DESKTOP ACID SULPHATE SOIL ASSESSMENT REPORT

PROPOSED REZONING OF LOT 4 DP 825704 & LOT 2 DP 601094 11 – 33 MUMFORD STREET, PORT MACQUARIE

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This report has been prepared by David Pensini – Building Certification and Environmental Services with all reasonable skill, care and diligence for East Coast Screw Piers.

The information contained in this report has been gathered from discussions with representatives of East Coast Screw Piers, a review of the plans provided on behalf of East Coast Screw Piers and experience.

No inspection or assessment has been undertaken on other aspects of the proposed development outside the scope of this report.

This report does not imply, nor should it be implied, that the proposed development will comply fully with relevant legislation.

The report shall not be construed as relieving any other party of their responsibilities or obligations.

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The report is confidential and the writer accepts no responsibility of whatsoever nature, to third parties who use this report, or part thereof is made known. Any such party relies on this report at their own risk.

For and on behalf of David Pensini – Building Certification and Environmental Services.

Prepared by: David Pensini

Signed: 

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Appendix 1 – Development Concept

PREFACE

The land which comprises the subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie.

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area.

The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/industrial use.

The purpose of this report is to assess the potential Acid Sulphate Soil impacts associated with any future development of the subject site as a consequence of the rezoning of the subject site.

1. INTRODUCTION

1.1 Background

The subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie and is situated within the Port Macquarie-Hastings local government area. With a population of approximately 45,000 Port Macquarie serves as the regional centre for the Port Macquarie-Hastings local government area.

This Acid Sulphate Soils Assessment Report has been prepared to accompany an application to Port Macquarie Hastings Council which seeks to have portion of the subject site rezoned in order to support the ongoing development of the general area.

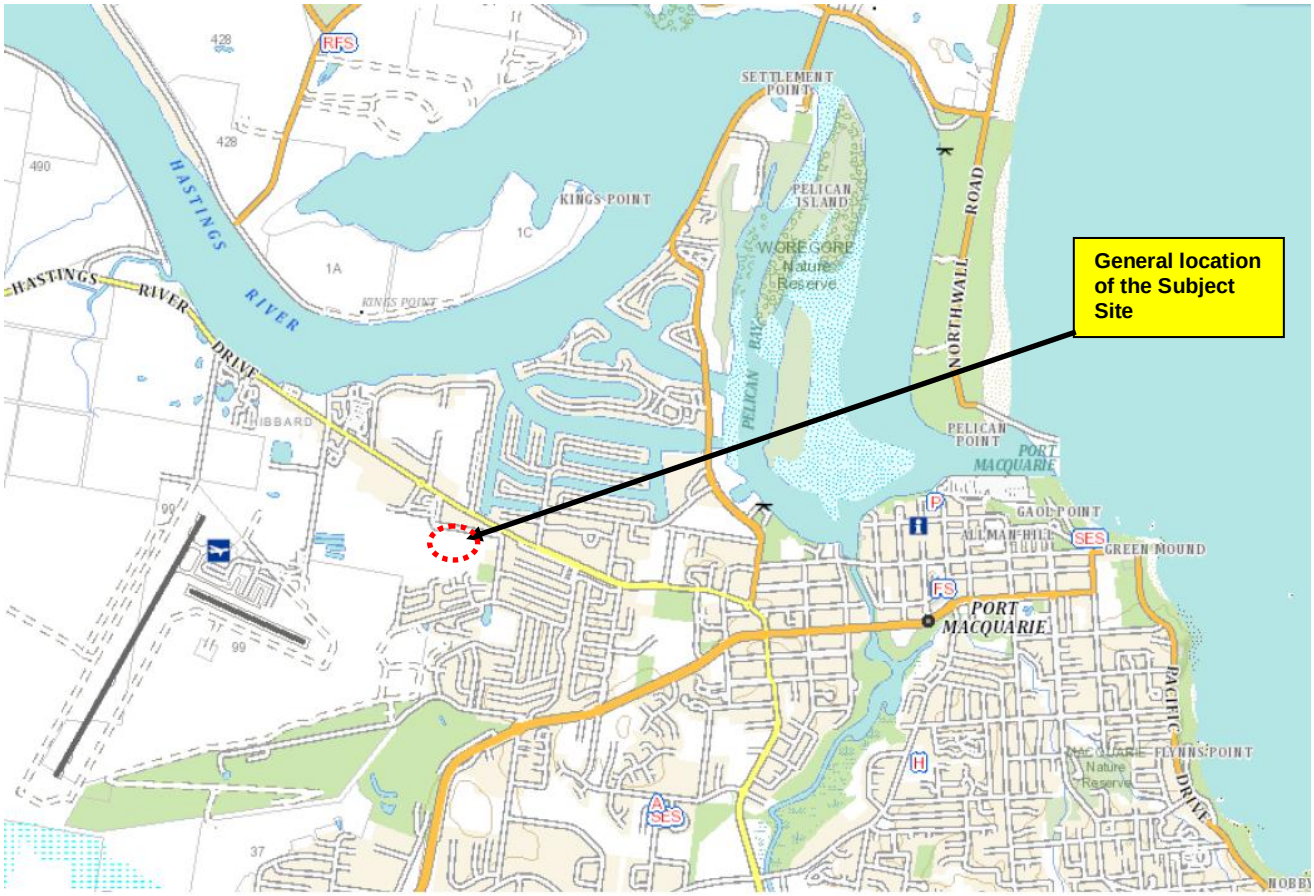
The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use.

1.2 Site Location

The subject site is located approximately 2.2km west of the Port Macquarie CBD, within a geographic area known as Hibbard which is a historical urban area on the western fringes of the developed areas of Port Macquarie. Being located in a historical area land use in the locality is a mixture of residential, larger vegetated bushland lots and a mix of commercial business, light industrial and recreational uses.

It is noted that the subject site comprises two (2) separate Torrens Title allotments which share a common east/west property boundary; refer **Figure 1** below.

Figure 1 - Site Location

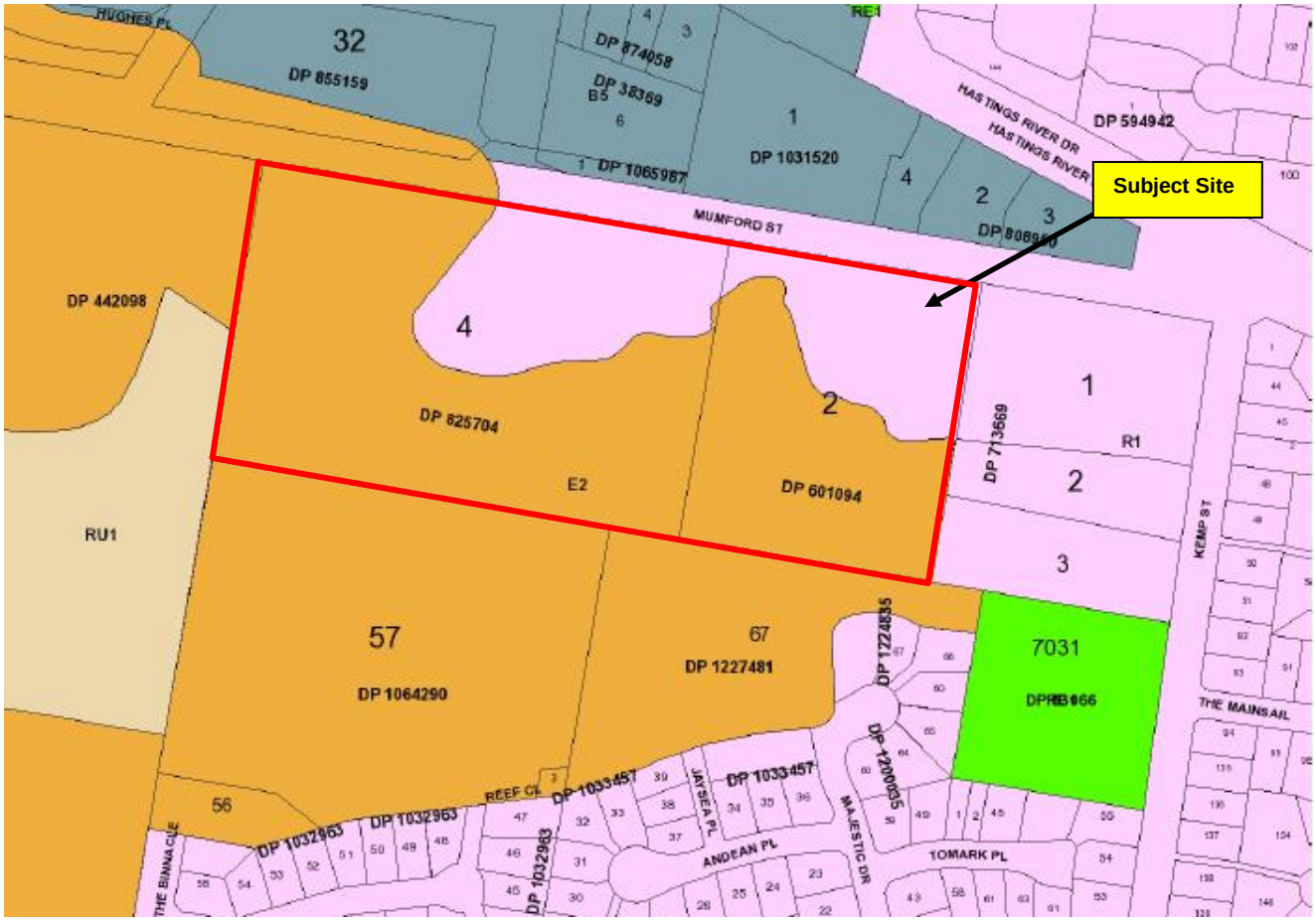


The subject site is positioned on the western fringe of the urbanized area of Port Macquarie in an area which is known locally as Hibbard. Being a historical area of Port Macquarie land use within the immediate area has not changed considerably although it is noted that some urban expansion has occurred on land to the south of the subject site whereby residential subdivision has occurred on what was historically rural land.

The character of the locality is that of a business fringe area with a mixture of residential, commercial, educational and open space areas of land. The subject site forms part of a historical subdivision with the majority of lots having been developed as part of the urban expansion of Port Macquarie. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, residential and recreational development is present to the north and east of the subject site.

The subject site is rectangular in shape and in accordance with Port Macquarie Hastings Local Environmental Plan 2011 has a mixed land use zoning comprising Residential (R1) along the northern central and eastern portions of the subject with an Environmental Conservation (E2) land use zoning applying to the remainder of the subject site. Business (B5) and Residential (R1) land use zonings apply to adjoining and adjacent land to the north and east respectively whilst an Environmental Conservation (E2) land use zoning is present to the south and northwest of the subject site. A Rural (RU1) land use zoning is present to the southwest. The relationship of the subject site with surrounding land use is depicted in **Figure 2** below;

Figure 2 – Landuse Zoning



1.3 Development Proposal

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area. The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use. In this regard a development concept for the subject site is provided for in **Appendix 1**.

It is noted that the development concept provided in **Appendix 1** is considered to be indicative only.

Access to subject site will continue to be via the existing Mumford Street road reserve which adjoins the subject site to the north.

In this regard the rezoning of the land is required to demonstrate that the future development of the land can be undertaken without negative impacts associated with the disturbance of acid sulphate soils beyond that which would be associated with existing conditions.

This report will focus upon identifying the acid sulphate soil management requirements which will be applicable to any future development, (using the development concept in

Appendix 1 for context), so as to allow for an assessment of the subject sites suitability for rezoning.

2. ACID SULFATE SOILS

2.1 Background

Estuarine sediments of coastal NSW from the Holocene geological age may contain iron pyrite, the main constituent of ASS. These sediments are generally found below 5 metres (m) Australian Height Datum (AHD), typically in coastal and floodplain areas.

Pyritic sediments can be divided into classes based on their oxidised state. If the pyritic material is being oxidised it will generally have a pH of less than 4.0 and is called actual acid sulfate soil (AASS). If the pyrite material is below the water table and has not been oxidised, it is termed potential acid sulfate soil (PASS) and generally has a pH of greater than 4.0.

The pH has the potential to become much lower when the PASS is exposed to oxygen. Sediment which, after the addition of hydrogen peroxide, has a pH of less than 2.5 strongly indicates the presence of ASS (ASSMAC, 1998).

Disturbance or poor management and use of ASS can generate sulfuric acid and salts. ASS can lower soil and water pH and increase salinity, reducing or precluding vegetation growth and producing soil conditions which may be detrimental to concrete and steel components of structures.

The release of sulfuric acid from ASS often mobilises metals such as aluminium, iron and magnesium from otherwise stable soil matrices. Elevated concentrations of such elements in site runoff may result in changes which are potentially detrimental to receiving water bodies and associated aquatic organisms.

2.2 Indicators for AASS

Indicators of AASS soil conditions are typically;

- Unusually clear or milky blue-green drainage water within or flowing from the area (aluminium mobilised by the acid leachate acts as a flocculating agent).
- Extensive iron stains on any drain or pond surfaces, or iron-stained water and ochre deposits.
- Water of pH <4 in adjacent streams, drains, groundwater or ponding on the surface.
- Soil pH <4.
- Soil horizons containing Jarosite (a pale yellow, “straw coloured” mineral, which can. precipitate as pore fillings and coatings on fissures) or iron oxide mottling in auger holes or recently dug surfaces. With a fluctuating water table, jarosite may be found along cracks and root channels in the soil. Jarosite is not always found in actual acid sulfate soils.
- Jarosite present in surface encrustations or in any material dredged or excavated and left exposed.
- Dominance of mangroves, reeds, rushes and other salt/swamp-tolerant vegetation.

- Sulfurous (H2S) smell after rain following a dry spell, or when the soils are oxidised or disturbed.

2.3 Indicators for PASS

Indicators of PASS soil conditions are typically;

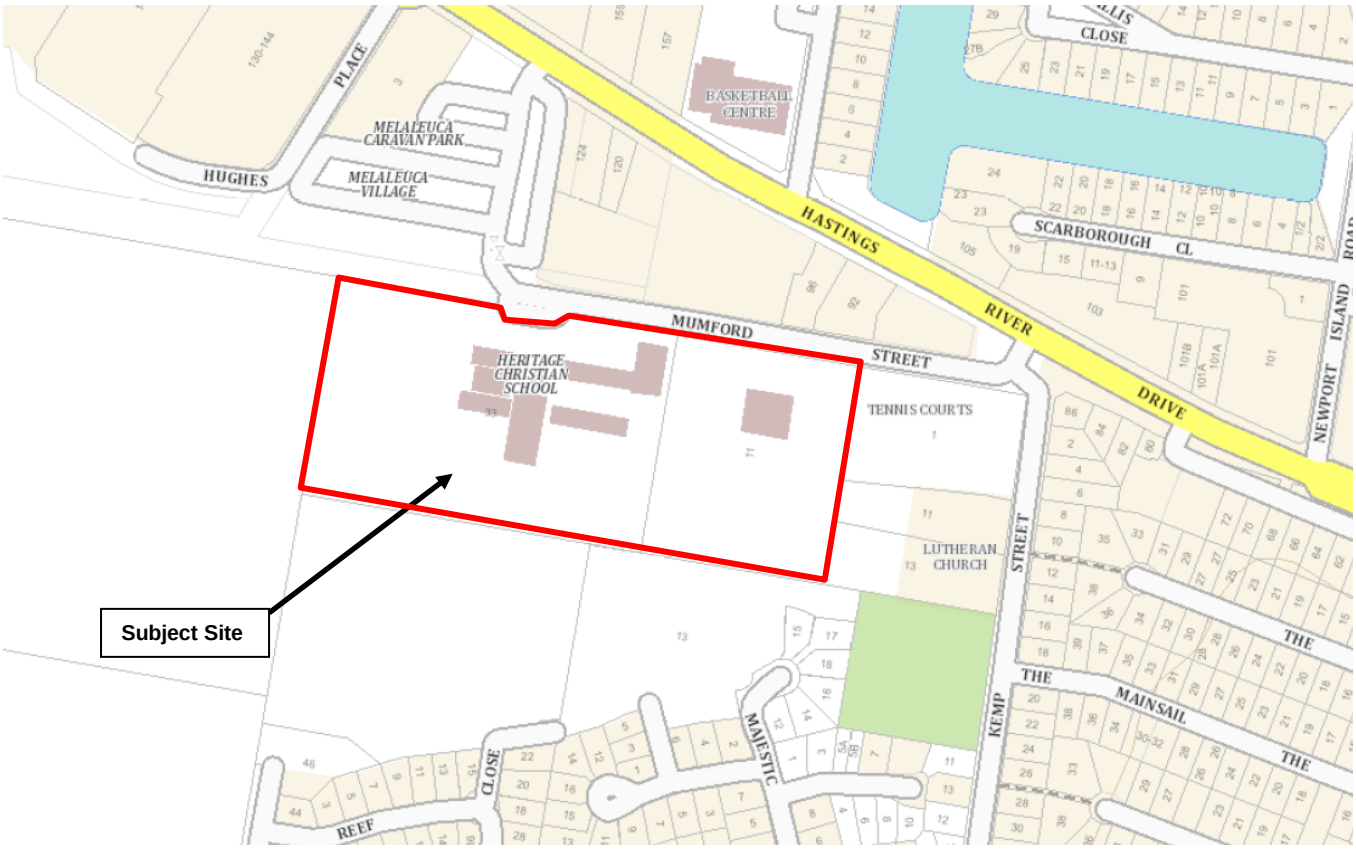
- Typically waterlogged coastal clayey sediments (soft, buttery texture, blue grey dark grey to black or dark green-grey) or silty sands or sands (mid to dark grey).
- pH of 6.5 – 7.5.
- Positive peroxide test.
- Offensive odour, predominantly due to hydrogen sulfide, H2S.

3. SUBJECT SITE

3.1 Site Description

The subject site comprises two Torrens Title lots each of which is rectangular in shape with a combined area of 6.23 hectares, refer to **Figure 3**.

Figure 3 – Subject Site



It is noted that the subject site has been developed for educational and religious purposes with Lot 4 DP 825704 supporting the operation of the Port Macquarie Heritage Christian School whilst Lot 2 DP 601094 supports the presence of a church building.

Heritage Christian School on 33 Mumford Street, Port Macquarie

Church building on 11 Mumford Street, Port Macquarie

The subject site has been cleared of the majority of vegetation with grasslands and scattered and clusters of trees predominant over much of the subject site. It is however noted that an area of Forested Wetland is present in the north-western portion of Lot 4 DP 825704 whilst narrow remnants of Forested Wetland vegetation are also present adjacent to the southern boundaries of the subject site and the western boundary of Lot 2 DP 601094. Extensive areas of Forested Wetland are present on adjoining and adjacent land to the west and southwest whilst a narrow band of Forested Wetland vegetation separates Lot 2 DP 601094 from managed grasslands within developed residential properties in the southern eastern aspect. Vegetation associated with managed gardens and landscaping are present on adjoining and adjacent land to the north and east of the subject site.

Access to the subject site is available via Mumford Street which adjoins the subject site to the north.

3.2 Climate

The local climate is considered to be temperate with summer dominant rainfall.

The average daily maximum temperature is around 21.5^{0}C, while the average daily minimum temperature is around 10^{0}C - 11^{0}C.

Long-term average annual rainfall is around between 1,500 mm.

Annual pan evaporation is estimated to be approximately 1,400 mm.

3.3 Topography

The subject site is located within the flood plain of the Hastings River and accordingly the topography of the subject site and adjoining and adjacent land is relatively flat. However, reflecting the presence of extensive areas of wetland on adjoining and adjacent land to the south and west some very gentle north to south downslopes is present in the locality.

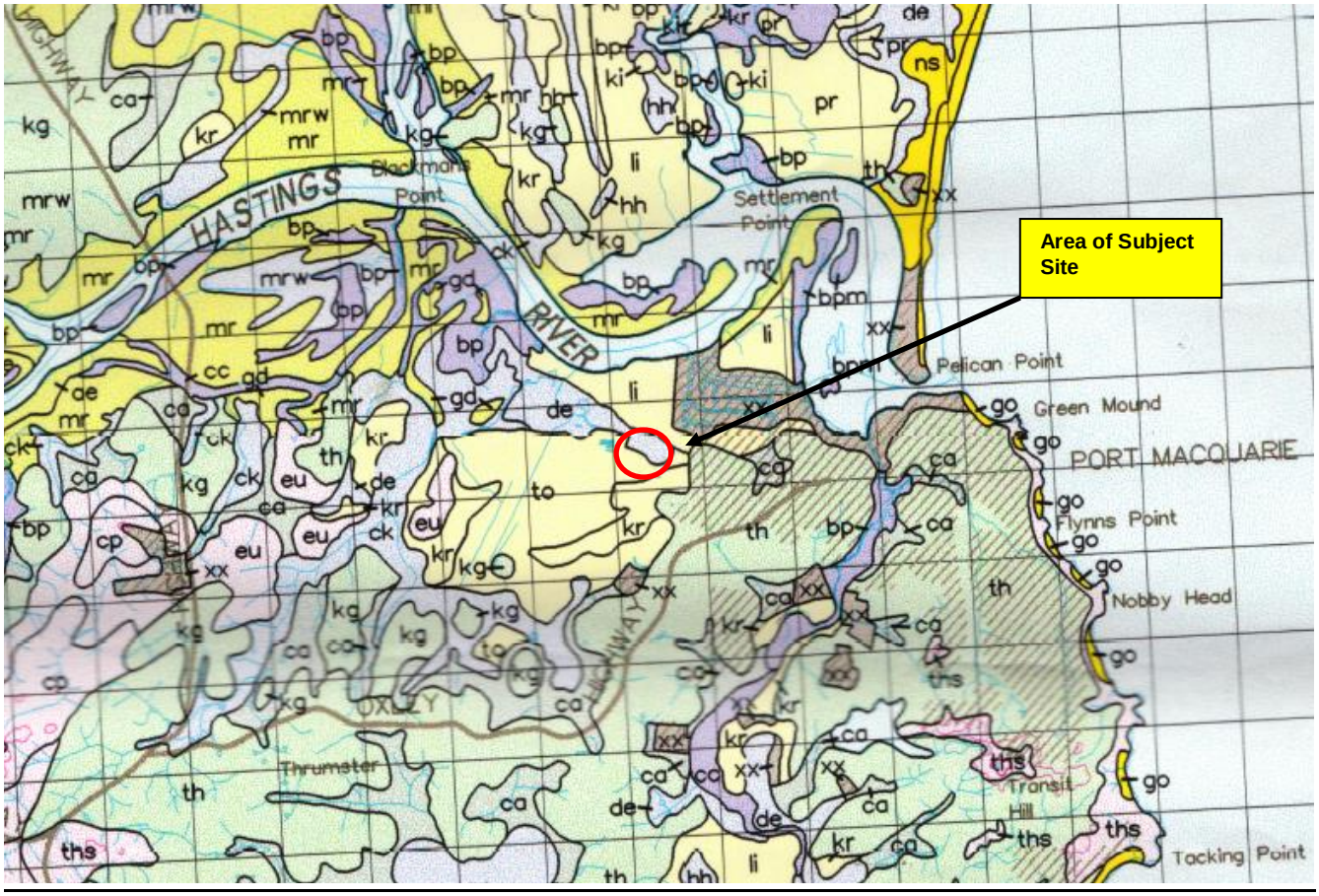
It is noted that the topography of the subject site has been altered over time with filling providing for more elevated land which supports the existing building infrastructure present on the subject site.

Slope conditions on adjoining and adjacent land are similar to that of the subject site.

3.4 Geology and Soils

Reference to the 1:100,000 Kempsey – Korogoro Point Soil Landscape Series Sheet 9435 (1999) indicates that two soil landscape groups are likely to be present in the – refer to **Figure 4**.

Figure 4 - Extract from the 1:100,000 Kempsey – Korogoro Point Soil Landscape Series Sheet 9435 (NSW DLWC, 1999)



Soils in the area of proposed development are primarily characterised as Delicate (de) and are comprised of flat coastal swamps of extremely low relief and elevation (<1m) on back barrier sand plains overlain by thin alluvial deposits. Limitations associated with this soil landscape group include the following:

o Flooding hazard
o Waterlogging
o Low wet bearing strength
o Acid Sulphate Soils
o Acidity
o Salinity

The subject site may also contains the Torrens (to) landscape; consisting of low relief, low elevation level sandplain on Pleistocene back barrier muddy sands. Limitations associated with this soil landscape group include the following:

o Localized flooding
o Seasonal waterlogging
o Low fertility
o Very strong acidity
o High aluminium toxicity potential
o Low available water holding capacity

3.5 Ground Water

No specific ground water information is available for the subject site and immediately surrounding areas however given the location of the subject site within the flood plain of the Hastings River and the presence of areas of Forested Wetland vegetation it is likely that ground water conditions would be expected within 1m of natural ground level.

4. POTENTIAL DISTURBANCE OF ACID SULFATE SOILS

4.1 Presence of Acid Sulphate Soils

In determining the need for and extent of ASS management on the subject site the presence and spatial characteristics of ASS on the subject site needs to be understood in the context of the proposed future development works.

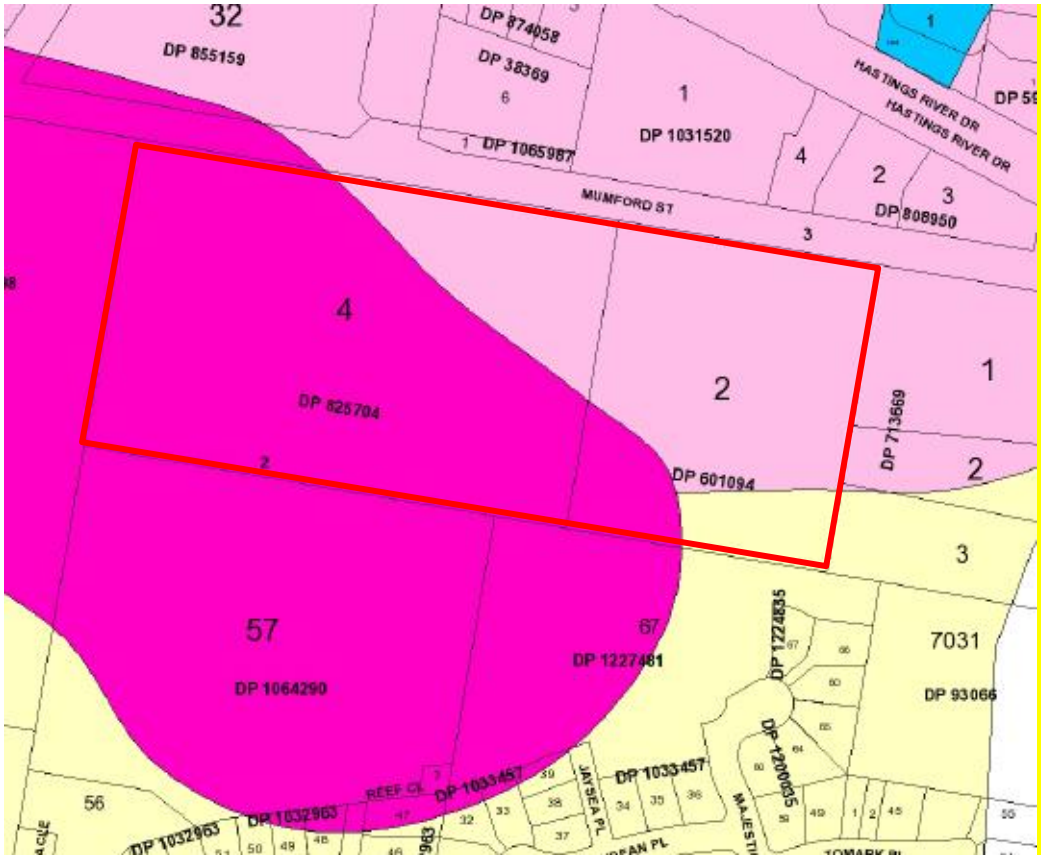
An understanding of the potential presence of ASS on the subject site is provided as follows;

4.1.1 Desk Top Assessment

According to the NSW Department of Natural Resources Acid Sulfate Soil Risk Maps, the subject site is categorised as being at risk of containing acid sulfate soils, refer to **Figure 5**.

Figure 5 indicates that Class 2, Class 3 and Class 5 land are shown to be present on and adjacent to the subject site.

Figure 5 - NSW DNR Acid Sulfate Soils Risk Map extract.



The significance of the Risk Map classifications as they relate to the proposed development of the subject site is indicated as follows;

- Works below natural ground level and works by which the watertable is likely to be lowered are likely to present an environmental risk if undertaken in Class 2 land;

- Works beyond 1 metre below natural ground level and works by which the watertable is likely to be lowered beyond 1 metres below natural ground level are likely to present an environmental risk if undertaken in Class 3 land; and

- Works which are likely to lower the watertable below 1 m AHD on adjacent Class 2 or 4 lands are likely to present an environmental risk if undertaken in Class 5 land.

4.2 Acid Sulphate Soils on the Subject Site

The ASSMAC (1998) Guidelines provides that a risk of acid generation and, therefore, a management plan is required, if soils exhibit one of the following criteria:

- Oxidisable sulphur (SPOS) is >0.03% or TPA or TSA is >18 mol H+/tonne if coarse texture soils (sands); or

- Oxidisable sulphur (SPOS) is >0.1% or TPA or TSA is >62 mol H+/tonne if fine texture soils (silty clays and clays).

It is noted that no infield assessment of acid sulphate conditions has been undertaken at this stage of the planning process. However based upon the information provided in Section 4.1.1 above there is a high probability of Acid Sulphate Soil conditions on the subject site and accordingly an Acid Sulfate Soils Management Plan (ASSMP) will be required to address the environmental risks associated with the disturbance of soils associated with the any future development of the subject site.

4.3 Acid Sulphate Soil Management Issues

Given the likely presence of PASS within the soil profile within 1m of the natural ground level, any bulk earthworks or services related excavations on the subject site has the potential to create AASS conditions and as such the management of the impacts of soil excavation on the subject site is required.

Additionally any site groundwater dewatering will result in the more frequent exposure of PASS and thus an increased risk of acid drainage. This increased risk of acid drainage also requires a management response.

4.3.1 Preliminary Risk Assessment

The following preliminary risk assessment has been undertaken in relation to the potential to cause adverse environmental impacts on soil and water quality of activities which are likely to be relevant to the any future development of the subject site.

Inherent risk will be assessed by combining the likelihood and consequence of the identified potential risk. In determining the assessment of the likelihood and consequence, the following rating processes was utilised.

Table 1 – Level of Likely Environmental Risk from PASS

Factors in deciding Level of Risk	No Risk	Low Risk	Increasing Risk (Moderate Risk)	High Risk
Volume of Material to be disturbed	<1 tonne	1 – 10 tonnes	11 – 50 tonnes	>50 tonnes
Distance between depth of PASS and depth of disturbance	>2m	>1m	0.5m – 1m	0m
Change of surface drainage	Nil, or reduction in depth of existing drainage	Shallow surface drainage well above ASS	Mid level drains within 0.5m of ASS	Deep drains >1m in depth
Duration of disturbance	Nil	<1 day	1 – 7 days	>7 days
Level of uncertainty with mitigation strategy	No mitigation as no disturbance	High certainty with method	Certainty with method but in clay soils	Method untested
Likely severity of PASS based upon peroxide reaction and final pH	Nil (pH>4.5)	Mild after 5 minutes (pH<4.5)	Medium (pH<3.0)	Vigorous (pH<3.0)
Connection to natural water bodies or wetlands	Nil	Areas totally bunded to prevent discharge	Water quality management infrastructure provide for some control	Connected directly to creek, drain or wetland

Based upon the above the following preliminary risk assessment for potential future development activities has been undertaken.

Table 2 – Construction Activities and Impact Risk Assessment

Activity	Potential Impact	Risk Assessment		
		Low	Medium	High
Shallow Ground Disturbance	Exposing ASS at the disturbed areas to surface run-off, thus causing release of acid into the environment in the short term			X
	Changing surface run-off behaviour and subsequent			X

	acid releases into the environment in the short and long term			
Excavation and stock piling of ASS in 'Dry Areas'	Exposing ASS to surface run-off, thus causing release of acid into the environment in the short term and long term		X	
	Exposing potential ASS to air and surface run-off, thus causing increased oxidation and increased release of acidity into the environment in the short term and long term			X
	Changing surface run-off behaviour and subsequent acid releases into the environment in the short and long term			X
	Leaching acid into the environment at the disposal/placement point			X
Construction of underground services, drains etc	Exposing ASS at/near the new alignment to surface run-off and services infrastructure, thus causing the release of acid into the environment in the short and long term			X
	Exposing potential ASS at/near the new alignment to air, surface runoff and water flows, thus causing increased oxidation and increased release of acid into the environment in the short and long term			X
	Changing surface run-off behaviour and subsequent acid releases into the environment in the short and long term			X
	Leaching acid into the environment at the disposal/placement point			X
Dewatering	Exposing potential ASS at/near the new alignment to air, surface runoff and water flows, thus causing increased oxidation and			X

	increased release of acid into the environment in the short and long term			
	Discharge of acid laden ground waters into the environment in the short term			X

The above risk assessment indicates that active management of future construction activities will be required in order to respond to the risks associated with the disturbance of ASS on the subject site.

Notwithstanding the above based upon the nature and scale of the proposed development it is possible for the future development of the subject site to be undertaken so as to not result in acid sulphate soil impacts which could not be mitigated through the adoption of best practice ASS management principles. In this regard the filling of the subject site to provide for flood free building platforms can significantly reduce the potential impacts associated with ASS.

5. ACID SULFATE SOIL MANAGEMENT

5.1 Objectives of Future ASSMP

The objective of an ASSMP is to consider both the existing and potential future environmental impacts relating to PASS material in and around the subject site and to detail mitigation measures to minimise the potential impacts on the subject site and on adjoining and adjacent land and waterways.

The control measures in an ASSMP aim to mitigate the environmental impacts of development to acceptable levels and should be based on the following objectives:

- Control and, where possible, minimisation of disturbance of ASS;
- Confirmation of the success of impact control measures by the means of validation monitoring;
- Compliance with statutory requirements; and
- Preservation of water quality on an ongoing basis.

It will be necessary that the management of Acid Sulphate Soils which are likely to be present on the subject site be addressed via an ASSMP which is specifically developed around the nature and scope of any future development proposal for the subject site.

5.2 Construction Management Controls

5.2.1 Management Strategy

Any future ASS management strategy which is developed adopted for any future development should be based upon the following key components;

(i) Avoidance – the disturbance of soils with an unknown ASS classification are to be avoided.

(ii) Neutralization of Acid Generating Capacity – The acid generating capacity of all soils which are excavated onsite is to be addressed prior to reuse on site or offsite disposal.

(iii) Water Management – the management of surface waters during the implementation of this management plan is important in ensuring that off site impacts associated with the disturbance and management of ASS are minimized.

(iv) Management of Dewatering – the impacts associated with site groundwater dewatering and the reduction in site groundwater recharge resulting from increased impervious surfaces will need to be considered as part of the development of any future ASSMP. This lowering of groundwater tables could result in the more frequent exposure of PASS and thus an increased risk of acid drainage. The impacts of this require a management response.

6. CONCLUSION

A conservative assessment of the impacts of existing and future uses of the land which is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie indicates that the proposed rezoning of portion of the subject site to support its use for educational and commercial/business purposes can be undertaken so as to not adversely impact upon acid sulphate soils.

It is possible for the future development of the subject site to be undertaken so as to not result in acid sulphate soil impacts which could not be mitigated through the adoption of best practice ASS management principles.

In this regard the Acid Sulphate Soil impacts associated with any future development of the subject site should be the subject of development specific assessment with the adoption of management strategies which reflect the nature and scale of future development.

Based upon the information contained within this report there are no Acid Sulphate Soil related constraints to the proposed rezoning of portion of the subject site.

Disclaimer

The findings referred to in this report are those which, in the opinion of the author, are required to meet the requirements for Acid Sulphate Soil management. It should be noted that the Local Authority having jurisdiction for the area in which the property is located may, within their statutory powers, require different, additional or alternative works/requirements to be carried out other than those referred to in this report.

This report has been prepared partially on information provided by the client. Information provided by the client in respect of details of construction.

The author denies any legal liability for action taken as a consequence of the following:

- The Local Authority requiring alternative or additional requirements to those proposed or recommended in this report.
- Incorrect information, or mis-information, provided by the client with regard the proposed development which is in good faith included in the strategies proposed in this report and later found to be false.

APPENDIX 1 – DEVELOPMENT CONCEPT