CITY OF SYDNEY

George Street North Pedestrianisation Acid Sulphate Soil Management Plan

Acid Sulphate Soil Management Plan
October 2022

The City of Sydney acknowledges the Gadigal of the Eora Nation as the Traditional Custodians of our local area.

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Introduction

This document forms the Acid Sulphate Soil Management Plan (ASSMP) for the proposed works for the George Street North Pedestrianisation Project.

The site location is shown on Figure 1.

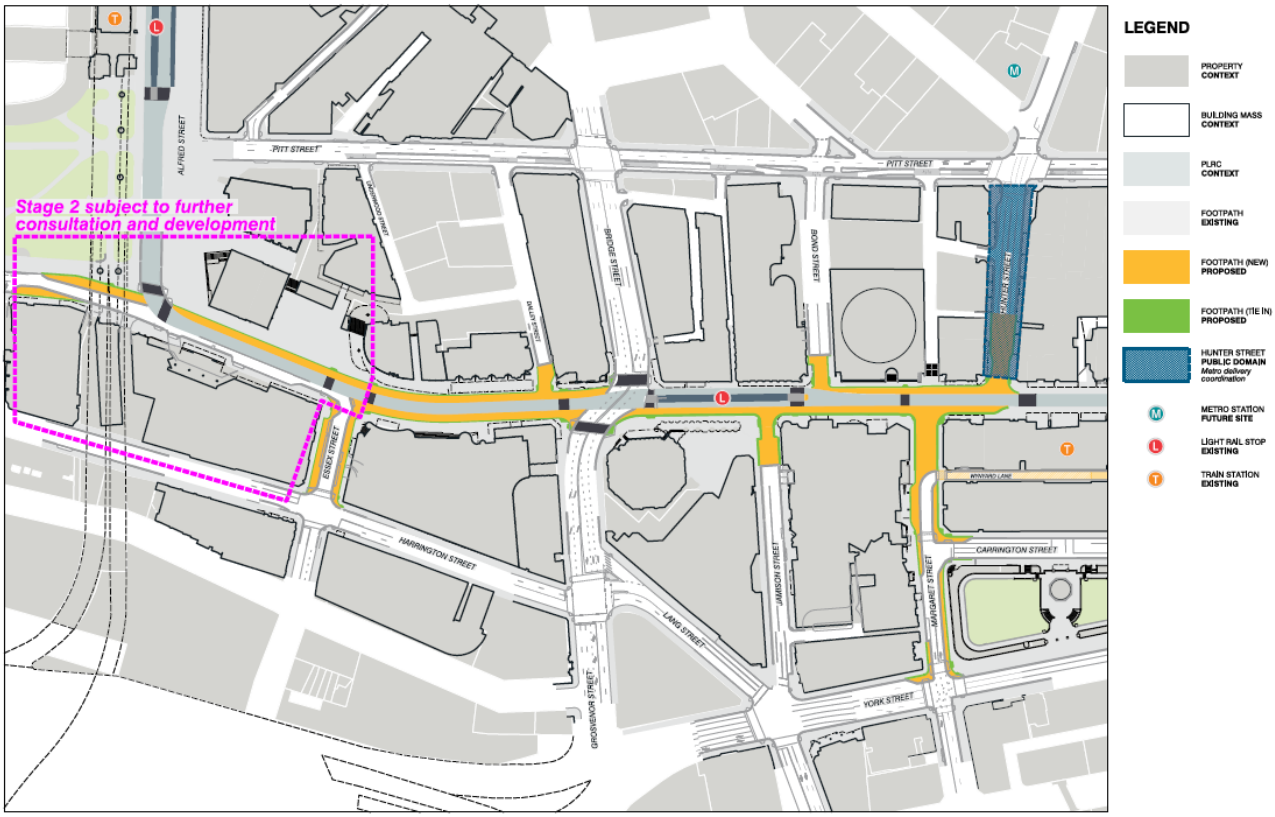

Figure 1. Project location and extent

This ASSMP presents the approach and methodology for management of Acid Sulphate Soils (ASS) if encountered during redevelopment of the site.

The objective of this ASSMP is to reduce potential environmental impacts associated with the disturbance of ASS within the area of the proposed redevelopment works.

1.1. Site Characteristics and Proposed Development

Site Features

The boundary of works encompasses George Street between Hunter Street and Alfred Street, adjacent footpaths and tie in works with side streets. The boundaries are shared with several multi-storey buildings, including some with basement car parks.

ASS environment

ASS is commonly found in low lying coastal floodplains, estuaries, rivers and creeks. They are naturally occurring sediments rich in iron sulphides that form sulphuric acid when exposed to oxygen. Acid sulphate soils include potential acid sulphate soils (PASS) and actual acid sulphate soils (AASS).
PASS are soils which contain iron sulphides or sulphidic material. In their undisturbed state, PASS may exhibit a pH of 4 or greater, and may be slightly alkaline. When exposed

to air, the sulphides in PASS oxidise and release significant quantities of acid. Following oxidation, the pH of these soils may fall considerably below pH 3.5.

AASS are highly acidic soils resulting from the oxidation of iron sulphides or sulphidic material present in the soil profile. AASS are formed through the disturbance of PASS, which may be a result of either natural disturbances (e.g. regional fall in groundwater levels which exposes PASS to oxygen) or human disturbances (e.g. excavating PASS). AASS are typically characterised by pale yellow mottles, coating of soils with jarosite and pH of 4 or less.

The site is located within Class 5 lands as described on City of Sydney Council's Acid Sulphate Soil Map Sydney Local Environmental Plan 2012. Figure 2 below records the Acid Sulphate Soils in the area.

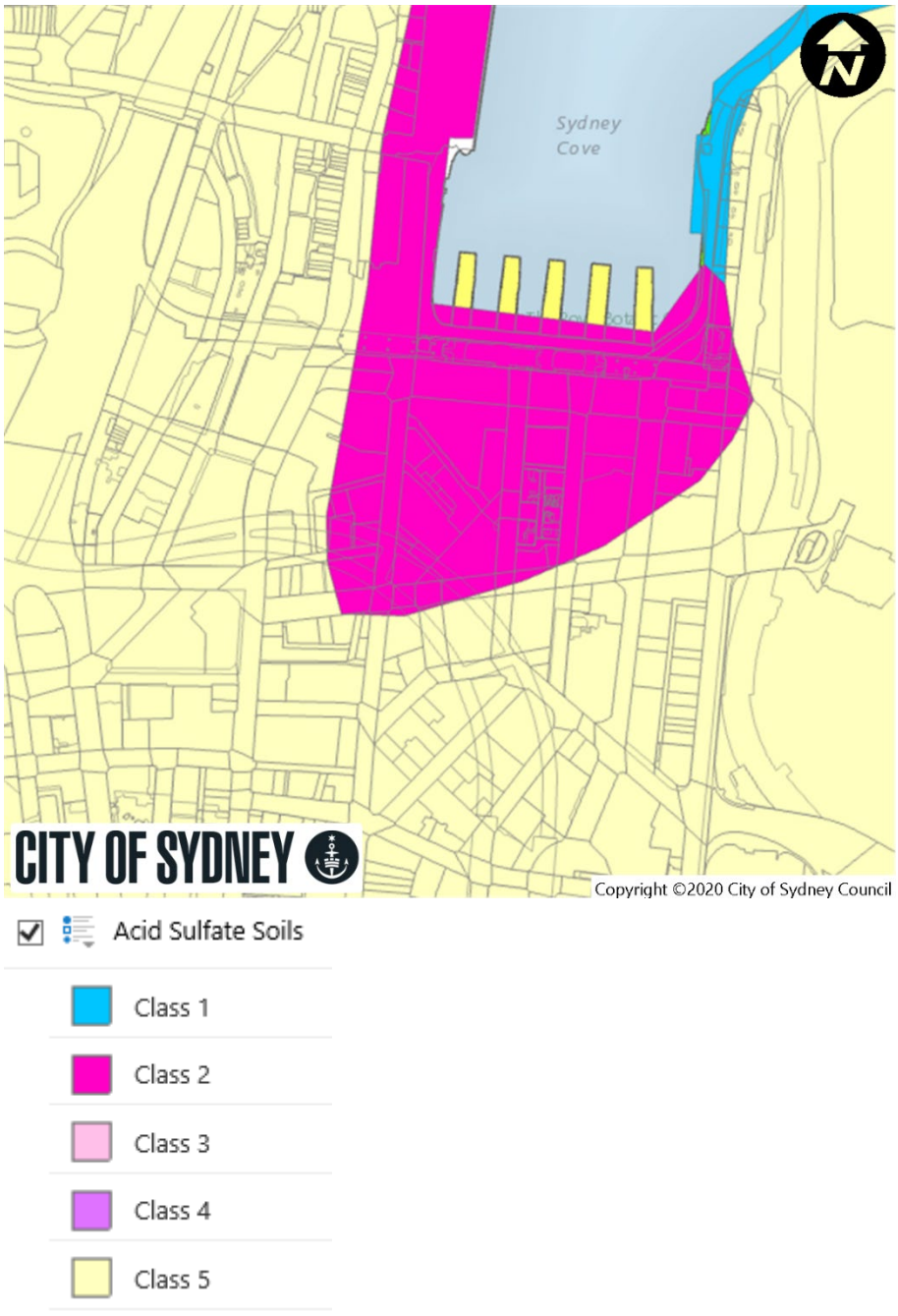

Figure 2. Acid Sulphate Soils Site Classifications

Class 5 soils are considered to be free from Acid Sulphates. This management plan forms strategies for the unlikely even that ASS are found.

Potential environmental impacts from ASS

ASS poses a risk to the environment due to their potential to oxidise when excavated or disturbed, which may lead to the generation of acidic leachate causing pollution of land, surface waters and groundwater.

Acidic leachate can also be detrimental to the quality of in ground structures and services, causing acidic erosion.

Acidic leachate can also mobilise toxic concentrations of metals.

2. ASS management

2.1. General

The proposed location of works occurs over highly disturbed land. The roads and surrounds have been excavated multiple times ensuing to a low likeliness of encountering ASS. Consequently, the management strategies provided below should be implemented on a case-by-case basis where soils excavated from the site are considered to potentially comprise ASS.

Where potential or actual ASS is encountered during excavation works, the following general management procedures are considered applicable:

– Appoint an appropriately qualified person to manage identified ASS issues;
– Temporarily stockpile the excavated suspected potential or actual ASS separate to other excavated materials;
– Undertaking liming and monitoring; and
– Assess the waste classification of the material following treatment and dispose of the limed stockpile to an appropriately licensed landfill.

These procedures are further discussed in the following sections.

For the purposes of this ASSMP, it has been assumed that less than 1000 tonnes of ASS will require neutralisation.

2.2. Training and responsibilities

The Principal Contractor will appoint an appropriately trained person who will be responsible for the management of ASS issues at the site during earthworks and construction activities.

The person must be familiar with:

– Details in this ASSMP;
– Council and other relevant statutory requirements;
– Recognition of ASS;
– ASS testing and treatment procedures; and
– On-site management of ASS, including implementation of the appropriate management procedures.

If required, a suitably qualified environmental consultant should be engaged to assist or train the contractor in managing ASS issues and activities.

2.3. Visual classification

The preliminary visual checking of potential ASS will be based on material type, colour and consistency. Any unconsolidated natural soils that are not derived from rock could potentially be ASS and may comprise grey, to dark grey and black, very soft to soft, occasionally firm clays, clayey sands and sands. These soils will be classified as suspected acid sulphate soils. It should be noted that sands, with only minor amounts of silt and clay, can contain pyrite and therefore acidify upon exposure.

2.4. Sampling and analysis

Screening of potential ASS may be undertaken if exposed soils are considered to be potential ASS. Screening includes pH field screening (pH_F) and pH peroxide screening (pH_{FOX}) and can be carried out on-site or by a laboratory. Soils that record a pH_{FOX} of below 4 will be managed as acid sulphate soils.

Based on the results of pH monitoring, visual assessment and field screening, selected soils samples (at a minimum rate of 10% of screened samples) will be sent for laboratory analysis using the chromium reducible suite method to confirm the peroxide screening test results to confirm the required liming rate for neutralisation.

The action criteria are based on the percentage of oxidisable sulphur (or equivalent) for different soil types.

2.5. Temporary stockpiling

Excavated ASS will be temporarily stockpiled prior to treatment as follows:

- ASS will be stockpiled at least 40 m from stormwater drains or creeks and, if possible, placed in a topographically high area to avoid inundation following heavy rain. The soil stockpiles will be bunded, and placed on strong impermeable plastic sheeting, and provision made for collection of surface runoff and appropriate sediment, erosion and dust controls.
- A supply of fine-grained agricultural lime (with a neutralisation factor of at least 97%) will be kept on site during construction work. The amount of lime to be kept on site will be sufficient to provide emergency liming of existing stockpiles on site.
- The stockpiles will also be observed for obvious signs of oxidation, such as jarosite staining, throughout their duration on-site.
- Bunding around stockpiled ASS will be limed at a rate of 5 kg/m^2.

Extended periods of stockpiling without treatment (more than two days) will require leachate collection and monitoring. Where monitoring of the leachate indicates low pH (< 6), the addition of a neutralising agent (e.g. lime) will be required prior to discharge to sewer/drain, subject to requirements from the relevant authorities.

2.6. Treatment pad and liming methodology

PASS and suspected AASS will require treatment on a specially prepared treatment (or liming) pad. The treatment pad should preferably be located on a paved area. If no paved area is available, a suitable surface should be created, which may comprise a compacted clay layer or covering by timber boards on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25 mm thickness.

Soils placed in the treatment stockpile should be covered by polythene or low-density polyethylene sheet of at least 0.25 mm 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.

The treatment area should be appropriately bunded with straw bales and/or a silt fence placed on the down gradient perimeter of the stockpile area to filter runoff.

Infiltration of water to the stockpile, such as run-on water from upslope, should be minimised 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.

The type and amount of lime to be applied will be such that a neutralising value (NV) of 100 can be achieved. The NV will be identified prior to mixing.

NV relates to the purity of the lime - an NV of 100 is required to ensure that the lime is effective in neutralising the potential acid. Fine powdered agricultural lime (CaCO3) 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 and, hence, amount of lime will have to be adjusted accordingly.

The treatment pad and stockpiled ASS will be limed at an appropriate rate based on the results of the field screening and laboratory analysis. It is recommended that a factor of safety of 1.5 to be applied to account for incomplete mixing of soil and lime. This factor of safety is in addition to any correction factors for purity or particle size.

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

– Soil will be spread in thin (<200 mm) layers on specially prepared impervious treatment pads within the boundary of the site works; and
– Lime will be added to the soil by hand or by light weight truck and mixed using light weight rotovators or similar tools.

2.7. Monitoring following treatment

To demonstrate that appropriate quantities of lime have been used, a lime register shall be maintained by the Principal Contractor. The register shall list all lime delivered to the site, verified by delivery dockets, and where the lime has been used. The lime register shall be a verifiable performance indicator.

The above verification is considered suitable for verification of treatment for soils being disposed off- site to a licensed landfill and because the soil volumes are likely to be relatively small.

Should the soil be considered for on-site re-use, then the following monitoring program (or other equivalent) is recommended for the neutralised material:

– A minimum of four validation tests shall be undertaken on the neutralised ASS or a minimum 1 per 200 m^3, whichever is greater. The validation testing shall consist of:
  – the measurement of titratable actual acidity (TAA),
  – the measurement of SCR,
  – the pH of the soil after peroxide oxidation (pH_{FOX}), and
  – the measurement of excess neutralising capacity to pH 6.5.

  The soil shall be deemed to be effectively neutralised and may be re-used on-site when:

  a. total acidity calculated as TAA, plus the acidity equivalent of the measured S_{CR}, is <1.5 times the measured acid neutralising capacity,

     and

  b. pH_{FOX} is greater than 6.5.

  – If the treated material does not meet the above criteria, additional lime will be added to the material and monitoring will continue for a further two weeks, at which time a review of the

monitoring frequency will take place. The liming rate will be assessed based on the validation results.

– If treatment exceeding 1000 tonnes is required, an environmental consultant should be consulted.

2.8. Waste classification and off-site disposal

The treated soil will be disposed to an appropriately licensed landfill following a waste classification by an appropriately qualified environmental consultant.

The waste classification and disposal will be undertaken in general accordance with the Waste Classification Guidelines – Part 1: Classifying Wastes.

Note: the neutralised soil cannot be classified as Virgin Excavated Natural Material (VENM).

Alternatively, the neutralised soil may be re-used on site, subject to contamination and engineering requirements. An appropriately qualified environmental consultant should be consulted to assess the suitability of the material for on-site re-use.

3. Contingency plan

3.1. Management of significant volume of excavated material

Should the volume of excavated material requiring management become significant (say over 1000 tonnes), an appropriately qualified environmental consultant should be consulted to review and recommend alternative management procedures, if required.

3.2. Management of dewatering activities

If dewatering exceeding 24 hours 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 ASS in the area.

In this case, the Principal Contractor will install and/or employ appropriate groundwater control systems to minimise the ingress of groundwater into the excavation such that the surrounding groundwater table will be maintained.

The surrounding groundwater level will be monitored regularly by the Principal Contractor, who will also attempt to minimise the length of dewatering, where possible.

If dewatering is required, it may be undertaken using a spear point and pump system or other method where appropriate. The water will be pumped into a temporary holding tank for monitoring prior to discharge to sewer/drain. Based on the monitoring results, if the water is assessed to be impacted by ASS, the water will be appropriately treated as described previously.

3.3. Treatment of water

Should groundwater or surface water impacted by ASS be encountered, an appropriately qualified environmental consultant will be engaged as soon as practicable to assess the impacted water and recommend treatment procedures.

A typical treatment procedure is outlined below which may be applicable, subject to assessment by the environmental consultant.

- A suitable water holding tank and a water pump will be used for the storage, treatment and monitoring of ASS impacted water.
- The water will be monitored at least daily for pH and electrical conductivity (EC). Where the pH or electrical conductivity exceeds the relevant water quality guidelines or site-specific disposal criteria, hydrated lime will be added and thoroughly mixed.
- The monitoring results will be reviewed at least daily and compared against predetermined water quality objectives prior to discharge, subject to approval. The application of hydrated lime will continue until the water quality objectives are met.

3.4. Other unexpected issues

Should other unexpected issues be encountered, an appropriately qualified environmental consultant will be engaged as soon as practicable to assist in addressing the issues.