Gladstone Area Water Board

East End Pipeline Acid Sulfate Soil Management Plan

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Gladstone Area Water Board

CONTENTS

1 INTRODUCTION

The Acid Sulfate Soil Management Plan (ASS MP) is one component of the GAWB Construction Environmental Management Plan (CEMP) for the East End Pipeline Project (hereafter referred to as "the Project"). Section 4.1 of the CEMP provides further background and detailed description of the Project.

The ASS MP describes how acid sulfate soil (ASS) will be managed and any potential impact minimised during construction. This ASS MP has been prepared with consideration of Project requirements, and to address the legal and other requirements.

1.1 Plan purpose

The purpose of this ASS MP is to:

- Describe how GAWB and its contractor(s) will manage and control risks associated with ASS during the construction of the Project
- Provide strategies to control potential impacts of ASS during construction
- Address the requirements of applicable legislation
- Address approval, permit/licence and contractual requirements.

1.2 Management objective and performance criteria

Objectives and performance criteria for the Project in relation to ASS include the following:

Objectives	**Performance Criteria**
• To provide a strategic and systematic framework to enable construction of the project with minimal environmental or social impact due to ASS • To ensure all construction activities are undertaken with the objective of preventing such impacts	• Consider disturbance and management of ASS/PASS • No adverse impacts to land or groundwater chemistry

1.3 Plan Scope

This plan applies to all works associated with the Project.

1.4 Interface with other documents

This ASS MP forms part of the overall CEMP for the Project.

2 ASS MANAGEMENT PROCEDURES

Elements / Issues:	**Acid Sulfate Soils** – Earthworks operations involving disturbance of ASS, specifically: 1. Excavation of shallow Actual and Potential Acid Sulfate Soils (AASS/PASS) located at below 5 m AHD during earthwork activities associated with the project. 2. On-site treatment of AASS/PASS spoil from excavations either insitu or at a lime treatment area, or removal off-site for disposal at licensed facility (if required due to the contamination status of the soil). 3. Potential adverse changes to groundwater dynamics and chemistry, particularly near creek crossings. 4. Discharge of acidic groundwater, seepage or intercepted rainwater off-site.
Operational/policy	To minimise adverse impacts resulting from: • disturbance of AASS/PASS on site during construction • impact to groundwater chemistry (through disturbance of ASS) and migration of impacted groundwater off-site towards drains, creeks or waterways temporary placement of spoil containing ASS on site • on-site treatment of AASS/PASS spoil from excavations, and discharge of any acidic seepage and intercepted rainwater off-site.
Statutory Requirements:	Development is covered under the: • *Environmental Protection Act, 1994*; and • Environmental Protection (Water) Policy, 2019. Additional reference is made to: • The ANZG 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality - 2018' • State Planning Policy Part E Interim development assessment requirements, State interest—water quality 2016. • State Planning Policy, July 2017 • State Planning Policy - State Interest Guideline Water Quality February 2021 • State Planning Policy 2/02, 'Planning and Managing Development involving Acid Sulfate Soils' Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines 2 (Version 3.8) • Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines Version 5.1, 2024 • Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, Canberra ACT. CC BY 4.0. (National ASS Sampling Guidelines) • Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT. CC BY 4.0. ('*National Acid Sulfate Soil Laboratory Guidelines*') • Shand, P, Appleyard, S, Simpson, SL, Degens, B, Mosley, LM 2018, National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments, Department of

	Agriculture and Water Resources, Canberra, ACT. CC BY 4.0. *'National Acid Sulfate Soil Dewatering Guidelines'*)
Performance Limits	1. ASS spoil from trench excavations that is placed as backfill can be limed 2. in-situ utilising a factor of safety of 3.0 and re-placed as backfill within 24 hrs. Lime verification analysis is not required given that a higher factor of safety is adopted. 3. Any lime treated ASS spoil that cannot be backfilled into the trenches shall be subject to verification testing using the Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) or the Chromium Reducible Sulfur (CRS) suite. The lime-treated material is to have: • a 'verification net acidity' of less than zero, • a pH_{KCl} after neutralisation of greater than or equal to 6.5. Note: Net Acid Soluble Sulfur (S_{NAS}) analyses is to be undertaken if ASS investigations indicate the presence of jarosite in the soils. 4. Records of lime used to treat spoil quantities should match records of bulk lime bought on to site and used for that purpose. A general photographic record of the lime mixing procedures should be made and maintained for reference. 5. Photographic records made of the developed site should be used to demonstrate no obvious degeneration of aesthetic value of the site and immediate surrounds. 6. The pH of any surface waters accumulating on site, including during the installation of the pipeline, shall be monitored and if necessary treated on-site to achieve a pH between 7.0 and 8.5 before discharge on-site. 7. Discharge water quality criteria are to be set for local waterways based on either ANZG limits or State/Local Water Quality Objectives (WQOs). Should it become necessary to discharge water from excavations directly to any drain or waterway (e.g. following a heavy rainfall event) monitoring parameters and provisional limits set for discharge of surface waters off site are to be met. 8. Note that other non-ASS related parameters such as nutrient load may be specified for discharge offsite under the auspice of unrelated legislation. 9. Any untreated spoil sent off-site for disposal must meet the acceptance criteria of the proposed disposal facility (e.g. licensed landfill). **Groundwater** 10. Monitoring parameters and provisional limits for groundwater are to be based on 'base line' values established prior to construction. 11. Should results of groundwater monitoring indicate potential impacts to receiving water quality, i.e. rivers or creeks along the alignment, monitoring would be required at upstream and downstream locations within the waterway. **Receiving Waters** 12. Should it become necessary to discharge water directly to any rivers or creeks along the alignment for any reason (e.g. following unexpected heavy rainfall) water quality shall meet the State Government WQOs for the relevant river or creek.
Implementation Strategy	**Treatment of ASS** **Trenching** 1. Additional ASS testing is required where trenching will result in disturbance to soils below 5 m AHD (refer Table 1).

2. A liming regime shall be developed for the trenching works. Lime treatment rates are to be calculated using the approach outlined in the National ASS Sampling Guidelines. Professional judgment by a CPSS is to be used to determine whether Acid Neutralising Capacity (ANC) can be used in the net acidity equation. For example, for high-risk areas, ANC should not be considered unless corroboration testing is undertaken, and ANC is deemed to be effective. In low-risk areas, consideration can be given to utilising ANC in the net acidity equation.
3. Spoil is to be lime treated at the rates determined following the ASS investigations.
4. ASS spoil from trench excavations is required to be limed in-situ and placed as backfill within 24 hrs. Liming rates shall incorporate a factor of safety of 3 which will be sufficient to negate the requirement to undertake verification testing of the material used to backfill the trenches.
5. During trenching, spoil shall be placed on the up-gradient side of the trench.
6. A layer of lime shall be applied to the surface prior to the placement of spoil on the side of the trench (nominally spread at rates of 2.5 - 5 kg/m2 pending the results of additional testing).
7. During excavation of the trench, local drawdown of the groundwater table (where required) shall be undertaken in stages to minimise the risk of oxidation of PASS.
8. During excavation of the trench, lime shall be adequately mixed into the soil as it is backfilled into the trench. Backfilling of treated spoil shall be carried out within 24 hours of disturbance.
9. Excavated material that cannot be backfilled into the pipe trench (mounding of spoil <0.3 m thickness on top of the backfilled trench is acceptable), is to be collected and placed within a purpose-built treatment area for treatment and verification.
10. Spoil at the lime treatment area is to be verified by carrying out the CRS suite or SPOCAS analysis. Testing shall be conducted at a rate of 1 test per 100 m3 of spoil.
11. Any soil that does not meet the performance criteria shall have further lime added and be re-tested to confirm neutralisation.
12. Stockpiling of soil and liming shall not be carried out in areas directly adjacent to creeks and rivers.

Management of Naturally Acidic Non ASS

13. Wherever possible, excavations involving disturbance of ASS are to be carried out in a staged manner to minimise the time that ASS are exposed and minimise the risk of further oxidation and impact to the receiving environment.
14. Spoil to be treated at a lime treatment area must be taken offsite within 48 hours of excavation. No stockpiling is to take place within 25 m of a waterway. Should it be required to stockpile spoil for longer than 48 hours, spoil shall be taken to a stockpiling area that is not
15. within 50 m of a waterway or open drain and shall be positioned above flood levels with appropriate bunding. A guard layer of agricultural lime shall be placed beneath the stockpile at a rate of 5 kg/m2.
16. ASS spoil that is required to be taken to a lime treatment area is to be transported in covered trucks. The top of the spoil shall be moistened by the application of a light water spray before covering. The trucks will then be covered by a tarpaulin or other dust proof cover and effectively sealed prior to transport off-site.
17. All trucks are to be visually checked for closed tailgates and

fastened covers before leaving the site. Trucks are to be free of any considerable amount of adhering soil.

Management of Naturally Acidic Non ASS

18. Spoil identified during investigations as containing naturally acidic non ASS can undergo a lower level of treatment as per the Soil Management Guidelines V4. A reduced factor of safety of 1.2 can be adopted for material reused as backfill in trenches.
19. Any identified naturally acidic non ASS that cannot be used as backfill within trenches can have required aglime added during transport in trucks, thus achieving a degree of mixing during transport and placement. Alternatively, the aglime can be incorporated into the spoil at a designated treatment area/s. Verification testing is not required for naturally acidic Non ASS.

Lime Treatment Areas

20. Design details of designated lime treatment areas is to be included in this EMP once these are available.
21. Lime treatment areas shall not be constructed within 50 m of waterways.
22. Due to the project length, more than one treatment area may be utilised. Treatment areas will be progressively constructed then decommissioned once works cease in a particular area.

    Lime treatment areas are to be free of vegetation and either (a) covered by a sealed hard surface such as concrete or asphalt, or (b) alayer of imported compacted non-ASS clayey material (0.3 metres thick), or (c) if clays are present at the soil surface, have guard layer of agricultural lime applied to the exposed surface at a rate of 5 kg/m2 and worked in using a rotary hoe (or similar) and compacted to create suitable ‘pad’.

23. Lime treatment areas are to be surrounded by an adequate low permeability perimeter bund (low permeability compacted earth or concrete/block work or layers of sandbags or similar) to prevent runoff from escaping following rainfall.
24. All spoil requiring treatment on the pad is to be treated within 24 hours of disturbance.
25. Excavated ASS spoil that is not backfilled in trenches (or taken directly offsite for disposal to landfill) is to be placed in one of the purpose-built lime treatment areas for treatment with agricultural lime.
26. ASS material shall be placed on top of the 'guard layer' in up to 300 mm thick layers (or windrows) to allow drying (if wet) before lime addition and mixing.
27. Materials requiring liming at differing rates are to be kept separated at all times and tracked independently.
28. Once a layer of ASS is sufficiently dry (the length of drying time will depend on the texture of the soil), apply agricultural lime to the spoil using physical or mechanical means, at the required liming treatment rate and mix well.
29. Lime neutralisation of treated ASS spoil is to be verified by carrying out SPOCAS or CSR suite on the treated spoil in accordance with the Monitoring Section of this EMP and held in the bunded treatment area until verification testing is completed and results meet performance criteria. Once verified, the material may be used in earthwork activities subject to the suitability of geotechnical properties of the material.
30. Lime treatment areas are to be reinstated at the conclusion of the project.

Lime Guard Layers

31. Anywhere where alluvium is exposed at the base of the trench excavations, a surface application of lime is to be applied to the base of the excavation prior to backfilling. Rates are to be determined following the site investigations.

32. A surface application of lime is to be applied to the base of all excavations left uncovered for longer than 48 hours, at rates of the order of 2.5-5 kg/m^2 (to be confirmed following additional investigations).

Liming General

33. Mitigation strategies in the Corrective Actions Section shall be implemented if remediation procedures fail to achieve the nominated 'Performance Limits'.

    Sufficient quantities of the lime shall be retained on site to allow replenishment of guard layers and lime treatment of spoil. Stockpile(s) of agricultural lime will be kept well inside the site boundary and covered, where necessary to prevent nuisance dust, in volumes sufficient for predicted treatment works.

34. Personnel working with ASS shall be inducted to a site Occupational Health and Safety Plan. As a minimum, personnel in contact with ASS shall wear nitrile gloves, long sleeved shirt, full length pants and safety footwear when directly handling untreated ASS and during prolonged exposure to lime.

35. Lime to be used shall be of high quality (calculations are based on 96% purity) and kept in a dry state.

Management of Surface Water

36. No 'active' drawdown of the permanent groundwater table is to take place in areas containing PASS during trenching or any other construction activities.

37. Sufficient quantities of the chosen water neutralising agents (e.g. hyrdrated lime) shall be kept on-site in a dry state (eg. locked in a shed, toolbox).

38. Should significant volumes of water become ponded in the trench or open excavations (eg. > 50 litres), water monitoring and when required, treatment, shall be undertaken prior to discharge. Treatment shall involve the application of hydrated lime (in small amounts) until the pH is between 7.0 and 8.5 and other performance indicators are met. Small quantities of the neutralising agent shall be used and the pH shall be regularly monitored during lime addition to limit the risk of over dosing (refer to Table 5 of the SPP 2/02 attached in Appendix C).

39. Once neutralised, the water may be discharged to sewer if a licence is obtained from Council and Councils discharge parameters are met or else discharged on-site using 'soaker' hoses in areas at least 100 m away from waterways.

40. Should discharge to any river or creek be required, the discharge water shall be sampled and analysed to meet either ANZG limits or State/Local Water Quality Objectives (WQOs).

41. Note that other non-ASS related parameters such as nutrient load may be specified for discharge offsite under the auspice of unrelated legislation.

Spatial Tracking

42. Spatial tracking is to be undertaken and records of day to day earthworks and treatment activities operations shall be maintained. This includes in-situ lime treatment and treatment at a designated lime treatment areas.

43. To enable adequate monitoring of lime mixing operations the following must be adopted:

	44. A photographic record of the lime mixing procedure is to be made and retained for reference. 45. Where verification testing is required, lime treated spoil from a specific location shall not be 'accepted' until verification test results are known, reported and accepted.
Monitoring	**Limed Spoil** 1. Lime neutralisation of treated ASS spoil is to be verified by either the SPOCAS or CRS suite. Verification testing should be undertaken at a rate of one sample per 100 m3. 2. Lime verification sampling and analysis is to be undertaken on all treated spoil within 72 hours of lime treatment. 3. Each sample taken for verification testing is to be a composite (of at least 1 kg) blended from a minimum of 6 discrete grab samples collected from within the treatment cell. 4. Verification sampling must be undertaken by a suitably trained person. **Sample Handling** 5. Soil verification samples are to be collected in specified sample containers supplied by a NATA accredited laboratory, and kept refrigerated during sampling and frozen up until dispatched to the laboratory. 6. Samples must be submitted to the NATA accredited laboratory, 7. accompanied by the appropriate 'chain of custody' documentation.
Corrective actions	**Lime Treatment** 1. Should results of verification testing of ASS spoil treated at a lime treatment area indicate residual acidity outside the allowable limits the affected material shall remain within the nominated treatment area, and be re-treated with sufficient lime to achieve the 'Performance 2. Limits' and verification process repeated until these limits are met. **Surface Waters** 3. If the pH of any water to be discharged off-site is outside of the specified performance limits, dose locally with hydrated lime slurry at a concentration sufficient to adequately increase the pH level (refer to the SPP 2/02 Table 5) and monitor pH during dosing to limit risk of over dosing. 4. Once earthworks are underway, should water quality in any monitoring wells fall outside adopted 'Performance Limits', resample affected wells and if the parameters do not return to within the required 'Performance Limits' at the next scheduled event, contact the Environmental Officer, implement more frequent sampling and analysis, and meet with the Principal Contractor to review ASS management strategies.

3 DOCUMENTATION

The following documents are required to measure environmental performance of the project in relation to ASS management:

1. Environmental Management Plan (EMP) – Acid Sulfate Soils
2. Site Induction Form(s)
3. Inspection and Monitoring Records – Form(s)

4. Environmental Compliance Report(s)
5. A Site Activities Register
6. Rectification Request and Instruction – Form(s)
7. General Progress Report(s)
8. Material Tracking Sheet
9. Soil Treatment Monitoring Form
10. Concerns Register

Item 1 is included in Appendix B; the remaining items are defined in Section 4.

4 REPORTING FRAMEWORK

4.1 Site Induction / Training

All employees of the Principal Contractor and sub-contractors working at site must undergo a site induction relating to the Environmental Procedures and Management framework outlined in the EMP. The induction will aim to develop and instil a high level of environmental awareness in all project personnel. It is the responsibility of the Principal Contractor to verify the satisfactory completion of an appropriate Site Induction form.

4.2 Records of Monitoring and Inspection

The outcome of all on-going site monitoring programs, ASS verification testing, weekly meetings, and site ‘walk over’ inspections will be recorded on an appropriate Inspection and Monitoring Record form. Any monitoring that requires more frequent attention shall be completed as required and recorded on a separate form.

4.3 Environmental Compliance Reports

Audit(s) of implementation of this EMP shall be carried out and an Environmental Compliance Report prepared.

4.4 Corrective Action Requests and Instructions

Any non-conformance will be documented on an appropriate form stating the nature of the non-conformance and the mechanisms implemented to rectify the problem. Any CARs (and follow up actions) are to be reported in the Monthly Monitoring Report.

4.5 Material Tracking Sheet

All ASS material excavated shall be recorded by the Site Supervisor daily on the Material Tracking Sheet. Material Tracking Sheets need to be returned to the site environmental officer or the environmental team for record keeping.

Refer to Section 6 for the for the Material Tracking Sheet.

4.6 Soil Treatment Monitoring Form

Soil Treatment Monitoring Forms are required for each lime treatment area in order to log the activities associated with lime treatment, including verification testing of treated ASS material where this is required. Soil Treatment Monitoring Forms need to be retained for record keeping.

Refer to Section 6 for the for the Soil Treatment Monitoring Form.

4.7 Concerns Register

The Concerns Register is to be filled out by the Site Supervisor for each concern raised by a member of the public.

Refer to Section 6 for the Concerns Register.

5 REFERENCES

5.1 Regulatory Documents

- *Queensland Environmental Protection Act 1994*.
- Queensland Environmental Protection (Water and Wetland Biodiversity) Policy 2019.
- State Planning Policy, July 2017
- State Planning Policy – State Interest Guideline Water Quality April 2016 (Policy 9)
- Department of Local Government and Planning and the Department of Natural Resources and Mines 2002, State Planning Policy (SPP 2/02) Guideline "Planning and Managing Development involving Acid Sulfate Soils“
- Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, Canberra ACT. CC BY 4.0. (*'National ASS Sampling Guidelines 2018'*)
- Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT. CC BY 4.0. (*'National ASS Laboratory Guidelines 2018'*)
- Shand, P, Appleyard, S, Simpson, SL, Degens, B, Mosley, LM 2018, National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments, Department of Agriculture and Water Resources, Canberra, ACT. CC BY 4.0. (*'National ASS Dewatering Guidelines 2018*')
- Dear, S-E, Ahern, CR, O'Brien, LE, Dobos, SK, McElnea, AE, Moore, NG and Watling, KM 2014, Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines V4.0, Department of Science, Information Technology, Innovation and the Arts, Queensland Government (‘*Soil Management Guidelines V4*')

6 APPENDIX

MATERIAL TRACKING SHEET

This form is to be filled out by the Site Supervisor on a daily basis in order to track the movement of ASS from its excavation location to the lime treatment area.

Material Tracking Sheet No.:

Excavation					Transport to Lime Treatment Area (Yes/No)		Lime Treatment
Area / Chainage	Date excavated	Depth of excavated soil (m)	Approximate Volume excavated (m^3)	Reused as backfill (Yes/No)	Date transported	Time	Treatment Location/ Area

Site Supervisor Name: **Site Supervisor Signature:**_____ **Date:**

Please include additional comments overleaf.

RETURN THIS FORM TO THE SITE ENVIRONMENTAL OFFICER OR THE ENVIRONMENTAL TEAM FOR RECORD KEEPING

SOIL TREATMENT MONITORING FORM

This form is to be filled out by the Site Supervisor for each treatment area in order to log the activities associated with lime treatment including verification testing of treated ASS material.

Soil Treatment Monitoring Form No.:

Origin of excavated spoil requiring lime treatment (i.e. Area/Chainage)	**Date transported to treatment area**	**Treatment Location/ Area**	**Date of soil treatment**	**Spoil has been treated according to the liming rates specified in the ASS EMP** *(Yes / No Liming Rate)*	**Discrete, composite samples have been collected for verification testing** *(Yes / No)*	**Date of verification Sampling**	**Samples have 'passed' verification testing** *(Yes / No)*	**Date of Round 2 Verification Sampling**	**Samples that 'failed' verification (if any) have now 'passed' verification** *(Yes / No / NA)*

Site Supervisor Name: **Site Supervisor Signature:**_____ **Date:**

Please include additional comments overleaf.

RETURN THIS FORM TO THE SITE ENVIRONMENTAL OFFICER OR THE ENVIRONMENTAL TEAM FOR RECORD KEEPING

CONCERNS REGISTER

This form is to be filled out by the Site Supervisor for each concern raised by a member of the public.

Concerns Register Form No:

Fitzroy to Gladstone Pipeline	**CONCERNS REGISTER**	Complaint No.

Complainant Details

Name: _____

Address: _____

Contact Phone No. _____

Date: _____

Time: _____

Received by: _____

Nature of Concern

Detail of Complaint: _____

_____

Location of Incident: _____

Date of Incident: _____

Persons Involved: _____

Concern Received By:

Telephone:

In Person:

In Writing:

Action Taken or Required:

Action Required (Y/N):

Time/date of Action: _____

Type of Action: _____

_____

Responsible Person: _____

Follow Up

Remedial activities performed _____ Date: _____

_____ Performed by: _____

Complainant Response To Action: _____

Further Action Required? (Y/N)

If Yes, Details of Further Action Required: _____

Prevention Of Re-Occurrence

Preventative Action Required? _____

If Yes, Details of Further Action Required: _____

Site Supervisor Name: **Site Supervisor Signature:** _____ **Date:**

RETURN THIS FORM TO THE SITE ENVIRONMENTAL OFFICER OR THE ENVIRONMENTAL TEAM FOR RECORD KEEPING