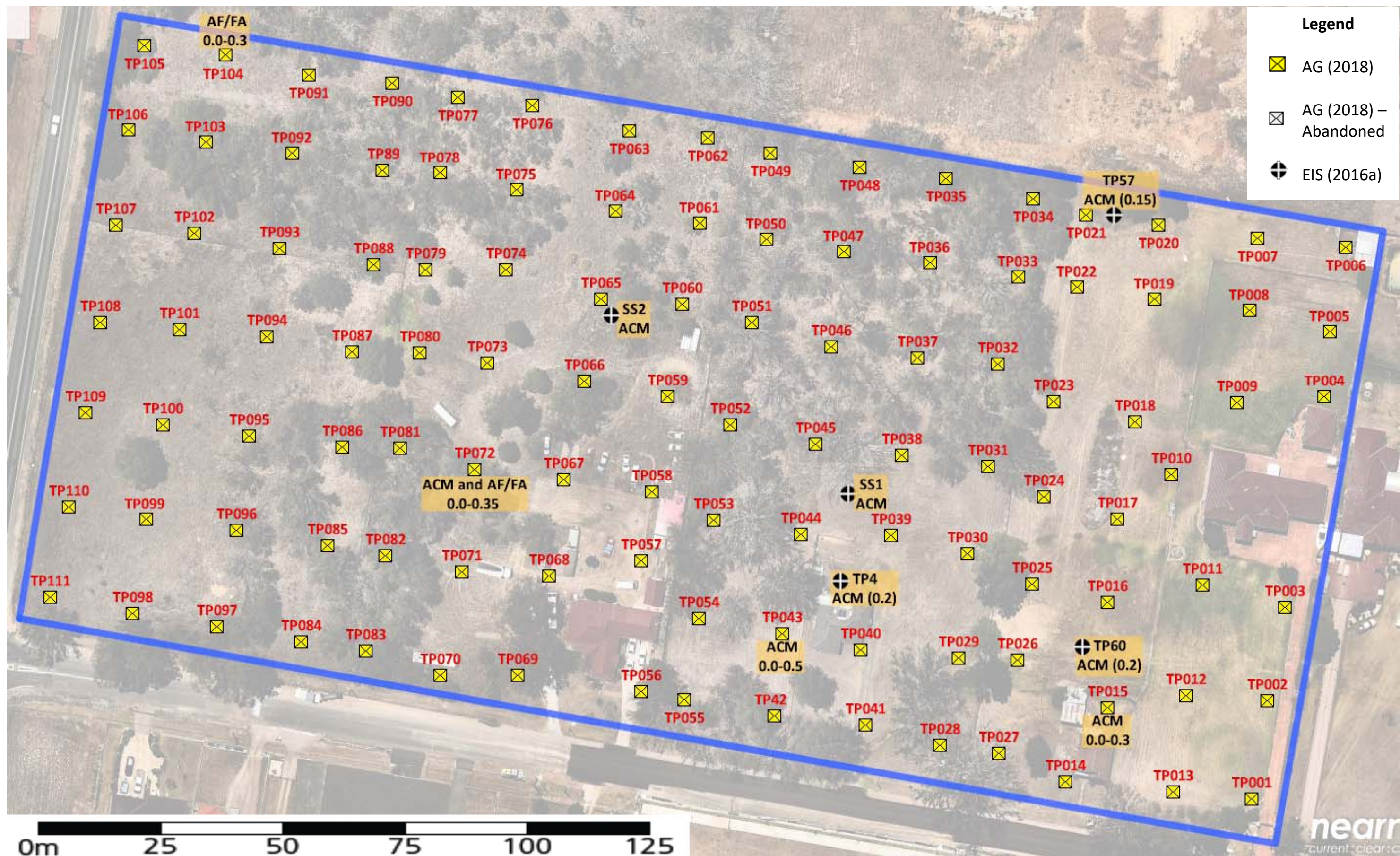
WA DOH 2009, 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' dated May 2009.

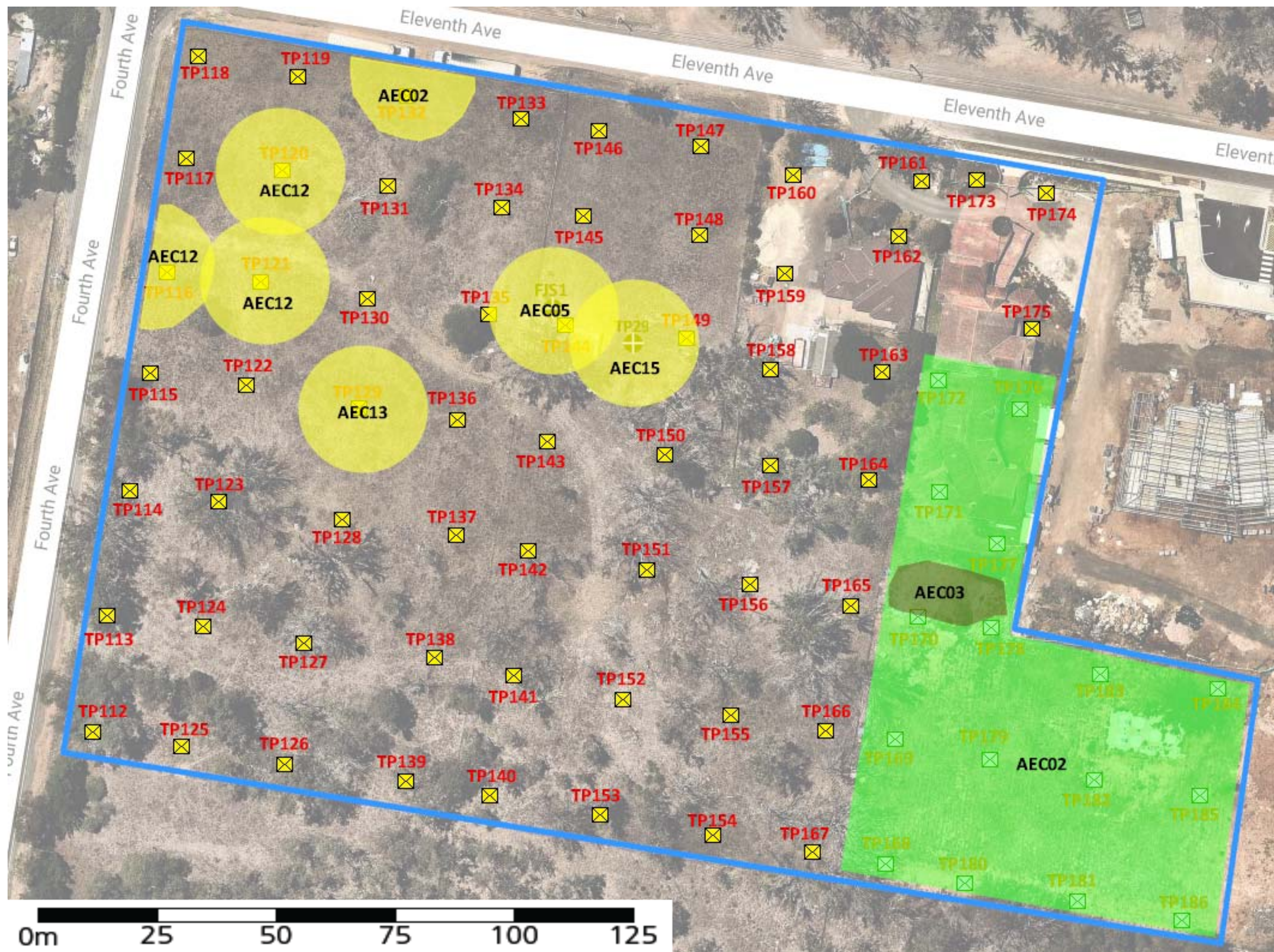
FIGURES





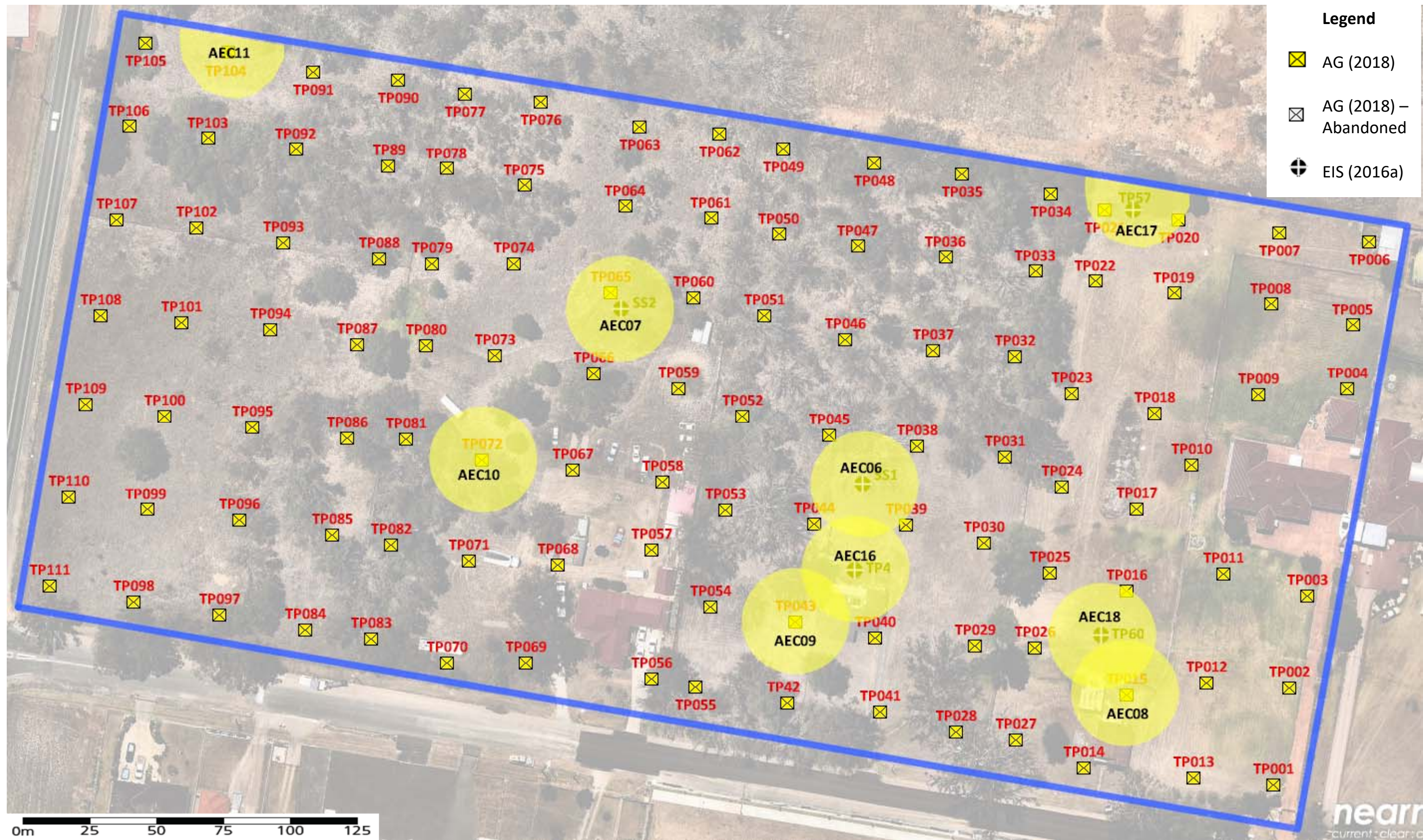


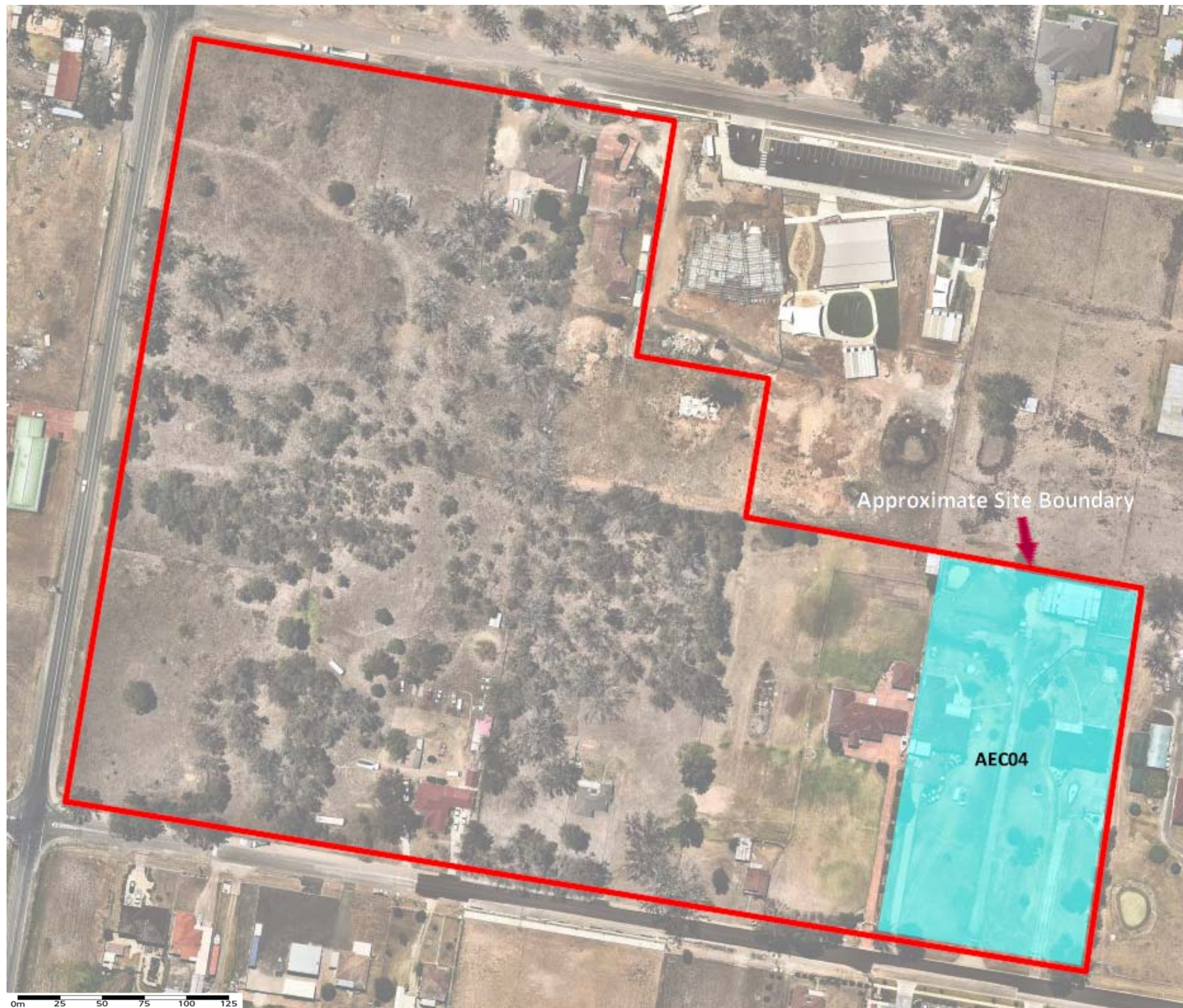




- Legend**
- AG (2018)
 - AG (2018) – Abandoned
 - ⊕ EIS (2016a)

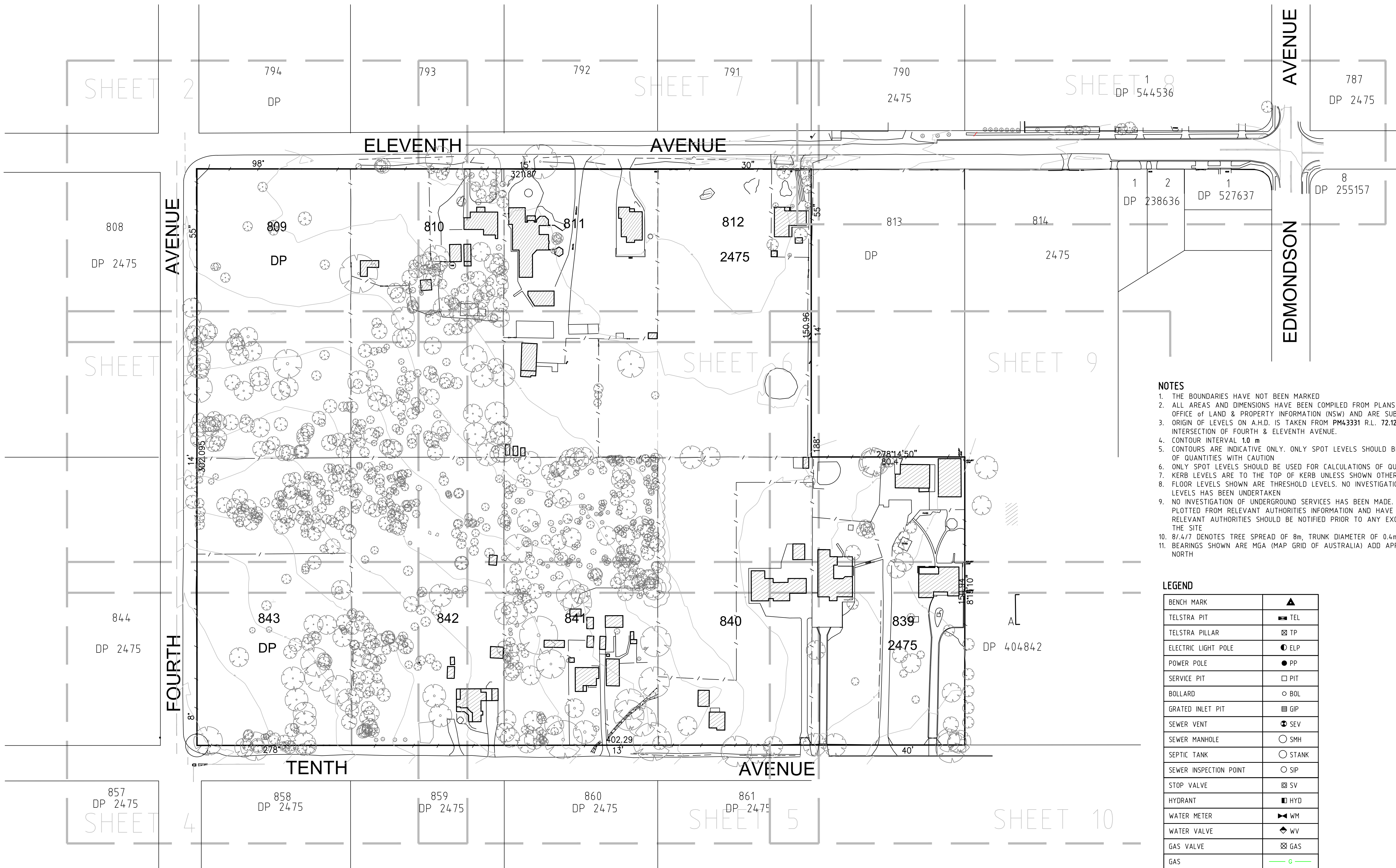
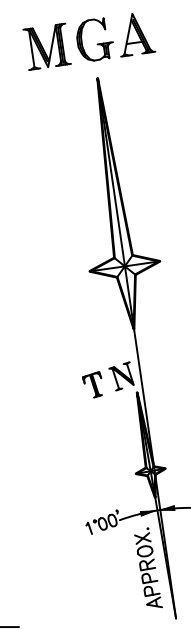






APPENDIX A

SURVEY

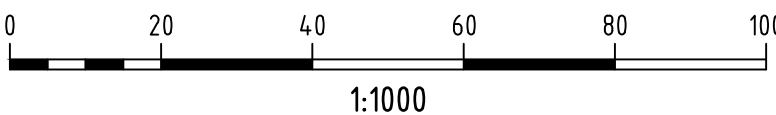


- NOTES**
1. THE BOUNDARIES HAVE NOT BEEN MARKED
 2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY THE OFFICE OF LAND & PROPERTY INFORMATION (NSW) AND ARE SUBJECT TO FINAL SURVEY
 3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM PM43331 R.L. 72.125 (A.H.D.) AT THE INTERSECTION OF FOURTH & ELEVENTH AVENUE.
 4. CONTOUR INTERVAL 1.0 m
 5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
 6. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
 7. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
 8. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
 9. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
 10. 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
 11. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH

LEGEND	
BENCH MARK	▲
TELSTRA PIT	TEL
TELSTRA PILLAR	TP
ELECTRIC LIGHT POLE	ELP
POWER POLE	PP
SERVICE PIT	PIT
BOLLARD	BOL
GRATED INLET PIT	GIP
SEWER VENT	SEV
SEWER MANHOLE	SMH
SEPTIC TANK	STANK
SEWER INSPECTION POINT	SIP
STOP VALVE	SV
HYDRANT	HYD
WATER METER	WM
WATER VALVE	WV
GAS VALVE	GAS
GAS	G
TELSTRA	T
WATER	W
STORMWATER	SW
DRAIN	DR
SEWER	S
ELECTRICITY (U'GROUND)	E



REFER TO NOTES AND LEGEND



Revision	Date	Description	Reference
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E	21/06/17	ADDITIONAL DETAIL & LEVELS ADDED - TENTH AVENUE	41240-011

Revision	Date	Description	Reference
D	17/05/17	ADDITIONAL DETAIL & LEVELS ADDED - ELEVENTH AVENUE & EDMONDSON AVENUE	44694
C	07/07/16	ADDITIONAL DETAIL & LEVELS ADDED	43508
B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED	42607
A	08/12/15	PART OF LOT 812 ADDED TO DETAIL	42606

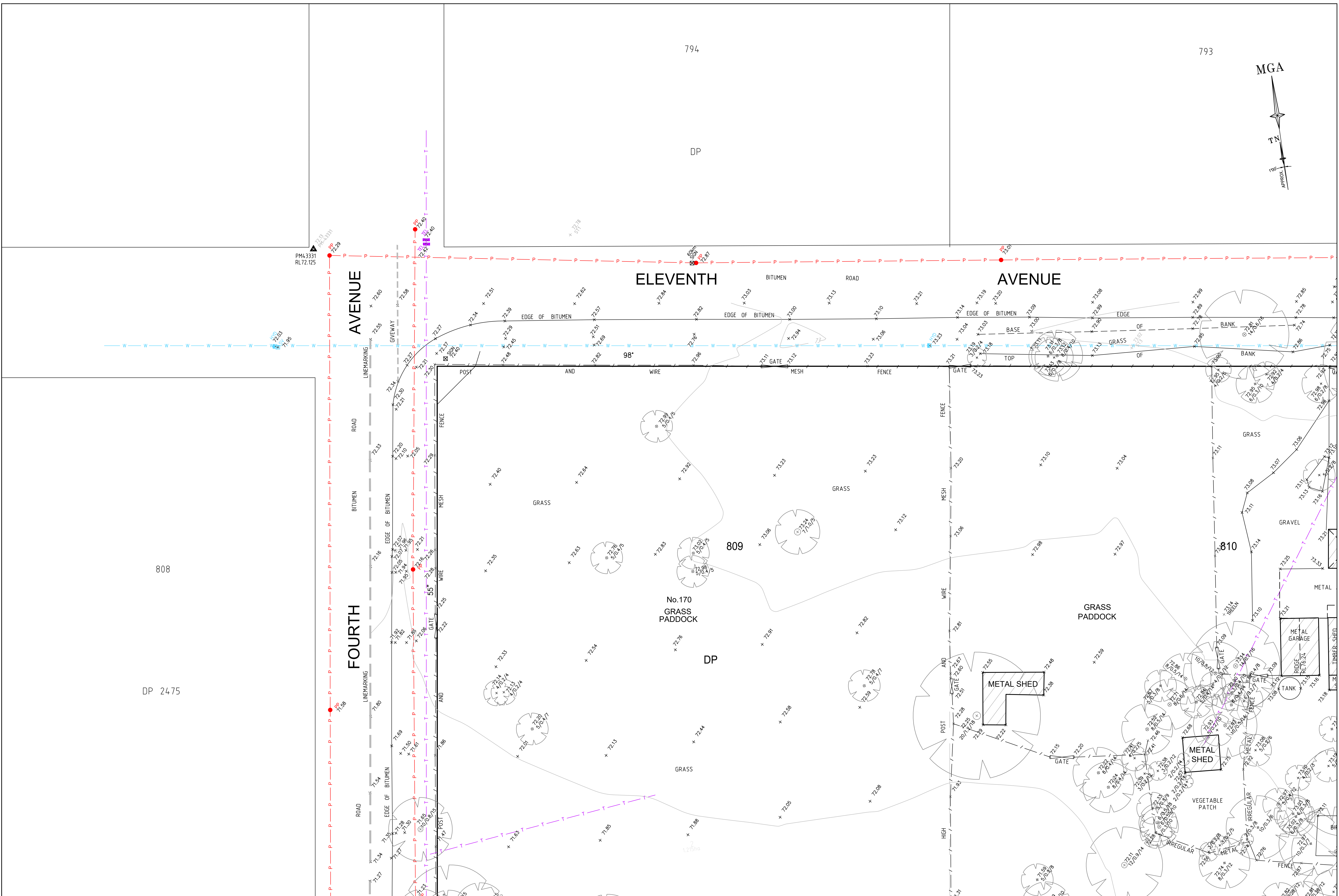
THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:
.....
Registered Surveyor NSW

LTS
LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au

Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client CATHOLIC EDUCATION OFFICE SYDNEY
Drawing title
PLAN OF DETAIL AND LEVELS OVER LOTS 809, 812,
841-843 DP 2475 KNOWN AS No.145-165 TENTH AVENUE
AND No.146-170 ELEVENTH AVENUE, AUSTRAL

datum AHD	project number -	reference number 41240DT
site Area 6.076ha	scale 1:1000 @A1	date of survey 17/10/2014
LGA LIVERPOOL	OF SHEET 11	SHEETS 1



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1:250
SEE SHEET 1 FOR LEGEND AND NOTES

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reference number
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date of survey
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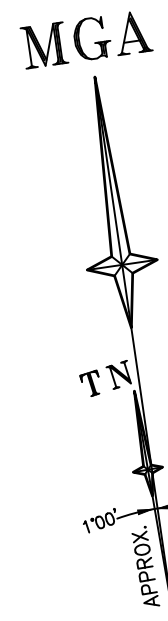
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11 SHEETS

reference number
41240DT
date of survey
17/10/2014
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844

DP 2475

AVENUE

FOURTH

843

DP

GRASS Paddock

GRASS

842
GRASS Paddock

No.155
GRASS

2475

METAL SHED

FIBRO GARAGE

SING
WEAT
CO
MET

GARDEN

TENTH

AVENUE

857

DP 2475

858

DP 2475

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DP 2475

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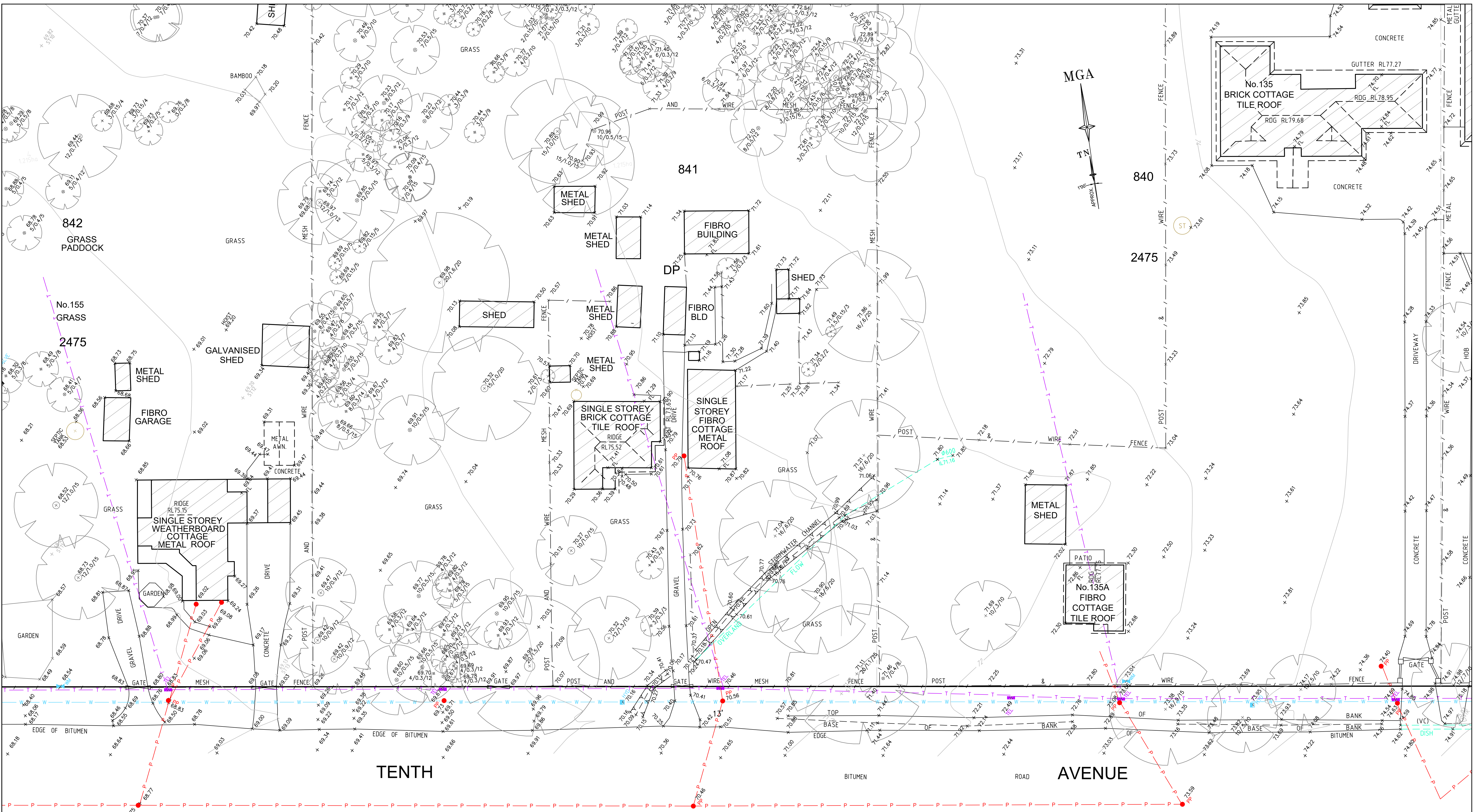


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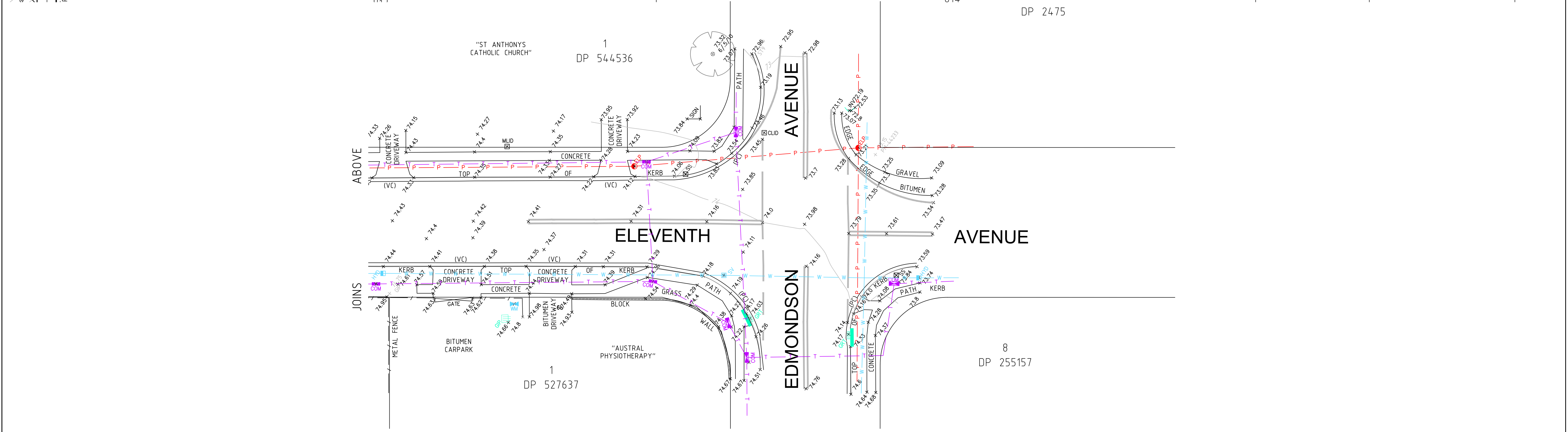
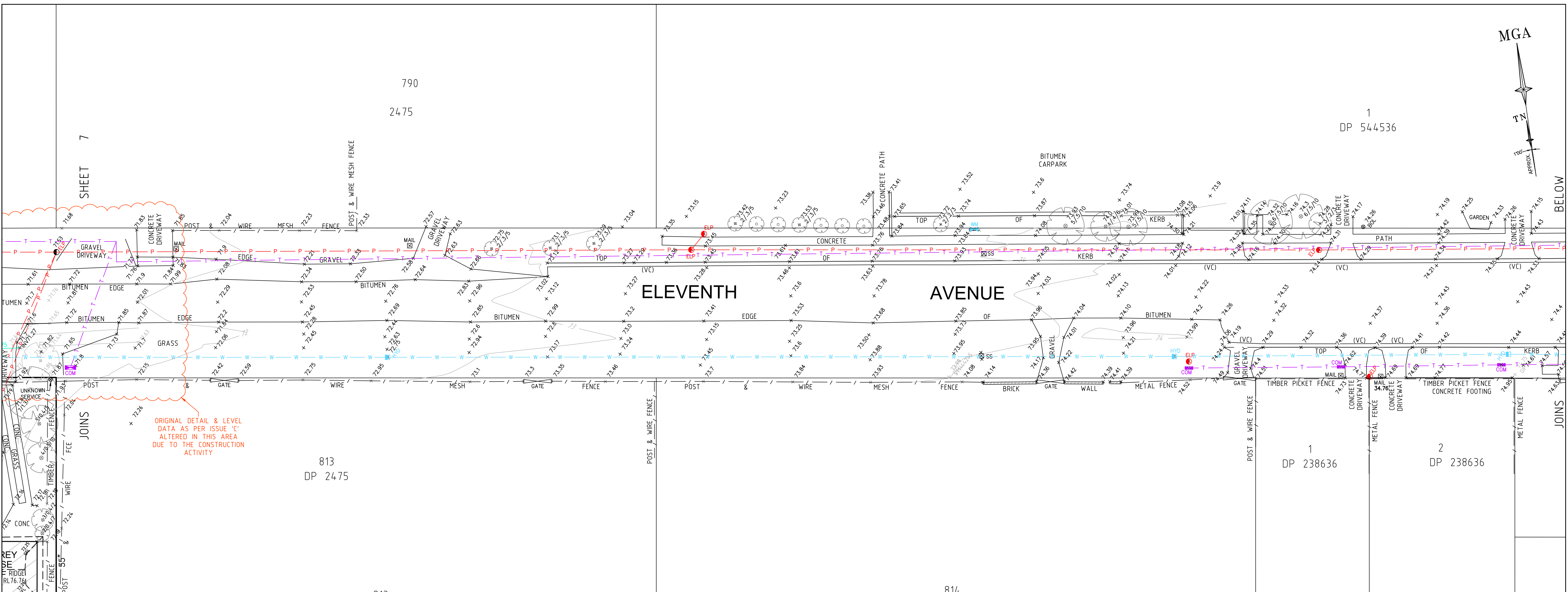
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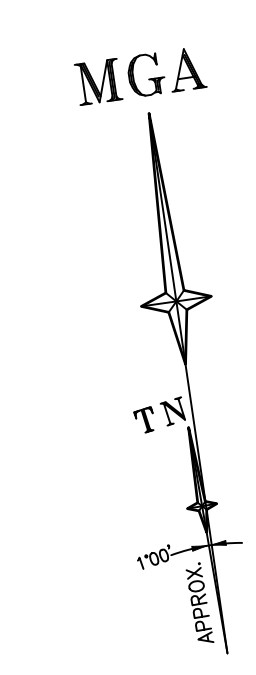
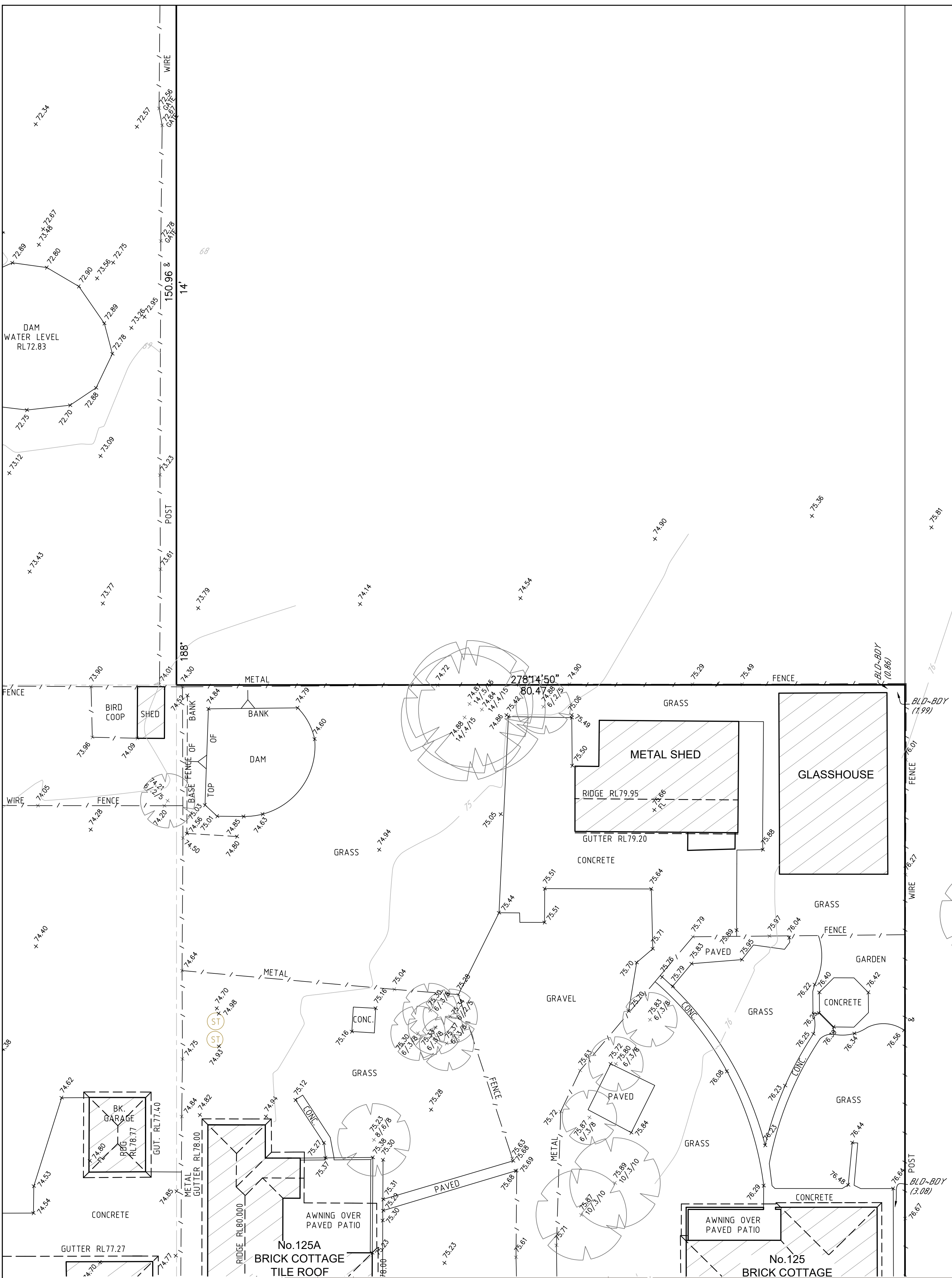
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LGA LIVERPOOL	OF SHEET 11	SHEETS 8



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datum AHD	project number -	reference number 41240DT
site Area 6.076ha	scale 1:250 @A1	date of survey 17/10/2014
LGA LIVERPOOL	SHEET 11 OF 11	SHEETS 9



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B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED	42607
A	08/12/15	PART OF LOT 812 ADDED TO DETAIL	42606
Revision	Date	Description	Reference

THIS IS THE PLAN REFERRED TO
IN MY LETTER DATED:
.....
Registered Surveyor NSW



Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client CATHOLIC EDUCATION OFFICE SYDNEY
Drawing title
PLAN OF DETAIL AND LEVELS OVER LOTS 809, 812,
841-843 DP 2475 KNOWN AS No.145-165 TENTH AVENUE
AND No.146-170 ELEVENTH AVENUE, AUSTRAL

datum
AHD
site Area
6.076ha
LGA
LIVERPOOL

project number
-
scale
1:250 @A1
OF SHEET
11 SHEETS
reference number
41240DT
date of survey
17/10/2014
| 10