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CivilCo Pty Ltd

Remediation Action Plan

4-16 Northwood Rd & 274-274A
Longueville Rd, Longueville NSW

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1. Introduction

EI Australia was engaged by CivilCo Pty Ltd (the 'client') to prepare a remedial action plan (RAP) for 4-16 Northwood Rd & 274-274A Longueville Rd, Longueville NSW (the 'site'). This site is an irregular shaped land parcel covering approximately 4,435 m^2 (0.44 hectares) located in Northern Sydney as presented in **A.1, Appendix A**. At the time of drafting this RAP, site structures remained and included residential and commercial structures, and a commercial service station.

1.1 Proposed Rezoning

CivilCo Pty Ltd intends to develop the land for mixed use, with residential and retail activities proposed. No finalised development plans were provided to EI, however preliminary design sketches indicate the demolition of all current structures and the construction of a multi storey mixed use building with ground floor commercial use. The remedial works will be focused on making the land suitable for residential use with minimal access to soil with a single level of basement parking.

A Telstra tower was present at the rear of the site, and given the size and appearance of the feature, EI consider it likely this feature will remain at the end use of the site. Due to the significant amount of underground services and sensitivity of the area, no intrusive investigation will occur within the Telstra enclosure.

1.2 Remedial Objective

The key objective of the RAP is to ensure the site is remediated in a safe and acceptable manner, to a condition which is suitable for the proposed use. Methodologies provided will ensure the remedial works are compliant with relevant guidance while preventing adverse effects on the surrounding environment.

1.3 Remedial Scope

The site amalgamates five individual properties with individual site histories of various descriptions. Previous environmental investigations completed by previous consultants indicate the former activities of concern were the commercial service station and mechanical workshop activities (4 Northwood) and the former bus depot (16 Northwood). An underground petroleum storage system (UPSS) at 4 Northwood Rd and a disused above ground storage tank (AST) at 16 Northwood Road will require decommissioning, which will be voluntarily completed as part of the site preparation. Mechanical hoists, waste oil sumps and an oil water separator will also require removal and validation, identified within the former workshop (4 Northwood).

Based on the findings of historic works, the current scope of works includes:

- Review of available data relevant to the remediation of the site from previous investigation reports to develop site acceptance criteria;
- Review remediation technologies and select the most appropriate remedial strategy (or combination of strategies) for the site;
- Provide methods and contingencies to carry out the remedial works in accordance with the applicable environmental regulation (e.g. SEPP 55); and

- Development of a sampling, analysis and quality strategy for contamination delineation and post-remedial validation.

1.4 Regulatory Requirements

The following regulatory framework and guidelines were considered:

Legislation

- *Contaminated Land Management Act 1997* (CLM Act);
- *Water Management Act* 2000 (Water Act);
- *Protection of the Environment Operations Act 1997* (PoEO) and associated Regulations including Waste Regulation 2014 (Waste Regs);
- *State Environment Protection Policy 55 – Remediation of Land* (SEPP 55) under the Environmental Planning and Assessment Act 1997 (EP&A Act);
- *Lane Cove Council's Local Environmental Plan* (LEP) 2009 and *Development Control Plan* (DCP) No.4 Site Waste Management and Minimisation; and
- *Work Health and Safety Act 2011* (WHS Act 2011) including Regulations and Codes of Practice.

Guidelines

- ANZAST (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, (WQ Guidelines);
- DECCW (2009) Guideline for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008, (UPSS Guidelines);
- EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Edition);
- EPA (1995) Sampling Design Guidelines;
- EPA (2014) Technical Note: Investigation of Service Station Sites, NSW EPA, Doc. EPA 2014/0315, April 2014.
- EPA (2016) *Environmental Guidelines: Solid Waste Landfills*;
- HEPA (2018) *The PFAS National Environmental Management Plan* (NEMP);
- NEPM (2013) Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater;
- NEPM (2013) Schedule B(2) Guideline on Site Characterisation;
- OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* (CROCS);
- WADOH (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, Published by the Western Australian Department of Health, May 2009

2. Roles and Responsibilities

Roles and responsibilities of key personnel required to complete remediation works are provided in **Table 2-1**. Details of persons responsible should remain valid throughout the lifetime of the remedial works.

Table 2-1 Remedial Management Team

Team Member	Organisation	Responsibilities
Property Owner	CivilCo Pty Ltd	▪ Overall responsibility of site and key liaison for council. ▪ Appoint site contractors and all other members of the RMT.
Project Manager – Site Operations	CivilCo Pty Ltd	▪ Overall site management and day to day decision maker. ▪ Key communicator between site and owner. ▪ Ensure relevant control plans are developed and implemented and appoints required staff to the roles required by the RMT.
Remediation Contractor	TBA	▪ Site preparation including the implementation of environmental controls required by the site management plans and relevant legislation. ▪ Completion of remedial tasks in accordance with the methods of the RAP and relevant legislation. ▪ Ensure consultant is informed of remedial schedules and is employed for key components, such as waste classification and validation. ▪ Effectiveness of mitigating measures required for remedial activities. ▪ Ensure appropriate handling of all material and correct offsite disposal of waste under appropriate documentation. Copies of all waste documents are required by the environmental consultant for inclusion to the site validation report. ▪ Reporting any environmental issues, complaints or unexpected finds to the project manager and environmental consultant.
Environmental Consultant	EI Australia	▪ Development of the remediation objectives and strategy. ▪ Support all other members of RMT in understanding the requirements of the RAP and the potential risks posed should measures not be implemented. ▪ Supervision of key remediation components, collection of all environmental samples and provide guidance to ensure the remediation is understood and effective. ▪ Complete site validation tasks and detail the works in a validation report concluding on site suitability.
Local Authority	Lane Cove Council	▪ Responsible for the granting of all consents and ensuring the recommendations of environmental reports are implemented.

3. Site Setting

The subject site includes nine individual land titles incorporating five individual land parcels over 0.44-hectares. Situated in site is situated the local government area of Lane Cove Council within the 'Northwood Neighbourhood Centre' approximately 9 kms from Sydney CBD. Physical site descriptors are presented below.

Table 3-1 Site Description

Road Address	Lot & DP	Area (ha)	Current Use	Current Zone
4 to 10 Northwood Rd	Lot 1 DP 663462 & Lot 4 DP 321048	0.16	Commercial Service Station	B1: Neighbourhood Centre
12 Northwood Rd	Lot A DP 307899	0.03	Mixed commercial (retail) residential	
14 and 14a Northwood Rd	Lots B and G DP 307899	0.05	Mixed commercial (retail) residential	
16 Northwood Rd	Lots C and D DP 307899 & Lots 1 and 2 DP 445348	0.1	Commercial office and kitchen	E2: Environmental Conservation (16 Northwood only)
274 & 274a Longueville Rd	Lots 1and 2 DP 857133	0.1	Residential use	R4: High density residential

Note 1 Zoning from Lane Cove LEP 2009

A plan showing the site allotments is provided in **Appendix A**, **Figure A.2**.

To the east of the site is Gore Creek and associated bushland, with parts of 16 Northwood Road zoned E2 land. To the west and north are both recreational and residential activities with commercial activities to the south. South west of site, across Northwood Road were two retail BP and Caltex.

3.1 Previous Investigations

Previous investigations provided to EI for preparation of this RAP were

- Douglas Partners (DP) *Phase 1 Contamination Assessment, 4 – 16 Northwood Rd, 274 & 274a Longueville Rd, Lane Cove*. Project No. 45217.01 dated April 2013 (the PSI report); and
- DP *Report on Groundwater Testing, 4 – 10 Northwood Rd, Longueville* Project 84979.01 Dated August 2016 (the GW report);

A summary of relevant findings presented in **Table 3-2**.

Table 3-2 Previous Report Findings

Report	Summary
The PSI	The PSI details current site conditions as at 11 April 2013. The site was situated on a ridgeline with land sloping east and south east. Local topography was noted at a relative level of 40 – 60 meters above Australian Height Datum (mAHD). Ground levels of the site

Report	Summary
	had been modified with evidence of cut and fill noted for site levelling purposes. Regional topography indicates surface water drainage would likely mobilise towards Gore Creek, east south-east of site. No beneficial use of groundwater downgradient of site was noted and is likely to flow east south-east towards Gore Creek and ultimately discharging to Lane Cove River, a marine feature. The site was underlain by Hawkesbury Sandstone of the Triassic Age comprising medium to coarse grained quartz sandstone, very minor shale and laminate lenses and was not within an area of known acid sulfate soil (ASS) occurrence. Site history for each lot and surrounding land were completed. Vacant land was noted at the Longueville Road properties, with current residential structures built between 1990 – 2000 and was of low contamination risk. Land at 4 Northwood Road was used for commercial purposes from 1950, starting as a Milk Bar, then service station from 1970. Commercial use at 16 Northwood was noted from 1940s likely related to a Bus Depot and from 1978 used by Higune Pty Ltd, related to gym and exercise type activities. One UST was identified within the basement of 16 Northwood, likely associated with a fill point observed at 14 Northwood. These are considered related to former bus depot activities. Construction of the neighbouring golf course occurred in 1970. Anecdotal information revealed that the large circular concrete repair noted east of the workshop was due to the removal of a large tree. Waste oil was collected from the site and disposed of at an offsite location. Construction of the current workshop required uncontrolled filling and council record revealed an environmental incident where the rear of 4 – 14 Northwood received uncontrolled fill of an unknown origin. EPA searches did not indicate the presence of significantly contaminated land near the subject site and no significant finds were noted from Section 149 certificate searches. Potential contamination issues were: ▪ 4 & 16 Northwood: A light non aqueous phase liquid (LNAPL) was identified and further investigation of the LNAPL was outside the scope of the investigation. Potential contaminants of concern from historic use as a service station / bus depot were TPH, PAH, BTEX, VOCs, and Pb. ▪ 4 – 16 Northwood Potential filling of unknown origin, impacted by heavy metals (HMs), TPH, BTEX, PAH, phenols, organochlorine and organophosphorus pesticides (OCP / OPP), polychlorinated biphenyls (PCB) and asbestos. The PSI concluded further intrusive investigations were required to assess the degree of contamination posed by the above potential contaminants.
Previous reports on 4 – 14 Northwood Road Service Station (reported as part of PSI)	Potentially contaminating activities of most interest was the speedway service station and mechanical workshop which occupied 4 Northwood Road. A full underground petroleum storage system (UPSS) was in use within the central western part of the property, with bowsers and fuel lines dispensing fuel within the forecourt area, over concrete hardstand. Surface water of the service station was treated onsite via a oil water separator. The PSI mentions two report related to the service station site, however these reports have not been provided to EI. The reports are: ▪ DP (2008) *Report on Phase 2 Contamination Assessment, 4-14 Northwood Road, Longueville*, prepared for Blueprint NSW and STC Architects Pty Ltd (Project 45217, January 2008); and ▪ OTEK Australia Pty Ltd (OTEK) (1995), *Environmental Site Assessment, Location: Caltex Service Station, Northwood NSW,* prepared for Caltex Oil (Australia) Pty Ltd. Job No. S95C072, June 1995) Service station activities have occurred at the site since 1970, prior to which the site was used as a Milk Bar. Four underground storage tanks (USTs) of various sizes containing petroleum fuel were noted as well as a small above ground storage tank (AST) containing waste oil. An interceptor trap and hydraulic hoist were noted within the workshop. One of the USTs was upgraded prior to 1995. The OTEK investigation included drilling of eight hand auger boreholes for the collection of

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	soil samples to 1.5m below ground level (mBGL). Photoionisation detector screening (PID) of soil was completed and no volatile organic compounds (VOCs) were detected in the field. Samples were analysed for lead (Pb), total petroleum hydrocarbons, (TPH), benzene, toluene ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAH) and total phenolics. All results were below the criteria however sampling was limited and did not extend to cover the depth of USTs. Also, no mention of the criteria applied was given. The DP (2008) investigation included drilling of sixteen boreholes and the installation of four groundwater monitoring wells (MWs). Four USTs remained at the site, located in the southern forecourt area. No tank removal was ever recorded by WorkCover, however given the constraints of the sandstone setting, it was concluded that all tank upgrades would likely occur within the same tank put cut into the sandstone bedrock geology. The potential for abandoned USTs within this pit was likely. Soil results were compared to the NSW EPA (1994) *Guidelines for assessing Service Station sites* and groundwater results compared to the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality* for the protection of 95% species in freshwater ecosystems. Results were generally below site criteria, with low levels of contaminants detected. TRH $C_{10} – C_{36}$ fraction was detected in groundwater sample GW111/031207 at 850 µg/L however was not associated with petroleum hydrocarbons and using a 'silica gel' clean-up was determined as natural, and of no risk to the development.
The GW Report	Sampling of groundwater was completed as part of due diligence of the land owner, in 2008, 2011 and 2015 by DP. Samples were collected from three existing wells present across the site, BH102, BH111 and BH112. A new well, BH1 was also installed and sampled as part of the investigation. Further wells were proposed but could not be installed due to access issues. A bowser leak in 2013 was noted by the site operator, likely to have occurred over 2 days. No groundwater observations were made during that time. NEPM (2013) criteria for residential land use were used to screen the analytical results. Hydrocarbon impacts were clearly identified down gradient of the USTs and workshop, however were found to reduce between sampling rounds. Potential migration offsite was unknown. Removal of the USTs and additional sampling was recommended, including an assessment of offsite migration.

3.2 Conceptual Site Model

From the previous site reports, a conceptual site model (CSM) was developed by EI to assist with collection of data. Sources of contamination were identified as:

- Historic activities including the use and storage of petroleum fuels and oils, including the potential use of firefighting foams containing PFAS;
- Infrastructure remaining at the site used to store chemicals, being the underground petroleum storage system (UPSS) and above ground storage tank (AST) identified at 4 and 16 Northwood road, respectively;
- Current automotive servicing activities at 4 Northwood road using mechanical hoists, waste oil pits, LPG and storage of lead and hydrocarbon-based chemicals;
- Onsite migration of petroleum contaminants from the service stations across Northwood Road. In particular, the Caltex service station which was notified as being significantly contaminated but did not require active management under the CLM Act; and
- Site structures containing hazardous building materials such as asbestos containing material (ACM) and lead in paint;

Contaminants of concern were:

- Soil – Total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene and xylene (BTEX), total phenolics, heavy metals (HM) being arsenic (As), cadmium (Cd), copper (Cu), chromium (Cr), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn), organochlorine and organophosphate pesticides, polychlorinated biphenyls (PCB), per- and poly- fluoroalkyl substances (PFAS) asbestos.
- Groundwater - Light non-aqueous phase liquid (LNAPL), TRH, PAH, BTEX, VOCs, and Pb. pH should also be assessed.

A summary of the CSM is presented in **Table 3-2**.

Table 3-2 Receptor and Exposure Pathways

Medium	Transport Mechanism	Exposure Pathway	Potential Receptor	Likelihood of Exposure
Soil, Rock	Mechanical transportation of sediment Offsite disposal	Dermal contact Ingestion Inhalation (asbestos)	Future site occupants Construction and Maintenance Workers	Exposure potential considered minimal for all areas outside of 4 Northwood, based on the minor contaminant concentrations reported and proposed development (bulk excavation). Ingestion and dermal contact exposures are low and standard construction OH&S requirements will appropriately manage all risk, particularly related to hazardous building materials.
Vapour (4 & 16 Northwood only)	Upward migration of VOCs from groundwater and soil headspaces	Inhalation	Future site occupants Construction and Maintenance Workers Offsite residents	Exposure pathway present at 4 & 16 Northwood and removal of UPSS / UST required to reduce risk Exposure potential considered minimal in all other areas of site.
Groundwater	Vertical and horizontal infiltration through bedrock	Dermal contact Ingestion Inhalation Volatilisation	Future site occupants Construction and Maintenance Workers Offsite residents	Exposure potential moderate based on contaminant concentrations identified and the excavation to be completed across the site. Ecological risk is low given heavy metal concentrations are consistent with background levels for urban areas.

3.3 Data Gaps

Data gaps are the primary requirement of the current remedial works, as characterisation of soil has been restricted by the presence of onsite structures. Furthermore, as the end use of site does not propose the significant storage of petroleum chemicals, in-situ infrastructure currently onsite are not considered to represent end use conditions. To ascertain site suitability these influential sources of impact require voluntary removal, ensuring future characterisation sampling is representative the end use. Data gaps were identified as follows:

- Quality of soil to be retained at the end use of site, including the uncontrolled fill deposited within the rear of 4 – 14 Northwood Rd;
- Quality of groundwater beneath the site including an investigation of potential LNAPL present in 4 Northwood and potential offsite migration of contaminants;
- Potential vapour risk posed by groundwater beneath the site for the proposed use;
- Presence of emerging contaminant concentrations such as PFAS in soil and groundwater; and

- Potential offsite migration of groundwater impacts.

3.4 Risk, Hazards and Mitigation

Specific risks associated with excavating potential contaminated soils and exposure to groundwater:

- Health and safety risks to workers associated with petroleum gases (i.e. VOCs and TRH); and airborne asbestos;
- Potential vapour present in significantly odorous soil presenting an ignition source; and
- Potentially hazardous wastes associated with asbestos and the dispersion of windborne fibrous hazards in excavation areas.

4. Remedial Strategy

Remedial strategies outlined in the Site Auditor guidelines provide a preferred order of hierarchy for selection based on sustainability. The methods were assessed for suitability for the current scenario and, with a preferred order of hierarchy for each, which were considered as part of decision-making processes for the remedial works, with the objective defined in **Section 1.2.**

4.1 Remediation Required

Preliminary site investigations revealed impacts to soil and groundwater which pose a potential risk to the proposed development however the presence of onsite structures, in-situ UST and UPSS infrastructure and underground services limited access to much of the site and adequate characterisation is needed to ascertain site suitability. Remedial tasks required are:

- Removal of contaminant sources which will not be present at the end use of site, including site structures, UST, and UPSS followed by remediation of impacted soil and associated validation; and
- Address existing data gaps by guiding future works and ensuring that all future samples collected are representative of end use condition proposed for the site.

Hazardous building materials were identified within onsite structures and will require adequate management as defined by WHS Regulations (2017). These regulations will ensure no adverse effects to surrounding receptors occur during demolition and are enough to adequately manage all risk presented by these contaminants and is not considered a remedial task.

4.2 Preferred Remedial Option

Proposed rezoning will require land to be suitable for land use activities of greater sensitivity than the current commercial use. Remedial methods were selected by the nature of the identified contaminant and how well the method would perform in the current site setting, with consideration of cost, time and physical constraints specific to the site. The remedial works must ensure that the resulting effects of the remediation do not increase the risks posed by the identified contaminants.

Petroleum contaminants are known to be volatile and odorous and exposure of petroleum contaminated soil should remain as minimal as possible. Stockpiles of contaminated material will require placement in unexposed areas of the site on top of concrete hardstand and should not come in to direct contact with any other soil across the site. Effective sediment and odour control will be managed through effective staging of the development works and the includes the following tasks:

- **Task 1 –Remediation of Service Station:** Decommissioning of the UPSS present at 4 Northwood Rd, in accordance with Australian standard AS4976-2008 *The removal and disposal of underground petroleum storage tanks*. This includes the demolition and removal of all onsite structures, canopy, bowsers, fuel lines and USTs. Any soil impacted by hydrocarbons surrounding infrastructure that appear contaminated will be ‘chased out’ until no further contamination is observed, and all excavated material will be segregated and stockpiled on hardstand for classification and offsite disposal. Resulting excavations will be validated by the Environmental Consultant and if necessary, reinstatement of excavations with material validated as suitable for site use will be completed. Should significant volumes of impacted soil be identified, consideration of soil treatment technologies may be required.

- **Task 2 – AST Removal:** An in-situ AST was identified within the basement of 16 Northwood road, enclosed behind brickwork with an external filling point present in the driveway of 14 Northwood Rd. No record of the tank was held by WorkCover. Mechanical access to the UST is restricted by building height and demolition of the structure may be required to gain access. Any soil indicating contamination near the UST will be chased, excavated and stockpiled separately above hardstand to await classification for disposal and/or management. Validation of the resulting excavation will be completed by the Environmental Consultant on completion.
- **Task 3 - Additional Soil Characterisation:** Sampling of soil provided to EI was limited and did not extend beyond 4 Northwood Rd. Additional soil characterisation would include soil sampling of material beneath existing infrastructure to assess the potential presence of contamination within unassessed areas of the site, including PFAS analysis, the collection of physicochemical properties of soil for ecological evaluation (i.e. cation exchange capacity and pH). Former and proposed soil sampling locations are shown on **A.2, Appendix A**. Boreholes in some locations (as indicated on figure) will require further advancement to allow for the installation of groundwater wells for the additional groundwater investigation.
- A visual inspection of the entire site surface for the presence of asbestos as ACM is required, once all demolition has been completed and hardstand is removed, to expose the site surface. An asbestos clearance and photographic logs will be required for the validation report.
- The additional soil investigation dataset will be supplemented by inclusion of the soil validation sampling results.
- **Task 4 – Additional Groundwater Characterisation:** Efforts should be made to preserve existing groundwater monitoring wells, to be sampled post remediation works. Re-evaluation of the previously identified LNAPL at BH111 will be required and shall include the installation of further wells downgradient from the service station and mechanical workshop. Installation of wells at an upstream location and within areas considered down hydraulic gradient of BH111, the former service station and workshop sites, the AST and the neighbouring service station sites. The groundwater characterisation will include an evaluation of the site's compliance with the *Duty to Report Contamination under the CLM Act 1997* and should significant contamination be reported within groundwater; direct vapour assessments may be required.

The works detailed above can be undertaken as part of site construction once demolition has occurred and access to the site surface is provided.

4.3 Acceptance Criteria

To confirm the effectiveness of the remediation and to ultimately ensure the site is suitable for the proposed commercial / residential land use zone, the data collected will be evaluated against criteria for residential with minimal access to soil land use scenarios, being the proposed land use of greatest sensitivity.

Soil to remain onsite will be evaluated using NEPM 2013 HILB and HSLA&B criteria for residential with minimal access to soil, as well as the NEMP for PFAS contaminants. Consideration of ecological suitability for accessible soil and landscaping areas and aesthetic suitability as defined by the NSW Site auditor is also required. Any material which requires offsite disposal will require waste classification in accordance with EPA (2014) *Waste Classification Guidelines*.

Groundwater from the site discharges at Gore Creek and ultimately Lane Cove, being marine in nature. Groundwater will be evaluated against NEPM (2013) groundwater investigation levels for marine waters, based on the ANZECC (2000) water quality guidelines. As the receiving waterbody is located at some distance from the site, direct use of the trigger values is considered conservative as contaminant concentrations are expected to attenuate prior to discharge and may require further evaluation of risk using ANZECC *Recreational Water Quality* guidelines (2000). Potential vapour risk posed by groundwater contamination will be evaluated against NEPM 2013 HSL A&B criteria and PFAS concentrations to be evaluated in accordance with NEMP.

5. Remedial Works

Management options for the identified contamination were selected and will be completed as follows:

- Site Establishment;
- Site Demolition
- Service Station Remediation
- AST Removal
- Waste Management
- Additional soil investigation
- Additional groundwater investigation
- Evaluation and Validation

5.1 Site Establishment

5.1.1 Preliminaries

The remedial works are considered Category 2 under State Environmental Planning Policy No.55 (SEPP 55) – Remediation of Land. Category 2 works will not require development consent. Notice should be given to Council at least 30 days prior to the commencement of remediation works. Provision of this RAP, as well as an indication of commencement and completion dates of the works in writing, is usually enough to meet the requirements of this notification. Establishment of environmental controls, site access, security, fencing, and signage is required prior to works commencement.

5.1.2 Management Plans

Site-specific management plans are required to manage any adverse effects resulting from the remedial work. The plans will be developed in accordance with Lane Cove Council DCPs and any development consent conditions issued for the site with consideration of WHS legislation. Plans shall include, but not be limited to a construction environmental management plan (CEMP), health and safety (H&S) plan and a hazardous materials management plan (Hazmat). Site clean-up procedures for personal protective equipment, disposable overalls and hearing protection will be included. A project plan should also be developed to outline engineering design for temporary shoring excavation support (if required), staging of demolition and remediation works, stockpiling, waste material loading, traffic management and waste tracking. Staging should include but not be limited to the areas to be demolished, hardstand removal and soil to be excavated.

5.2 Site Demolition

Removal of all onsite structures is required to access underlying soil requiring remediation. Prior to demolition, a hazardous material survey is required in accordance with WHS regulations (2017) and removal of the material in accordance with the plan will be completed by a suitably qualified hazardous materials removal contractor.

Building demolition should be in accordance with Australian standard (AS)2601 – 2001 and wherever possible, waste should be segregated into metal, wood and brick / concrete.

When underlying soil at the site surface is exposed, either the environmental consultant or the Hazardous Materials (HazMat) Removal Contractor should ensure that the surface of the site shows no visible asbestos as ACM. Where ACM is identified, removal will occur by:

- Manually collecting the ACM using emu-bobbing. Wearing nitrile gloves in wet soil conditions, any ACM will be collected and placed into double lined, sealed and appropriately labelled asbestos waste bags.
- All asbestos impacted soils should be taken to a facility licenced to receive asbestos waste and
- Evidence of the effective removal of the ACM will be required via an asbestos clearance certificate which includes observations of the site surface, details of the ACM identified, volumes removed and disposal details and photographic log.

5.3 Service Station Remediation

All infrastructure will require removal to achieve access to underlying strata. It is likely that temporary shoring will be required during the remedial excavation works to ensure remedial excavations are conducted safely. Planning should include the mitigation of aesthetic effects resulting from atmospheric exposure of potentially contaminated soil given the odorous and volatile nature of petroleum. WorkSafe records indicate current USTs remaining as:

- 4 x UST containing petroleum (14,700L, 17,800L, 20,000L and 25,000L);
- 1 x 190kg LPG decanting cylinder;
- Waste oil separator, south east corner of 4 Northwood; and
- Hydraulic hoist / Waste oil pits in mechanical workshop.

A figure extracted from the DP PSI is included as **A.3, Appendix A** which indicates the locations of these features within the former service station land. Procedures for removal of the building, tanks and canopy are:

- Complete a hazardous materials assessment on site buildings and hazardous material removal contractors will effectively remove and dispose of any offending material.
- Complete building demolition in accordance with AS2601-2001. Where possible, segregate waste streams.
- Engage a licensed liquid waste transporter to remove any liquid contents from the UPSS infrastructure, waste oil pits and oil water separator tank and dispose of any liquid waste to a suitably licensed liquid waste facility. Waste disposal documentation is required for site validation.

For the works described below, supervision will be required by a suitably qualified environmental professional to reduce volatilisation risks and ensure the remedial works are competed in accordance with the DECC (2010) UPSS Technical Note: Decommissioning, abandonment and removal of UPSS and AS4976-2008 (R2016) *The removal and disposal of underground petroleum storage systems.*

- Above ground infrastructure including mechanical hoists, oil water separators, bowsers, fuel lines and vent lines will be removed followed by excavation of the waste oil pits and decommissioning of the USTs. Once the USTs are excavated, they will be rendered safe for transport by a licensed contractor for offsite destruction/disposal. The contractor must provide formalised certification of the tank destruction/disposal.
- Any soil showing signs of contamination will screened using a photoionisation device (PID) and all soil producing readings greater than 20 parts per million (ppm) will be excavated, segregated and stockpiled awaiting further classification. Any impacted soil will be 'chased'

and removed until no further signs of contamination are present and PID readings are <20 ppm.

- Excavated soil is to be managed in accordance with the methodologies presented in **Section 5.12** and remain segregated from clean soil awaiting waste classification. Should significant volumes of material or contaminant concentrations be identified, bioremediation of the contaminated material may be suited, and samples will be collected to evaluate the suitability of this method. Once classified, material will be transported to an off-site waste disposal facility to minimise dust and odour issues
- All excavation works should be undertaken by licensed contractors experienced in the decommissioning and removal of fuel infrastructure, demolition of buildings and the remediation of hydrocarbon contaminated soils.
- Validation of excavations will be required as described in **Section** 7 of this report.

5.3.1 General Excavation Procedure

- The remedial excavation should be staged in such a way to encompass all impacted soils present in the designated area, while allowing machinery to track across the shortest path required.
- Machinery and/or equipment used for the excavation works should be dedicated to the remedial works, and should be clean, free of all solid materials.
- Mark out the extent of the soil impact, being a 5m by 5m grid, with the former investigation borehole location being centrally within the square. The extent of the impacts should be marked in a way to withstand external conditions and should remain throughout the entire remedial excavation.
- The remedial excavation shall continue until natural material is reached and all visual signs of contamination are removed. Should the site boundary be encountered prior to the target depth being reached, excavation will cease and samples at the site boundary will be collected, for characterisation purposes.
- All excavated, impacted material is to be stockpiled separately from all other excavated materials, on either remnant hardstand, or an impermeable surface (such as a plastic liner). Sedimentation control will be required at the base of the hydrocarbon stockpile to reduce mechanical dispersion of the contaminant.
- Any soils with heavy staining and/or unusual (e.g. petroleum hydrocarbon, chlorinated solvent) odour are to be isolated from other excavated materials, for waste classification sampling and testing. The screening of soil headspace samples will be conducted for any (suspected) VOC screening.
- Soil validation samples will be collected from the base and side walls of the final excavations, in accordance with validation sampling requirements (**Section 7**) along with visual and olfactory observations.
- Validation samples will be collected from excavation surfaces (walls and bases) for laboratory analysis for lead, TRH, PAH and asbestos (as presence / absence), as a minimum.

5.4 AST Removal

Above ground demolition may occur at anytime however must consider the location of the AST within the basement. The remedial excavation should be staged as detailed in **Section 5.3.1** above. Procedures for this task are:

- Complete a hazardous materials assessment then remove and dispose of any offending material, followed by demolition in accordance with AS2601-2001.
- Remove any liquid contents from the AST to a suitably licensed liquid waste facility and include waste disposal documentation.
- Dismantle the AST and associated infrastructure to be rendered safe for transport by a licensed contractor for offsite destruction/disposal, and certification must be provided.
- Any soil showing signs of contamination will be screened using a PID and all soil with readings >20ppm will be chased, excavated and stockpiled until no further signs of contamination are present and PID readings are <20 ppm.
- Excavated soil is to be managed in accordance with the methodologies presented in **Section 5.12** and transported to an off-site waste disposal facility authorised to accept the material; and
- Validation of excavations will be required as described in **Section** 7 of this report.

As above, all works must be completed by licensed contractors experienced in the decommissioning and removal of fuel infrastructure, and demolition.

5.5 Waste Management

1. Prior to any soil material being removed from the site, a formal waste classification certificate shall be completed, in accordance with the EPA (2014a) *Waste Classification Guidelines*.
2. Soil samples designated for waste classification will be collected at a rate of one sample per 25m^3 up to 2,500m^3. For spoil exceeding 2,500m^3, a minimum of 10 samples is required and 95% UCL statistical calculations of contaminant concentrations will be compared to the criteria. For quality assurance / quality control (QAQC) procedures, collect one intra-laboratory and one inter-laboratory duplicate for every 20 primary samples and one rinsate blank per sampling round. Samples to be analysed for TRH, BTEX, PAH, HMs, perfluorooctanesulfonic acid (PFAS), organochlorine / organophosphorus pesticides (OCP / OPP), polychlorinated biphenyls (PCBs) and asbestos.
3. Any asbestos identified will be treated as an unexpected find and the unexpected finds protocol (**Appendix C**) will be engaged.
4. Results of analysis will be compared to waste classification criteria and a classification certificate will be provided, to enable offsite disposal.
5. Ensuring that the waste fill/soil streams are kept separate, material will be loaded, transported and disposed offsite to waste landfill facilities that are appropriately licensed to receive the materials corresponding to the documented waste classifications.
6. In accordance with the *POEO (Waste) Regulation 2014*, waste movements will be tracked and disposal receipts (dockets) will be maintained by the site manager and copies provided to EI for final reporting purposes.

5.6 Materials Handling and Management

Table 5-1 summarises the measures that should be implemented in respect of materials handling during remedial and bulk excavation works at site.

Table 5-1 Materials Handling and Management Requirements

Item	Description/ Requirements
Excavation Contractors	Excavation should be completed by a suitably qualified contractor to ensure staff are aware of the sites environmental, health and safety requirements, that all adverse effects are either mitigated, isolated or reduced, no nuisance effects or uncontrolled discharge occurs because of the works and any pollution incidents, health impacts or complaints are appropriately managed.
Stockpiling of Materials	All stockpiles will be maintained as follows: ▪ Present on sealed surfaces such as concrete, asphalt, or high-density polyethylene. If placed on bare soil, the land will be over-excavated to ensure adequate removal of all impacted material, and located in areas of the site which dot do not pose environmental risk (e.g. sheltered areas). ▪ No greater than 2m in height, be appropriately battered and sediment measures surrounding each base to manage stormwater runoff. Material will either be covered or kept moist to prevent dust blow. ▪ Stockpiles will be in approved locations of the site, selected to mitigate environmental impacts while facilitating material handling requirements. Any contaminated material will only be stockpiled in non-remediated areas of the site or at locations that do not pose any risk (e.g. sheltered areas).
Transport of Material (off-site)	Material shall be transported via a clearly distinguished haul route defined within construction management plans. All haulage routes for trucks transporting soil, materials, equipment and machinery shall comply with all road traffic rules, minimise noise, vibration and odour to adjacent premises, utilise state roads and minimise use of local road. Implementation of sediment measures to reduce the mechanical movement of soil onto public roadways or vehicle wheels is required, such as wheel washing/cleaning facilities placed at each site entry/exit. Any residue from the cleaning facility will be collected and deemed contaminated unless proven otherwise. Spool material will require offsite disposal. Trucks transporting soils from the site are to be covered with tarpaulins (or equivalent). All deliveries of soil, materials equipment or machinery should be completed during the approved hours of remediation and exit the site in a forward direction. Removal of waste materials from the site shall only be carried out by a recognised contractor holding the appropriate EPA NSW licenses, consents and approvals.
Material Tracking	Materials excavated from the site should be tracked from the time of their excavation until their disposal ("cradle to grave"). Tracking of the excavated materials should be completed by recording the following: ▪ Origin of material; ▪ Material type; ▪ Approximate volume; and ▪ Truck registration number. Disposal locations will be determined by the remediation contractor and the receiving facility, weighbridge dockets and waste certification information should be provided to the environmental consultant for validation reporting.

Item	Description/ Requirements
Importation of Material	Landscaping soil, or material imported as fill for planter boxes, is to be certified as either Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM) criteria by the supplying contractor. Copies of certification are to be provided to site management and the Environmental Consultant. Any material outside of these classifications are to be sampled for characterisation, which can be achieved by: 1. Collecting one soil sample per 100m^3 of imported soil in deposited areas. 2. Analysis of samples for contaminants of concern, including TRH, BTEX, PAH, HMs, PFAS, OCP / OPP, PCBs and asbestos (at least). 3. Acceptance will be achieved once all contaminant concentrations are reported to be below the site criteria. 4. Analysis results should be presented to the Environmental Consultant for inclusion in the site validation report. Visual inspection of the imported material to confirm consistency is recommended and should excavated materials be identified as potentially contaminated or unsuitable for reuse, the following procedure should be: ▪ Visually assess if the contaminated material can be isolated from other material, and stockpile separately if possible. ▪ Stockpile in contaminated material area and sample in accordance with waste classification procedure in **Section 5.2**. Consideration of foreign material contaminants should be considered. ▪ Subject to classification, 'clean' materials may then be reused as filling material on-site or disposed of at an appropriate receiving facility.

5.7 Additional Soil investigation

During, or prior to, the remediation works further soil investigations are required to address the identified data gaps and shall include soil sample collection from unassessed areas of the site to characterise the material and determine suitability of the land for the proposed sensitive use. Sample design guidance recommends a minimum of 13 sampling points are required for a site of similar size. Additional soil sampling is proposed in locations as shown on **A.2, Appendix A.**

Analysis shall target fill and natural soil at each location, to be analysed for contaminants of concern presented in **Section 3.2.** If further contamination of potential risk is identified, further remedial works may be required and will be addressed via an addendum to this RAP.

5.8 Additional groundwater investigation

Groundwater investigations are required on completion of all remedial tasks, and will include the installation of wells as shown in **A.2, Appendix A** and targets groundwater ingress to site, migration of contaminants from offsite sources and migration of contaminants from UPSS and UST onsite.

Former well installation logs indicate groundwater ingress within sandstone to be approximately 3 – 4 mBGL. Wells should be installed to screen at least 1m above the standing water level (SWL) as well as 2 m below the SWL to assess the potential presence of LNAPL and vapour within the vadose zone. Groundwater monitoring wells will be adequately developed to remove sediment from the well, and be left for at least seven days prior to sampling, post development. Sampling will be completed using micropurge techniques and will analyse for the contaminants of concern presented in **Section 3.2,** including field measurements of pH, ORP and TDS.

Should further contamination of potential risk be identified, further remedial works may be required and will be addressed via an addendum to this RAP.

5.9 Evaluation and Validation

All findings and investigation methodologies of the additional investigations will be reported via an investigation update letter, and should significant contamination be identified, further works will be addressed via an addendum to this RAP. These works may include soil vapour sampling, indoor air quality assessment, active groundwater remediation and bioremediation of significantly contaminated soil.

Once site validation has been achieved, the findings of the work will be reported as discussed below in **Section 6**.

6. Sampling, Analytical and Quality Plan

The sampling, analytical and quality plan (SAQP) plays a crucial role in ensuring that the data collected are representative and provide a robust basis for site assessment decisions.

6.1 Data Quality Objectives

In accordance with the NEPM and the Australian Standard AS4482.1 *Guide to the Sampling and Investigation of Potentially Contaminated Soil*, Data Quality Objectives (DQO) were developed in a sequential manner as documented below.

Table 6-1 Data Quality Objectives

Step	Description
State the Problem	The site amalgamates five land lots of various historic use. Contaminating activities have been identified that are unsuitable for the proposed rezoning, which requires land to be suitable for residential use, with basement parking.
Identify the Decision	No significant contamination was identified and decisions that need to be made are: ▪ Has the nature and extent of soil and groundwater impacts onsite been defined? ▪ Does the level of impact coupled with the fate and transport of identified contaminants represent an unacceptable risk to identified human and/or environmental receptors on or offsite? and ▪ Will further remediation and/or special management be required before the site is suitable for the intended land use?
Identify Inputs to the Decision	Inputs to the decision process include: • Previous investigation works; • Details of the proposed site use; • Understanding of current site use and historic activities that have occurred, including potential offsite sources of contamination; • Geological and hydrogeological data relevant to the area, including physicochemical parameters for calculating ecological criteria; • Field screening data and site observations for the presence of visual/olfactory contamination indicators; • Contaminant concentrations in soil validation samples confirming effective removal of identified impacts; and • Further input to the decision will be sample collection and handling, field and laboratory QAQC and confirmation that data quality indicators (DQIs) were achieved.
Define the Boundary of the Assessment	Spatial – Works are limited to the site boundaries (Appendix A, Figure A.2) and the estimated (3m) excavation depth. Temporal – The results will be valid on the day samples are collected and will remain valid if no changes to site use occur, and contamination (if present) does not migrate from off-site sources. Constraints of sampling requiring consideration include access restrictions (due to site operations and/or conditions) and presence of both above and underground services / structures.

Step	Description
Develop a Decision Rule	The decision rules for validation are: • Is the site suitable for the proposed land use? *If the concentrations of contaminants in the soil that remains are below the relevant criteria for the intended land use; then the site will be deemed suitable for the proposed development.* • Is additional information required to determine the suitability of the site for its proposed use? *Should additional information be required as determined by the conceptual site model (CSM), then appropriate recommendations will be provided.* Decision criteria for analytical data are defined by the Data Quality Indicators (DQI) in **Table 6-2**.
Specify Acceptable Limits on Decision Errors	Specific limits for this project are to be in accordance with NEPM, appropriate data quality indicators (DQIs) for assessing the useability of the data, and EI standard procedures for field sampling and handling. To assess the useability of the data, pre-determined DQIs for completeness, comparability, representativeness, precision and accuracy, as presented below in **Table 6-2**. If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the useability of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of samples.
Optimise the Design for Obtaining Data	• Written instructions will be issued to guide field personnel in the required fieldwork activities. • Soil excavation is to be performed as per **Section 5**. Soil validation sampling is to be completed as per the methodology prescribed in **Section 7**. • Validation sampling procedures that would be implemented to optimise data collection for achieving the DQOs. • Review of the results will be undertaken to determine if further excavation and additional sampling is warranted. Additional investigations would be considered to be warranted where soil concentrations are found to exceed remediation criteria endorsed by the NSW EPA, relevant to the proposed land use(s).

6.2 Data Quality Indicators

To ensure that the data collected is of an acceptable quality, the data set will be evaluated against the data quality indicators (DQI) outlined in **Table 6- 2**, which related to both field and laboratory-based procedures.

Table 6-2 Data Quality Indicators

Data Quality Objective	Data Quality Indicator	Acceptable Range
Accuracy	Field – Trip blank (laboratory prepared) Laboratory – Laboratory control spike and matrix spike	< laboratory limit of reporting (LOR) Prescribed by the laboratories
Precision	Field – Blind replicate and spilt duplicate Laboratory – Laboratory duplicate and matrix spike duplicate	<30% relative percentage difference (RPD [%]) Prescribed by the laboratories
Representativeness	Field – Trip blank (laboratory prepared) Laboratory – Method blank	< laboratory limit of reporting (LOR) Prescribed by the laboratories
Completeness	Completion (%)	-

6.3 Deviations from RAP

While it may be possible to vary the sequence and/or details of the remediation and validation works to meet site constraints, a qualified Environmental Scientist should be appointed to the project to ensure:

- Critical stages of the site remediation/validation process are appropriately supervised, implemented and documented, with the relevant data collected for environmental reporting purposes; and
- Any deviations from the works specified in this RAP are properly documented and approved, as required under the OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*.

Performing remedial and validation works without the presence of a qualified environmental engineer/scientist when necessary may lead to project delays and extra costs due to additional environmental requirements imposed by regulatory authorities. Furthermore, spoil removed from the site without proper waste classification may lead to regulatory action and potential penalties under the POEO and CLM Acts.

6.4 Remedial Contingencies

At this stage it is anticipated that the proposed remedial technologies should be effective in dealing with the contamination present, however remedial contingencies may be required should the scenarios detailed in **Table 6-3** arise.

Table 6-3 Remedial Contingencies

Scenario	Remedial Contingencies/Actions Required
Highly contaminated soils or asbestos wastes not identified during previous investigation are encountered	Work to be suspended until the Environmental Project Manager can further assess impacted soils/ materials and associated risks. Follow the unexpected finds protocol as detailed in **Appendix C** of this RAP.
Further tanks are encountered at the site	Systems to be removed and the excavations appropriately validated and backfilled by experienced contractor as described within the RAP. Environmental Consultant must supervise any further UST removal.
Highly impacted buried contaminated materials are uncovered	The leachability of heavy metals and hydrocarbons will need to be assessed before disposal options are considered. Follow the unexpected finds protocol as detailed in **Appendix C** of this RAP.
Significant asbestos wastes are encountered	Work to be suspended and asbestos work removed by a suitably qualified contactor, in accordance with the requirement of SafeWork NSW. Follow the unexpected finds protocol as detailed in **Appendix C** of this RAP.
Contamination is identified near heritage items or significant trees (if identified)	Stop work. Review contaminant concentrations and risks to heritage items / flora. Assess human health and environmental risks if contamination remains in place. Review natural attenuation options.
Changes in proposed basement excavation depth	Review of the remediation works completed for the site.

7. Validation Strategy

To achieve site validation, the calculated value, known as the'95% upper confidence limit' (95% UCL), of the average concentration for each analyte will be less than relevant residential land use scenario values. Where the 95% UCL is less than the relevant threshold value but one or more individual sample measurements are more than 250% above the criteria, the corresponding area of site should be re-investigated to determine whether it constitutes a 'hot spot'. Should backfilling be required, validation of imported fill materials used for the backfilling of remediated areas would be required to verify their suitability for the proposed land use.

Asbestos clearance to be completed by either the environmental consultant or asbestos removal contractors and an asbestos clearance provided to confirm all removal of ACM has occurred. Should this not be provided, asbestos validation sampling may be necessary, and should be completed in accordance with WADOH asbestos sampling guidelines, at double density using qualitative methods.

The recommended soil sampling and handling is proposed in **Table 7-1.**

Table 7-1 Validation Methodology

Action	Description of Required Works
Sample Collection (soils)	Soil validation sampling will be directly from the exposed surface of excavation, or from the material brought to the surface by the backhoe/excavator bucket. Sampling data shall be recorded to comply with routine chain of custody requirements.
Sampling Frequency	**Remediation Excavations:** 1 sample per 100m^2 of the base of the excavation (minimum of one base sample per excavation pit) and one sample per 10 lineal metres along each wall (with a minimum of one sample per excavation pit wall). **Stockpiled Materials:** Sampling of stockpiles at a rate of 1 sample per 25m^3, with a minimum of 3 samples per stockpile. Stockpiles exceeding 250m^3 but not exceeding 2,500m^3 may be sampled in accordance with NEPM (2013) – which allows characterisation according to 95%UCL of the mean concentration of an analyte provided a minimum of 10 representative samples are assessed.
Sampling, Handling, Transport and Tracking	▪ The use of stainless-steel or disposable (one time use) sampling equipment; ▪ All sampling equipment (including hand tools or excavator parts) to be washed in a 3% solution of phosphate free detergent (Decon 90), followed by a rinse with potable water prior to each sample being collected; ▪ Direct transfer of the sample into new glass jars, bottles, vials or plastic bags is preferred, with each plastic bag individually sealed to eliminate cross contamination during transportation to the laboratory; ▪ Label sample containers with individual and unique identification including Project No., Sample No., depth, date and time of sampling; ▪ Place sample containers into a chilled, enclosed and secure container for transport to the laboratory; and ▪ Provide chain of custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer

Action	Description of Required Works
	of samples from the field to the environmental laboratory.
Sample Containers & Holding Times	▪ Metals - 250g glass jar / refrigeration 4^{o}C / 6 months (maximum holding period); ▪ TRH/BTEX - 250g glass jar / refrigeration 4^{o}C / 14 days (maximum holding period); ▪ PAH - 250g glass jar / refrigeration 4^{o}C / 14 days (maximum holding period); and ▪ Asbestos – up to a 10 Litre resealable plastic (polyethylene) bag / no refrigeration / indefinite holding time.
Laboratory Analysis	Each sample obtained for soil validation purposes will be analysed as follows: 4 and 16 Northwood – Analysed for lead, TPH, BTEX, VOC, PAH and phenols. Testing of imported materials intended for backfilling of excavated areas shall include but not be limited to the minimum suite specified for imported fill under the EPA (2014a) guideline (e.g. heavy metals, TRHs, BTEX, PAHs, PFAS, OCPs, OPPs, PCBs and asbestos).
Field QA/QC	Quality assurance (QA) and quality control (QC) procedures will be adopted throughout the field sampling program to ensure sampling precision and accuracy, which will be assessed through the analysis of 10% field duplicate/replicate samples. Appropriate sampling procedures will be undertaken to prevent cross contamination, in accordance with EI's Standard Operating Procedures Manual. This will ensure: ▪ Standard operating procedures are followed; ▪ Site safety plans are developed prior to works commencement; ▪ Split duplicate field samples are collected and analysed; ▪ Samples are stored under secure, temperature-controlled conditions; ▪ Chain of custody documentation is employed for the handling, transport and delivery of samples to the contracted environmental laboratory; and ▪ Contaminated soil, fill or groundwater originating from the site area is disposed in accordance with relevant regulatory guidelines. In total, field QA/QC will include one in 10 samples to be tested as intra-laboratory, blind field duplicates, one in 20 samples to be tested as inter-laboratory, split field duplicates, as well as one VOC trip blank, one VOC spike sample and one equipment wash blank sample per sample batch.
Laboratory Quality Assurance and Quality Control	The contract laboratory will conduct in-house QA/QC procedures involving the routine analysis of: ▪ Reagent blanks; ▪ Spike recoveries; ▪ Laboratory duplicates; ▪ Calibration standards and blanks; ▪ QC statistical data; and ▪ Control standards and recovery plots.
Achievement of Data Quality Objectives	Data quality objectives (Table 6-2) are to be achieved and an assessment of the overall data quality should be presented in the final validation report, in accordance with the EPA (2017) *Guidelines for the NSW Site Auditor Scheme*.

7.1 Reporting

All fieldwork, chemical analyses, discussions, conclusions and recommendations will be documented in a validation report for the site. The validation report will be prepared in general accordance with requirements of the EPA (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and EPA (2017) *Guidelines for the NSW Site Auditor Scheme* and will confirm that the site has been remediated to a suitable standard for the proposed development.

The Site Validation Report will be submitted for Council and/or Site Auditor review at the completion of the remediation works program.

8. Conclusions

Based on the information available from previous investigations at the site, this RAP has been prepared to inform the remediation works at 4-16 Northwood Road and 274 - 274A Longueville Road, Longueville NSW .

Demolition of site structures and voluntary remediation to remove petroleum storage systems is required, to enable further site characterisation and to make the suitable for the proposed mixed use.

The preferred approach involves excavation and offsite disposal of impacted fill materials. Groundwater beneath the site has been found to be suitable for the proposed commercial land use. Demolition of the former service station site will be required as part of the service station remedial works. It is envisaged that the remediation works will be implemented in stages, as follows:

- Site Establishment;
- Site Demolition
- Service Station Remediation
- AST Removal
- Waste Management
- Additional soil investigation
- Additional groundwater investigation
- Evaluation and Validation

Material management procedures are provided to characterise soil for offsite disposal, and contingency measures are provided for any unexpected finds. In summary, EI considers that the site can be made suitable for the proposed commercial land use through the implementation of the works described in this RAP.

9. Limitations

This report has been prepared for the exclusive use of CivilCo Pty Ltd (the client), being the only intended beneficiary of our work. The scope of the RAP is limited to that agreed with our client.

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the environmental industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The methods and conclusions presented in this report are based on a limited investigation of conditions, with specific sampling locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during remedial activities. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

References

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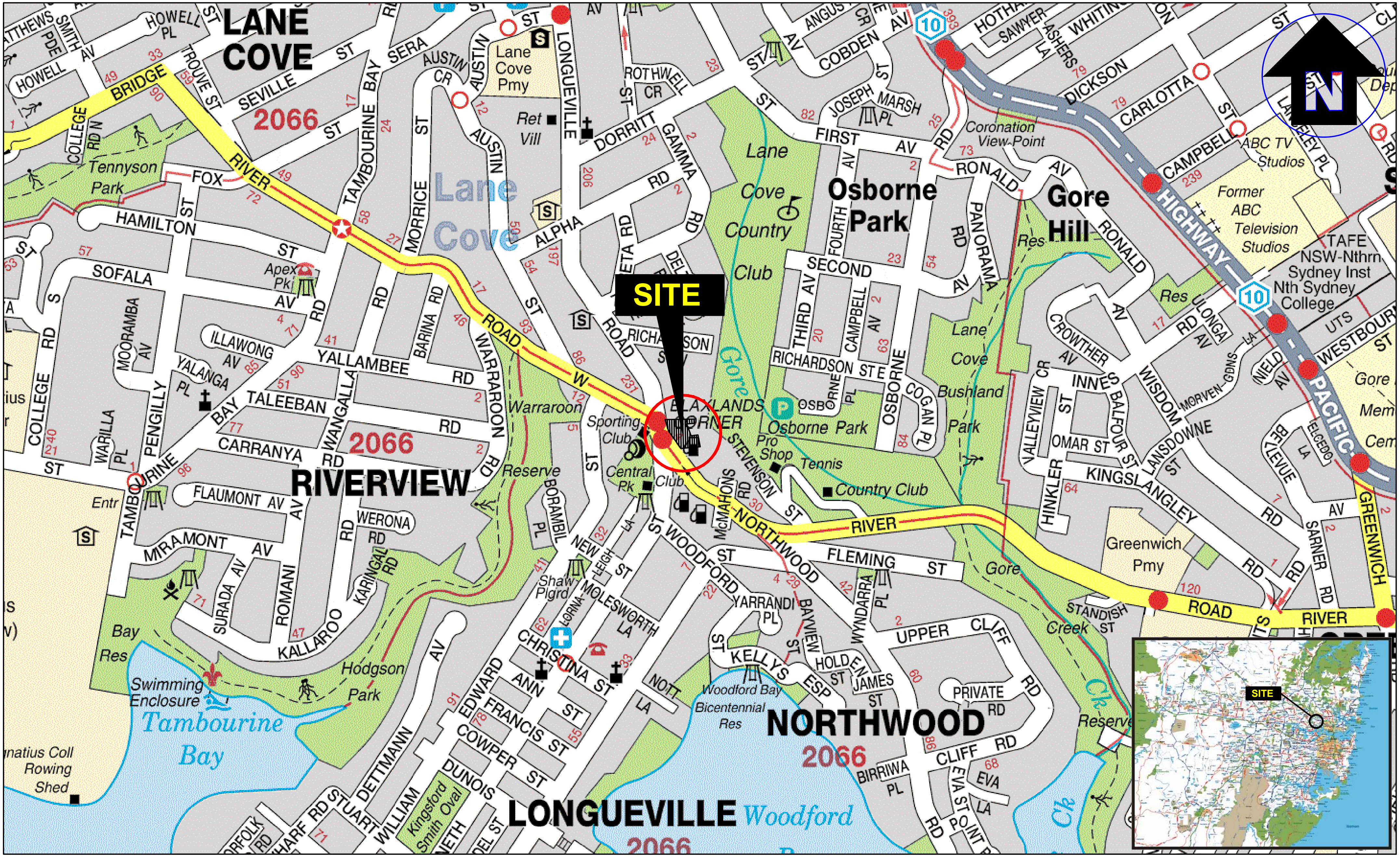
Appendix A –Figures



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Scale:	Not To Scale

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Remediation Action Plan

4-16 Northwood Rd & 274-274A Longueville Rd, Longueville NSW

Site Locality Plan

Figure: 1

Project: E24062.E06

LEGEND

- Approximate site boundary
- Approximate lot boundary
- Approximate previous borehole/monitoring well location (DP, 2016)
- Approximate previous soil sample location (DP, 2016)
- Service station remedial area
- Approximate location of AST infrastructure
- Approximate proposed borehole/monitoring well location
- Approximate proposed borehole location

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Date:	16-11-18

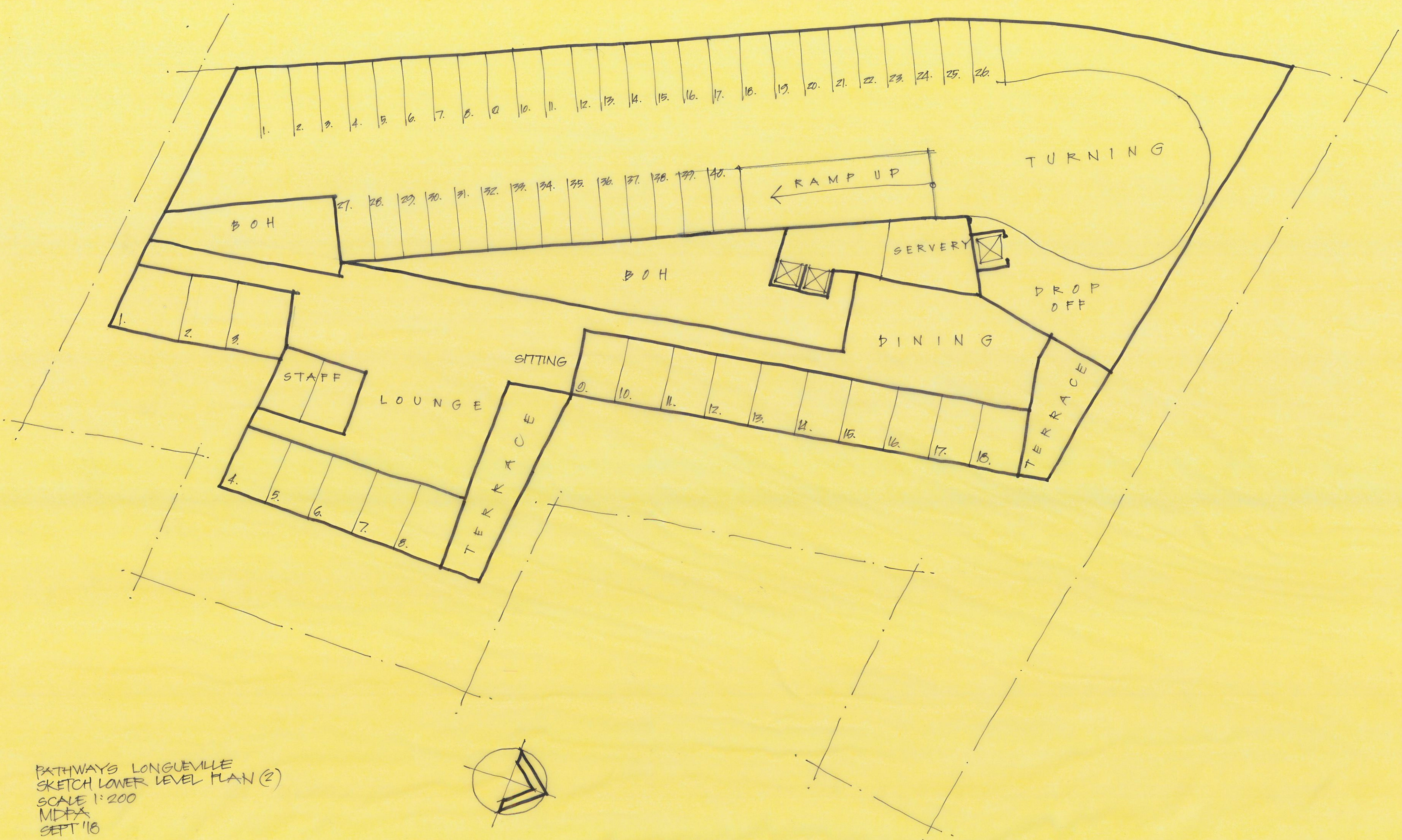
Civil Co Pty Ltd
Remediation Action Plan
4-16 Northwood Rd & 274-274A Longueville Rd,
Longueville NSW

Site Layout Plan

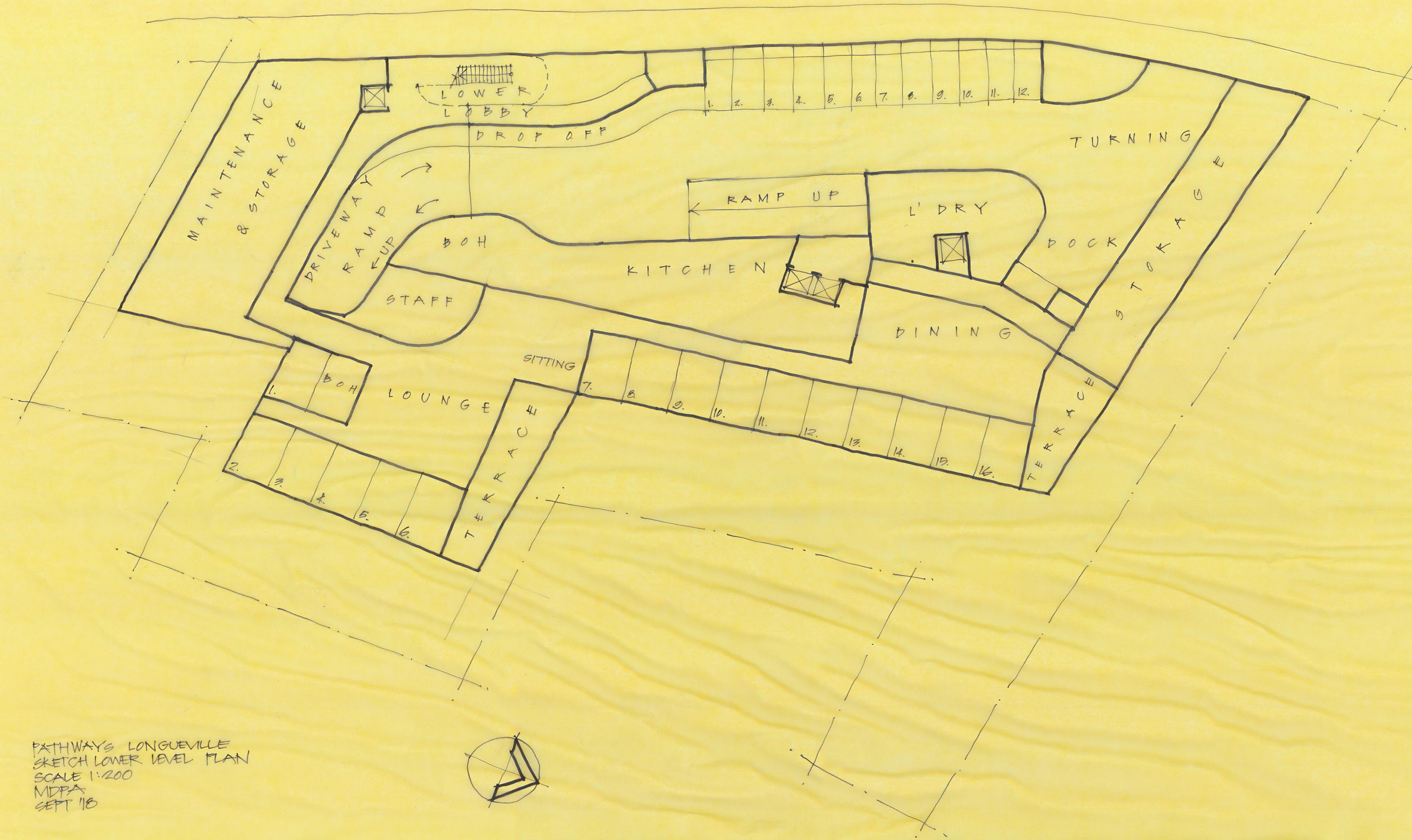
Figure:
2

Project: E4062.E06

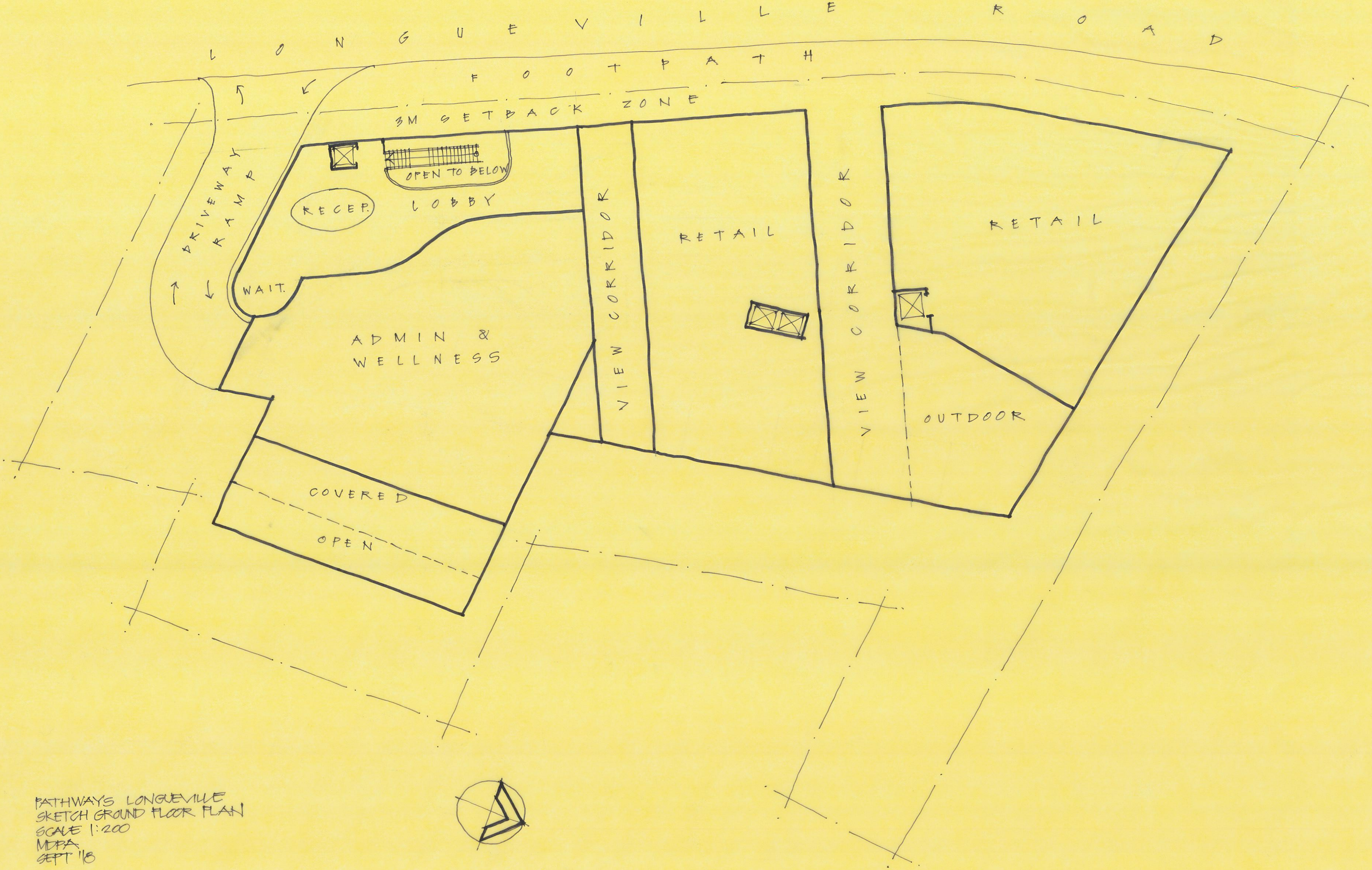
Appendix B – Proposed Development



PATHWAYS LONGUEVILLE
SKETCH LOWER LEVEL PLAN (2)
SCALE 1:200
MDPA
SEPT '18



PATHWAYS LONGUEVILLE
SKETCH LOWER LEVEL PLAN
SCALE 1:200
MDPA
SEPT '18



PATHWAYS LONGUEVILLE
SKETCH GROUND FLOOR PLAN
SCALE 1:200
MDPA
SEPT '18

PATHWAYS LONGUEVILLE
SKETCH UPPER FLOOR PLAN (TYPICAL - LEVELS 1 & 2)
SCALE 1:200
MDPA
SEPT '18

Appendix C – Unexpected Finds Protocol

Unexpected Finds Protocol

In the event of an unexpected find, immediately cease work and contact the site foreman.

Site foreman to construct temporary high visibility barricading to prevent worker access to the area. Foreman to apply appropriate stormwater/sediment control measures.

Site foreman to take arrange an inspection by the Environmental Consultant

Environmental Consultant to undertake a detailed site inspection and collect representative samples for analysis as per documented sampling procedures outlined in this RAP.

Environmental Consultant to assess field screening and/or laboratory analytical results against documented site Clean-Up criteria outlined in this RAP

If substance is assessed as not presenting a risk to human health, then:

Site foreman to remove safety barricades and environmental controls and continue works

If substance is assessed as presenting a risk to human health, then:

Environmental Consultant to supervise remediation & undertake validation sampling as required. An addendum to this RAP may be required.

Site foreman to remove safety barricades and environmental controls and continue works

Environmental Consultant to submit an assessment/validation/clearance to site foreman for distribution to Client and appropriate regulatory authorities.