Soil and Water Management Sub Plan

Kingscliff High School Upgrade
SSD-8744305

December 2021

RICHARD CROOKES CONSTRUCTIONS

Contents

Document control

Approval and authorisation

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Approved on behalf of ENV by	Ben Pieterse
Signed	
Dated	09/12/2021
Approved on behalf of Richard Crookes Construction by	
Signed	
Dated	

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Copy number	Issued to	Version
1	Richard Crookes	REV2
2	Richard Crookes	REV3

Glossary / Abbreviations

Abbreviations	Expanded text
ASS	Acid Sulphate Soil
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
CSWMSP	Construction Soli and Water Management Sub-Plan
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DSI	Detailed Site Investigation
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESCP	Erosion and Sediment Control Plan
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EWMS	Environmental Work Method Statements
OEH	Office of Environment and Heritage
PASS	Potential Acid Sulphate Soil
PIRMP	Pollution Incident Response Management Plan
POEO Act	*Protection of the Environment Operations Act 1997*
TSC Act	*Threatened Species Conservation Act 1995*

1 Introduction

1.1 Context

The Kingscliff High School Upgrade Project obtained approval SSD-8744305 under Section 4.38 of the Environmental Planning and Assessment Act 1979 by the Minister of Planning and Public Spaces on the 3rd November 2021.

This Soil and Water Management Sub Plan (CSWMSP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Kingscliff High School (KHS) Upgrade (the Project).

This CSWMSP has been prepared to address the requirements of the Kingscliff High School Upgrade Environmental Impact Statement, and all applicable legislation.

1.2 Background and project description

The Kingscliff High School Upgrade Project will include the demolition of existing facilities including carparks, along with the following planned upgrades;

- Construction of a new Visual Arts, Music and Performance Building (Building O) in the north-western portion of the site;
- Refurbishment of a car park to the east of Building O;
- New bike parking facilities in the northern portion of the site;
- An extension to the south of the existing Building A;
- A new hydrant booster, tank and pump room in the north-eastern portion of the site;
- A new Covered Outdoor Learning Area (COLA) to the east of existing Building H;
- Demolition of a footpath and new landscaping works to the north of the current Building F; and
- Alterations and refurbishment of existing buildings C and G.

The Project site is located in the town of Kingscliff, in the Northern Rivers region of New South Wales (NSW), within the Tweed Shire Local Government Area (LGA).

The Environmental Impact Statement (EIS) prepared by SJB Planning on behalf of the NSW Department of Education (DoE) in support of State Significant Development Application (SSD) SSD-8744305, assessed the impacts of construction and operation of the Project on soils and water, within chapter 6.15.

The EIS identified the potential for direct and indirect impacts on water quality but concluded that provided the proposed mitigation and management measures are implemented, no significant long-term impacts would be expected.

This plan is to meet condition B19 of SSD-8744305. A compliance matrix is set out in Table 1.

Table 1: Condition B19 Compliance Table

Condition	Condition Requirements	Document Reference (Page Number)
B19	The Applicant must prepare a Construction Soil and Water Management Sub-Plan (CSWMSP) and the plan must address, but not limited to the following:	
	be prepared by a suitably qualified expert, in consultation with Council	Appendix D
	measures to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving site	17 Appendix A
	describe all erosion and sediment controls to be implemented during construction, including as a minimum, measures in accordance with the publication Managing Urban Stormwater: Soils & Construction (4th edition, Landcom 2004) commonly referred to as the 'Blue Book'	13
	include an Acid Sulfate Soils Management Plan, if required, including measures for the management, handling, treatment and disposal of acid sulfate soils, including monitoring of water quality at acid sulfate soils treatment areas	Appendix C
	provide a plan of how all construction works will be managed in a wet-weather events (i.e. storage of equipment, stabilisation of the Site)	Appendix A
	detail all off-site flows from the site	10-14-15-19
	describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including but not limited to 1 in 5-year ARI.	Section 6.3 15+19 Appendix A

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how Richard Crookes Construction proposes to manage and protect soil and water quality during construction phase of the Project.

2.2 Objectives

The key objective of the CSWMSP is to ensure that impacts on soil and water quality during construction are minimised.

To achieve this objective, Richard Crookes Constructions will ensure that:

- Appropriate controls and procedures are implemented and maintained during construction activities to avoid or minimise potential erosion and sedimentation impacts, impacts to water quality and marine environments adjacent to the Project site.
- Safeguards outlined in the EIS prepared of the Project are addressed and assigned responsibility in this Plan.
- Compliance with Condition B19 of the SSD application number SSD-8744305.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the Project:

- Ensure full compliance with the relevant legislative requirements and the EIS.
- Minimise and manage potential soil and water quality impacts from the construction phase of the Project.
- Manage water quality impacts attributable to the project (i.e. maintain waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the environmental protection licence and/or ANZECC guidelines).
- Ensure training on best practice soil and water management is provided to all construction personnel through site inductions.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

All legislation relevant to this CSWMSP is included in the CEMP.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this plan include:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000)
- Department of Environment and Conservation (DEC): Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW – March 2004
- Tweed Heads Development Control Plan (DCP) 2008.
- Protection of the Environment Operations (POEO) Act 1997
- Contaminated Land Management Act 1997

4 Existing Environment

The following sections summarise what is known about factors influencing soils and water within and adjacent to the Project site.

The key reference document is the EIS prepared by SJB Planning, dated May 2021.

4.1 Existing Soil Landscape

The site is situated on the Cudgen variant cub soil landscape. This soil landscape is characterized sandy, deep (>100 cm), well-drained Krasnozems. The Cudgen (cub) landscape is characterized low hills and rises formed on top of lamington basalts (eSPADE 2021).

4.2 Geology

The NSW Government soil map index shows the site to be located on Lamington Volcanics - Tertiary basalt, with members of rhyolite, trachyte, tuff, agglomerate & conglomerate (eSPADE 2021).

4.3 Groundwater

The detailed site investigation (DSI) states that there are ten registered groundwater bores located within 1km of the site, with the nearest groundwater bore located approximately 330m south-west of the site and used for irrigation purposes. The depth to groundwater in the bores ranged from 1.8m bgl to 12 m bgl, and yields ranged from 0.25 to 3.4 L/s.

4.4 Acid sulphate soils

Borehole testing undertaken across the site indicated the risk of Potential Acid Sulphate Soils (PASS) with the excavation of soils from a depth of 0.75m below ground level or greater. In accordance with Clause 4.5.5 of the EIS an ASS management plan (ASSMP) has been prepared as a part of a Detailed Site Investigation (DSI) by Douglas Partners (ref: 97611.00) in July 2021 and is to be implemented where the excavation of soils from a depth of 0.75m or greater is required to facilitate the proposal. The ASS management plan is located in Appendix C of this plan.

4.5 Climate and rainfall

The Kingscliff climate is sub-tropical with mean temperatures ranging between a mean minimum of 12°C in July and a mean maximum of 29°C in January. The annual mean rainfall is 1284 mm, with the highest monthly mean rainfall recorded in the month of February (Bureau of Meteorology, 2021).

4.6 Surface Water

The DSI states that the location and regional topography of the site indicates that excess surface water and flows towards Cudgen Creek, located approximately 270m south-east of the proposed development area.

4.7 Flooding

The Drainage and Flood Assessment undertaken by GHD on 13 August 2021 (ref:12540727) found that the proposed development was mostly unaffected by overland flow originating from upstream catchments and surcharge of the existing stormwater network.

4.8 Contamination

The DSI for the site states based on site history information and a site inspection, the potential for contamination at the site is considered to be relatively low and arise primarily from two sources:

- Fill material that may have been imported to the site during filling of a former dam and construction of the high school; and
- Historical agricultural use.

Contaminants of potential concern included:

- Metals/metalloids (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine Pesticides and Organophosphate pesticides; and
- Asbestos.

The Douglas Partners Report concluded that there is no contamination based human or environmental health risk at the site and no further investigation was required.

5 Environmental aspects and impacts

The key aspects and potential impacts associated with the management of soil and water during the delivery of works are listed in Table 2.

These potential impacts and opportunities have been considered in the development of this CSWMSP and site-specific procedures for the works.

Table 2: Aspects, Potential Impacts, and Mitigation Measures

Aspects	Potential impacts	Mitigation Measures
Discharge of contaminated water from within site boundary during rainfall.	• Contamination of downstream watercourses • Contamination of soils	Section 6.1, 6.6 and 6.3
Concrete washout	• Contamination of downstream watercourses • Contamination of soils	Bunded area to be provided
Dust from the worksite or from vehicles	• Potential pollution of waterways and air	Section 6.1.2.2
Earthworks/Embankment works/platform excavation works	• Potential spread of contamination into soils /surface or groundwater • Personnel exposure to contaminants • Sediment degrading surrounding environment • Change to flooding characteristics	Section 6.1.3
Flooding of worksites	• Contamination of floodwaters by sewage, fuels and/or chemicals onsite	Section 6.3 and Section 6.4
Leaks or spillages of fuels, oils and grease from construction plant and equipment at compounds.	• Contamination of soil • Contamination of stormwater systems, watercourses, riparian environment • Personnel exposure to contaminants	Section 6.4
Sediment laden runoff during rainfall	• Runoff entering drainage lines causing pollution and impacting aquatic life downstream.	Section 6.1.3
Sediment tracking onto public roads from vehicles leaving site.	• Potential impact on traffic safety • Potential for sediment laden runoff during rainfall • Potential for generation of dust	Section 6.1.2.2
Storage of hazardous substances	• Contamination as a result of a spill • Impact to stormwater systems and watercourses from pollution	Section 6.4
Construction laydown spills	• Contamination as a result of a spill • Impact to stormwater systems and watercourses from pollution	Section 6.4
Inappropriate management (handling, stockpiling, transport, and disposal) of identified contamination or contaminated materials encountered during demolition/construction works.		Section 6

6 Environmental mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the EIS. Specific actions and processes which will be implemented to comply and address the requirements and measures are outlined below and summarised in Table 3.

6.1 Erosion and sediment control

This section outlines the erosion and sediment control measures to be implemented during the construction phase of the Project.

6.1.1 General principals

Erosion and sediment control measures are to be implemented and maintained in accordance with *Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines* (the Blue Book).

Erosion and sediment control measures on land are to be implemented and maintained to:

- Prevent sediment moving off-site and sediment laden water entering any water course, draining line, or drain inlets.
- Reduce water velocity and capture sediment on-site.
- Minimise the amount of the material transported from site to surrounding pavement surfaces.
- Divert clean water around the site.

6.1.2 Specific Controls

Erosion control is primary to an erosion and sediment control plan. This can be achieved though the following controls:

6.1.2.1 Erosion and Sediment Control

Sediment control measures (e.g. sediment fencing, silt curtain, mesh or gravel “sausage”) must be installed prior to any construction activities commencing to prevent sediment and any other material (e.g. concrete, grout) moving off-site and entering any water course, drainage line or drain inlets. Dirty water or foreign material must not be released into drainage lines and/or waterways.

Erosion and sedimentation controls are to be checked weekly and maintained as required (including clearing of sediment from behind barriers). Records of inspections and maintenance works undertaken are to be kept on-site and provided on request.

6.1.2.2 Vehicle Access

The site access point shall be stabilised, and fencing (e.g. sediment fence or barrier) used to restrict all vehicular movements to that point. Any temporary access points shall be constructed in accordance with Figure 2 Standard Drawing SD 6-14, Appendix A. Stabilised access points with rumble grids or wheel washes to prevent mud tracking on roads will be established. Longer term and/or heavily used haul roads will generally be sealed. Sealed haul roads will be regularly cleaned.

6.1.2.3 Sediment Loss

Calculations on the sediment loss for the proposed earthworks phase of the project indicate the Erosion Hazard is very low. Soil loss has been calculated at 51 t/Ha/year. Soil Loss calculations are provided as Appendix B.

The calculated value is less than the threshold (150t soil loss/ Hectare / year) whereby the requirement to install a sediment basin is triggered. Therefore, only 2nd and 3rd level erosion and sediment control measures shall be required to be implemented as per the ESCP for the site.

6.1.2.4 Stockpile management

The following stockpile management measures shall be applied:

- Stockpiles must be located at least 5 m from likely areas of concentrated water flows, and more than 10 m from any waterway.
- Stockpile heights shall not exceed 4 m, and slopes shall not be steeper than 2:1.
- Adequate sediment control measures must be installed prior to stockpiling material.
- Stockpiles that will be in place for more than 20 days, or which are susceptible to wind or water erosion, shall be covered or otherwise protected from erosion, within 10 days of forming each stockpile.

6.1.3 Sediment Controls

- Sediment controls will be installed around stormwater inlet pits and where they will not cause or exacerbate flooding. Traffic management and safety will need to be considered if installing such devices on or near live traffic.
- Turbid construction runoff will be diverted into sediment retention devices such as sediment sumps, sediment fences and other sediment traps where feasible to prevent surface run-off from leaving the site.
- Sediment removed from any trapping device will be relocated where further pollution to downslope lands and waterways cannot occur.
- Mulch bunds will not be used in concentrated flow areas or if they have the potential to result in tannin leachate into waterways.
- All erosion and sediment controls will be inspected at weekly, before a site closure of two days or more, prior to and after rainfall exceeding 20 mm in 24 hours. Maintenance will be carried out as required prior to the next forecast rainfall event. Details of inspection will be maintained via the Site Manager's weekly diary.
- Concrete washout will be confined to designated concrete washout locations or using a Concrete Waste Separation Unit (CWSU), which allows for recycling of concrete waste.
- Clean water diversions to be constructed and stabilised around work areas
- No stockpiles of materials or storage of fuels or chemicals would be located adjacent to the existing culverts.
- Stockpiles will not be placed within 2m of hazards areas including likely areas of high velocity flows such as paved areas and driveways.
- Temporary sediment traps will be retained until after revegetation/rehabilitation.

6.2 Water quality monitoring program

Water quality monitoring will take place for all dewatering works in accordance with the ANZG water quality guidelines. Baseline monitoring is required for any surface water discharge off site as per the POEO Act 1997. Where practicable any water collected in excavations / site works will be used within the premises (e.g. dust suppression, watering retained vegetation).

For reuse of water onsite, the following criteria must be met:

- pH – 6.5 to 8.5
- No visible oil and grease
- No potential for water to leave the premises

- No surface runoff will be generated from the reuse (reuse includes dust suppression, watering retained vegetation etc.)
- No potential for water to reach any watercourse

6.3 Flooding

The following measures will be implemented to mitigate the impacts of stormwater and flood flows during large rainfall events:

- Stockpiling and storage of materials to occur outside potential flood areas.
- Temporary facilities and hazardous material storage to be above flood levels.
- Maintain overland flow paths.
- Construction equipment (or excess material) would be removed from flood prone areas where significant events are predicted.
- Site sheds and chemical stores will be protected from the anticipated flood events.
- Site inspections will be completed to ensure all erosion and sediment controls are in place prior to the significant event.
- Where applicable, temporary levees or bunds would be strategically placed to contain potential flooding impacts resulting from any temporary works on the floodplain and minimise the risk to surrounding properties which might otherwise be affected.
- In extreme flood events, such as 1 in 100 year ARI, temporary sandbags or diversions will be strategically placed to partially divert excessive floodwater flows away from the site and prevent overloading of stormwater drains and loss of large amounts of soil from site. Internal drainage systems will be inspected, reviewed and bolstered as necessary.

6.4 Spill prevention and response

The following control measures shall be implemented to minimise the risk of pollution caused by accidental leaks or spills:

- No vehicle wash-down shall occur on-site.
- The lowest volume of hydrocarbons (oil, grease, petrol and diesel) practicable will be stored on-site.
- Chemical storage areas will be bunded and chemicals will be stored in accordance with the products Safety Data Sheet (SDS). All fuels, chemicals and hazardous liquids must be stored away from drainage lines, within an impervious bunded area, and not on slopes steeper than 1:10.
- Refuelling and maintenance of vehicles, plant, and equipment shall not be undertaken at any location which drains directly to waters without appropriate temporary bunding being provided. Refuelling operations must not be left unattended.
- An emergency spill kit is to be kept on site at all times and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site.
- Any leaks or spills must be managed and cleaned up in accordance with RCC's Spill Response Procedure.
- All construction equipment must be inspected by qualified personnel prior to the commencement of work to reduce the risk of hydrocarbon spills or leaks.
- Vehicles and plant must be properly maintained and regularly inspected for fluid leaks.

- Portable toilets must be positioned securely within approved compound areas and emptied on a regular basis using a licensed service provider and human waste disposed of to a local sewerage treatment plant.

6.5 Acid Sulphate Soils

According to the DSI, PASS is occurring from 0.75m. An ASS management plan (ASSMP) has been prepared as a part of the DSI and is to be implemented where the excavation of soils from a depth of 0.75m or greater is required to facilitate the Project. An excerpt of the ASSMP is provided as Appendix C.

6.6 Importation of Soil

Imported soil materials must comprise Excavated Natural Material (ENM) or Virgin Excavated Natural Material (VENM).

In accordance with SSD-8744305 Condition C22, Richard Crookes must:

- Ensure that only VENM, ENM, or other material that meets the requirements of a relevant order and exemption issued by the EPA, is brought onto the site;
- Keep accurate records of the volume and type of fill to be used;
- Make these records available to the Certifier upon request;
- Ensure the exportation of waste (including fill or soil) from the site is in accordance with the provisions of the Protection of the Environment Operations Act 1997 and the NSW Environment Protection Authority “Waste Classification Guidelines”; and
- Ensure the exportation of waste is transported to a licenced waste facility or an approved site subject to a resource recovery order and exemption.

Soil classification and movement records must be kept by Richard Crookes for no less than seven years.

Table 3: Soil and Water management and mitigation measures

ID	Environmental Aspect	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW1	Sediment laden runoff during rainfall	Erosion and sediment control measures are to be implemented and maintained in accordance with *Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines* (the Blue Book)	Environmental Consultant	Ongoing	Project Manager or their delegate	Best practice, EIS, Conditions of Consent B19c
SW2	Sediment laden runoff during rainfall	Sediment control measures (e.g. sediment fencing, silt curtain, mesh or gravel “sausage”) must be installed prior to any construction activities commencing.	Sediment fencing, silt curtain etc.	Ongoing	Project Manager or their delegate	Best practice, EIS, Conditions of Consent B19c
SW3	Sediment tracking onto public roads from vehicles leaving site.	A stabilised site access point shall be established prior to construction works commencing. Measures must be in place to ensure that sediment and other materials are not tracked onto roadway by vehicles leaving the site.	Temporary fencing etc.	Pre-construction	Project Manager or their delegate	Best practice, EIS, Conditions of Consent B19b

ID	Environmental Aspect	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW4	Inappropriate management (handling, stockpiling, transport, and disposal) of identified contamination or contaminated materials encountered during demolition / construction works.	Any stockpiles must comply with the requirements outlined in Section 6.1.2.		Ongoing	Project Manager or their delegate	Best practice, EIS
SW5	Leaks or spillages of fuels, oils and grease from construction plant and equipment at compounds.	Any leaks or spills must be managed and cleaned up in accordance with the RCC Spill Response Procedure.		As required	Project Manager or their delegate	Best practice, EIS
SW6		Vehicles and plant must be properly maintained and regularly inspected for fluid leaks.		As required	All staff	Best practice, EIS
SW7	Storage of hazardous substances	The lowest volume of hydrocarbons (oil, grease, petrol and diesel) practicable will be stored on-site.		Ongoing	Project Manager or their delegate	Best practice, EIS
SW9		Chemical storage areas will be bunded and chemicals will be stored in accordance with the products Safety Data Sheet (SDS). All fuels, chemicals and hazardous liquids must be stored away from drainage lines, within an impervious bunded area, and not on slopes steeper than 1:10.		Ongoing	Project Manager or their delegate	Best practice, EIS

ID	Environmental Aspect	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW8	Leaks or spillages of fuels, oils and grease from construction plant and equipment at compounds.	All construction vehicles and equipment must be inspected by qualified personnel prior to the commencement of work to reduce the risk of hydrocarbon spills or leaks.		Ongoing	Project Manager or their delegate	Best practice, EIS,
SW9	Flooding of worksites & Sediment laden runoff during rainfall	Provide a plan of how all construction works will be managed in a wet-weather event (i.e. storage of equipment, stabilisation of the site).		Ongoing	Project Manager or their delegate	Best Practice, Conditions of Consent B19e
SW10	Discharge of contaminated water from within site boundary during rainfall. & Sediment laden runoff during rainfall	Detail all of-site flows from the site		Ongoing	Project Manager or their delegate	Best Practice, Conditions of Consent B19f
SW11	Discharge of contaminated water from within site boundary during rainfall. Sediment laden runoff during rainfall	Describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including, but not limited to 1 in 5-year ARI		Ongoing	Project Manager or their delegate	Best Practice, Conditions of Consent B19g
SW12	Acid Sulfate Soils	Adherence to the Acid Sulfate Soils Management Plan - Appendix C				Conditions of Consent B19d

7 Compliance management

7.1 Roles and responsibilities

The Richard Crookes Construction Project Team's organisational structure and overall roles and responsibilities are outlined in the CEMP and Table 3 of this plan.

7.2 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to soil and water management issues. The induction training will address elements related to soil and water management including the mitigation and management measures outlined in Section 6 of this plan. Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management.

7.3 Monitoring and inspection

Routine inspections of erosion and sediment controls will occur weekly and prior to, during and following significant (>25mm) rainfall over a 24-hour period to determine if controls are adequate. Monitoring of surface water will be required if water discharge off site is necessary. Water quality must meet the ANZG Water Quality Guidelines or Section 120 of the POEO Act.

7.4 Weather monitoring

Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office associated with the activities is established.

7.5 Reporting

The contractor shall maintain a documentation and record system in support of this CSWMSP monthly reporting requirements to enable review and auditing of management systems and procedures. Monthly reporting includes information on relevant soil and water data, summary and includes the reporting if any incidents and non-conformance.

Reporting requirements are outlined in the CEMP.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

References:

ASSMAC,1998, *NSW Acid Sulfate Soils Manual*.

Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000

Bureau Of Meteorology, Gold Coast Seaway Summary Statistics 2021

Douglas Partners,2021,Detailed Site Investigation, Far North Coast Schools Project Kingscliff High School

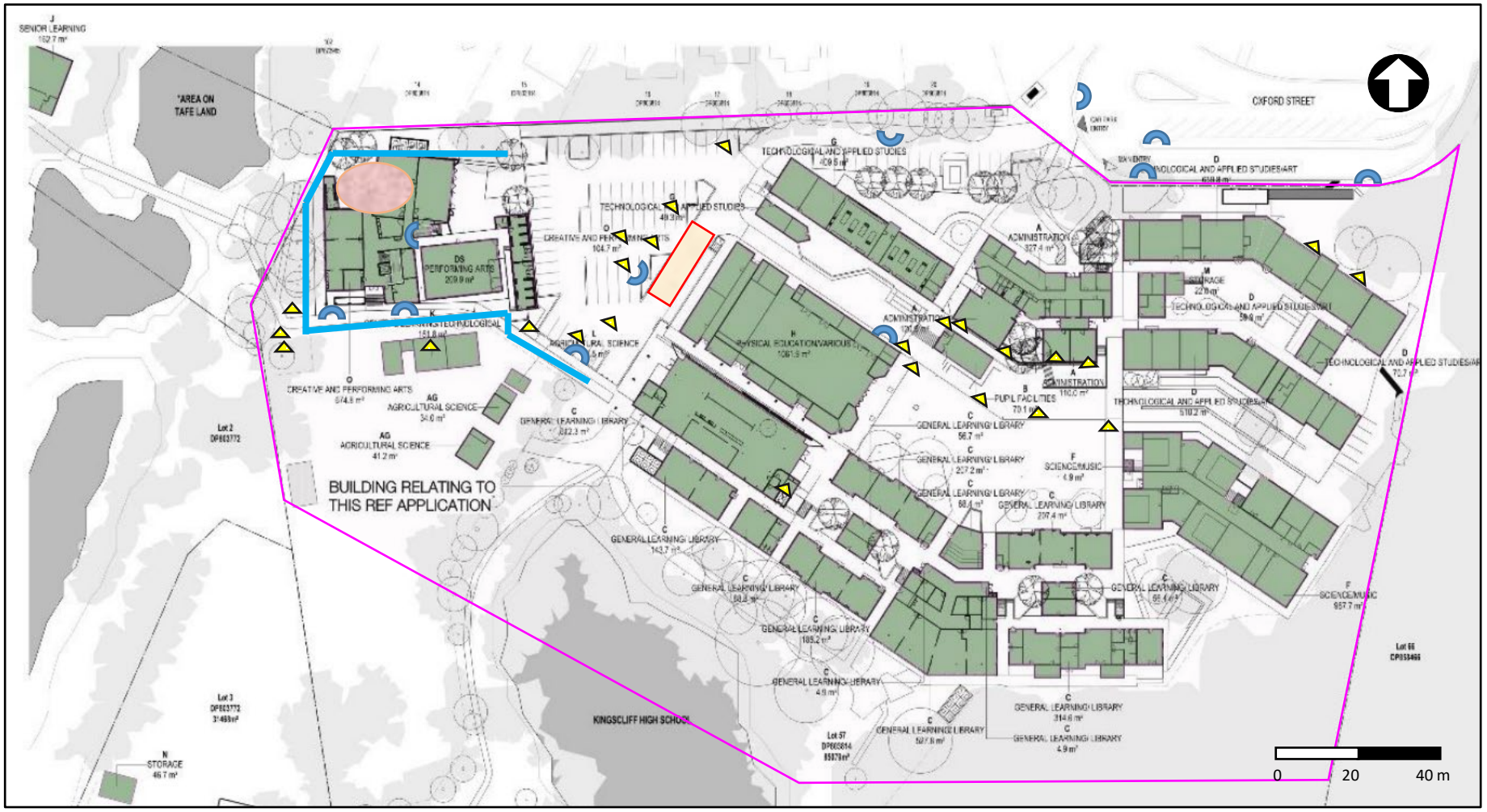
GHD, 2021,*Kingscliff Schools Drainage and Flooding Assessment.*

Landcom (2004), Managing Urban Stormwater: Soils and Construction (Blue Book).

Richard Crookes Constructions,2021*, Construction Environmental Management Plan, Kingscliff High School Upgrade*

SJB Planning, 2021, *Environmental Impact Statement, Kingscliff High School*

Appendix A – Figures



Legend

- Sediment Fence
- Wire Mesh/Gravel Sediment Filter
- Construction Area
- Stockpile
- Stabilized Site Access
- Drop Inlet Sediment Trap

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Figure 1 – ESCP Drawing
33 Oxford Street, Kingscliff 2487

Project: Kingscliff High School Upgrade
Client: Richard Crookes Construction
ENV Project Number: 216222

STABILISED SITE ACCESS SD 6-14

CONSTRUCTION NOTES

1. Strip the topsoil, level the site and compact the sub-grade
2. Cover the area with geotextile
3. Construct a 200mm thick pad over the geotextile with Ø40-70mm aggregate
4. Ensure the structure is at least 15m long or to the building alignment and at least 3m wide
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence
6. If required, inclusion of a shaker grid may be included at the construction site end of the stabilised site access

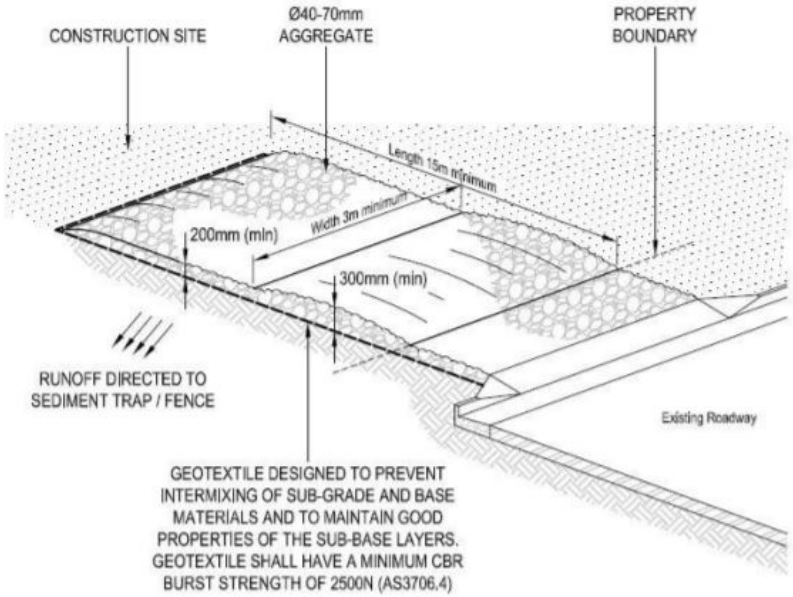

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Figure 2 – Standard Drawing 6-14
33 Oxford Street, Kingscliff 2487

Project: Kingscliff High School Upgrade
Client: Richard Crookes Construction
ENV Project Number: 216222

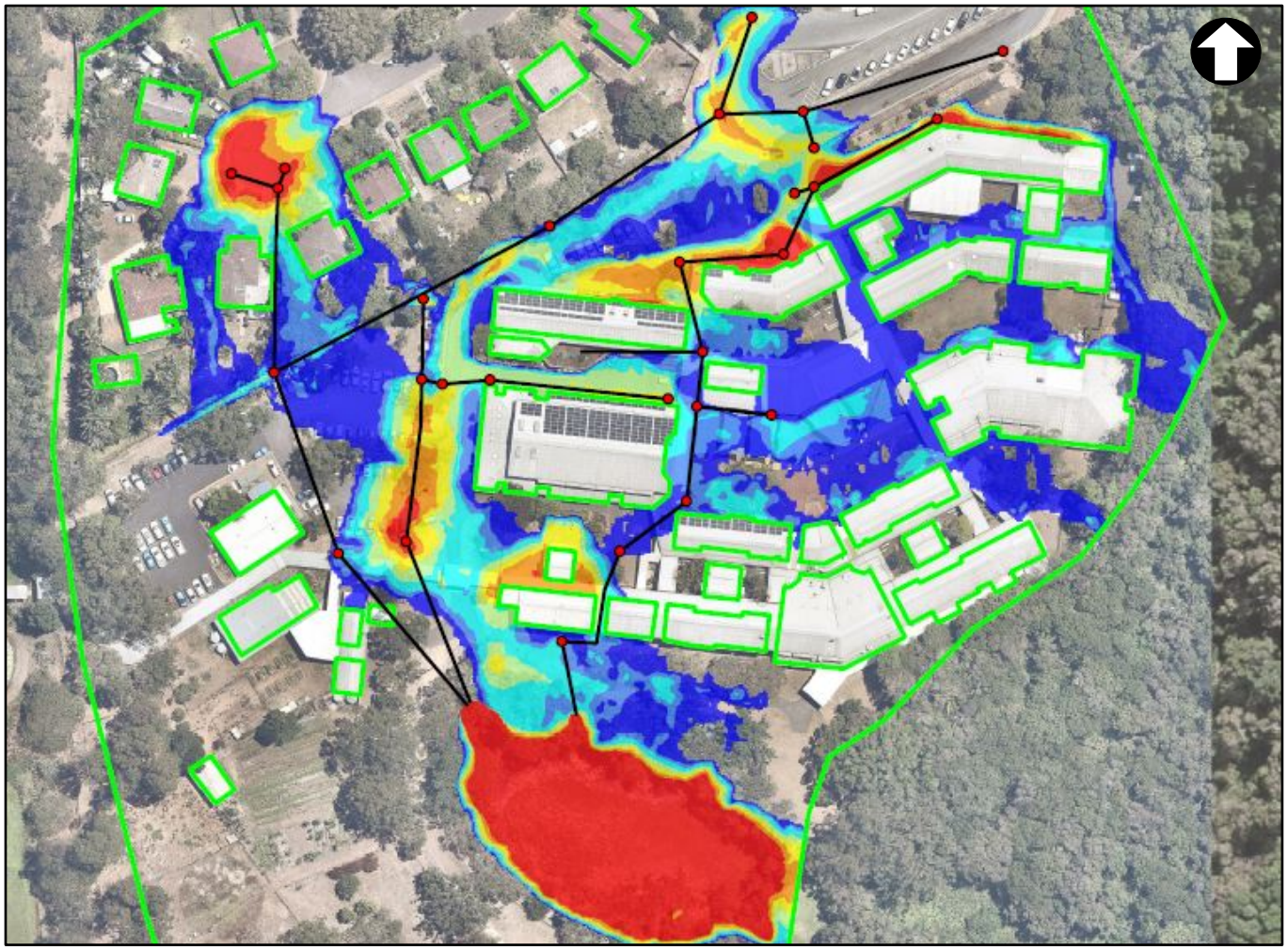

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Figure 3 – Excerpt of GHD Flood Level Map (1 in 100-year ARI)
33 Oxford Street, Kingscliff 2487

Project: Kingscliff High School Upgrade
Client: Richard Crookes Construction
ENV Project Number: 216222

Image Source: GHD (2021). NSW Department of Education SINSW01427-20 - Kingscliff High School Flooding Assessment Phase 2

Appendix B – Soil Loss Calculations

Site area	Sub-catchment or Name of Structure						Notes
	West						
Total catchment area (ha)	0.52						
Disturbed catchment area (ha)	0.5						

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F						From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	25						Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)	25						
% clay (fraction finer than 0.002 mm)	50						
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F						Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5						See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	85						
x-day, y-percentile rainfall event (mm)	57						
Rainfall R-factor (if known)	8200						Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)							

RUSLE Factors

Rainfall erosivity (*R*-factor)	8200						Auto-filled from above
Soil erodibility (*K*-factor)	0.015						RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	100						
Slope gradient (%)	1.5						
Length/gradient (*LS*-factor)	0.32						
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2						Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.51						See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	51						
Soil Loss Class	1						See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	39						Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	3						See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	151						See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	154						

Appendix C – Acid Sulfate Soils Management Plan
Douglas Partners (2021) Report on Detailed Site Investigation for Contamination Far North Coast Schools Project

Note: the ASSMP is an excerpt of the full document.

13. Acid Sulfate Soil Management Plan (ASSMP)

As detailed above, PASS is present at the site below a depth of approximately 0.75 m bgl. If any excavation of soil from approximately 0.75 m or below occurs the procedures detailed in this ASSMP should be implemented.

The objective of the ASSMP is to reduce the potential on- and off-site environmental impacts associated with the disturbance of PASS identified at the site.

13.1 Management Strategy for On-Site Treatment

13.1.1 Overview

If soil below 0.75 m is excavated it is required to be neutralised with lime. Liming is required to control the oxidation of pyritic material contained within the soil when released from below the water table into aerobic conditions, with the associated generation of acid.

It follows that, where lime neutralisation treatment is to be undertaken, it will require management in a controlled environment, in a bunded and lined pad with perimeter drainage and a sump, in order to enable the collection and separate treatment of any acid leachate formed during the soil drying and liming process. The proposed treatment area is located in the north-western section of the site, as shown in the attached Drawing 2.

It should be noted that saturated soil cannot be neutralised effectively with lime, particularly where it is cohesive. This is because the lime must be well mixed into the soil and this cannot be performed when the soil is overly wet and 'sticky'. Hence, the excavated soil must be dried back on a lined pad before effective mixing can take place with earthmoving machinery.

All water draining from the soil, once it is removed from the excavation, should be considered as potentially acidic and should be separated in a controlled area, such as the aforementioned bunded and lined pad, and not be allowed to flow back into waterways or stormwater until it has been tested for pH and for any other environmental tests required by the appropriate regulatory authority.

13.1.2 Neutralisation Pads

On-site neutralisation of ASS should be carried out as follows:

- Prepare a liming pad/stockpile site of appropriate area for the volume of soil to be treated. The pad should be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues, with a natural (or shaped) fall to the local drainage sump.
- The surface of the pad should be lined with selected approved compacted clay (at least two layers to a combined compacted thickness of 0.5 m) or a geosynthetic liner.
- A guard layer of fine agricultural lime (i.e. aglime) should be applied over the clay subgrade or compacted clay liner, to neutralise downward seepage. The guard layer of lime should be applied at a rate of approximately 5 kg lime per square metre of surface area for every 1 m height of stockpiled soil.
- The excavated soil should then be spread onto the guard layer in layers of 200 mm to 300 mm thickness, leaving a 1 m flat area between the toe of the spread soil and the containment bund or

drain. When spreading the first soil layer, care should be taken not to churn up the lime guard layer.

- Let the soil dry back to facilitate lime mixing (if too wet, then adequate mixing of lime cannot be undertaken).
- Apply aglime to the stockpiled soil over each spread layer and harrow for thorough mixing prior to spreading the next layer. The liming rate required varied considerably between sampling locations, ranging from 2.1 kg/t to 58 kg/t. In general, an overall liming rate of 30 kg/t would be expected to sufficiently neutralise PASS in most locations on-site, however in some locations up to 58 kg/t may be required. The validation testing procedure described in Section 13.1.4 will identify whether the liming rate is sufficient to neutralise PASS.
- Continue the spreading/liming/harrowing cycle until excavation is complete.
- Liming pads should be bunded off, and a circumference drain excavated to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.
- When testing indicates that lime neutralisation is complete, then the stockpiled soil may be removed from the liming/neutralisation pad.

Figure 1 below shows a schematic cross section of a treatment pad, extracted from Dear et al (2014)[11].

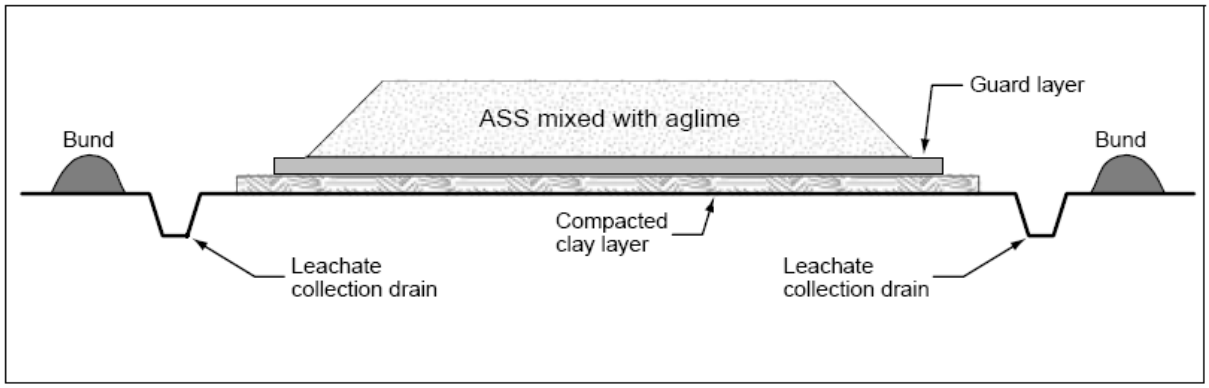

Figure 1: Schematic cross section of treatment pad

Liming of each area of excavation should be pre-planned and appropriate liming pads constructed. Allowances should be made during construction planning to occupy sufficient land to allow for these liming pads. Leachate collection location, lining and construction should be similarly pre-planned.

13.1.3 Neutralising Materials

Aglime should be used as the preferred neutralisation material for the management of ASS as it is usually the cheapest and most readily available product available for soil neutralisation. This material is mildly alkaline (pH of 8.5 to 9), of low solubility, and does not present any handling problems if used correctly. The aglime comprises calcium carbonate typically made from limestone that has been finely ground and sieved to a fine powder.

The aglime purity should preferably be 95% or better, (i.e. NV >95, where NV is the neutralising value, a term used to rate the neutralising power of different forms of materials relative to pure, fine calcium

[11] Dear SE, Ahern CR, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM (2014) *Queensland Acid Sulfate Soils Technical Manual: Soil Management Guidelines*, QLD Department of Science, Information, Technology, Innovation and the Arts.

carbonate which is designated NV = 100). Aglime is typically sold at an NV of 95% to 98%. There could be economic justification for using a less pure grade of aglime; however, under these circumstances, the individual lime dosing rates should be increased by a factor of 100/NV.

Due to its low solubility in water, aglime is not suitable for the neutralisation of leachate, which requires a product with a very quick reaction and high solubility. The most suitable neutralising agent for leachate and stockpile drainage water is slaked or quicklime (calcium hydroxide). This is made by treating burnt lime with water (slaking) and comes as a fine white powder. It has a typical NV of about 135. Due to its high alkalinity (pH of about 12.5 to 13), slaked or quicklime should not be allowed to come into contact with the skin or be inhaled.

13.1.4 Validation Testing

Validation testing of the soil and drainage water is required to be conducted after the addition of lime to test whether mixing has been adequate, and to reduce the risk of acidic water being returned to watercourses. Based on an existing plus potential acidity of <0.5%, validation samples of soil should be collected and tested for field pH screening and chromium suite at a minimum frequency of one sample per batch of mixed soil, with a minimum of one sample per 1,000 m^3 of treated soil.

In accordance with Dear et.al. (2014) single non-random grab samples are not recommended for this type of testing. Composite samples should be collected according to either a random or stratified-random protocol. Within each sample for laboratory analysis, a minimum of six subsamples of consistent volume should be collected. The subsamples should extend through the total depth of the treated material but avoid the underlying guard layer. The subsamples should be thoroughly mixed together in a container with a secure lid. Following the compositing of the material, a composite sample should be collected for laboratory analysis.

In addition, the pH of all ponded drainage water around the confines of the treatment bunds should be measured daily.

The soil and water contained within the treatment bunds should not be removed until the target values have been achieved as presented in Table 6 below. Similarly, additional layers of soil should not be added to the bunded stockpile for treatment until the underlying layers have been validated.

Table 6: Target Levels of Neutralised Soil and Water

Test	Target Level
Acid neutralising capacity (ANC)	To exceed existing plus potential acidity of the soil by at least a safety factor of 1.5.
pH_F of soil	6.5 to 8.5
pH_{KCL} of soil	Greater than 6.5
pH of water	6.5 to 8.5

It should be noted that validation testing (i.e. chromium suite tests) will require at least four days turn-around, possibly longer, and hence sufficient time should be allowed in the treatment programme for such verification testing. Only appropriately skilled operatives, such as available through DP, should collect and test verification samples. In addition to normal daily supervision of the soil management process, it is suggested that regular formal inspections be undertaken.

13.2 Management Strategy for Off-Site Disposal

If any PASS is required to be disposed off-site during the development, it must be undertaken in accordance with the NSW EPA *Waste Classification Guidelines – Part 4: Acid Sulfate Soils*, as detailed below.

- PASS must be kept wet at all times during excavation and subsequent handling, transport and storage; and
- PASS must be received at the proposed disposal facility within 16 hours of excavation.

13.2.1 Disposal of PASS Below the Water Table

PASS may be disposed of below the permanent water table provided:

- this occurs within 24 hours of excavation; and
- the PASS must meet the definition of virgin excavated natural material (VENM) under the *Protection of the Environment Operations Act 1997*.

The following requirements must also be met:

- The disposal facility (i.e., landfill) must be licensed by the NSW EPA to dispose of PASS below the water table;
- PASS must be kept wet at all times until burial under the water table;
- PASS must be buried at least 2 m below the lowest historical level of the water table;
- PASS must be disposed of within eight hours of receipt at the landfill; and
- The landfill operator must be provided with documentation for each truckload of material received, indicating that the soil's excavation, transport and handling have been undertaken in accordance with the *Acid Sulfate Soil Manual* (1998)[12].

The landfill operator is required to meet the following requirements:

- The pH of each load of PASS received must be tested prior to placement below the water table in accordance with the test methods specified in the *Acid Sulfate Soil Manual*. These details must be recorded and retained by the landfill operator;
- Soil that has dried out, undergone any oxidation of its sulfidic materials, or which has a pH less than 5.5 must be treated by neutralisation and disposed of at a landfill that can lawfully accept it; and
- The pH of the water into which the PASS is placed must not be less than 6.0 at any time.

[12] Acid Sulfate Soil Management Advisory Committee, (1998). *Acid Sulfate Soil Manual.* (ASS Manual 1998)

13.2.2 Disposal of PASS Above the Water Table

If PASS cannot be classified as VENM or no facility is available to dispose of the material under the water table, it may be disposed of above the water table provided the following conditions are met:

- The soil must be treated in accordance with the neutralising techniques contained in the *Acid Sulfate Soil Manual 1998*;
- Following treatment, the soil must be chemically assessed in accordance with Step 5 in Part 1 of the *Waste Classification Guidelines,* to determine whether any contaminants are present, and assigned a waste classification; and
- It must be disposed of at a landfill that can lawfully accept that class of waste.

13.3 Training and Induction

Training and induction sessions should be conducted for all contractors and staff involved in the excavation, transport or handling of soils or earthworks on the site. The sessions should be designed to ensure that staff are made aware of relevant issues and are familiar with their responsibilities.

13.4 Record Keeping

Current good management practices should be adopted by the appointed contractor. Complete records of all testing and treatment should be maintained by the contractor, and such records should be made available as required.

13.5 Emergency Response Procedures

Construction activities which may cause potential environmental hazards are summarised in Table 7 below together with recommendations for “Emergency Response Procedures”.

Table 7: Emergency Response Procedures

Construction Activity	Potential Environmental Threat	Emergency Response
Excavation of trenches	Flooding of open excavation causing adjacent groundwater levels to rise, leading to potential acid leachate once the excavation is drained	• Inform site foreman and project manager/ environmental officer; • Determine excavation pH; • Correct excavation pH; • Drain pit to tanks/ponds for water quality assessment prior to discharge.

Construction Activity	Potential Environmental Threat	Emergency Response
Stockpiling/Neutralisation	Stockpile washes or slips outside of bunded lime pad	• Inform site foreman and project manager/ environmental officer; • Estimate volume of material breaching bund; • Conduct pH analysis of adjacent watercourses (if any); • Remove breached soil into a bunded limed pad; • Over-excavate contaminated area to 0.2 m depth, apply and mix lime at rate as for guard layers (5 kg lime per m^2 of surface).
Stockpiling/Neutralisation	Breach in stockpile containment bund	• Inform site foreman and project manager/environmental officer; • Close breach in bund; • Conduct pH analysis of adjacent watercourses (if any); • Correct pH in any adjacent watercourse (if required).

For all construction activity incidents which pose an environmental threat, an incident report must be completed to determine how the incident occurred, to implement additional control measures, and to modify work procedures to reduce the likelihood of the incident re-occurring.

Appendix D – Consultant Qualification

Ben Pieterse
Environmental Scientist

Qualifications

Bachelor of Environmental Science. Southern Cross University, 2019.

National Acid Sulfate Soils Guidance - Identification and Assessment Course. Southern Cross University, 2021.

Conduct Backhoe/Loader Operations. Lawrence Davis Industry Training, 2021.

Asbestos Awareness Training. Alert Force, 2020.

Construction Induction. Workplace Health and Safety QLD, 2019.

Certificate II Information Technology. TAFE NSW, 2008

Key areas of Experience:

- Desktop and field- based site assessment
- Technical report writing
- Contaminated land investigation and remediation
- Resource recovery and waste management
- Project management
- Stakeholder engagement
- Environmental management
- On-site wastewater assessment

Career Summary

A multi-skilled and accomplished Environmental Scientist, Ben is approaching three years of environmental consulting experience in the northern NSW region. A member of the Australasian Land and Groundwater Association (ALGA) Association of NSW – Ben's expertise is crucial in identifying environmental issues and delivering the correct solution.

Ben's recent experience includes; Leading the preparation of Construction Environmental Management Plans, Management of works contracts and subcontractor engagement, Routinely applying resource recovery options for materials generated by local Councils and private enterprise, leading the successful assessment and of a local Council site, routinely applying resource recovery options for materials generated by local Councils and private enterprise.

Environmental Project Highlight

2021 - Detailed site investigation and acid sulfate soil assessment associated with the development of a constructed wetland at Byron Bay, NSW.
Client: Byron Shire Council

- Consultation with stakeholders to establish target project outcomes.
- Develop project budget, contract procurement and engagement and coordination of subcontractors.
- Lead site investigation program (borehole drilling and soil sampling program).
- Preparation of Detailed Site Investigation Report and Acid Sulfate Soils Management Plan.
- Ongoing consultation with client on project outcomes and requirements for management of excavation spoil.