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Anna Harris
TKD Architects Pty Ltd

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Dear Anna

RE: Acid Sulfate Soil Management Plan, Alexandria Park Community School, Park Road, Alexandria NSW

1. Introduction

This Acid Sulfate Soil Management Plan (ASSMP) has been prepared for the proposed redevelopment of the Alexandria Park Community School, located on Park Road, Alexandria (the site). It is understood that the proposed development will involve service relocation works, which may disturb a small amount of natural soils locally around the services. It is understood that no piling, dewatering or basements are proposed for the redevelopment.

The work was commissioned by Anna Harris of TKD Architects Pty Ltd (TKD) in response to a proposal submitted by Coffey on 31 August 2017 (Ref: SYDEN199382-P04).

This ASSMP presents the approach and methodology of acid sulfate soil management at the site during the construction phase to be followed by the Contactor and its subcontractors. It provides a basis for specifications for acid sulfate soil management, however it is important to note that this document is not a specification.

The objective of the ASSMP is to reduce the potential environmental impacts associated with the disturbance of acid sulfate soils within the area of the proposed works. The ASSMP is prepared in general accordance with the Acid Sulfate Soils Assessment Guidelines (Ahern et al, 1998a) and the Acid Sulfate Soils Management Guidelines (Ahern et al, 1998b) in the Acid Sulfate Soil Manual, published by the Acid Sulfate Soils Management Advisory Committee (ASSMAC).

2. Background

City of Sydney council presents its requirements regarding acid sulfate soils in the Sydney Local Environmental Plan (LEP) 2012. The Sydney LEP identifies five classes of land, with Class 1 having the highest risk of acid sulfate soils, and Class 5 having the lowest.

The Lotsearch report for the site (dated 25 January 2017) indicates that the southern portion of the site is underlain by Class 3 land, whereby works more than 1m below the natural ground surface present an environmental risk; Works by which the water table is likely to be lowered more than 1m below natural ground surface present an environmental risk.

Since TKD have indicated that localised service relocations works may disturb natural soils, an ASSMP would be required for the proposed redevelopment.

3. Site Characteristics

A Detailed Site Investigation (DSI) with respect to land contamination was undertaken by Coffey in May 2017 (Ref: SYDEN199382-R01-Rev1). The DSI involved a desktop assessment for the likelihood of acid sulfate soils occurrence within the site.

No sampling or laboratory testing for acid sulfate soils was undertaken as part of the DSI program.

Relevant site characteristic details from the DSI are summarised below.

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. A site walkover was undertaken by Alex Ructtinger (18th January 2017) and Junaid Riaz (23rd & 24th January 2017), experienced Coffey environmental scientists. Key site features are 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 play area
  - 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 foundation. The northern half of the site was surfaced predominantly with grassed.
- The site was noted as being generally flat. However available topographic survey data indicates that site levels range from 16mAHD in the north to 13mAHD in the south of the site, with a gentle slope down towards the south/southwest.
- 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.

3.1. Surrounding Land Uses

The site is situated in an area characterised by various commercial and retail land uses which are summarised in Table 3.1.

Table 3.1: Surrounding Land Uses

Direction	Land Uses
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

3.2. Geology, Hydrogeology& Hydrology

3.2.1. 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). The sands are expected to be underlain by Hawkesbury sandstone at depth. Intrusive investigations conducted by Coffey (2017) indicate fill material is present within the site, overlying the Botany Sands. The fill layer was observed to be between approximately 0.9m and 1.8m thick.

3.2.2. Hydrology

No water bodies are located within the site, however the historic Sheas Creek swamp area was previously located on the southern section of the site. This area was progressively reclaimed between 1887 and circa 1900 based on historical parish maps (refer Section 4.2).

Alexandria Canal is the nearest surface water body to the site, which flows within a concrete lined channel, approximately 950m southwest of the site. Alexandria Canal discharges into the Cooks River.

3.2.3. 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 on 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.

Subsequent groundwater monitoring conducted as part of this study reported standing groundwater levels ranged between 12.870mAHD (MW1) and 13.110mAHD (MW3) (approximately 2.5m to 3.5m below ground surface) indicating groundwater flows in a south-westerly direction.

A search of groundwater bores registered with the NSW Office of Water is included within the Lotsearch Report (Appendix B). Numerous registered groundwater bores are located within 500m of the site. All bores are reported for monitoring purposes with the exception of GW106192, which is listed for domestic purposes. The use of the bore 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 bore is located 248m north-east and hydraulically up-gradient from the site.

3.2.4. Acid Sulfate Soils

With reference to the Acid Sulfate Soil Risk Map for Botany Bay (Map No 9130S3), published by the Department of Land & Water Conservation, and records presented in the Australian Soil Resource

Information System (www.asris.csiro.au), the site is identified as having low risk of acid sulfate soil impact. 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 the site beneath fill used to reclaim the surrounding area.

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 1m below the natural ground surface. Similarly, development controls are required for works that lower the water table by more than 1m below the natural ground surface.

3.3. Acid Sulfate Soil Risk at Site – Construction Activities

It is understood that the proposed development shall comprise the construction of new school facilities. The design of the proposed school is currently in concept phase, and a selection of drawings that describe the various layout options for the proposed development are provided in Appendix A. Based on the three concept designs, the proposed development will include:

- Demolishment of all permanent and temporary school buildings currently on site.
- Construction of new school buildings and facilities within site. Coffey understands the final design has not yet been completed.
- Construction of play areas.
- Landscaping within the site.
- Service installation within the site.

TKD has indicated that the proposed development will not include a basement.

It is unclear at this stage how the building foundations will be constructed.

TKD has indicated that service relocation works will be required in the southern portion of the site, which may involve disturbing of natural soils. It is understood that the volume of soil to be disturbed will be relatively small.

Based on the above information, this plan has been developed to manage the minor amounts of natural alluvial soils that may be disturbed during service relocation works within the southern portion of the site. Should other intrusive works which may disturb natural alluvial soils be conducted in other parts of the site (e.g augered piling), this document should be revised to incorporate the significance of the new details.

3.4. Potential Environmental Impacts from Acid Sulfate Soils

Exposure and oxidation of potential acid sulfate soils may lead to the generation of acidic leachate. Acidic leachate can be detrimental to the environment and the quality of in ground structures and services. Materials and machinery used may be susceptible to acidic corrosion. Acidic leachate can also mobilise toxic concentrations of metals.

4. Management Plan and procedures for Acid Sulfate Soils

4.1. General

As the service relocation plans have not been finalised, the actual volume of potential acid sulfate soil (PASS) material that is to be disturbed is unknown. However, it is considered that this volume is likely to be relatively small.

Since an acid sulfate soils intrusive investigation has not yet been conducted for the site, and only a relatively small amount of PASS is proposed to be disturbed, it should be assumed at this stage that all natural alluvial material beneath the site should be treated as PASS as a precaution.

The following general management procedures are considered applicable for this site based on the current understanding of the proposed development:

i. Appoint an appropriately qualified person to manage the acid sulfate soil issues during the construction activities;

ii. Temporarily stockpile the excavated material (piling spoil);

iii. Assess the potential presence of acid sulfate soils within stockpiled soils for treatment and disposal purposes;

iv. Undertaking liming (if required);

v. Dispose of the limed stockpile to an appropriately licensed landfill, or reuse on site.

These procedures are further discussed in the following sections.

4.2. Training and Responsibilities

The Contractor should appoint an appropriately trained person who is responsible for managing the acid sulfate soil issues at the site during the earthwork activities. This person could be the Site Foreman trained in acid sulfate soils management.

The person should be familiar with:

- Details in this ASSMP;
- Council and other relevant statutory requirements;
- Recognition of acid sulfate soils;
- Acid sulfate soil testing and treatment procedures; and
- Onsite management of acid sulfate soils, including implementing management procedures.

If required, a suitably qualified environmental consultant should be engaged to assist or train the Contractor in managing the acid sulfate soil issues and activities.

4.3. Temporary Stockpiling

The excavated soils should be temporarily stockpiled and treated (if required) on a specially prepared treatment (or liming) pad. The treatment pad should be located on a concrete paved area. If no concrete area is available, an area should be covered by timber boards on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness. Once the soils have been stockpiled, the stockpile should be covered by polythene or low-density polyethylene sheet of at least 0.25mm thickness to prevent erosion of stockpiled materials. Heavy objects not containing any sharp edges should be placed on the sheets to prevent them from being blown by the wind. Straw bales or a silt fence should be placed on the perimeter of the stockpile area to filter runoff. Infiltration of water to the stockpile, such as run-on water from upslope, should be managed with diversion banks. The

surface area of the stockpile exposed to oxidation should be minimised, and the stockpile should be covered when not in use.

Extended periods of stockpiling (more than a couple of days) will require leachate collection and monitoring. Where monitoring of the leachate indicates low pH (below 6.5), the addition of lime will be required prior to discharge to sewer/drain[1], subject to requirements/approvals from the relevant authorities.

4.4. Laboratory SPOCAS Testing

Laboratory testing should be carried out for representative soil samples collected from the stockpile to assess the level of acid sulfate strength and the required liming rate. Depending on the volume of the stockpile, a minimum of three representative samples, or 1 per 25m^3 should be collected. The soil samples will be tested by a NATA accredited laboratory for the presence of acid sulfate soils based on the Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) method (or another acceptable method).

Based on the results, if acid sulfate soils are assessed not to be present in the stockpile, the stockpile may be reused on site, subject to further contamination testing and engineering requirements.

4.5. Treatment Pad & Liming Methodology

If acid sulfate soils are identified based on the laboratory results, liming should be applied to the stockpile. The type and amount of lime to be applied will be such that a neutralising value (NV) of 100 can be achieved. The NV should be identified prior to mixing. NV relates to the purity of the lime and an NV of 100 is required to ensure that the lime is effective in neutralising the potential acid. Fine powdered agricultural lime ($CaCO_3$) generally has an NV of 90% to 100% whilst other manufactured forms of lime can have an NV as low as 80%. Where NV is below 100, the factor of safety, hence the amount of lime, will have to be adjusted accordingly.

The following liming procedures (or other equivalent) should be undertaken:

- Spreading of the soil in thin (<200mm) layers on specially prepared impervious pads within the boundary of the site works; and
- Addition of lime by hand or machinery followed by mixing, using light weight rotovators or similar tools. The amount of lime to be added shall be assessed from the results of the laboratory SPOCAS testing, with a factor of safety of 1.5 applied to account for incomplete mixing. This factor of safety is in addition to any correction factors for purity or particle size.

4.6. Waste Classification and Offsite Disposal

The treated soil may be disposed of to an appropriately licensed landfill following a waste classification. The waste classification and disposal should be undertaken in accordance with relevant standards and requirements, including the NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste. The waste classification should also take into account the acid sulfate soil requirements. It is noted that the treated soil cannot be classified as Virgin Excavated Natural Material (VENM) as per the NSW EPA definition.

Alternatively, the treated soil could be reused on site following monitoring as per Section 4.7, subject to contamination and engineering requirements.

[1] Discharge to sewer/drain would also be subject to other criteria such as the presence of contaminants and suspended solids.

4.7. Monitoring Following Treatment

The following monitoring program (or other equivalent) is recommended for lime treated material where the material is to be used on site for structural or general filling, prior to its placement:

- Monitoring of soil pH weekly based on Appendix I of the Acid Sulfate Soils Assessment Guidelines (Ahem et al, 1998a); and
- Laboratory testing of representative soil samples for SPOCAS (or similar) after four weeks.

The following acceptance criteria will be used over a four week period to assess whether the soils have sufficient neutralising capacity to account for the quantities of acid produced:

- Soil pH ≥ 6.5; and
- Net acidity level below Acid Sulfate Soils Assessment Guidelines (Ahem et al, 1998a) relevant action level (18mol H^+/tonne for material less than 1000 tonnes.

Should the soil pH fall below 6.5 and continue to fall, then additional lime will be added to the material and monitoring will continue for a further four weeks, at which time a review of the monitoring frequency will take place.

5. Contingency Plan

5.1. Management of Dewatering Activities and Drainage Strategies

If prolonged dewatering is required (although not expected), such activity may result in drawdown of the groundwater table in the area. The lowering of the groundwater table may enhance oxidation of the potential acid sulfate soils in the area.

The contractor should install and/or employ appropriate groundwater control systems to control the ingress of groundwater into the excavation such that the surrounding groundwater table will be maintained. The surrounding groundwater level should be monitored regularly by the contractor. The contractor should also endeavour to minimise the length of dewatering where practicable.

If dewatering is required, it may be undertaken using a spear point and pump system or other method where appropriate. The water should be pumped into a temporary holding tank for monitoring prior to discharge to sewer/drain[2], subject to requirements/approvals from the relevant authority. Based on the monitoring results, if the water is assessed to be impacted by acid sulfate soils, the water should be treated as per Section 5.2.

5.2. Treatment of Water

Should groundwater or surface water impacted by acid sulfate soils be encountered, an appropriately qualified environmental consultant should be engaged as soon as practicable to help address the issue.

Where treatment of water is required prior to disposal, the following procedure may be followed.

A suitable water holding tank and a water pump will be brought for storage and treatment of the water. The tank will allow treatment and monitoring of water to be carried out for assessing disposal options. These waters should be monitored for pH and electrical conductivity (EC). Measurements should be undertaken daily, and hydrated lime should be added and thoroughly mixed if the pH or electrical

[2] Discharge to sewer/drain would also be subject to other criteria such as the presence of contaminants and suspended solids.

conductivity exceeds the relevant water quality guidelines or site specific disposal criteria. The monitoring results should be reviewed at least daily and compared to the water quality objectives prior to discharge. The application of hydrated lime should continue until the water quality objectives are met.

Alternatively, the acidic waters can be disposed of to a licensed treatment facility in accordance with the NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste.

5.3. Other Unexpected Issues

Should other unexpected issues be encountered, an appropriately qualified environmental consultant should be engaged as soon as practicable to help address the issues.

6. Limitations

This ASSMP is prepared based on the current level of understanding of the site and the proposed development. It should be reviewed and updated progressively as work is completed and if changes to the development is made. Relevant amendments in the ASSMP should be made as necessary.

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of this site at all points.

This plan has been prepared based on limited available information regarding acid sulfate soils at the site. The actual subsurface status could be different. No sampling and testing has been undertaken at the for acid sulfate soils.

This plan does not address geotechnical or contamination issues.

7. References

Ahern C R, Stone Y and Blunden B (1998a) Acid Sulfate Soils Assessment Guidelines, Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW.

Ahern C R, Stone Y and Blunden B (1998b) Acid Sulfate Soils Management Guidelines, Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW.

Coffey (2017), Detailed Site Investigation: Alexandria Park Community School, Parl Road, Alexandria NSW (ref: SYDEN199382-R01-Rev1)

Lotsearch (2017), Environmental Risk and Planning Report: Alexandria Park Community School, Park Road, Alexandria, NSW 2015.

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

8. CLOSURE

We trust the above report meets your current requirements. If you have any further queries regarding the information presented herein, please do not hesitate to contact us.

For and on behalf of Coffey

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