DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Soil characteristics of Sunshine Bay Estate, Batemans Bay

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Introduction

This report and the accompanying plan detail the soil characteristics of land encompassed by the proposed Sunshine Bay Estate at Batemans Bay. The soils information collected provides the subdivision with a sound base for sediment and erosion control strategies.

Methods

Five sites over the Estate were excavated by backhoe to a depth of at least 2.0 m or refusal. These sites were broadly indicative of the range of soils on the Estate. Site locations are shown on the accompanying plan. The soil profiles were described on DLWC Soil Data System cards. This information is available via the Manager, Soil Data System, DLWC Parramatta. Samples were taken of soil materials and dispatched by courier to Scone DLWC Research Service Centre.

Laboratory analysis was conducted on the following samples:-

Profile	Layer	Depth (cm)
1	1 2 3	0-20 20-70 70-175
2	1 2 3	0-10 10-40 40-200
4	1 2 3	0-15 15-35 35-100

NB. Landscape Units 3 & 4 have been differentiated on terrain characteristics. They have similar soil types. Consequently, laboratory analysis has been conducted for Unit 4 but not Unit 3.

Results

The estate site has been subdivided into four landscape units:-

Landscape unit	Description	Profile
1	alluvial swampy open depression	1
2	drainage lines	2
3	upper slopes and crests	3
4	sideslopes	4

Sideslopes, Landscape Unit 4, constitute greater than 75% of the site area. The upper slopes and crests, Landscape Unit 3, have similar soil types to Unit 4. The major difference between the two units is that Unit 3 soils tend to be shallower.

Landscape Units 1 & 2, the drainage line and alluvial swampy areas, cover less than 10% of the site area but are significant as they comprise the only major drainage line of the site. Drainage for Unit 1 is much slower relative to Unit 2.

Brief descriptions of soil profiles for each of the landscape units:

Landscape Unit 1. (alluvial swampy open depression), Soil profile 1.

0-20cm	dark grey silty clay loam
20-70cm	very dark grey silty clay
70-175cm	acid silty clay loam
175-250+cm	light brown acid clay

Landscape Unit 2. (drainage lines), Soil profile 2.

0-10cm	dark greyish brown silty clay loam
10-40cm	dark greyish brown silty clay
40-200+m	yellowish brown sandy clay

[1]Landscape Unit 4. (sideslopes), Soil profile 4.

0-15cm	very dark grey sandy loam
15-35cm	bleached sandy clay loam
35-100cm	red clay
100-150cm	pallid silty clay loam
150-250cm	weathered bedrock

[1] Landscape Unit 3. (crests and upper slopes), Soil profile 3 has similar soils to Unit 4. The major difference is that Unit 3 soils are shallower than those of Unit 4.

Laboratory Results

Lab. No	Method	P7B/1 Particle Size analysis(96)					P8A/2	P9B/2	P13A/3	C2A/3	C1A/3	C6A/2
	Sample Id.	clay	silt	f.sand	c.sand	gravel	D96	EAT	USCS	pH	EC (dS/m)	OC(%)
1	BB1/1	24	40	27	9	<1	21	8/5	ML-MH	5.0	0.18	4.81
2	BB1/2	40	41	14	5	0	16	5	MH	4.9	0.44	4.57
3	BB1/3	20	35	36	8	1	7	6	ML-MH	3.9	0.91	1.26
4	BB2/1	16	42	16	16	10	38	3(1)	ML-MH	4.6	0.08	3.29
5	BB2/2	20	35	12	15	18	38	3(2)	CL	4.8	0.07	2.01
6	BB2/3	27	24	6	20	23	59	3(1)	CL	4.4	0.08	0.37
7	BB4/1	13	24	20	28	15	29	3(1)	SL	5.0	0.13	7.28
8	BB4/2	13	30	14	21	22	41	3(1)	SC-ML	4.7	0.07	1.50
9	BB4/3	65	28	1	4	2	12	6	CH	3.8	0.16	0.34

Interpretations

Soil erodibility

The Unified Soil Loss Equation (USLE) includes a measure of soil erodibility known as K-factor (Wischmeier and Smith, 1978). The USLE K-factors are a derived index of a soil materials susceptibility to sheet and rill erosion. From the laboratory data for the site K-factors have been derived using the SOILOSS program (Rosewell and Edwards, 1988).

Sample	K-factor	Erodibility
BB1/1	0.022	moderate
BB1/2	0.022	moderate
BB1/3	0.055	high
BB2/1	0.036	moderate
BB2/2	0.037	moderate
BB2/3	0.037	moderate
BB4/1	0.015	low
BB4/2	0.047	high
BB4/3	0.020	low

Soil erodibilities fall within the low to moderate range for all materials except for the acid silty clay loam subsoil of the alluvial swampy unit (sample BB1/3) and the bleached sandy clay loam A_2 horizon of the sideslope unit (sample BB4/2). Both of these materials have high soil erodibilities as expressed by derived K-factors.

Salinity

Low levels of salinity were recorded across the site and no salinity related problems were observed.

Acidity

Soil pH's are 5.0 or below for all the laboratory samples. For site revegetation the application of lime would be required to correct for potential problems such as aluminium toxicity which occur in soils with pH lower than 5.0. The application rate, would be relatively low - about 2 kg of lime per m^3 of soil material would be needed.

Acid Sulfate Materials

Laboratory tests were not conducted for potential acid sulfate materials at the site. Extensive testing has occurred in the vicinity as part of the DLWC Acid Sulphate[2] Risk Management program.

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[2] Since the completion of the Risk Mapping the spelling "sulfate" (not 'sulphate') has become the standard.

Problems associated with acid sulfate soils only manifest themselves when materials are exposed and allowed to oxidise. Potential acid sulfate soils are generally saturated estuarine sediments found below 1m ASL.

Only the alluvial swampy unit has the right combination of factors for possible acid sulfate materials. This unit exhibited strong sulphide odour on excavation which is often indicative of potential acid sulfate soils.

If possible subsoil materials of the alluvial swampy unit should not be disturbed. Should disturbance be necessary it is recommended that further testing be undertaken to identify any potential acid sulfate materials. If acid sulfate materials are identified an Acid Sulfate Soil Management Plan would need to be prepared in line with the Environmental Protection Agency Guidelines on Acid Sulfate Soils (EPA, 1995).

Topsoil materials

The depth of topsoil ranges from very shallow less then 5cm on upper slopes to 20cm in the drainage line units. During construction a range of topsoil stripping depths may be required. During the revegetation phase it is likely that topsoil stripped from lower areas in the landscape will need to be relocated to the upper slopes and crests.

Topsoil materials are not saline and only moderately erodible. They are, however, slightly acidic and for revegetation purposes would benefit from a light application of lime. Most of the topsoils at the site suffer from moderate levels of gravel.

The A_2 horizon (bleached sandy clay loam) of the upper slopes and crests and sideslope units is in general not a good medium for revegetation. This material occurs immediately below the topsoil. It is infertile (as indicated by it's bleached appearance), gravelly (greater than 20% gravels) and highly erodible (K-factor 0.047).

References

- Wischmeier, W. H. and Smith, D.D. (1978) *Predicting Rainfall Erosion Losses - A guide to Conservation Planning.* Agriculture Handbook No.537, US Department of Agriculture, Washington DC.

- Rosewell, C.J. and Edwards, K. (1988) *SOILOSS - A program to Assist in the Selection of Management Practices to Reduce Erosion.* Technical Handbook No. 11, soil Conservation Service of NSW.

- Environmental Protection Agency (1995) *Assessing and Managing Acid Sulfate Soils, Guidelines for Land Management in NSW Coastal Areas,* EPA, Chatswood, NSW.

- Tulau, M.J. (1995) *Acid Sulphate Soil Risk of the Mogo, Nelligen and Durras 1:25 000 map sheets.* Soil Conservation Service of NSW.

8

D. P 836917

PRELIMINARY

SUNSHINE

ROAD 20.115

BAY

EDWARD

ROAD

Landscape Unit (1)

BASS

120

P 836917

COMMERC

SITE

CRESCENT

CANNING Landscape Unit (2)

D. P. 803654

LOT 203

830979

Landscape Unit (3)

Landscape Unit (4)

RESERVE

PUBLIC

RESERVE

POOLE PLACE

AVENUE

LAWSU

PUBLIC

RESERVE

EYRE PL.

MITCHELL

THOMAS

CRESCENT

PUBLIC

RESERVE

GRAY

PL

OXLE

SUN