Alexandria Park Community School

Remedial Action Plan

Park Road, Alexandria NSW

8 December 2017

When you
think with a
global mind
problems
get smaller

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Remedial Action Plan – Alexandria Park Community School

Prepared for
TKD Architects Pty Ltd

Prepared by

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Revision	Description	Date	Originator	Reviewer	Approver
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Executive Summary

Coffey Services Australia Pty Ltd (Coffey) was commissioned by TKD Architects Pty Ltd (TKD) to prepare a Remedial Action Plan (RAP) in support of a Development Application (DA) for the redevelopment of the existing Alexandria Park Community School located on Park Road, Alexandria (the site). The site is currently owned by the Department of Education (DOE), and covers an area of approximately 2.7ha.

The RAP is required to manage contamination identified in the Detailed Site Investigation (DSI) conducted for the site (SYDEN199382-R01-Rev02), in order to render the site suitable for the proposed development.

TKD and DoE propose to redevelop the site and build new school facilities. The new school has been briefed to accommodate up to 1,000 primary school students and up to 1,200 secondary school students on one campus in an integrated and fully connected school building.

Specifically, this project includes:

- Demolition of all existing buildings on-site, including the temporary pop-up schools;
- Remediation of specific areas of the site containing contaminated fill;
- Construction of multiple school buildings of up to five stories, arranged along the western and southern parts of the site comprising:
  - Classroom home bases;
  - Collaborative learning spaces;
  - Specialist learning hubs;
  - Learning support spaces;
  - Offices for teachers and administrative staff;
  - Library; and
  - Student canteen.
- Construction of a sports hall and multiple outdoor sports courts;
- An all-weather multipurpose synthetic sports field;
- Informal play spaces and Covered Outdoor Learning Space or COLA;
- A community centre;
- A pre-school for 39 children;
- Site landscaping including green links, community garden and open space;
- Construction of a new on-site car park and associated vehicular access point off Belmont Street; and
- Augmentation and construction of ancillary infrastructure and utilities as required.

Coffey previously carried out a Detailed Site Investigation (DSI) at the site. The DSI identified contamination at the site, including fill impacted with bonded (non-friable) asbestos and lead. A underground storage tank (UST) has also been discovered within the site, which will require consideration within the RAP.

The objectives of the RAP were to:

- Set remediation goals and objectives
- Consider several remedial options and outline the preferred remedial strategy that will mitigate contamination risks and facilitate redevelopment of the site for its intended use.

- Provide procedures and plans for implementation of the proposed remedial works.
- Outline minimum controls necessary to complete the proposed remedial works in a manner that minimises risks to worker health and safety (WHS) and the environment.
- An additional objective of this RAP is to assist TKD in meeting the minimum requirements of the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014* (UPSS Regulation) with regard to decommissioning, remediation and validation of the UST identified on site.

Coffey has prepared this RAP report in general accordance with the reporting requirements for a RAP that are set out in NSW Office of Environment and Heritage (OEH) 2011 *Guidelines for Consultants Reporting on Contaminated Sites*.

Based upon a review of appropriate remedial technologies and discussions with TKD, the preferred remedial strategy for managing asbestos and lead contaminated fill is **capping and on-going management**. It is considered likely that some **excavation and off-site disposal** will be also be required to achieve design levels and conduct service trenching. **Excavation and off-site disposal** would also be the contingent option in the event that capping and on-going management to cover for unforeseen situations where the 'cap and contain' option is not viable.

The preferred remedial strategy for the UPSS is decommissioning and removal of the UST and excavation and offsite disposal of impacted soils around the UPSS.

At the completion of the remedial works, a validation report will be prepared in general accordance with NSW OEH 2011 *Guidelines for Consultants Reporting on Contaminated Sites*, and the National Environment Protection (Assessment of Site Contamination) Measure, 1999 (amended April 2013), documenting the works as completed.

Subject to the successful implementation of the measures detailed in this RAP, it is considered that the site can be made suitable for the proposed land-use as a school.

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Abbreviations

ACM	Asbestos Containing Material
AHD	Australian Height Datum
AEC	Area of environmental concern
m BGL	metres Below Ground Level
CLM	Contaminated Land Management
COC	Chain of Custody
CoPC	Chemical of Potential Concern
DECCW	Department of Environment, Climate Change and Water
DP	Deposited Plan
DQIs	Data quality indicators
DQOs	Data quality objectives
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of reporting
NATA	National Association of Testing Authorities
NSW EPA	NSW Environment Protection Authority
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PID	Photo Ionisation Detector
POEO	Protection of the Environment Operations
QA/QC	Quality Control/Quality Assurance
RAP	Remedial action plan

RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
TRH	Total Recoverable Hydrocarbons
UPSS	Underground Petroleum Storage System
UST	Underground storage tank
VOC	Volatile Organic Compounds

1. Introduction

Coffey Services Australia Pty Ltd (Coffey) was commissioned by TKD Architects Pty Ltd (TKD) to prepare a Remedial Action Plan (RAP) in support of a Development Application (DA) for the redevelopment of the existing Alexandria Park Community School located on Park Road, Alexandria, NSW (the site). The site is currently owned by the Department of Education (DoE), and covers an area of approximately 2.7ha.

The RAP is required to manage contamination identified in a Detailed Site Investigation (DSI) conducted for the site (SYDEN199382-R01-Rev02), in order to render the site suitable for the proposed development.

The work was commissioned by Anna Harris of TKD. The works were undertaken in accordance with the fee proposal submitted by Coffey dated 31st August 2017 (ref: SYDEN199382-P04).

2. Background & Proposed Development

TKD have provided a description of the proposed development, and this is detailed below.

The redevelopment of the Alexandria Park Community School ('the School') will address issues of capacity for schools in the inner city areas of Sydney and is also driven by the population growth resulting from the large number of residential developments that are transforming the former industrial precincts of Zetland, Waterloo and Alexandria.

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The new school has been briefed to accommodate up to 1,000 primary school students and up to 1,200 secondary school students on one campus in an integrated and fully connected school building.

Specifically, this project includes:

- Demolition of all existing buildings on-site, including the temporary pop-up schools;
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- A community centre;
- A community pre-school for 39 children;
- Site landscaping including green links, community garden and open space;
- Construction of a new on-site car park and associated vehicular access point off Belmont Street; and
- Augmentation and construction of ancillary infrastructure and utilities as required.

Delivery of the project will be undertaken in sequential phases to maintain an operational school on the Park Road Campus and will involve enabling works separate to this application followed by three main construction phases for the new building and external works.

It is understood that to achieve the design levels and install services, minor excavation works will be undertaken in some locations of the site. A copy of selected design plans (general arrangement plan and landscape plan) are provided in Appendix A.

Coffey understands a Development Application (DA) will be submitted to the relevant planning authorities, which will likely be subject to evaluation against planning policy:

- State Environmental Planning Policy 55 – Remediation of Land (SEPP55) 1998

The planning policies above state that when determining a planning instrument, the determining authority should consider whether the land is suitable, or can and will be made suitable for the proposed use.

Coffey previously carried out a contaminated land Detailed Site Investigation (DSI) for the site (SYDEN199382-R01-Rev02). The DSI included a Preliminary Site Investigation (PSI) for the site. The DSI identified contamination at the site, including fill impacted with bonded (non-friable) asbestos, lead within fill and VHCs in groundwater.

The DSI concluded that “Based on the findings of the investigation, it is concluded that the site can be made suitable for the proposed development, subject to:

- Preparation of a Remedial Action Plan (RAP) for the site, to mitigate the health risks associated with the pollutant linkages outlined above (within the DSI).

Following the completion of the DSI, and during construction of a temporary demountable school within the site (pop-up school site 2), an underground storage tank (UST) was encountered by the construction contractor ProGroup. Coffey understands that ProGroup and the project managers for the pop-up school 2 site (Root Partnerships) have sought advice from another consultancy in relation to the handling of the UST. It is understood that the tank remains in-situ, however it is unclear if the UST has been validated in accordance with the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014* (UPSS Regulation). For the purpose of this RAP, it is assumed that the UST has not yet been validated, and this RAP will document the decommissioning, remediation and validation requirements for the UST.

3. Objectives and scope of work

The objectives of the RAP are to:

- Set remediation goals and objectives
- Consider several remedial options and outline the preferred remedial strategy that will mitigate contamination risks and facilitate redevelopment of the site for its intended use.
- Provide procedures and plans for implementation of the proposed remedial works.
- Outline minimum controls necessary to complete the proposed remedial works in a manner that minimises risks to worker health and safety (WHS) and the environment.
- An additional objective of this RAP is to assist TKD in meeting the minimum requirements of the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014* (UPSS Regulation) with regard to decommissioning, remediation and validation of the UPSS identified on site.

To fulfil these objectives, Coffey has prepared this RAP in general accordance with the reporting requirements for a RAP that are set out in NSW Office of Environment and Heritage (OEH), Guidelines for Consultants Reporting on Contaminated Sites, 2011 (OEH 2011).

4. Site information

The following information has been summarised from the Coffey (2017) DSI.

4.1. Site identification

Site identification details are summarised in Table 4.1 and the location of the site is shown on Figure 1 attached.

Table 4.1: Site information

Item	Description
Address	Park Road, Alexandria NSW.
Site area	Approximately 2.7 ha
Title identification	Lot 11 in DP615964; Lots 1 & 2 in DP74696; Lot 3 in DP69494; and Lots A & B in DP109038.
Current zoning	SP2 - Infrastructure: Educational Establishment. Sydney Local Environmental Plan (LEP) 2012
Local Government Authority	City of Sydney Council
Owner	Department of Education (DoE)

Current land use	Public school (combined primary and secondary schools)
Proposed uses	Public school (combined primary and secondary schools)
Surrounding land use	North: Buckland Street, residential and commercial properties beyond East: Park Road, Alexandria Park and a business/commercial park (to the south east) South: Commercial retail properties and high density residential dwellings West: Commercial retail properties, and high density residential dwellings

4.2. Site description

The site comprises an approximately rectangular parcel of land covering an area of approximately 2.7ha. Figure 2 shows the current layout of the school and boundaries of the site (and investigation locations). A site walkover was undertaken by experienced Coffey environmental scientists on the 18th January 2017 and 23rd & 24th January 2017. The key site features observed during the site walkovers are noted in Figure 2, and summarised below.

- The southern half of the site currently comprises the existing school grounds and buildings of Alexandria Park Community School. The southern half of the site comprised the school grounds, and consisted of:
  - Staff carpark
  - School facilities and buildings/class rooms (Block A to Block C)
  - Basketball court
  - Equipment play areas
  - Grassed play area
  - Vegetable gardens
  - Equipment storage sheds
- At the time of the walkover, the northern half of the site comprised a rectangular grassed field on which the temporary 'pop up' school was being constructed. The pop up school comprises a number of demountable buildings constructed on raised pier foundations. The northern half of the site was surfaced predominantly with grassed.
- The site was noted as being generally flat. Available topographic survey data indicates that site is situated at an elevation of approximately 13mAHD, with a very gentle slope down towards the south/southwest.
  - Anecdotal evidence from the manager coordinating the pop-up school construction works indicated that bonded asbestos cement (fibro) fragments had been encountered within the northern half of the site during service excavations. During the site walkover, a fragment of bonded asbestos cement was also noted on the grassed playground adjoining the Park Street entrance. The fragment was triangular shaped and approximately 4cm in length. The fragment edges were sub-angular and did not crumble with moderate hand pressure.
- During the walkover, the Coffey environmental scientist did not observe visible signs of chemical contamination such as soil staining, odorous soils, bare soil patches, and visible signs of plant stress. The uncontrolled storage of waste materials was not observed within the site. No evidence of bulk storage tanks was noted.

5. Summary of Site History

The Coffey DSI detailed the history of the site, and this is presented below.

A review of the site history indicates that the site was undeveloped in 1887, and a majority of the southern portion of the site was part of the Sheas' Creek swamp land.

Between 1887 and 1893 the land was reclaimed, and the site was predominantly developed with residential terrace dwellings. By 1930, the site and surrounding areas were developed for commercial/industrial uses. The site housed several large warehouses until circa 1975 when all the structures on site were demolished.

The warehouses were occupied by several businesses, including Murray Brothers (furniture manufacture), Federal Match Company (match manufacture). Land surrounding the site was also occupied by various industrial uses.

By 1982, the current school buildings and grounds of Alexandria Park Community School were constructed on the southern half of the site. The northern half of the site remained vacant, and was possibly used as a sporting oval. Land uses surround the site have been developed recently for a mixture of commercial and residential uses.

6. Environmental setting summary

The following information has been summarised from the Coffey (2017) DSI.

Table 6.1: Summary of environmental setting

Item	Description
Topography and drainage	The site is located at an elevation of approximately 13 m Australian Height Datum (AHD). Surface water from the site is anticipated to flow to the storm water drains located within and surrounding the site. A large stormwater easement dissects the site in an approximate north-east to south-west strike. Some surface water falling on unsealed surfaces is anticipated to percolate into the ground and migrate to the groundwater within the Botany Sands aquifer, beneath the site.
Surface waters and wetlands	No surface water bodies are located within the site, however the historic Sheas Creek swamp area was previously located across the southern section of the site. This area was progressively reclaimed (presumably with fill material) between 1887 and circa 1900 based on historical parish maps. Alexandria Canal, which flows within a concrete lined channel, is the nearest surface water body to the site, approximately 950m southwest of the site. Alexandria Canal discharges to the Cooks River.
Groundwater bores	A search of groundwater bores registered with the NSW Office of Water is included within the Coffey (2017) DSI. Numerous registered groundwater bores are located within 500m of the site. All are reported to be used for monitoring purposes with the exception of GW106192, which is listed for domestic purposes. The use of the well is considered unlikely for potable purposes as the groundwater well is located within Zone 2 of the Botany Groundwater Management Zone, which restricts the abstraction of groundwater for domestic purposes. The well is located 248m north-east and up hydraulic gradient from the site.
Critical habitats	There are no Critical habitat declarations at or within 500 m of the site.
Geology	A review of the Sydney 1:100,000 Geological Sheet (Sheet No. 9130; dated 1983) produced by the NSW Geological Survey indicates the site is underlain by Quaternary aged medium to fine-grained marine sand with podsols (Botany Sands). Intrusive investigations conducted by Coffey (2017) indicate fill material is present within the site to a maximum depth of 1.8m bgs, overlying the Botany Sands. The Botany Sands are expected to be underlain by Hawkesbury Sandstone at depth. The thickness of the Botany Sands was not proven within the Coffey (2017) DSI which extended to 6.0m depth.
Acid sulfate soils (ASS)	With reference to the Acid Sulfate Soil Risk Map for Botany Bay (Map No 9130S3), published by the Dept. Land & Water Conservation, and records presented in the Australian Soil Resource Information System (www.asris.csiro.au), the site is identified as having a low risk of acid sulfate soil materials being present. Coffey note that an area of Disturbed Terrain encroaches the southern boundary of the site, which is likely to relate to historic land reclamation activities to develop the historic Sheas Creek swamp area. As acid sulfate soils are formed when naturally occurring sediments are deposited in low lying estuarine conditions, it is considered feasible that potential acid sulfate soils may exist within natural sands beneath fill (used to reclaim the surrounding area), and below the groundwater table at the site. It is noted that the southern portion of the site is classed as Class 3 under the City of Sydney Local Environment Plan (LEP), which indicates acid sulfate soils may be encountered where works are conducted more than 1 meter below the natural ground surface. Similarly, development controls are required for works that lower the water table by more than 1 meter below the natural ground surface. An acid sulfate soils assessment was conducted by Environmental Investigation Services (EIS) ref: E30907Klet-ASS, which identified the presence of Potential Acid Sulfate Soils

	(PASS) below RL5mAHD. No PASS or Actual Acid Sulfate Soils (AASS) was identified in the soil samples they collected from the site above RL5mAHD. Coffey subsequently prepared an Acid Sulfate Soils Management Plan (ASSMP - Coffey (2017) ref: SYDEN199382-L03-Rev01) which revealed that disturbance of soils below RL5mAHD was unlikely for the proposed development, and hence disturbance of the identified PASS was unlikely. The ASSMP was prepared as a precautionary measure for implementation during construction activities, if required.
Hydrogeology	Groundwater is expected to occur within the natural Botany Sands. The topography of the site slopes very gradually to the south/south west. The former Sheas' Creek swamp land was located across the southern portion of the site before it was reclaimed as part of the development of the area. Sheas Creek currently exists today as a concrete lined drain which discharges into the concrete lined Alexandria Canal. Considering this and the presence of Alexandria Canal to the southwest, it is anticipated that groundwater would flow in a south/south-westerly direction. Groundwater monitoring conducted as part of the DSI reported standing groundwater levels ranged between 9.533mAHD (MW1) and 10.683mAHD (MW3) indicating groundwater flows in a south-westerly direction. The data confirms that the groundwater table is situated within the unconfined aquifer of the natural botany sands.

7. Previous reports

The site has been subject to a number of previous investigations and contamination assessments. A summary of these documents which are relevant to this RAP are presented in Table 7.1. Figure 2 illustrates the approximate locations of the investigation locations.

Table 7.1: Summary of Contamination Investigations and Assessments

Report	Scope of Works and Report Findings and Recommendations
Geotechnical Investigation – Proposed Temporary School Buildings, Alexandria Park High School (GeoEnviro Consultancy Pty Ltd, 2016). Ref JG16980A-r1	GeoEnviro was commissioned by Kollanyi Architects Pty Ltd (acting on behalf of the DoE) to conduct a geotechnical investigation for the proposed temporary school buildings within the Alexandria Park Community School oval. The investigation did not include environmental sampling, however provided valuable information on the ground conditions within the oval. Twelve (12) boreholes were conducted as part of the investigation. The relevant results of the investigation revealed: • Fill material was encountered in all borehole locations to depths ranging from 0.4m to 3.4m bgs. The fill material predominately consisted of Gravelly Clayey SAND, with some gravelly silty sand and silty sand. Abundant anthropogenic materials were observed in the majority of the boreholes including bricks, concrete and sandstone fragments. • Natural sand was encountered within all of the boreholes from 0.4m to 3.4m bgs. • Groundwater inflow was encountered in BH1 to BH10 at depths varying from 2.4m to 3.7m bgs. • Bedrock was not encountered in the investigation.

Phase 1 and Limited Soil Sampling Investigation – Waterloo High School – Alexandria Park Junior Campus, 7-11 Park Road, Alexandria (Hibbs & Associates Pty Ltd, 2016). Ref: S9179	The report prepared by Hibbs & Associates presents a Phase 1 and limited soil sampling investigation for the sports field located at 7-11 Alexandria Park Road, Alexandria, which comprises the northern part of the current site. This assessment was prepared prior to the construction of the temporary pop-up school, when the location was a vacant grassed field. The investigation found that there was potential for contamination to be present on site due to the known former industrial activities undertaken on site (furniture manufacturing, office machine development, mechanical industries). The key findings from these investigations are summarised below: • Drilling of five (5) hand augers to depths between 0.9m and 1.6mbgs. • Collection of soil samples from fill and residual soils for chemical analysis for chemicals of potential concern (COPC) identified by Hibbs & Associates, including heavy metals (As, Cd, Cr, Cu, Pb, Ni, Hg and Zn), total recoverable hydrocarbons (TRH) and, monoaromatic hydrocarbons (BTEX). • Ground conditions encountered were described as approximately 200mm of dark brown silty clay topsoil, overlying grey to red to brown silty sand and clay fill to the maximum depth of investigation (1.6m bgs). Natural material was not encountered within the sampling locations. • No odorous or visibly stained/discoloured soils were noted by Hibbs & Associates during the investigation. No visible signs of ACM were noted during the investigations. PID headspace readings recorded concentrations ranging between non detect (presumed to be <0.1ppm) and 0.4ppm, indicating a low likelihood for ionisable VOCs to be present in soil samples collected. • A total of five (5) soil samples were submitted for chemical analysis. In summary, the analysis reported concentrations of organic COPC were reported below the adopted health investigation and screening levels for a generic low density residential land use (i.e. HIL A as presented within Schedule B1 of the ASC NEPM (NEPC, 2013). • In conclusion, Hibbs & Associates 'has not encountered any soil conditions that would preclude the continued use of the site' as a school. Hibbs & Associates recommended that 'appropriate controls should be implemented during site development to manage the potential risk associated with the presence of asbestos beneath the site. This should include the development and implementation of an unexpected finds protocol."
Detailed Site Investigation – Alexandria Park Community School, Park Road, Alexandria (Coffey 2017). Ref SYDEN199382-R01-Rev02	Coffey was commissioned by TKD to undertake a DSI (which included elements of the PSI) for the site. As part of the works, Coffey reviewed the following relevant previous assessments which were conducted previously for the site: • Hibbs & Associated, 2016; Phase 1 and Limited Soil Sampling Investigation: Waterloo High School; and • GeoEnviro Consultancy Pty Ltd, 2016; Geotechnical Investigation: Proposed Temporary School Buildings, Alexandria Park High School, Park Road, Alexandria NSW. Coffey completed an intrusive investigation within the site, which comprised the following: • Excavation of six (6) test pits (denoted TP3 to TP8) to depths ranging between 1.4m and 2.4m bgs; • Drilling of seven (7) hand auger holes (denoted HA1 to HA7), which extended to a maximum depth of 1.1m bgs;

	• Drilling of three (3) boreholes (BH1 to BH3) to maximum depths of 6.0m bgs, and conversion of each borehole into monitoring wells (MW1 to MW3) • Soil and groundwater sampling from each soil bore / groundwater well location for a range of contaminants of potential concern (CoPC) to assess soil and groundwater quality beneath the site. The lithology recorded during the investigation revealed a layer of fill (maximum thickness of 1.8m) overlying natural Botany Sands. A large quantity of foreign (or anthropogenic) materials were observed within the fill, including bonded asbestos cement fragments, which were observed and noted in various locations and depths within fill across the site. With the exception of the ACM, no other visual or olfactory indications of significant contamination were noted during the investigation. Anecdotal evidence from the construction manager of a temporary pop up school on site, and visual observations within open service trenches (65m to 90m in length) during the site walkover revealed asbestos (bonded) fragments were located within fill material. Standing water levels within MW1 to MW3 ranged from 10.683mAHD (MW3) to 9.533 (MW1) which indicated groundwater flow was towards the south-west. No odours, visible sheens or non-aqueous phase liquid (NAPL) were noted in the three groundwater wells that were sampled. The conceptual site model which was developed based on the results of the investigations identified several plausible pollutant linkages with regards to the proposed development, including contaminant sources: • Bonded ACM within fill across the site; • Lead within fill; and • Volatile halogenated compounds (VHCs) within groundwater, which have the potential to present an indoor air vapour risk. The DSI also identified the following chemicals which exceeded ecological investigation criteria: • Fill materials containing concentrations of Benzo(a)pyrene[1] that exceeds ecological criteria. • Copper in all three monitoring wells and total recoverable hydrocarbons (TRH) C_6-C_{10} fraction within MW2 that exceed the ANZECC (2000) marine aquatic criteria. It was determined within the CSM, that the above ecological criteria would not present an unacceptable risk to environmental health, with regard to the proposed development. Based on the data obtained from the site, a preliminary waste classification for the fill material on the site indicated a classification of General Solid Waste, to be managed as Special Waste (Asbestos).

[1] A polycyclic aromatic hydrocarbon (PAH).

	It was concluded that the site could be made suitable for the proposed development, subject to the preparation of a Remedial Action Plan (RAP) to mitigate the health risks associated with the pollutant linkages identified. As a result of the identification of VHCs in groundwater, it was further recommended that a soil vapour investigation be conducted to determine if an unacceptable indoor vapour risk may be present.
Soil Vapour Investigation – Alexandria Park Community School, Park Road, Alexandria (Coffey 2017). Ref: SYDEN199382-L02	Coffey was commissioned by TKD to undertake an intrusive soil vapour investigation at the site. The objectives of the investigation were to: • Identify the presence of volatile organic compounds (VOCs), including VHCs at the location where VHCs were detected in groundwater (MW2); • Attempt to delineate the VOC vapours (if present); and • Preliminary assessment of the indoor vapour risk posed to future occupants of site buildings. Seven intrusive soil vapour locations (SS1 to SS7) were positioned in areas surrounding MW2. A soil vapour sample was collected from each location using 1.4L Suma canisters, which were sent to a NATA accredited laboratory for analysis for VOCs. The findings of the investigation did not identify the presence of VOCs at location MW2 (represented by SS1), however trichloroethene[2] (TCE) was detected above the adopted soil vapour screening levels at SS3 and SS7. A subsequent preliminary health risk assessment revealed that the potential future indoor vapour risk associated with a slab on ground building is considered to be low, and acceptable at those locations. The report also detailed the finding of a UST within a section of the site (in the area of the proposed playing field close to the western boundary of the site) where a temporary pop up school was being constructed, however due to access constraints caused by the construction activities at the time, the area around the UST could not be assessed. The UST, and other possible sources within the site (or adjacent sites) was recommended to be considered further within a RAP for the site.
Acid Sulfate Soils Assessment – Proposed New School Facilities, Alexandria Park Community School (EIS, 2017). Ref: E30907Klet-ASS	As noted above a limited Acid Sulfate Soil Assessment was conducted for the site by EIS (Ref: E30907Klet-ASS, dated 23 October 2017). EIS were commissioned by TKD to conduct the works. The findings of the assessment are summarised below: • Acid sulfate soil samples were collected from two borehole locations (BH1 in northern part of site and BH7 in southern part of site). • The investigation did not identify the presence of actual acid sulfate soils (AASS) in the soil samples collected. • However, the investigation identified potential acid sulfate soils (PASS) within two soil samples, with peroxide oxidisable sulfur (SPOS) detected up to 0.2% w/w. The two soils samples collected are within soil strata located below RL5m AHD.

[2] Also known as trichloroethylene.

	• An Acid Sulfate Soils Management Plan (ASSMP) was recommended to be prepared, should the soil below RL5mAHD be disturbed as part of the proposed development.
Acid Sulfate Soils Management Plan – Alexandria Park Community School, Park Road, Alexandria (Coffey 2017). Ref: SYDEN199382-L03-Rev01	Coffey was subsequently commissioned by TKD to prepare an Acid Sulfate Soils Management Plan for the site, to detail the appropriate management procedures should the soils beneath RL5mAHD be disturbed as part of the proposed development, or if the groundwater table is lowered beneath RL5mAHD. It was assessed that, based on the information provided to Coffey with regards to the proposed development, it was unlikely that soils beneath RL5mAHD would be disturbed, or that the water table would be lowered beneath RL5mAHD. The document contains an approach to manage the identified PASS below RL5mAHD should it be encountered (assessed to be unlikely).

8. Review of Investigation Sampling, Analysis & Quality Control

8.1. Sampling Pattern and Density

A detailed appraisal of the site's historical uses and DSI has identified that contamination (in the form of bonded ACM and lead) in the site exists within heterogeneous fill which appears to be present as a layer up to approximately 1.8m, covering large parts of the site, and a localised potential source of contamination (the UST).

A review of the DSI and soil vapour investigation report prepared by Coffey indicates that the soil sampling pattern has adopted a combination of judgemental and systematic sampling patterns, which is considered consistent with the recommendations made within the Sampling Design Guidelines (NSW EPA, 1995).

On review of the available investigation data for the site, Coffey notes the following:

- Sixteen (16) investigation locations (including three boreholes for monitoring wells) have been established within the site by Coffey as part of the DSI.
- Seven (7) targeted investigation locations were conducted as part of the Coffey (2017) soil vapour investigation.
- Five (5) investigation locations were established within the site by Hibbs & Associates.
- Twelve (12) investigation locations were established by GeoEnvironmental Consultancy. Coffey note that no samples were collected from the GeoEnvironmental investigation locations for chemical analysis. However, borehole logs for these boreholes indicate that fill characteristics appear to be reasonably consistent with ground conditions observed in the Coffey investigations (i.e. similar fill types and anthropogenic inclusions). As the GeoEnvironmental borehole logs present information which informs the understanding of ground conditions at these locations, these locations are considered valid investigation locations.
- The investigation methods employed machine drilled boreholes, machine excavated test pits and hand augers, predominantly to characterise the soil materials beneath the site. Coffey recognise that hand augers and boreholes have limitations when characterising fill materials, as they are

less conducive to allowing observation of anthropogenic inclusions (including potential asbestos containing materials) than other investigation methods such as test pitting.

- Observations made of fill materials exposed along service trench excavations measuring between 65m and 90m.
- Table A of the Sampling Design Guidelines (NSW EPA, 1995) recommends 40 sampling positions for a 3.0 ha site. With regard to assessing fill materials, the investigation density meets the minimum investigation density recommended by the Sampling Design Guidelines (NSW EPA, 1995). The Sampling Design Guidelines recommend a systematic sampling programme where the distribution of contamination is expected to be random. Given the access restrictions present within the site, it was not possible to establish a systematic sampling grid, and therefore the distance between sampling locations in certain areas of the site is more than that recommended by the Sampling Design Guidelines. As such, the degree of uncertainty associated with unexpected contamination associated with fill materials present in these areas is assessed to be greater. Conversely, in other areas of the site where the distance between sampling locations is less, the degree of encountering unexpected contamination is assessed to be proportionally less.
- In the absence of specific point sources of potential contamination identified from the site history at the time of the DSI intrusive works (i.e. before identification of the UST), the three groundwater monitoring wells (MW01 to MW03) were positioned across the site to assess general flow conditions, and relative change in water quality conditions across the site.

Coffey notes that due to access restraints during construction of the pop-up school, no investigation locations could be established in the vicinity of the UST (identified following the completion of the DSI), and as such this is considered to represent a data gap. Based on soil cuttings observed from MW2 and MW1, and groundwater sampling results from MW2 and MW1, it is assessed that significant contamination related to the UST is considered unlikely. It is considered likely that contamination (if any) would be localised around the UST.

8.2. Data Gaps

Based on a review of available information, the following data gap exists:

- Subsurface (soil and groundwater) conditions surrounding the identified UST.

8.3. Reliability Assessment of Existing Data

The Coffey (2017) DSI, and Coffey (2017) Soil Vapour Investigation has adopted a range of quality control measures to assess the reliability of field and laboratory procedures, in accordance with recommendations provided within Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 (the 'ASC NEPM') (NEPC, 2013).

In summary, the report prepared by Coffey concluded that the field and laboratory data met the Data Quality Objectives. Coffey's review of this information indicates that that the data appears generally accurate, representative and usable for the purposes of developing a RAP.

9. Site characterisation

The following information has been summarised from the Coffey (2017) DSI.

9.1. Ground Conditions

The generalised subsurface conditions encountered across the site during the DSI comprised variable fill material underlain locally by sands of the Botany Basin. Bedrock was not encountered in the investigation. Table 9.1 summarises subsurface conditions encountered during the Coffey (2017) DSI.

Table 9.1 – Summary of Observed Subsurface Conditions

Unit	Depth to Top of Unit (mbgs)	Approx. Unit Thickness	Material Description
Fill	0m	0.9m to 1.8m	FILL with the general consistency of clayey sand and clay: Colouration ranged from brown to red to orange to grey. The clays were generally low plasticity, and the sands were fine to coarse grained. Some angular gravels were observed within the fill. Abundant anthropogenic materials including bonded asbestos containing cement fragments (fibro), concrete, plastic, tiles, wood and metal.
Marine Sand	0.9m to 1.8m	>6.0m	SAND: Fine grained, grey to brown.

Groundwater inflow was encountered within the boreholes at the following depths:

- BH1: 4.0m bgs
- BH2: 3.3m bgs
- BH3: 4.0m bgs

GeoEnvironmental Consultancy reported groundwater inflows at depths between 2.4m and 3.7mbgs.

The subsurface conditions observed by Coffey are generally consistent with those reported in the Hibbs & Associates (2016) and GeoEnviro Consultancy (2016) environmental and geotechnical investigations.

9.2. Groundwater Conditions

Groundwater sampling was conducted as part of the DSI. Groundwater depths below the top of PVC casings were measured with an IP meter to detect the presence of NAPL. NAPL was not detected during the monitoring event. A summary of the groundwater depths measured across the site is presented in Table 9.2.

Table 9.2 – Summary of Groundwater Depths Measured Across Site

Groundwater Monitoring Well	Top of Casing Elevation (mAHD)	Depth to Groundwater (mbTOC)	Groundwater Elevation (mAHD)
MW1	12.870	3.337	9.533
MW2	13.030	2.886	10.144
MW3	13.110	2.427	10.683

Based on standing water levels presented above, groundwater is assessed to flow in a south westerly direction.

Groundwater samples were observed to range between slightly cloudy and clear, and were all brown in colour, which was attributed to the fine sediment suspended in solution in the collected samples. No odours or sheens were observed in any of the groundwater purged from the monitoring wells or in samples submitted for laboratory analysis. Table 9.3 below provides a summary of the water quality parameters measured from monitoring wells installed across the site.

Table 9.3 – Summary of Water Quality Parameters

Parameter	Range	Comments
Dissolved Oxygen (DO)	0.22 mg/L (MW3) to 0.5 mg/L (MW1)	Indicative of low dissolved oxygen levels
Electrical Conductivity (EC)	415 us/cm (MW3) to 590 us/cm (MW2)	Indicative of potable water
Redox Potential	199 mV (MW3) to 329 mV (MW1)	Indicative of oxidising conditions
pH	5.65 (MW1) to 6.13 (MW2)	Indicative of slightly acidic conditions
Temperature	20.9^{0}C (MW1) to 20.6^{0}C (MW2)	-

Note: 199mV was added to the recorded redox value to convert data to standard hydrogen electrode (SHE) as per the manufacturer's instructions.

Conceptual site model

A conceptual site model (CSM) is a representation of site related information regarding contamination sources, receptors and exposure pathways (or pollutant linkages) between those sources and receptors. The following sections summarises the known potential sources of contamination, receptors and presents a discussion on the plausible linkages between sources and receptors via contaminant transport and exposure mechanisms under the proposed development of the site.

9.3. Contaminant sources

The identified sources of contamination impact at the site which require consideration within this RAP are considered to be:

- Bonded asbestos fragments within fill throughout the site;
- Lead within fill throughout the site; and
- Potential hydrocarbon impacts associated with the UPSS identified within the site.

9.4. Exposure Pathways

The pathways and exposure routes by which contaminants identified at the site may reach human receptors using the combined primary and secondary school are assessed to include:

- Inhalation (dusts, vapours and fibres)
- Dermal contact
- Ingestion
- Vertical and lateral contaminant migration through the saturated zone (UPSS only)
- Contaminant migration along preferential flow pathways (UPSS only)

9.5. Receptors

9.5.1. Ecological Receptors

The primary ecological receptor identified in relation to the site is aquatic species within the Alexandria Canal, which is located approximately 900m south west of the site.

Landscaping that exists within the site, and will be introduced as part of the proposed development likely within suitable imported growing medium is also a potential ecological receptor.

As detailed within the DSI, the conditions encountered within the site have a low likelihood to pose an unacceptable risk to ecological receptors, thus ecological receptors will not be considered further for the purpose of this RAP.

9.5.2. Human Receptors

The following current or future human receptors are identified giving consideration to the proposed land use:

- Current and future occupants of the site including school teachers, and primary/secondary school students (i.e. children aged between 4 and 18).
- Construction workers present on site during the redevelopment of the site.
- Maintenance workers - conducting subsurface excavations as part of existing and future maintenance events.
- Users of adjoining land.
- Visitors of the site (e.g. parents).
- Trespassers

9.6. Plausible Exposure Pathways

The followings sections present a discussion of the plausible exposure pathways associated with ground conditions recorded on site in the context of the current and proposed future use of the site as a primary school.

9.6.1. Human Health

Table A within Appendix E provides a summary of the plausible exposure pathways relevant to the human receptors identified above.

In summary the CSM has identified asbestos and lead within fill on site may pose an unacceptable risk to human users of the site if not remediated.

9.6.2. Ecological Receptors

Soil

The DSI has identified that the fill within the site is unlikely to pose an unacceptable risk to ecological receptors within the site. Risks to new landscaping within the site could further be managed by planting in imported soil mediums with appropriate capillary and root breaks. For these reasons

Coffey conclude that there is a low risk to ecological receptors on site from potentially contaminated soil.

Groundwater

The nearest water body and aquatic receptors are located in Alexandria Canal, approximately 950 down gradient of the site. Given the geographical distance to the canal, and the already degraded status[3] of the canal and groundwater within the Alexandria region, it is considered that groundwater from beneath the site is unlikely to pose an unacceptable risk to the canal.

9.6.3. Applicable Contaminant Sources to RAP

Based on the conceptual site model discussed above, the sources of contamination which will be considered further within this RAP and require remediation and validation are:

- Bonded asbestos and lead within fill; and
- Potential soil and groundwater hydrocarbon impacts associated with the UPSS.

10. Remedial goals and options appraisal

10.1. Remediation goals

The remediation goal is to mitigate potentially unacceptable risks to human health and the environment from fill (impacted with asbestos and lead) and the UPSS in light of the proposed redevelopment to make the site suitable for the proposed use

10.2. Objectives of the RAP

The objectives of the RAP is to document preferred remediation strategy to deal with asbestos and lead contamination in fill and the decommissioning and validation process of the identified UPSS in accordance with the UPSS Regulations (2014).

10.3. Extent of remediation required

The extent of remedial works required for the site capping works and the UPSS removal is shown on Figure 3 (Remedial Strategy Plan).

- Asbestos and lead within fill

  Based on information of fill obtained within the DSI, the entire site will require to be capped in accordance with Section 11.3.2.

[3] The NSW EPA have declared the river bed sediments of the Alexandria Canal to be contaminated with chlorinated hydrocarbons including organochlorine pesticides (chlordane, total DDT and dieldrin), polychlorinated biphenyls (PCBs) and metals. A remediation order for the canal has been issued on the 25 August 2000 as per Section 23 of the Contaminated Land Management Act 1997.

- UPSS

Based on information obtained within the DSI and subsequent vapour investigation, the extent of remediation is anticipated to be confined to a relatively small area of soil directly around the UPSS.

10.4. Remediation policy

The preferred order of options for remediation, as stated within Schedules A and B of the ASC NEPM (2013) is:

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

The guidance also notes that if remediation is likely to cause a greater adverse effect than leaving the site undisturbed, remediation should not proceed.

10.5. Remedial options appraisal

To achieve the remedial objectives, there are a number of remedial options considered to be appropriate, each with advantages and disadvantages. Remediation may comprise implementation of one or a combination of the remedial management measures described in Table 10.1.

The appropriateness of a particular option would vary depending on a large range of factors including:

- Space available onsite during remediation and construction.
- Air quality, noise, and impact on adjacent site users.
- Nature and extent of contamination.
- Geological and hydrogeological conditions.
- Type(s) of contamination, including the impacted media.
- Human health and environmental risks (both during and post redevelopment).

The selection of appropriate remedial techniques would also need to consider a large range of issues including:

- Effectiveness of remediation – will the solution meet the remedial objectives.
- Contractor experience with remedial technology.
- Sustainability – waste generation, stakeholder acceptance of the remedial solution etc.
- Acceptable timeframes
- Cost effectiveness.
- Long term liabilities and ongoing management requirements.

We have reviewed a range of remediation techniques and technologies available in the market place and assessed their suitability for dealing with the contaminants requiring remediation. In undertaking our assessment we have also given consideration to site and project specific issues. The remedial techniques and technologies considered included:

- Excavation and offsite disposal
- Capping and on-going management
- Excavation and onsite bioremediation / landfarming

Based upon the outcome of our review we have identified the following remedial options for further assessment:

- Asbestos and lead within fill:
  - Excavation of fill and offsite disposal to landfill
  - Capping of fill
- Hydrocarbon impacted soils around UPSS (after decommissioning and removal of UST):
  - Excavation of hydrocarbon impacted soils, onsite bioremediation / land farming and onsite reuse
  - Excavation of hydrocarbon impacted soils and offsite disposal to landfill

Table 10.1: Remedial options appraisal

Remedial Methodology	Description	Advantages	Disadvantages	Suitability
Excavation and offsite disposal to landfill	Excavate impacted materials. Transport directly to a licensed landfill facility. Re-instate site with clean validated fill material	Effectively removes the contamination from the site. Does not leave site legacy of contamination that requires management over longer term. Relatively fast method.	Higher CAPEX cost relative to capping and ongoing management associated with haulage and disposal of soil. Not viewed as an environmentally sustainable approach.	Yes – asbestos, lead and hydrocarbons
Capping and on-going Management	Impacted soils are managed on-site by either creating an engineered encapsulation (or containment) cell or by simple capping of the ground surface with a clean, layer of fill material.	Can be incorporated into the detailed design plans and meet remedial objectives. Cost effective. Relatively fast method.	May require notification of contamination on land titles. Restricted development options. Long term management of capping layer.	Yes – asbestos and lead No – hydrocarbons
Excavation and onsite bioremediation / land farming	Soils that are potential impacted by hydrocarbons related to the UPSS may be treated on site by bioremediation /land farming.	Cost effective. Soils successfully treated could be validated for re-use on site, or disposed offsite	Can be time consuming. Requires a relatively large area for treatment on site.	Yes – hydrocarbons

11. Preferred remedial strategy

11.1. Asbestos and lead

Based upon a review of relevant remedial technologies and discussions with TKD, the preferred remedial strategy is **capping and on-going management** following regrading works. It is considered likely that some **excavation and off-site disposal** will be also be required to achieve design levels.

Excavation and off-site disposal (Bulk Removal) would also be the contingent option in the event that capping and on-going management to cover for unforeseen situations where the 'cap and contain' option is not viable.

11.2. UPSS

The UPSS will must be decommissioned in accordance with the POEO (Underground Petroleum Storage Systems (UPSS)) Regulation 2014 (POEO UPSS Regulation 2014). The regulations state that a dis-used tank must be decommissioned, and a validation report must be prepared detailing the decommissioning.

11.3. Description of asbestos and lead remedial strategy

11.3.1. Excavation and off-site disposal

Designs levels and service corridor excavations etc have not yet been finalised, and as such the likely volume of material required to be excavated (i.e. for design levels, service trenching, pits etc) is currently not known. The volume shall be confirmed during detailed design. Based on information provided to Coffey regarding the proposed development, it is unlikely a significant amount of excavations within the site will terminate beyond the fill material boundary, and within the natural soils.

Since asbestos (bonded) has been previously identified within fill throughout the site, the WHS and environmental management procedures outlined within Section 14 should be followed when excavation within fill is conducted.

Waste must be disposed of at an appropriately licenced facility in accordance with the POEO Act 1997 and the POEO (Waste) Regulation 2014. Prior to the disposal of material from the site the remedial contractor should seek approval from the facility to accept the waste.

The fill has been pre-classified as **Special (Asbestos) Waste** with chemical analytes less than concentration values for general solid waste. Waste material must be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines: Part 1 Classifying Waste, prior to offsite disposal. Section 12.4 provides guidance for waste classification assessments of material during excavation.

Asbestos waste may require to be tracked utilising the WasteLocate app from the NSW EPA for quantities exceeding 10 m^2 (http://www.epa.nsw.gov.au/wasteregulation/wastelocate-asbestos.htm), as required. The NSW EPA has gazetted a temporary exemption from Clause 79 of the POEO (Waste) Regulation 2014, relating to the requirement to use WasteLocate to monitor the transportation of asbestos contaminated soil solely within NSW. This exemption has been gazetted temporarily until 30 September 2017. Reference should be made to the NSW EPA website prior to off-site disposal to check the status of the temporary exemption.

During material removal from site the following information shall be recorded and maintained by the remediation contractor and provided to TKD and the Environmental Consultant/Occupational Hygienist at the completion of the remedial works:

- All records waste transporters are required to have by the NSW EPA
- Landfill dockets including:
  - Date and time of disposal;
  - Name and address of landfill;
  - Amount of waste;
  - Type of waste; and
  - Truck registrations.

11.3.2. Capping

The purpose of the capping layer is to break the pollutant link between the contaminant source and a receptor, rendering the risk to the receptor effectively nil. Based on discussions with TKD and Coffey's understanding of the proposed development, appropriate capping will be required for the whole site. The capping strategy may differ for various elements of the proposed development, including those summarised in the following sections, although it is recognised other situations may arise during design and/or construction stages.

In any situation capping will comprise the following key elements:

- Collection of visible fragments from the graded fill surface prior to placement of the marker layer by a licensed Asbestos Assessor who should issue a Clearance Certificate at completion of the inspection.
- A marker layer immediately above the graded fill surface. The marker layer should meet the following conditions:
  - Water permeable
  - High visibility
  - Rot proof and chemically inert
  - High tensile strength
  - Coverage of the contaminated areas and 0.5m beyond boundary, if practical
  - Parallel Sheets to be fixed together or overlap by 20 cm.

  The aim of the geotextile is to:
  - Provide a separation layer between contaminated soil and workers; and
  - Act as a marker and separating layer for any future maintenance workers within service corridors.
- A cap for the relevant situation as described below.

Major Service Trenches

Major service trench corridors, where future access by a maintenance worker is likely to occur should be capped as follows:

- Trench to be excavated to design level under the observation of an licensed Asbestos Assessor (and with asbestos appropriate controls).
- Excavated materials to be stored and managed in designated stockpile area.
- Occupational hygienist must ensure the surface of the trench is free of any visible ACM, once excavation to design level has been achieved.
- Following inspection (and removal of ACM if required) by licensed Asbestos Assessor, a marker layer conforming to the above conditions shall be placed on the base and walls of the trench.
- Following installation of the geotextile, construction and maintenance workers may work within the trench without the supervision and controls of an occupational hygienist (assuming the integrity of the geotextile is acceptable).
- Inspections by a suitably qualified consultant will be carried during installation of the geotextile to verify that the encapsulation meets the requirements specified above.
- Site excavated fill material should not be used to backfill newly installed service trenches.
- Newly installed trenches should be surveyed so that they may be located with confidence and for inclusion in the validation report (refer to Section 12.4) and the On-going EMP (refer to Section 11.3.5) without the need for intrusive inspections.

Grassed/landscaped areas (e.g. ovals, sports fields, gardens)

In consideration for the grassed and landscaped areas, the following capping approach will apply:

- Once design levels have been achieved, and the collection of visible fragments of asbestos from the surface, grassed/landscaped areas shall be covered with marker layer conforming to the above conditions shall be placed.
- Clean imported soil (i.e. topsoil and subsoil) in areas of proposed soft ground cover (i.e. ovals, sports fields, gardens and grassed areas). It is proposed to provide clean imported topsoil materials having a minimum thickness 0.5m to promote the establishment of grass and shrubs in communal garden areas. It is expected that increased soil depths may be required locally where larger shrubs and trees are proposed. The actual depth of soil cover provided in communal garden areas shall be determined by the landscaping strategy.
- Inspections by a suitably qualified consultant will be carried during capping to verify that the encapsulation meets the requirements specified above, and that it covers the extent of the grassed/landscaped areas.
- The landscaped and grassed areas should be surveyed so that the depth of capping can be recorded for inclusion in the validation report (refer to Section 12.4) and the On-going EMP (refer to Section 11.3.5) without the need for intrusive inspections.

Concrete hardstand, bitumen, paved or synthetic grass covered areas

With reference to the proposed development, a large majority of the site will be sealed with concrete, hardstand, bitumen, paved or synthetic grass. These surface finishes essentially provides a barrier between contaminant sources and receptors, although of different levels of durability. Concrete and

paved hardstand surfaces are the most durable while bitumen and synthetic grass cover are less durable. These surfaces will require to be constructed with the following minimum specifications, to provide an adequate barrier to protect human receptors from underlying site soils:

- The soils beneath the concrete, paver, bitumen or synthetic grass must be covered with a marker layer conforming to the above conditions shall be placed.
- Concrete pavement must be constructed with a minimum thickness of 150mm above the maker layer.
- Bitumen, pavers or synthetic grass must be constructed with a minimum total thickness of 200mm of cap above the marker layer. The cap should comprise the capping surface (bitumen, pavers or synthetic grass) overlying an ENM or VENM cap above the marker layer.
- Inspections by a suitably qualified consultant will be carried during capping to verify that the encapsulation meets the requirements specified above.
- Newly constructed concrete/paved areas should be surveyed so that they may be located with confidence and for inclusion in the validation report (refer to Section 12.6) and the On-going EMP (refer to Section 11.5) without the need for intrusive inspections.

11.3.3. Survey

The surface of the geotextile fabric and also the top of the cap should be surveyed as outlined in Section 12.1 of this report.

11.3.4. Importation of Soils

Soil will be imported to the site for backfilling, grading and landscaping purposes. Imported soil will be required to be classified as excavated natural material (ENM) or virgin excavated natural material (VENM) and have appropriate certification in accordance with the NSW EPA ENM/VENM exemption and order. Prior to importation, the Environmental Consultant/Occupational Hygienist will need to approve the use of such material at the site. National Association of Testing Authorities endorsed analytical results may be required or further testing of the material may be requested at the discretion of the Environmental Consultant/Occupational Hygienist prior or following importation.

An assessment of the material will be carried out during importation to confirm the soil is suitable for use, and included within the validation report (refer to Section 12.3.

11.3.5. On-going (long term) EMP

An environmental management plan (EMP) will be required to ensure the integrity of the cap is maintained, ensure any works penetrating the capping system are appropriately controlled and the cap appropriately reinstated and to ensure appropriate repairs are made promptly to any damaged areas of the capping system. The On-going EMP will need to be implemented whilst ever the contaminated fill remains on the site.

The On-going EMP shall be prepared by a suitably qualified consultant following installation of the capping which succinctly describes the nature and location of contamination remaining on-site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

The EMP will be required to be recorded on the planning certificate issued under section 149 of the EP&A Act 1979 or a covenant registered on the title to land under section 88B of the Conveyancing Act 1919.

11.4. UPSS remedial strategy

11.4.1. UPSS removal

The UPSS will be removed in accordance with the POEO (Underground Petroleum Storage Systems (UPSS)) Regulation 2014 (POEO UPSS Regulation 2014). The sections below provide a guided approach for the removal of the UPSS on the site.

In the absence of as-built records for the UPSS, some uncertainty remains with regard to the location and extent of UST and associated fuel distribution infrastructure on site. It is recommended that a survey is carried out to improve confidence on the location of below ground infrastructure. It is recommended that non-destructive survey techniques including Ground Penetrating Radar (GPR) or magnetometry are employed to identify the location of UST (and other potentially significant infrastructure) and the lateral extent.

Careful consideration of the non-destructive survey techniques is required however to prevent other materials within the fill interfering with survey results.

This UPSS removal will need to include:

- De-gassing of UST prior to hot works commencing.
- Removal and disposal of residual liquids from the UST and lines.
- Disconnect fuel and other associated infrastructure from the UST.
- Excavate soils surrounding the UST to facilitate the removal of the tank. Excavated soils to be placed in designated stockpiling area on site.
- Remove tank and transport to nominated recycling facility or disposal site.
- Waste classification of soil associated with the UPSS removal for offsite disposal. The classification of soils associated with the UPSS removal should be conducted separately to other material within the site which will be excavated.
- Other actions required to meet prevailing regulations and guidelines.

11.4.2. Excavation of impacted soil surrounding UPSS

It is recommended that the excavation of impacted soils around (and below) the UPSS will be guided by s suitably experienced environmental consultant, who will attend site during the UST removal and excavation works. Excavations will be extended until there is no visual/olfactory or significant field screening evidence of petroleum hydrocarbon impact in the excavation.

Depending on the size of the tank and required extent of the remediation excavation, the excavation may require shoring, or constructed with an appropriate batter to prevent collapse.

UST excavations will be validated (in accordance with Section 12.2) to demonstrate achievement of the RAC.

11.4.3. Soil Stockpiling and Waste Classification

Excavated soils should be stockpiled in designated areas for assessment for waste classification purposes. Attempts should be made to segregate cleaner soils from those which exhibit indications of contamination (e.g. petroleum hydrocarbons, visible ACM) being present.

The waste classification of stockpiled soils will be assessed, to facilitate offsite disposal. Further details on the classification of waste are presented in Section 12.4.

11.4.4. Importation of soils

If soils are required to be imported for backfilling of the excavation resulting from removal of the UPSS the methodology should be as described below in Section 12.3.

12. Validation Plan

12.1. Validation of cap thickness

To validate the thickness of the cover layer complies with specified requirements, a survey by a licensed surveyor will be undertaken prior to placement of the marker layer, and again following the installation of the surface capping material. The survey results should be presented on a thickness contour plan. Photographs and spot measurements may be undertaken periodically by the environmental consultant undertaking the validations works as further evidence to demonstrate the cover layer has been installed in accordance with the RAP. These records will be provided within the validation report.

12.2. Validation of removal of UPSS and associated impacted soils

The excavation works should be supervised on a regular basis by a suitably experienced environmental consultant.

The validation work at the site will entail collecting soil samples for visual, olfactory and soil headspace measurements by on site the Environmental Consultant to guide excavation works.

Validation samples will be collected from the base and walls of the remediation excavation using the following sampling densities:

- Base – at least 1 sample from the base or one sample per 25m^2
- Walls – at least 1 sample per wall or 1 sample per 10 linear metres. Collection of samples at multiple depths at each sampling point should be considered, based on visual, olfactory and PID screening results.
- Pipework (if present) – at least 1 sample per 10m length of pipework (minimum one per pipe run)

If a soil excavation surface is considered to still be aesthetically impacted or the validation sample analytical results do not comply with the RAC, the soil will be further excavated, until validation results of the soil surface complies with the RAC.

The soil samples collected for the UPSS validation will be tested as follows:

- TRH, BTEX, PAH and lead. Field observation of fill material will include visual, olfactory and PID observation. Additionally, the fill sample will be visually inspected for presence of ACM. If ACM is suspected then assessment will be undertaken which may include laboratory analysis of selected samples, or further excavation to remove visible ACM.

A PID will be used to assist with the validation works, including guiding collection of samples from the base and walls of the excavation pits. Sample collection methods will be recorded and reported, with rationale for sample selection.

Based on the validation sampling results, one of the following actions will be made:

- If some of the validation samples fail the remediation (acceptance) criteria, the soil identified as failing the remediation criteria will be further excavated. Further validation sampling of these areas will then be required. Statistical interpretation of validation data may also be used to assess whether the remediation goals have been met.
- If some of the validation samples fail the remediation (acceptance) criteria and further excavation is not considered practicable (i.e. due to site boundary), alternate remedial strategies and / or risk assessment to assess the significance of the remaining contamination may be considered.
- If validation samples meet the remediation criteria, no further remedial works will be required.

Selected soil samples will be analysed by ISO/IEC 17025 certified laboratories with NATA accredited methods for the following analytes: TRH, BTEX, PAHs, Lead, Asbestos (if observed within fill).

Analytical results will be compared against the tier-1 heath, ecological and management criteria outlined in the amended ASC NEPM for residential land use (HIL/HSL A, EILs/ESLs and management limits). Further discussion is provided in Appendix C.

12.3. Imported soil assessments

As discussed in Section 11.4.4, imported soil will be required to be suitable for the proposed sensitive use of the site as a public school.

To confirm the material is suitable for use the following will need to be carried out:

- Prior to importation: Review of VENM/ENM certificates. If material to be imported is derived from recycled materials review compliance with resource recovery exemptions for any recycled materials. Where it is proposed to import blended material derived from multiple resource recovery exemptions the suitability of the blended material for the proposed use will need to be assessed.
- During importation: As a minimum visual inspection of all deliveries. Imported material will also be visually checked for the quantity, type and distribution of foreign material or odours which could cause ongoing concern to site users.

Dependent upon the source site and the information available for VENM/ENM certificates additional soil sampling, field screening, laboratory analysis and assessment of the results may be required, either prior to during importation.

Material imported as VENM will also be expected to meet the following validation criteria: Ambient background concentrations (ABC) of metals (where available) adopted from Schedule B5b of the amended ASC NEPM 2013.

Material imported as ENM will also be expected to have analytes less than the maximum average concentration for characterisation, and absolute maximum concentration, listed in Table 4 of the ENM order.

12.4. Waste Classification Assessments

The preference for soil sampling for waste classification purposes will be via sampling of a stockpile, however it may be suitable to conduct waste classifications in-situ within areas of the site following demolition of site structures, when access to underlying soils is available. The material will be assessed by a suitably qualified environmental consultant who will prepare a Waste Classification Report prior to removal and disposal offsite. This assessment will include:

- inspection of the stockpiled material, or review of a relevant photographic record; and
- collection and laboratory analysis of spatially representative samples of the soil material.

It is recommended that samples are collected at a rate of 1 sample per 25m^3 as per the guidance provided in Schedule B2 of the ASC NEPM (NEPC 2013). It is noted that this sampling frequency is for general waste classification of smaller stockpiles (i.e. <250m^3). The sampling frequency and analytical schedule may need to be adjusted on a 'case by case' basis by the environmental consultant, depending on factors such as:

- the volume of the material;
- the homogeneity of the material;
- investigation and laboratory analytical records relating to the material; and
- the visual assessment of the material.

Samples collected of waste soil will be analysed for a broad range of COPC consistent with the site history and informed by data presented within previous contamination assessment reports.

Samples will be collected using hand tools and/or mechanical excavation where a significant volume of soil is present within the stockpile being assessed.

Where stockpiling or sampling of stockpiled soil material is not practical or feasible, sampling of in-situ material may be used. The sampling plan would be designed in consideration of the recommendations made within the Sampling Design Guidelines (NSW EPA, 1995) so to gather sufficient evidence and collect samples for chemical characterisation that is representative of the waste materials being classified. Where in-situ classification is used, excavation of the material will be observed to confirm that the materials are reasonably consistent with those assessed for the in-situ waste classification.

12.5. Sampling analytical and quality plan (SAQP)

A sampling analytical and quality plan (SAQP) should be developed prior to the commencement of the program. The SAQP should identify all validation sampling requirements based on the proposed approach to remediation and give consideration to the validation plan outlined above and should include the following:

- Objectives of the sampling program
- Data gaps

- Data Quality Objectives
- Media to be sampled
- Analytes
- Sampling design and justification
- Sampling methods and procedures
- Field quality assurance / quality control (QA/QC) procedures
- Laboratory analysis including QA/QC
- Data Evaluation

12.6. Validation report

At the completion of the remedial works, a validation report will be prepared in general accordance with OEH 2011 and the ASC NEPM, documenting the works as completed. This report will contain information including:

- Information demonstrating compliance with appropriate regulations and guidelines.
- Confirmation that the as built details of the cap meet the remediation requirements
- Details of the source, classification and suitability of all imported materials.
- Any variations to the strategy undertaken during the implementation of the remedial works.
- Details of any environmental incidents and/or unexpected finds of contamination occurring during the course of the remedial works and the actions undertaken in response to these incidents.
- Details on waste classification, tracking and off-site disposal.
- As-built survey drawings showing elevation of the marker layer and elevation of top of the cap, and changes in the cap design.
- Clear statement of the suitability of the site that is the subject of the validation report, for the proposed use.
- Scope and requirements for the ongoing management (on-going EMP).

13. Approvals and licences

This section discusses some of the regulatory compliance requirements associated with the remediation. It is important to note that this section is not exhaustive and the Contractor must ensure they comply with applicable legislation and guidelines.

All works will be completed in accordance with the conditions of the Development Consent and in accordance with any other requirements of Council of the City of Sydney.

The relevant authority (currently SafeWork NSW) requires notification of UST removal works prior to commencement of work. The form Notice of Intention to Commence Construction Work must be filled out and sent to SafeWork before UST removal work begins. A licensed contractor is required to pump

liquids from the USTs. USTs must be disposed to an approved facility. The relevant authority also require notification following completion of UST removal.

Since asbestos is present within fill beneath the site, the relevant authority will require notification of asbestos works. All asbestos related works will be undertaken in accordance with Safe Work Australia Codes of Practice, relevant Commonwealth and state regulations, SafeWork NSW guidelines, requirements under the POEO Act (1997), any other relevant guidance and industry best practice.

Soils or liquids disposed from the site must be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines*. All impacted soil and water requiring off-site disposal will be transported and disposed of to either a licensed landfill, liquid waste facility or to public sewer following on site treatment. Waste classified as "hazardous waste" must be treated on site, with EPA approved methodology, to reduce the waste classification prior to offsite disposal. Any wastes leaving the site will need to be transported by a NSW EPA licensed contractor. Prior to waste leaving the site, written pre-approval from a licensed disposal facility will be obtained and included in the site validation report. All material leaving the site will be tracked and documented.

Other legislative requirement that may be applicable include but are not limited to:

- Contaminated Land Management Act 1997;
- Environmental Planning and Assessment Act 1979;
- Protection of the Environment Operations Act 1997;
- Waste Avoidance and Resource Recovery Act 2001; and
- WHS Act 2011 and the WHS Regulation 2011.

13.1. SEPP55

The potential for significant environmental impacts from the proposed remedial work is considered to be low and as such the proposed remedial works are considered to be category 2 remedial work as outlined in SEPP 55.

A notification of remedial works at the site will be required to be submitted to City of Sydney Council 30 days before category 2 remediation works commence.

13.2. SafeWork NSW

13.2.1. Asbestos Removal Licence

Based on the type of asbestos identified on site to date (bonded) the remedial contractor will be required to hold a minimum Class B Asbestos Removal Licence. A Class B asbestos removal licence allows a licence holder to remove non-friable asbestos and asbestos-containing dust associated with the removal of non-friable asbestos.

13.2.2. Asbestos Notification

The engaged remedial contractor will be required to prepare an Asbestos Removal Control Plan (ARCP) for the proposed remediation works. The engaged remedial contractor will subsequently be

required to submit the ARCP together with this RAP to the relevant authority (currently SafeWork NSW) and obtain the necessary NSW WorkCover Permit prior to commencement of remedial work (5 days notification required).

14. WHS and environmental management controls

A site specific Work Health and Safety (WHS), and Construction Environmental Management Plan (CEMP) will be required to be prepared by the remedial contractor and include, but not be limited to, the following:

- Inductions
- Toolbox talks
- Asbestos awareness training
- Record keeping
- Site specific safety plan
    - SafeWork NSW requirements
    - Risk assessments
    - Safe work method statements
    - Site specific safety requirements associated with remedial works outlined within this RAP and managing contaminated materials
- Access
- Barricades and signage
- Dust control
- Sediment control and water management
- Stockpile management
- PPE/RPE
- Noise
- Asbestos control and management

15. Contingency plan

Due to the nature of the contamination investigations being carried out at discrete locations on the site, the conditions encountered between investigation locations during remedial works may differ from those encountered during the DSI and other investigations. A set of typical issues and proposed corrective actions associated with a remediation program is provided in Table 15.1

Table 15.1: Contingency Plan

Potential issues	Proposed corrective actions, as appropriate	Responsible person	Communication and additional sampling/ monitoring
Excessive stormwater	Minimise active contaminated work area; improve stormwater diversion. Check control measures are adequate to prevent surface water runoff entering and leaving excavation and stockpile areas. Temporary bunding or diversion drain, HDPE sheeting placed under stockpiles, silt fences/hay bales surrounding stockpiles and protection existing drains to be regularly inspected to ensure that they are in good condition and if necessary upgraded where their performance is deteriorating.	Remedial contractor	Breaches are to be recorded in the daily site log and provided to TKD and DoE and the Environmental Consultant/Occupational Hygienist. No additional monitoring/sampling required.
Excessive dust	Use water sprays; stop dust-generating activity until better dust control can be achieved or apply interim capping systems on stockpiles or exposed material. Stop work in high wind conditions.	Remedial contractor	Breaches are to be recorded in the daily site log Additional monitoring/sampling may be required
Excessively wet material	Stockpile and dewater onsite. There is the potential for water to accumulate in excavation areas. If water does accumulate, it will require removal prior to validation and reinstatement.	Remedial contractor to contact Environmental Consultant/Occupational Hygienist to test any accumulated water	Water accumulated in excavations to be sampled by Environmental Consultant/Occupational Hygienist for potential contaminants of concern. Management/disposal options to be formulated based on analytical results.
Heavy rain	Ensure sediment and surface water controls are operating correctly. If possible divert surface water away from active work areas or excavations. Cover stockpiles.	Remedial contractor	None

Potential issues	Proposed corrective actions, as appropriate	Responsible person	Communication and additional sampling/ monitoring
Equipment failures	Maintain spare equipment or parts; keep rental options available or shut down affected operations until repairs are made. Clean up the spill with absorbent material. Stockpile the impacted material in a secure location.	Remedial contractor	Sample any impacted stockpiled materials (TRH, BTEX compounds and PAH) and determine appropriate disposal/treatment option based on an assessment of analytical results.
Unexpected contamination findings	If one or more of the situations identified within Table 16.1, then the steps in section 16.2.3 should be taken.	Remedial contractor	Further assessment will be required by the Environmental Consultant/Occupational Hygienist to determine an appropriate course of action.
Relics	If human remains, buried stone artefacts or other indications of an aboriginal site are discovered during excavation work, work shall cease until an appropriate action can be confirmed.	Remedial contractor	TKD, DoE and the required authorities will be notified.
Discovery of underground tanks during excavation works	Work to be suspended until Environmental Consultant/Occupational Hygienist can further assess impacted soils/materials and associated risks. Tank removal works to be overseen and validated by Environmental Consultant/Occupational Hygienist.	Remedial contractor	Validation of excavations after tank removal by Environmental Consultant/Occupational Hygienist. Validation samples would at a minimum be analysed for TRHs, BTEX compounds, Lead and PAHs.
Complaints are received directly relating to the works undertaken	Stop works and implement control measures to address complaint (if possible).	Remedial contractor	Notify relevant Project Managers following complaint and follow incident procedure.

16. Data Gaps, Uncertainties & Contingency Planning

16.1. Data Gaps & Uncertainties

The site has been subject to several phases of investigations and assessments to characterise historic site uses, and the contamination status of the site. Following the review of the available site history information and investigation data, the following potential data gaps and uncertainties have been identified:

- The presence of potentially unidentified contamination between investigation positions, or in areas where limited investigation data is currently available, or constraints have prevented access for appropriate assessment.
- Limitations associated with the investigation methods employed during previous investigations.
- Potential for further USTs and/or other sources of onsite/offsite groundwater contamination.

The above data gaps and uncertainties have been used to develop the Unexpected Finds Protocol presented in the following Sections.

16.2. Unexpected Finds Contingency Plan

An unexpected finds protocol must be prepared for the site by a suitably experienced environmental consultant prior to the commencement of the site redevelopment works. The following presents a discussion regarding the management of unexpected finds.

16.2.1. Management of Unexpected Finds

Should unexpected contamination or aesthetically unacceptable material be encountered onsite during subsurface excavations, works will stop in the affected part of the site, and the find should be assessed by an environmental consultant. This area will be isolated to minimise potential for disturbance. The Project Manager should be notified of the unexpected find, as soon as possible.

Due to the potential variability in both the nature and extent of an unexpected find, it is not considered reasonable to define specific remedial strategies for contamination associated with the unexpected find. However, it is considered reasonable to follow the preferred method for remediation option assessment, similar to that discussed in Section 11.

If wastes are likely to be generated as a result of managing unexpected finds, a methodology for waste classification is presented in Section 12.4.

16.2.2. Training and Induction of Personnel

Personnel involved in earthworks on site are to be inducted on the identification of potential unexpected finds and asbestos awareness. The induction can be undertaken at the time of general site induction and refreshed periodically at toolbox meetings.

Induction to provide awareness of all types of possible unexpected finds is not practicable. In general, a precautionary approach will be employed and the unexpected finds procedure outlined in the following section will be implemented.

Additionally, it is noted that some forms of potential contamination may not be associated with any visual or olfactory indications in the field. The unexpected finds procedure will not provide protection against such impacts.

16.2.3. Unexpected Finds Procedure

Should an unexpected find of actual or suspected contamination be encountered during the remediation or site redevelopment works, the following procedure applies:

1. Stop work in the potentially hazardous area as soon as it is safe to do so and move to the upwind side of the area, or away from the area.
2. Assess the potential immediate risk to human health posed by the unexpected find and assess if evacuation or emergency services need to be contacted.
3. Delineate an exclusion zone around the affected area using fencing and/or appropriate barriers and signage. Additional control measures may be required for odours and/or volatile compounds.
4. Contact the Project Manager, and advise of the unexpected find.
5. Contact the appointed licensed asbestos assessor/environmental consultant for advice and request a site visit to undertake an assessment of the unexpected find.
6. The licensed asbestos assessor/environmental consultant will assess the unexpected find and provide advice regarding:
    a) Preliminary assessment of the contamination and need for immediate management controls;
    b) What further assessment and/or remediation works are required and how such works are to be undertaken in accordance with contaminated site regulations and guidelines;
    c) Preparation of an addendum to the remedial action plan (if necessary) or provide clean up advice;
    d) Remediation works required (where applicable);
    e) Validation works required following remediation works (if applicable).
7. Works are not to recommence in the affected area until appropriate advice has been obtained from the asbestos assessor/environmental consultant.
8. If it is deemed safe to do so by the Principal Contractor or appointed Subcontractor, works may resume in the affected area.

16.2.4. Potential Unexpected Finds

Based on findings of previous investigations and site history, potential unexpected finds which could reasonably be expected within the site are summarised in Table 16.1.

Table 16.1: Summary of Non-specific Unexpected Finds

Potential Unexpected Find	Observed Characteristic	Key Contaminant of Concern
Buried dry waste materials	May include a variety of waste materials including wood, plastic, metal fragments, building rubble (e.g. concrete, brick, asphalt, cement fibre sheeting containing asbestos etc.).	Heavy metals, TRH, PAH, forms of asbestos
Chemical spills from the former Match making factory and furniture manufactures	The former match making factory and furniture manufacturer may have been subject to the use of various chemicals. Contamination could be identified as follows: Discoloured/locally stained soils; Sheens on water within excavations; Odours soils.	TRH, PAH, Heavy Metals, VOC, SVOC, Phenols
Structures or conduits containing deleterious materials	Could be identified as follows: Another buried tank, distribution lines, vents etc.; Deeper sand fill sometimes with stained or odorous characteristics; Presence of small concrete footings surrounding by odorous or visually impacted soils and/or groundwater.	TPH, BTEX, PAH, lead, VOC
Hydrocarbon Compounds	May be identified by a hydrocarbon odour which may vary in strength from weak (just detectable) to very strong (easily detectable at a distance from the source). The odour may or may not be accompanied by specific areas of dark staining (black-grey) or larger scale discolouration of strata from a previously identified 'natural colour' (e.g. brown-dark brown fill, or brown red mottled residual clay) May also be visible as a distinct coloured sheen on water within an excavation.	TPH, BTEX, PAH, lead, VOC

17. Conclusion

TKD intend to redevelop the site as part of the proposed development as described within Section 2.

The site has been subject to several phases of investigation and assessment to characterise historical uses of the site and surrounding land, and the contamination status of the site. Findings from the Coffey (2017) DSI indicate asbestos and lead contamination is present within the fill, and potential

hydrocarbon contamination associated with a UPSS which require remediation to make the site suitable for the proposed development in accordance with SEPP55. Coffey considers that investigations carried out to date are adequate for preparation of this RAP.

This RAP outlines a strategy to mitigate health risks associated with identified contamination and thereby mitigate potentially unacceptable risks during and following re-development. This RAP also presents a strategy to manage unexpected finds of contamination that may be encountered during construction.

If the remediation is carried out in accordance with this RAP using the preferred remedial option, then Coffey concludes the site should be made suitable for the proposed development.

18. Limitations

The reader should refer to the 'Important Information about Your Coffey Environmental Report' which is attached at the rear of the text of this report.

19. References

- ANZECC (2000): Australian Water Quality Guidelines for Fresh and Marine Waters.
- Australian Standard AS 4482 (2005): Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soils (Parts 1 and 2).
- Australian Standard AS 4964 (2004); Method for the qualitative identification of asbestos in bulk samples
- Coffey (2017); Detailed Site Investigation – Alexandria Park Community School, Park Road, Alexandria. Ref SYDEN199382-R01-Rev02
- Coffey (2017); Soil Vapour Investigation – Alexandria Park Community School, Park Road, Alexandria (Coffey 2017). Ref: SYDEN199382-L02
- Coffey (2017); Acid Sulfate Soils Management Plan – Alexandria Park Community School, Park Road, Alexandria. Ref: SYDEN199382-L03-Rev01
- EIS (2017) Acid Sulfate Soils Assessment – Proposed New School Facilities, Alexandria Park Community School. Ref: E30907Klet-ASS
- Geological Survey of New South Wales (1983); *Geological Series Sheet 9130 - Sydney* (1st Edition; Scale 1:100 000)
- GeoEnviro Consultancy Pty Ltd (2016); Geotechnical Investigation, Proposed Temporary School Buildings, Alexandria Park High School, Park Street, Alexandria NSW (REF: JG16980A-r1; dated September 2016).
- Hibbs & Associates (2016); Phase 1 and Limited Soil Sampling Investigation, Waterloo High School (Ref: S9179; dated July 2016).
- NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure* (No. 1) 1999, as registered 2013, and associated Schedule B guidelines.
- NSW DEC (2006); *Guidelines for the NSW Site Auditor Scheme* (2nd edition)

- NSW EPA (1995); *Sample Design Guidelines*
- NSW EPA (2014); *Technical Note: Investigation of Service Station Sites*
- NSW EPA (2014); *Waste Classification Guidelines*
- NSW EPA (2015); *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW OEH (2012); *Excavated Natural Material Exemption*
- NSW OEH (2011); *Guidelines for Consultants Reporting on Contaminated Sites*
- Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014 (UPSS Regulation)
- *State Environmental Planning Policy No 55 - Remediation of Land* and its associated planning guidelines *Managing Land Contamination* (DUAP/EPA, 1998)
- SafeWork NSW (2016); How to Manage and Control Asbestos in the Workplace
- SafeWork NSW (2016); How to Safely Remove Asbestos
- WA Dept. of Health (June 2011); *Recommended Procedures for Laboratory Analysis of Asbestos in Soil*.

Important information about your **Coffey** Environmental Report

Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but

steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

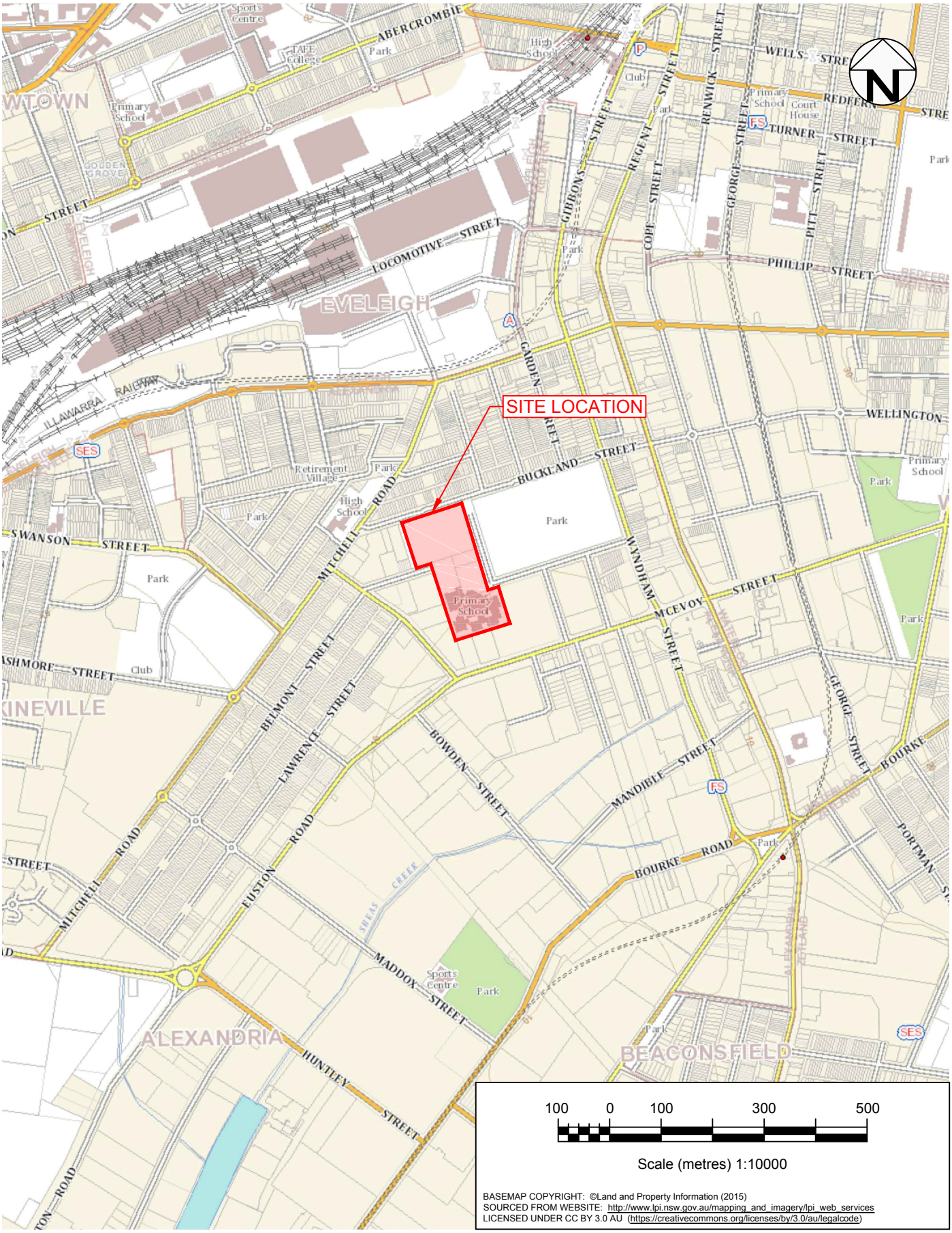
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Figures



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approved	AR
date	8 / 12 / 17
scale	AS SHOWN
original size	A4

coffey
A TETRA TECH COMPANY

client: TKD ARCHITECTS PTY LTD

project: ALEXANDRIA PARK COMMUNITY SCHOOL
PARK ROAD, ALEXANDRIA, NSW

title: SITE LOCATION

project no: 754-SYDEN199382-R03 | figure no: FIGURE 1 | rev: A

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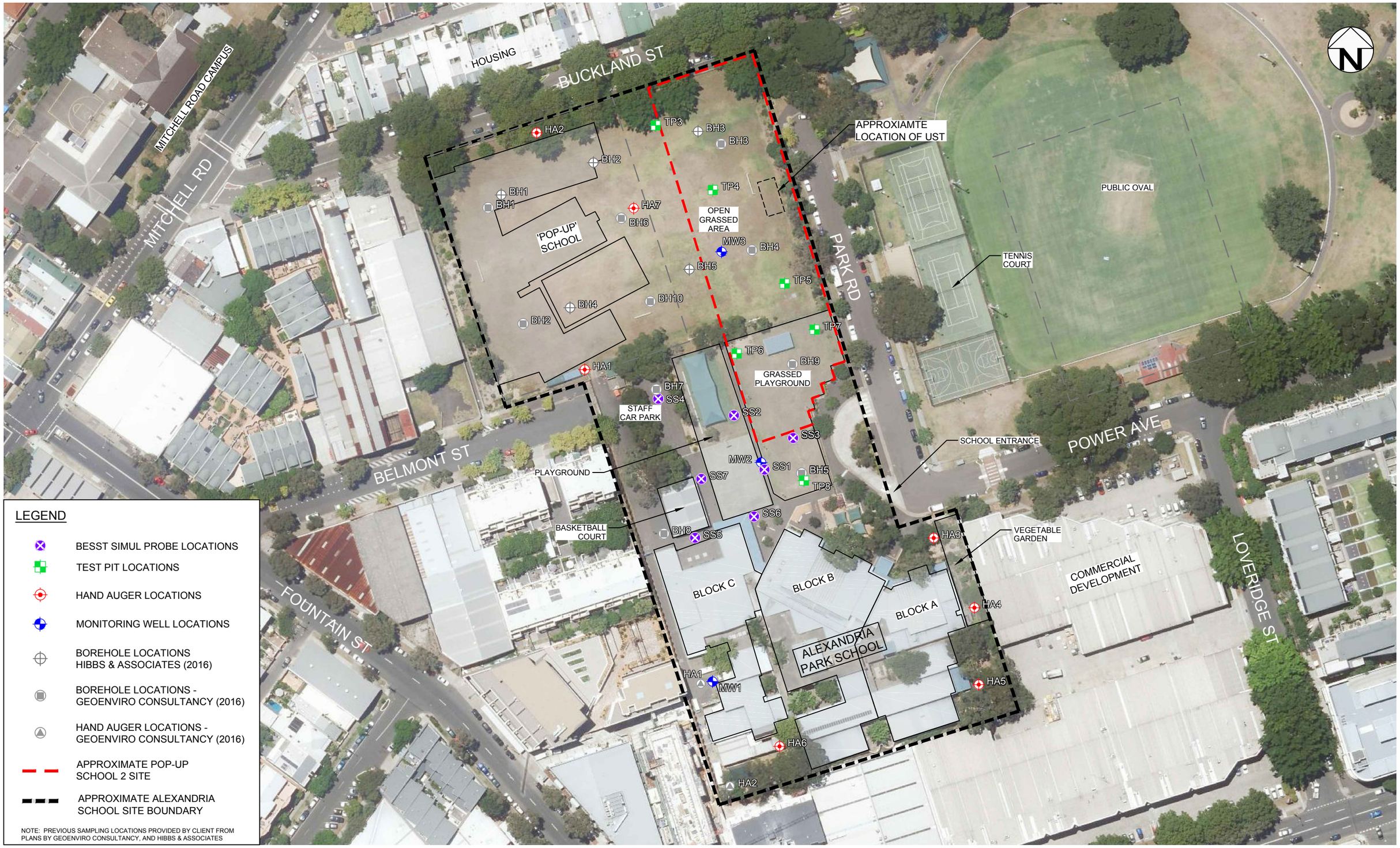

LEGEND

- BESST SIMUL PROBE LOCATIONS
- TEST PIT LOCATIONS
- HAND AUGER LOCATIONS
- MONITORING WELL LOCATIONS
- BOREHOLE LOCATIONS HIBBS & ASSOCIATES (2016)
- BOREHOLE LOCATIONS - GEOENVIRO CONSULTANCY (2016)
- HAND AUGER LOCATIONS - GEOENVIRO CONSULTANCY (2016)
- APPROXIMATE POP-UP SCHOOL 2 SITE
- APPROXIMATE ALEXANDRIA SCHOOL SITE BOUNDARY

NOTE: PREVIOUS SAMPLING LOCATIONS PROVIDED BY CLIENT FROM PLANS BY GEOENVIRO CONSULTANCY, AND HIBBS & ASSOCIATES

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	AR	AR	8/12/17

10 0 20 40 60

Scale (metres) 1:1250

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approved	AR
date	8 / 12 / 17
scale	AS SHOWN
original size	A3

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A TETRA TECH COMPANY

client: TKD ARCHITECTS PTY LTD

project: ALEXANDRIA PARK COMMUNITY SCHOOL
PARK ROAD, ALEXANDRIA, NSW

title: SITE LAYOUT

project no: 754-SYDEN199382-R03 | figure no: FIGURE 2 | rev: A

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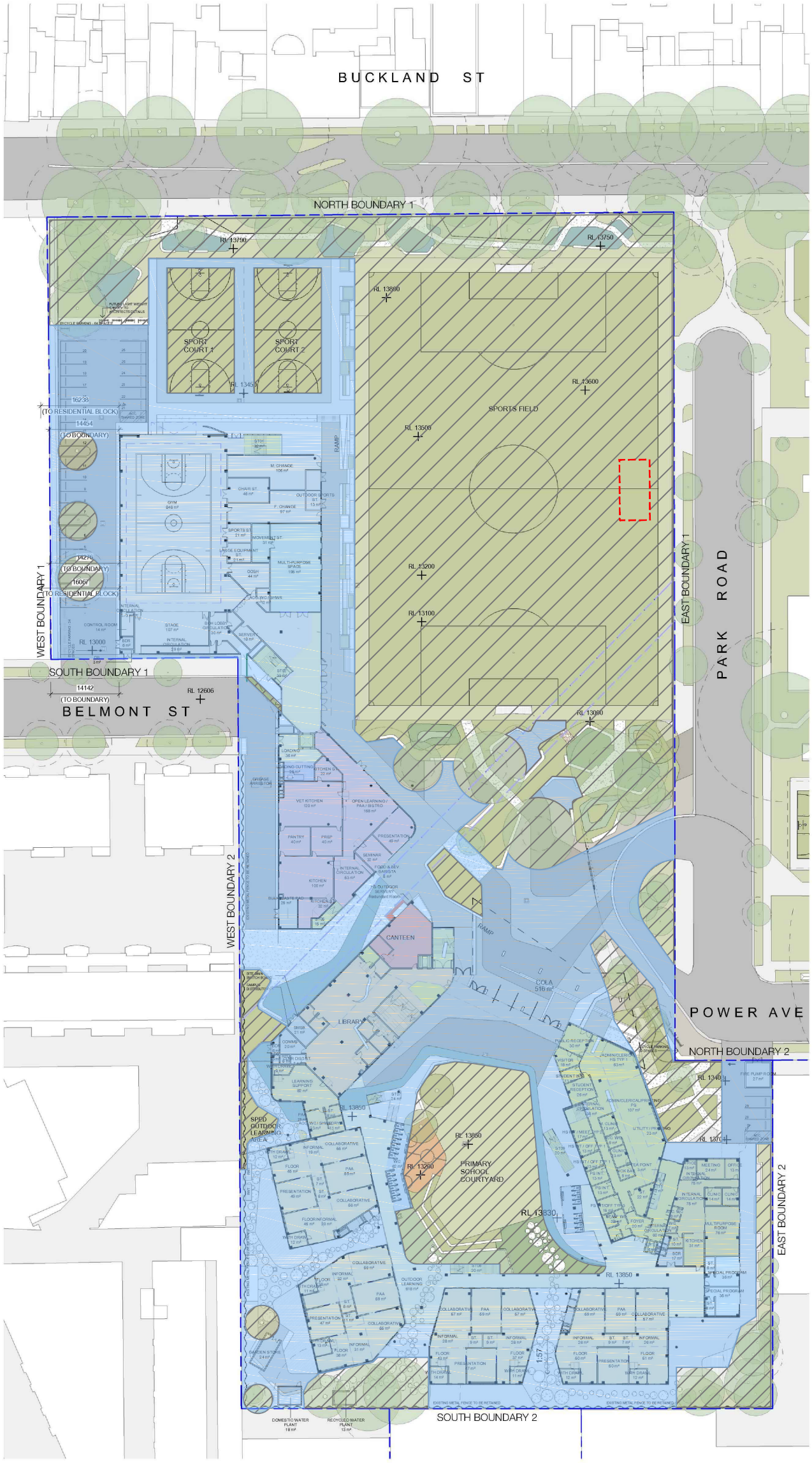

NOTE:
PROPOSED CAPPING LOCATIONS OF SERVICE CORRIDORS TO BE DETERMINED ONCE FINAL SERVICE DESIGNS HAVE BEEN COMPLETED.

revision no.	description	drawn	approved	date
A	ORIGINAL ISSUE	AR	AR	8/12/17

LEGEND

- CAPPING - CONCRETE / PAVED AREAS (SEALED SURFACES)
- CAPPING - GRASSED / LANDSCAPED AREAS (GRASSED SURFACES)
- REMEDIATION EXTENT (ASSUMED) OF UPSS

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Scale (metres) 1:1000

SOURCE: TKDArchitects - DWG No. AR.SD.2001 - 20/10/2017

drawn	AR / AW
approved	AR
date	8 / 12 / 17
scale	AS SHOWN
original size	A3

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A TETRA TECH COMPANY

client:	TKD ARCHITECTS PTY LTD		
project:	ALEXANDRIA PARK COMMUNITY SCHOOL PARK ROAD, ALEXANDRIA, NSW		
title:	REMEDIATION STRATEGY PLAN		
project no: 754-SYDEN199382-R03	figure no: FIGURE 3	rev: A	

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Appendix A – Selected Design Plans