

Preliminary Acid Sulfate Soil Assessment - 9 Gaudrons Road, Sapphire Beach



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1 Introduction

Earth Water Consulting Pty Limited (EWC) was engaged by Chris Bowen (the “Client”) to undertake a preliminary Acid Sulfate Soil Assessment (PASS) for 9 Gaudrons Road, Sapphire Beach (the “Site”) (Figure 1).

2 Proposed Development

We understand that it is proposed to rezone and subdivide the Site into 8 lots to be used for rural-residential living.

3 Scope of Work

This report presents the results of PASS investigations, undertaken in reference to the Acid Sulfate Soil Manual (ASSMAC, 1998), and CHCC LEP Part 7 Acid Sulfate Soils. The scope of work included:

- A desktop review of surface, geology, hydrogeology, geomorphic and ASS risk conditions;
- A site inspection and walkover to assess for indicative ASS biomes and features;
- Drilling of three hand auger boreholes to the depth of 1.2m;
- Collection of 2 soil samples at various soil profiles present and screening for ASS; and
- Preparation of this report which describes the results of our investigation.

4 Site Description

4.1 Site Identification

The Site details are provided in Table 1 and shown in Figure 1. The Site is zoned RU2, rural landscape.

Table 1 - Site Identification

Address	Lot ID	Approx Area (ha)
9 Gaudrons Road	Lot 11 DP 1141269	53

4.2 Location and Features

The Site is located at the beginning of Gaudrons Road, and comprises an elevated ridgeline at about 32mAHD that slopes down to the northwest and southeast to two unnamed intermittent gullies along the western and southern boundaries. An existing small farm dam is present in the southeastern corner that will be filled in during subdivision works. The groundsurface in the southeastern corner falls to about 10mAHD.

The Site formerly extended further east, but the eastern 100m was resumed by RMS for Pacific Highway upgrade works that were undertaken in the past decade.

As a result of the upgrade works the intermittent gully along the southern boundary has been impacted in natural shape and flows.

The Site is mainly cleared and used for banana and fig tree production. Relic forest is present along the western boundary (Photographs 1-3).



Photograph 1. Looking east across Proposed Lot 1



Photograph 2. Looking south across Proposed Lot 8 and 7 (in background).

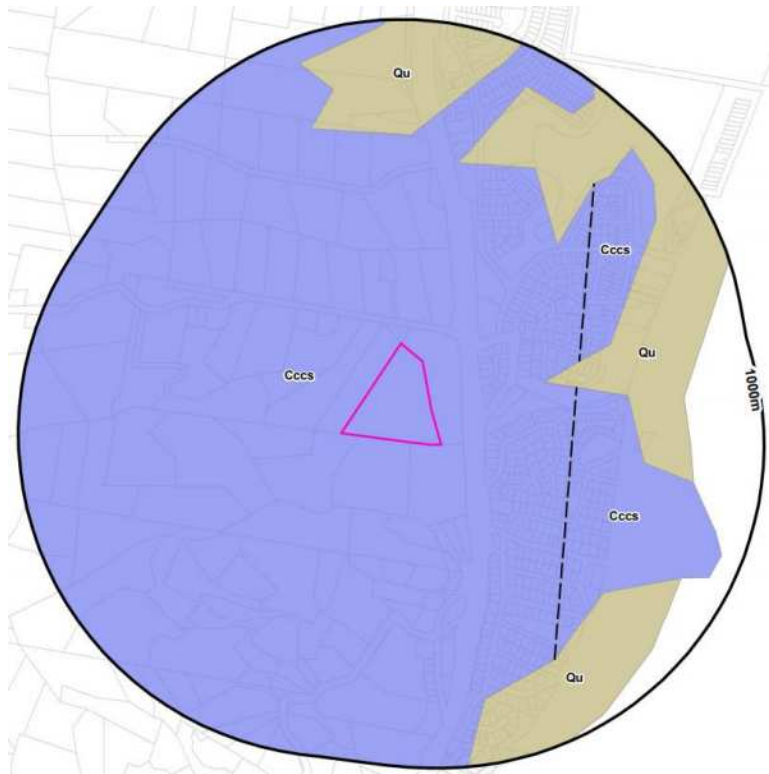


Photograph 3. Looking northwest across existing forest along western boundary.

5 Geology and Hydrogeology

5.1 Geology

The Site is underlain by the Coramba beds (Cccs). These are comprised of lithofeldspathic wacke, minor siltstone, mudstone, metabasalt, jasper and rare calcareous siltstone (**Photograph 4**).



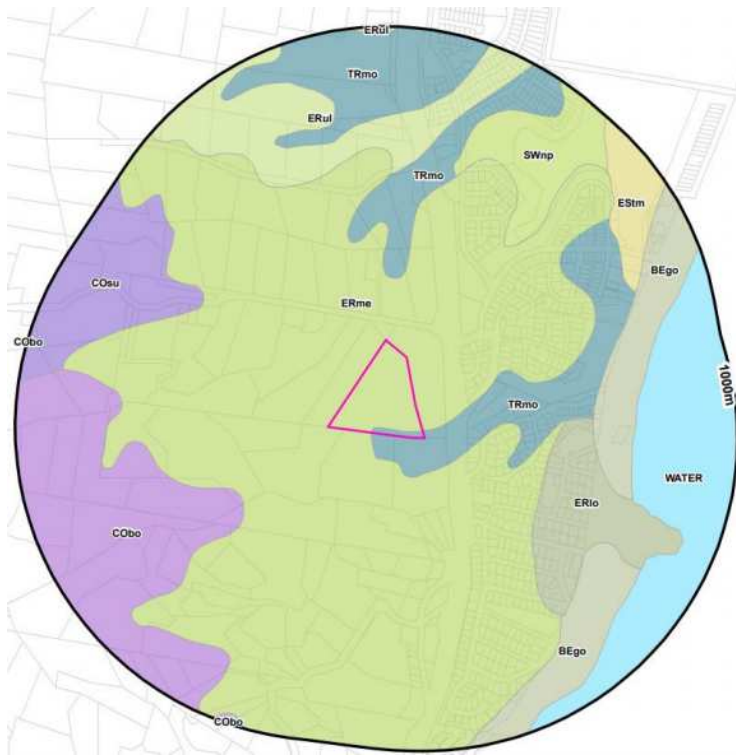
Photograph 4. Mapped geological formation and subject property location (magenta).

5.2 Soils

We reviewed the Soil Landscapes of the Coffs Harbour 1:100,000 Sheet (Milford, 1999), and the Site is underlain by soils of the Megan soil landscape (ERme). The creek line along the southern boundary contains a narrow band of overlying Moonee Soil Landscape (TRmo) (**Photograph 5**).

The Megan soil landscape is an erosional soil type located on rolling low hills to hills on Late Carboniferous-aged metasediments with local relief up to 90mAHD and 200m AHD. Soils are moderately deep (>100cm), well drained structured red or yellow Earths and podsols.

The Moonee soil landscape is a transferral soil type located on undulating rises, footslopes and drainage plains with local relief <30mAHD. Soils are moderately deep to deep poorly drained humic gleys.



Photograph 5. Mapped soil landscape and subject property location (magenta).

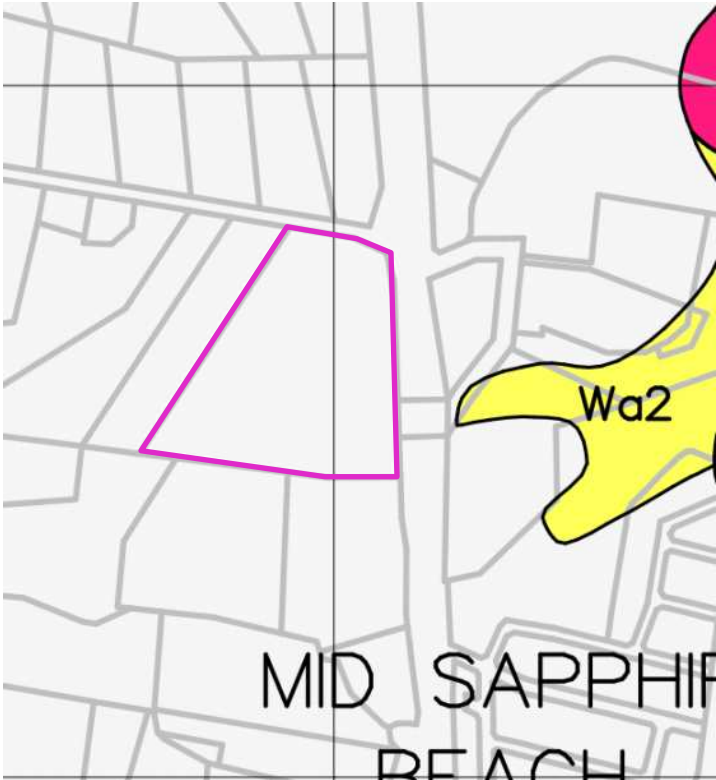
6 Acid Sulfate Soils

6.1 Mapped Occurrences of ASS

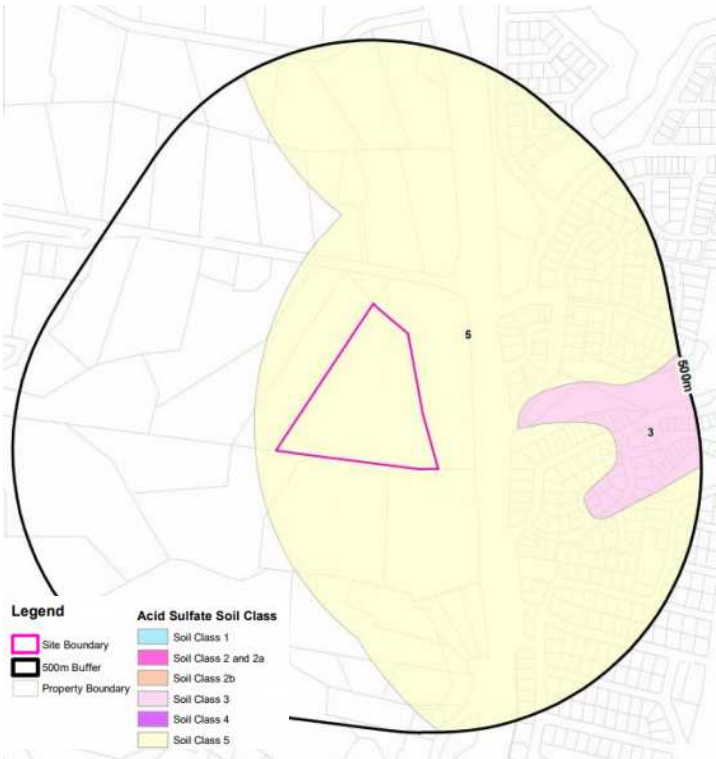
The published Moonee Beach 1:25,000 ASS Risk Map indicates that the Site is not underlain by identified potential ASS (**Photograph 6**). The nearest mapped ASS risk is associated with the intermittent gully along the southern boundary and is of low probability (yellow), lacustrine swale and sandplain at 2-4mAHD.

Coffs Harbour City Council Local Environmental Plan (LEP, 2013) and Coffs Harbour City Council Planning and Environment Spatial Maps - ASS layers that are derived from the published ASS risk mapping, indicates that the Site is underlain by mapped “Class 5” ASS risk (**Photograph 6**). Class 5 is a 500m wide buffer zone created around mapped ASS risk soils (also yellow but not to be confused with the yellow of published ASS Risk Mapping). The LEP mapped ASS risk is Class 3.

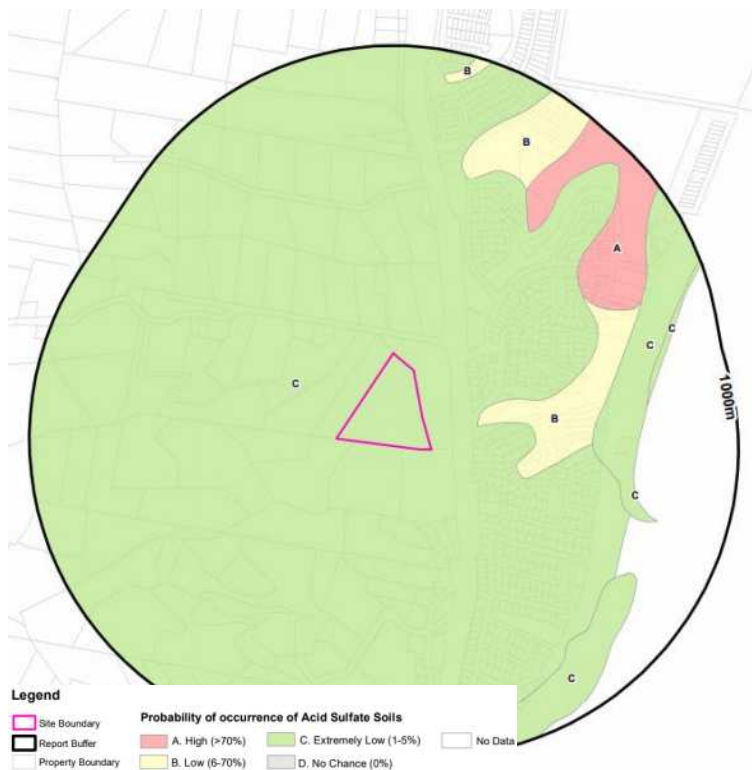
The published Australian ASS Atlas lists the entire property and surrounds up to the ridgelines as extremely low risk (1-5%), a general rating for non ASS areas (**Photograph 8**).



Photograph 6. Mapped ASS risk and subject property location (magenta).



Photograph 7. CHCC LEP Mapped ASS classes.



Photograph 8. Atlas of Australian Acid Sulfate Soils risk mapping.

In accordance with Part 7 of the LEP, development consent is required for the carrying out of the following works;

Within Mapped Class 5 – Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

As the lowest point of the Site is around 10mAHD, well above the 5m criteria, standard rural-residential development is not expected to permanently lower groundwater, and the filling of the dam will have no impact on groundwater levels, it is unlikely that the proposed subdivision and future development would trigger any ASS provisions. Notwithstanding, this PASS investigation has been undertaken for confirmation of the local ASS risk.

7 Subsurface Conditions

Site soils were observed by drilling three (3) boreholes (BH1-BH3) across the Site to a maximum depth of 1.2m using a hand auger. The location of the boreholes are shown in Figure 1 and a copy of the borehole logs are presented in Appendix A.

Natural soil profiles were observed in the boreholes, and were found to be representative of the Megan soil landscape, mid slope and lower slope (dry) positions.

The lithology encountered included a pale orange brown clay underlain by strong red brown clay.

Strong jarosite and iron mottling was not observed in the natural soils. No rotten egg odours, shell pieces, dark grey to black anaerobic soils or muds were encountered.

No groundwater inflow was observed in the boreholes to the maximum depth of 1.2m drilled.

7.1 Biophysical Indicators

The proposed development is situated above 5mAHD on a moderately to gently sloping land surface. Dominant tree species in the lower western forested zone included mixed eucalypt species. Grass species are present around the lower southeastern portion of the Site. These are not vegetation strongly associated with ASS soil presence but can be found around ASS soils.

No surface water seepage was observed or standing swampy ground.

7.2 ASS Screening Test Results

Two soil samples collected from BH2 (0.1-0.35 and 0.95-1.2m) were selected for field screening tests to determine their likelihood of containing Potential or Actual ASS (Pass/Aass) and whether further laboratory analyses would be necessary. The selected soil samples were placed in a chilled container (~4 C) and only removed when analysis was conducted.

Samples were analysed inhouse for the initial screening analysis. The screening report is included in Appendix B and summarised in **Table 2**.

Table 2 – Summary of Field Screening

Sample Location	Sample Depth (m)	pH _f (1:5)	pH _{fox} (1:5)	pH Change	Reaction
BH2	0.1-0.35	5.9	4.8	--0.9	Nil
BH2	0.95-1.2	5.7	4.7	-1	Nil
Typically, pH _f readings <4.0-4.5 indicate the presence of Aass.					
Typically, pH _{fox} readings of <3.0-3.5 can indicate the presence of Potential Acid Sulfate Soils (Pass).					
Typically changes of >1 pH unit and preferably >2 pH units can indicate the presence of Pass.					
Oxidation reaction rate and intensity can be indicators of Pass.					

In summary, the pH_f, pH_{fox} and reaction rate of all analysed samples were found to be below the Aass and Pass indicator threshold limits

8 Conclusions and Recommendations

ASS risk mapping shows no ASS risk in residual clay subsoils, and LEP mapping includes the southeastern corner of the Site only within the buffer (Class 5) around mapped ASS risk soils that are located further east of the Pacific Highway. Biophysical indicators and soil profiles suggest that the Site is not underlain by ASS. Groundwater was not encountered to 1.2m depth.

Field screening indicated no potential or actual ASS in effervescence and pH change.

As such ASS are not present at the Site that would be impacted by the proposed rural-residential development, and no further investigations or plans of management are required.

If dark grey to black, odorous or waterlogged alluvial sands or clays are encountered during development, then works should be halted until confirmation of the presence of ASS is undertaken and/or remedial strategies developed.

9 References

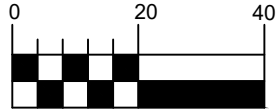
Coffs Harbour City Council Local Environmental Plan 2013.

Milford H.B, (1997), *Moonee Beach 1:25,000 Acid Sulfate Soil Risk Map*. Edition 2. Department of Land & Water Conservation.

Milford H.B, (1999), *Soil Landscapes of the Coffs Harbour 1:100,000 Sheet Report*. Department of Conservation and Land Management.

Stone Y, Ahern C.R., and Blunden B (1998), *Acid Sulfate Soil Manual 1998*. Acid Sulfate Soil Management Advisory Committee (ASSMAC), Wollongbar, NSW, Australia.

FIGURES



Horizontal Scale (metres) 1:1200

LEGEND

- Property Boundary
- Contour Line (2m)
- Drainage Alignment
- Dam to be removed
- Existing Dwelling
- Slope Direction
- Borehole Location



TITLE No.9 Gaudrons Road Existing Property Layout			FIGURE Figure 1	
PROJECT Prelim ASS for Proposed Subdivision of No. 9 Gaudrons Road, Sapphire Beach			SHEET 1 OF 1	ISSUE A
AUTHOR SD			CLIENT Chris Bowen	
DATE 26/11/20			PROJECT 2021-71	
SCALE 1:1200				

APPENDIX A



Soil Borelog

Borehole No:	BH1
Logged by:	SD
Drilling date:	2/11/2020
Drilling method:	Hand auger
Borehole location:	
Borehole coords:	513868, 6655678

Project ref:	2021-97
Client:	Bowen, Duce & Hunter
Address:	No. 9 Gaudrons Road

PROFILE DESCRIPTION

Depth (m)	Sampling depth/name	Graphic Log	Horizon	Texture	Structure	Colour	Mottles	Coarse Fragments	Moisture Condition	Comments
0.1			A1	Clay Loam	Strong	Dark Choc Brown	Nil	<10%	SM	Topsoil
0.2			A2	Clay Loam	Strong	Pale Brown	Slight OB	<10%	SM	Colluvium
0.3	s		B1	Light Clay	Strong	Pale Brown	OB	<10% qtz	SM	Residual
0.4										
0.5			B2	Light Clay	Strong	Orange Brown	Reddish Brown	<5%	SM	Residual
0.6										
0.7	s									
0.8										
0.9			B3	Medium Clay	Strong / Moderate	Pale Grey	Strong RB	<5%	SM	Residual
1.0										
1.1										
1.2										
1.3					Borehole terminated at 1.2m					
1.4										
1.5										

Moisture condition

D	Dry	M	Moist	W	Wet / saturated
SM	Slightly moist	VM	Very moist		



Soil Borelog

Borehole No: BH2

Logged by: SD

Drilling date: 2/11/2020

Project ref: 2021-97

Drilling method: Hand auger

Client: Bowen, Duce & Hunter

Borehole location:

Address: No. 9 Gaudrons Road

Borehole coords: 514062, 6653710

PROFILE DESCRIPTION

Depth (m)	Sampling depth/name	Graphic Log	Horizon	Texture	Structure	Colour	Mottles	Coarse Fragments	Moisture Condition	Comments
0.1			A1	Clay Loam	Strong	Dark Choc Brown	Nil	<10%	SM	Topsoil
0.2	S		B1	Light Clay	Strong	Orange Brown	Reddish Brown	<5%	SM	Residual
0.3										
0.4										
0.5										
0.6										
0.7										
0.8		B2								
0.9										
1.0	S									
1.1										
1.2										
1.3				Borehole terminated at 1.2m						
1.4										
1.5										

Moisture condition

D Dry M Moist W Wet / saturated
 SM Slightly moist VM Very moist



Soil Borelog

Borehole No: BH3

Logged by: SD

Drilling date: 2/11/2020

Project ref: 2021-97

Drilling method: Hand auger

Client: Bowen, Duce & Hunter

Borehole location:

Address: No. 9 Gaudrons Road

Borehole coords: 514046, 6655837

PROFILE DESCRIPTION

Depth (m)	Sampling depth/name	Graphic Log	Horizon	Texture	Structure	Colour	Mottles	Coarse Fragments	Moisture Condition	Comments
0.1			A1	Clay Loam	Strong	Dark Choc Brown	Nil	<10%	SM	Topsoil
0.2			B1	Light Clay	Strong	Orange Brown	Reddish Brown	<5%	SM	Residual
0.3										
0.4										
0.5										
0.6										
0.7										
0.8			B2	Medium Clay to Silty Clay	Strong / Moderate	Pale Grey	Strong RB	5-30% Phyllite	SM	Residual grading to XW Bedrock
0.9										
1.0										
1.1										
1.2										
1.3					Borehole terminated at 1.2m					
1.4										
1.5										

Moisture condition

D Dry M Moist W Wet / saturated
 SM Slightly moist VM Very moist

APPENDIX B



Results of ASS Field Screening

Client: Chris Bowen

Project No.: 2021-71

Site: 9 Gaudrons Road, Sapphire Beach

Date: 5/11/20

Notes:

Recorded by: SD

Sample Loc.	Sample Depth (mm)	pH water	pH f (1:5) [1]		pH H2O2 [2]	pH fox (1:5) [3]		pH f - pH fox [4]		Temp (deg) [5]	Colour Change [6]	Eff Reaction [7]	Fragments [8]	Comments
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
				n/a			n/a	0.0	n/a					
BH2	0.1-0.35	6	5.9		4.5	4.8		0.9		22.0	nil	nil	nil	
	0.95-1.2	6	5.7		4.5	4.7		1.0		22.0	nil	nil	Qtz	

Notes:-

n/a not available

n/t not tested

Ratings based on data in ASSMAC 1998

[1] pH measured on 1:5 soil:water suspensions. <4pH units may indicate AASS

[2] Should be pH 4.5-5.5

[3] pH measured on 1:5 soil:H2O2 suspensions. <3pH PASS, <4pH PASS Likely

[4] pH changes > 1-2 may indicate PASS

[5] Temperatures greater than 70 deg can indicate PASS

[6] Colour change from grey to brown tones can indicate PASS

[7] Nil = Nil, L = some, M = moderate, H = Much, V = Violent

[8] SS = shells, QTZ = quartz, J = jarosite, O = organics, Anthro = anthropogenic