SOILS AND LAND TYPES

OF

THE LOWER MARIBYRNONG VALLEY

And Erosion Risk Ratings

Report undertaken
For
Melbourne Metropolitan Board of Works

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APPENDICES

Acknowledgement

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Introduction

This survey in the valley of the Lower Maribyrnong River, carried out for the MMBW, was to identify the different land types, principally on the basis of soil and landscape, and to asses their erosion risk following disturbance and track development. The information forms part of the physical data base on which the development and management of the Maribyrnong River Park will be planned.

Further information on specific areas, particularly with respect to the effect of disturbance or to methods for minimizing Authority.

Methods

Land types were tentatively identified using stereoscopic interpretation of 1:10000 (approx.) scale black and white aerial photographs.

Field observations of the preliminary units were then made and the soils were sampled, by hand augering, and described. Six broad categories of soils were recognized and these were combined with the preliminary units to produce the final land units. A total of 16 units have been mapped on the basis of slope and soil type. Slopes and soils were inappropriate for the mapping of disturbed areas and these have been classified separately, with a total of six units being recognised. Generalized descriptions of the soils and land types are given in this report.

Interpretations of the physical characteristics of the land types have been made in the form of erosion risk ratings. These have been summarized in a table which provides a translation of the physical soil and land data into erosion risk classes.

SOIL TYPE DESCRIPTIONS

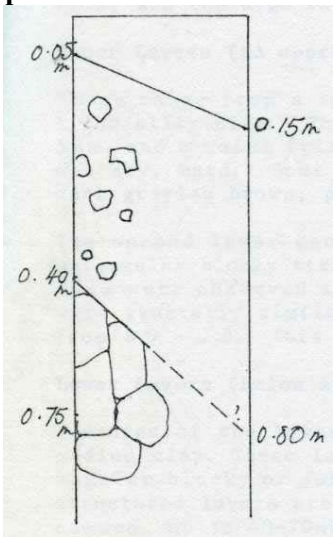
SOIL TYPE **Dark Clay Soils Derived From Basalt**
(Basaltic soils over rock)

Symbol: C

General Comments: Dark clay soils derived from basalt occur on the plains above the river valley and on the mid to upper slopes of the valley sides.

The depth of these soils is extremely variable. Some soils on the plain were deeper than 70cm while on some steep valley slopes, weathered bedrock occurred at about 40cm. Profile sampling at most sites was stopped by bedrock or basalt floaters at depths less than 80cm, sometimes as shallow as 10cm.

Typical Soil Profile:



Dark grey or black organic clay to light medium clay with strong crumb structure, often self-mulching on the surface. Stones and rotten basalt fragments of variable size often present. pH 6.0 – 7.0.

Variable boundary to dark grey, dark brown or black light to medium heavy clay. Moderate to strong angular or sub angular blocky structure with peds 2 – 10mm. Consistence mostly moist hard. Small fragments of weathered bedrock often present and diffuse or nodular carbonates sometimes below 50cm. pH 6.0 ranging to 9.0 at depth.

Weathered basaltic parent material or, in deeper profiles, weak angular blocky yellow brown medium to heavy clays or, in colluvial deposits, brown, sometimes mottled clays, sometimes weakly structured with larger peds, up to 40mm.

Profile Variation: Some of the basaltic soils, particularly on the gentler slopes, have lighter textured surface soils, for example clay loam or sandy clay loam. These usually have strong crumb structure although both weak crumb and apedal structures were also observed.

On some shallow soils on the steep slopes, horizons were very weakly developed and the soils were uniform medium clays with strong angular blocky or sub-angular blocky structure.

SOIL TYPE **Loamy Alluvium**

Symbol: 1a (1aw – wet component)

General Comments:

Alluvium has been deposited along the entire valley. In some places only remnants of the original terraces remain and only traces of alluvium occur on the lower slopes; in other places extensive areas of terrace remain and the terrain is prominently benched and undulating to level.

The soils, although predominantly loams, are variable due to variation in the amount of clay washed from higher slopes and to variations in the deposits along the valley. Some of the deposits are quite sandy but these have almost invariably been excavated and are mapped within the disturbed land units. Alluvium that is predominantly loamy is considered in this unit. The loamy alluvium is generally deep, i.e. >100cm, although rock floaters, principally of basalt, sometimes occur.

Typical Soil Profile:

Variation in the soil with depth is due mainly to differences in the nature of the material deposited rather than to pedological processes. Due to this, and the high variability, a schematic profile is not given.

Upper Layers (to approx. 50 cm)

These range from a loamy sand through sandy, silty and clayey loams to a light silty clay. The topsoil usually has a crumb structure with peds 2 – 5mm, and a moist friable consistence. In some instances the consistence was dry, hard. Some massive topsoils occur. Colours mostly dark grey or dark greyish brown; pH ranges from 5.5 to 7.5.

The second layer generally has a strong or moderate angular blocky or subangular blocky structure with peds usually in the range 5-15mm; peds of 50mm were observed and in some instances, layers were massive. Colours were generally similar to the topsoil though sometimes browner. pH ranges from 6.0 – 7.0. This layer often had a low tendency to slake.

Lower Layers (below approx. 50 cm)

Textures of the lower layers varied from sandy loam through light clay to medium clay. These layers were generally apedal though moderate or strong angular blocky or subangular blocky structures are common. Ped sizes of structured layers are highly variable, ranging from 3-15mm, which is more common, up to 40-70mm. Colours are generally dark grey to dark brown. pH ranges from 6.59.0. Slaking tendency is variable, ranging from nil to high; some layers also have slight to moderate tendency to disperse.

Other Soils:

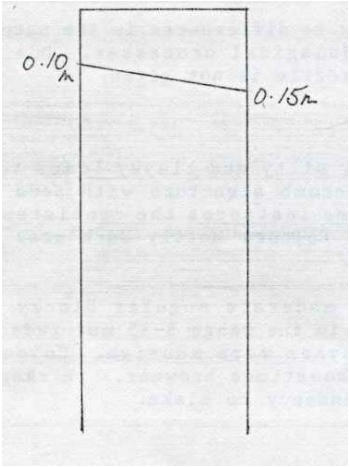
The loamy alluvium in the downstream regions generally has a higher watertable and has been distinguished by the symbol “law”. These soils are often mottled at depth as a result of water logging. Lower lowers may have high organic matter contents and were probably peaty topsoils which have been buried by recent alluvial deposits.

SOIL TYPE **Duplex Soils**

Symbol: d

General Comments: Duplex soils occur in two distinct situations in the study area; where a thin layer of Tertiary material overlies Tertiary basalt derived material and where coarse textured alluvium overlies a finer textured alluvium.

Typical Soil Profile Developed in Alluvium



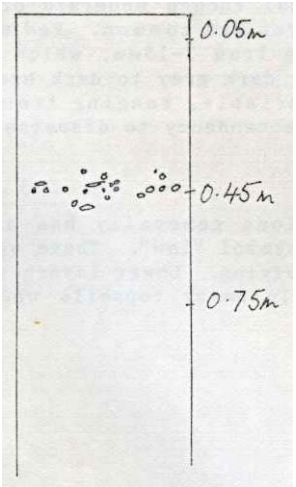
Dark brown loam to silty loam, massive with a dry hard consistence. Hydrophobic. Low tendency to slake and disperse. pH 5.5

Lower layers variable. Brown to yellowish brown usually structured heavy to silty light clays. Dry hard to extremely hard consistence. Ph 8.0-8.5

May be underlain by layers with lighter texture.

Some layers with moderate tendency to slake and low tendency to disperse.

Typical Soil Profile Developed in Tertiary Material



Very dark grey loamy sand, massive with moist friable consistence. pH 6.5

Brown loamy sand, massive with dry hard consistence. Cemented sand nodules and iron cemented fragments near bottom of horizon. pH 6.0-7.0

Brown medium clay with moderate, angular blocky structure. Moderate tendency to disperse and slake. pH 8.5

Gritty light clay with weak subangular blocky structure. High tendency to slake and disperse. Free calcium carbonates. pH 9.0

LAND UNIT DESCRIPTIONS

LAND UNIT **Steep Slopes with Dark Clay Soils Derived from Basalt** Map Symbol: S2c

General: This unit occurs extensively on the side slopes of the valley. Occurrence of surface rock and stone is variable, compounded by the fact that some areas have been cleared of stones while others appear to be 'dumping' grounds. Building rubble is also common on the upper slopes below the houses.

Slopes (typical and range): 25%-50%; 25%-65%

Soils: Soils are dark clays developed directly on basalt and also on basalt colluvium. Most profiles were less than 80 cm over bedrock or basalt floaters. In some instances large rock floaters were only 10-15mm from the surface. Topsoils were typically self-mulching.

Surface rock and stone: <1% up to 20%

Erosion Risk: Class 3

Permeability of Soil: Moderate

Site Drainage: Moderately well drained to well drained.

Flood Risk: Nil

Shrink-swell Potential: High

Comments: Although the well structured basaltic soils have a relatively low erodibility, the steep slopes result in a moderate erosion risk and several instances of accelerated erosion were noted where runoff had concentrated on tracks.

LAND UNIT **Steep Slopes with Basaltic Clay Soils over Fine Material** Map Symbol: S2c/fm

General: This unit is very small, the only mapped occurrence being near the trestle bridge at the edge of the study area. Basaltic soil overlies fine material derived from Silurian rocks.

Areas of steep slopes with basalt over alluvium occur at the junction of the S2c and S21a units but are too small to map separately.

Slopes (range): >25%

Soils: No observations

Surface rock and stone: Outcropping sedimentary rock

Erosion Risk: Classes 3 and 4

Permeability of Soil: Slow

Site Drainage: Well drained

Flood Risk: Nil

Shrink-swell Potential: Moderate to high

Comments: The basaltic soils are less erodible than the underlying fine material so that, where the basalt soil is still intact, an erosion risk class 3 has been given, the same as for the S2c unit. If the basaltic layer is removed, either through water erosion or disturbance, the underlying soil is likely to be readily eroded.

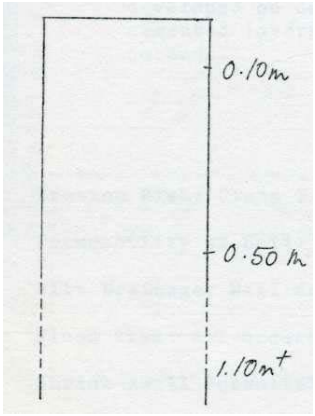
Should any disturbance to this unit occur, for example, in the construction of a walking track, extreme care should be taken to ensure that drainage water does not erode the basaltic soil cover. This is likely to be a particular problem if runoff is concentrated in drainage channels.

LAND UNIT **Steep Slopes with Clay Soils Derived from Basalt, overlying Coarse Material** Map Symbol: S2c/cm

General: This unit occurs where basaltic colluvium overlies Tertiary sediments which consist mostly of sands. The only mapped occurrence is on the western valley slope near the trestle bridge. Mapping of this unit is difficult due to the lack of surface expression and hence the boundary with the basaltic clay unit on the eastern bank in the upstream part of the valley, (for example at site 33) but these are too small to map.

Slopes (range): 25%-55%

Typical Soil Profile:



Very dark grey, light clay with strong crumb structure, gritty or with stones to 50mm; pH 7.

Dark grey, dark brown or brown medium clay, sometimes mottled, with strong angular blocky to moderate subangular blocky structures; sand and small fragments of Tertiary material may be present. pH 6.5-7.5.

Brown to yellow brown, sometimes mottled, clayey sand; apedal. pH 9. These sands with very high tendency to slake; slight tendency to disperse.

Surface rock and stone: Variable, up to 20% cover by stones up to 50cm.

Erosion Risk: Classes 3 and 4

Permeability of Soil: Slow to moderate

Site Drainage: Moderate

Flood Risk: Nil

Shrink-swell Potential: Moderate

Comments: The same comments that were made for unit S2c/fm apply here.

LAND UNIT **Steep Slopes with Loamy Alluvial Soils** Map Symbol: S21a

General: Steep slopes with alluvial soils are not common. In a few upstream localities they separate two terrace levels. Mostly, however, they are found as remnants on the lower valley slopes whee they are all that remain of the former alluvial terraces which have been removed by down cutting of the river.

Some steep slopes formed during track construction and excavation have been mapped in this unit.

The boundary of this unit with the basaltic clays on steep slopes is not readily apparent and has been indicated by a dotted line.

Slopes (range): 25% to vertical

Soils: See general description

Surface rock and stone (%) : 0

Erosion Risk: Class 4

Permeability of Soil: Moderate to rapid

Site Drainage: Well drained

Flood Risk: Most steep alluvial slopes are above flood level.

Shrink-swell Potential: Low

Comments: This unit is extremely susceptible to sheet and gully erosion due to the tendency of some layers to disperse and slake, the massive structure of some topsoils, and the very steep slopes.

These soils are also prone to compaction.

LAND UNIT **Steep Slopes with Sandy Soils** Map Symbol: S2a

General: Steep slopes with sandy soils occur on areas of coarse textured Tertiary deposits. Extent is relatively minor; however, the unit is of some significant because of the erosion risk.

Slopes (range): 25% to vertical

Soils: Coarse textured soils which are apedal and massive have developed on deep sandy deposits, with occasional ironcemented layers, coarse quartz gravel lenses and rock outcrop.

Erosion Risk: Class 5

Permeability of Soil: Rapid

Site Drainage: Well drained

Flood Risk: All occurrences are above flood level.

Shrink-swell Potential: Nil

Comments: Areas of these sandy soils have been used for sand/gravel extraction and are mapped as DE, DEV & DDV land units.

LAND UNIT **Moderate Slopes with Dark Clay Soils Derived from Basalt** Map Symbol: S1c

General: This unit is moderately common in the upstream sections of the study area.

Slopes (typical and range): 15%-20%; 10%-25%

Soils: Dark clays derived from basalt or basaltic colluvium. Depth of profiles variable, ranging from about 30-40cm where basaltic floaters are close to the surface to over 150cm on colluvial deposits.

Surface4 soils sometimes with clay loam or sandy clay loam textures.

Surface Rock and Stone: <1% up to 5%

Erosion Risk: Class 2

Permeability of Soil: Moderate to rapid

Site Drainage: Moderately well to well drained

Flood Risk: Nil

Shrink-swell Potential: High

Comments:

LAND UNIT **Moderate Slopes with Basaltic Clay Soils over Fine Material** Map Symbol: S1c/fm

General: This unit is mapped in only two localities in the upstream part of the valley.

Slopes (range): 12-20%

Soils: Only one site in this unit was observed. At this locality the basaltic layers extended to 40cm, below which, to a depth of 60cm was a dark brown light clay with moderate angular blocky structure, a pH of 8.5 and a moderate to high tendency to slake. Below this, to a depth of 70cm, was a similar clay but mottled, with a pH of 9 and with fine carbonates present. The tendency of this clay to slake was low. To a depth of more than 90cm was a brown moderately structured medium clay with a pH of 9 and with a high slaking tendency.

Surface Rock and Stone (%): 0

Erosion Risk: Classes 2 and 3

Permeability of Soil: Moderate

Site Drainage: Moderate-Well drained

Flood Risk: Nil

Shrink-swell Potential: Moderate to High

Comments: With the basaltic soil cover intact, this unit has a class 2 erosion risk, similar to the S1c unit. If the basalt soil cover is removed, however, the erosion risk category is class 3.

The same comments made for S2c/fm with respect to disturbance apply to this unit.

LAND UNIT **Moderate Slopes with Loamy Alluvial Soils** Map Symbol: S11a

General: This unit is not very extensive and occurs in the upstream parts of the valley. It is mapped on old alluvial terraces with gentle to moderate slopes.

Slopes (range): 10-25%

Soils: Some of the alluvial soils below slopes with basaltic soils contain clay lumps or pellets to about 25 mm diameter within the profile.

Surface Rock and Stone (%): 0

Erosion Risk: Class 3

Permeability of Soil: Moderate to rapid

Site Drainage: Well drained

Flood Risk: Most occurrences of this unit are above flood level.

Shrink-swell Potential: Low

Comments: The gentler slopes in this unit compared with those in S21a mean that the land in this unit is generally in a lower erosion risk category.

Surface soils in this unit are susceptible to compaction.

LAND UNIT **Moderate Slopes with Duplex Soils** Map Symbol: S1d

General: There are only two occurrences of this unit, both in the region near the Buckley Street causeway. One is a moderate slope on alluvium, the other is on Tertiary sand and basalt.

Slopes (range): 10-25%

Soils: As per general description.

Erosion Risk: Class 4

Permeability of Soil: Moderate

Site Drainage: Moderate to well drained

Flood Risk: Nil

Shrink-swell Potential: Moderate

Comments: This unit has a high susceptibility to erosion because of the course texture of the surface soils and their lack of structure, the dispersive and slaking tendency of the subsoils and the moderate slopes.

LAND UNIT **Moderate Slopes with Sandy Soils** Map Symbol: S1S

General: Moderate slopes with sandy soils occur on areas of coarse textured tertiary deposits; these occupy a relatively small area in the middle sections of the river valley.

Slopes (range): Up to 25%

Soils: Apedal, massive, coarse textured soils have developed on deep sandy deposits with occasional iron-cemented layers. Coarse quartz gravel lenses and rock outcrop occur.

Erosion Risk: Class 4

Permeability of Soil: Rapid

Site Drainage: Well drained

Flood Risk: Most occurrences are above flood level.

Shrink-swell Potential: Nil

Comments:

LAND UNIT **Undulating Terrain with Dark Clay Soils derived from Basalt** Map Symbol: Uc

General: This is an uncommon unit found near Thomson Reserve.

No field observations were made; the following information is derived from aerial photo interpretation and knowledge of the undulating terrain and basaltic soils in other places along the valley.

Slopes (range): 3-6%

Soils: See general description.

Surface Rock and Stone: 0

Erosion Risk: Class 1

Permeability of Soil: Moderate to rapid

Site Drainage: Poor to moderate

Flood Risk: Nil

Shrink-swell Potential: High

Comments: This unit has a low erosion risk class as a result of low slopes and the low erodibility of the basaltic soils.

LAND UNIT **Undulating Terrain with Basaltic Clay Soils over Fine Material** Map Symbol: Ucfm

General: This unit is very limited in area and is mapped in only three localities in the upstream part of the valley. It occurs where colluvial basalt overlies old terraces.

Slopes (range): 5-10%; 2-15%

Soils: The depth of basalt is variable, being deepest near the base of the adjacent uphill slope and becoming shallower towards the terrace edge. On the uphill margins, the alluvial material is probably too deeply buried to be of significance and the soils could be regarded as deep clays. These areas, however, are too small to map separately.

Erosion Risk: Class 4

Permeability of Soil: Moderate

Site Drainage: Moderate to well drained

Flood Risk: Nil

Shrink-swell Potential: Moderate

Comments: This unit has a high susceptibility to erosion because of the course texture of the surface soils and their lack of structure, the dispersive and slaking tendency of the subsoils and the moderate slopes.

LAND UNIT **Undulating Terrain with Loamy Alluvium** Map Symbol U1a

General: This is one of the more common units, being found in discontinuous stretches along the length of the valley. Individual occurrences, however, are often small.

Slopes (typical and range): 5-10%; (2-15%). Some very steep slopes, S21a, such as the river banks, are included in this unit, being too narrow to map separately.

Soils: See general description

Erosion Risk: Classes 1 and 2, depending on slope; higher risk on very steep slopes. Scouring by flood water and undercutting of banks may occur.

Permeability of Soil: Moderate to rapid.

Site Drainage: Mostly well drained, despite the fact that this unit receives runoff from steeper slopes above.

Flood Risk: This unit is prone to flooding.

Shrink-swell Potential: Low

Comments: The gentle slopes of this unit and the non-clayey soils make it one of the most suitable for tracks although flooding and susceptibility to scour by flood waters and surface compaction need to be considered.

LAND UNIT **Flat Terrain with Dark Clay Soils derived from Basalt** Map Symbol Fc

General: This unit is relatively extensive in the upstream parts of the survey area, occurring on all the flat land above the rim of the valley.

Slopes (range): <1%-5%

Soils: Generally deeper than 70 cm though large basalt floaters are found near the surface in some places, particularly near the break of slope leading into the valley.

Surface Rock and Stone: Scattered

Erosion Risk: Class 1

Permeability of Soil: Poor

Site Drainage: Poor

Flood Risk: Nil

Shrink-swell Potential: High

Comments: Deep wheel ruts indicate seasonally boggy conditions. Soil compaction was noted along vehicle tracks.

LAND UNIT **Flat Terrain with Loamy Alluvium (Commonly with High Water Tables)**

Map Symbol Fla
Map Symbol Flaw

General: This unit is extensive, occurring along the length of the valley on most of the flat alluvial terraces.

Slopes (range): <1% - 5%; this unit includes river banks.

Soils: Mottling was observed in some deep layers indicating poor soil drainage. The topsoils in some areas may have been removed.

Surface Rock and Stone (%): 0

Erosion Risk: Class 1

Permeability of Soil: Moderate to rapid

Site Drainage: Imperfect; poor in “Flaw” units

Flood Risk: This unit is prone to flooding

Shrink-swell Potential: Moderate

Comments: The poor drainage is the result of the low slopes and the position in the landscape which results in this unit receiving runoff from the surrounding terrain.

Along with the Ula unit, this is one of the most suitable for track construction although flooding and susceptibility to scour by flood waters and surface compaction need to be considered.

LAND UNIT **Flat Terrain with Duplex Soils** Map Symbol Fd

General: This is a minor unit confined to the upper alluvial terrace in the area near the Buckley Street causeway.

Slopes (range): 0-2%

Soils: See general description

Surface Rock and Stone (%): 0

Erosion Risk: Class 1

Permeability of Soil: Moderate

Site Drainage: Imperfect

Flood Risk: Nil

Shrink-swell Potential: Moderate

Comments:

LAND UNIT **Disturbed Land – Construction** Map Symbol DC

General: Land in this unit has some type of construction on it, such as roads and buildings.

Slopes (range):)
)
Soils:)
)
)
)
) Interpretation not appropriate
)
)
)
)
Erosion Risk:)
)
Permeability of Soil:)
)

Site Drainage:

Flood Risk: Nil

Shrink-swell Potential:

Comments:

LAND UNIT **Disturbed Land – Extraction Sites** Map Symbol DE

General: This unit occurs mainly in the upstream parts of the valley although there is an area near the canal where quarrying has taken place.

The basalt quarries cover most of this unit but also included are sites where topsoil has been extracted. In some places vertical faces have been cut and remain exposed.

Slopes (range): Flat to vertical

Soils: Site specific

Erosion Risk: Site specific

Permeability of Soil: Site specific

Site Drainage: Site specific

Flood Risk: Nil Site specific

Shrink-swell Potential: Nil

Comments: No overall erosion class can be assigned to this unit as risk depends on the slopes and soil types and these are quite variable. Some of the soils, however, are very erodible, being poorly structured and dispersible, and, where present on steep and moderate slopes, have a high erosion risk.

Some of the sites where topsoil has been excavated are already eroding quite badly and such erosion is likely to continue unless checked.

LAND UNIT **Disturbed Land – Extraction Sites: Vegetated** Map Symbol: DEV

General: Some of the areas where topsoil and sandy material have been excavated now have vegetation growing, although there is not always a complete cover. Most vegetation on these sites appears to be composed of volunteer species.

Slopes (range): Flat to vertical

Soils: Site specific

Erosion Risk: Site specific

Permeability of Soil: Site specific

Site Drainage: Site specific

Flood Risk: Nil Site specific

Shrink-swell Potential: Nil

Comments: As most of the upper soil layers have been removed, the material left on the surface is not always very suitable for plant growth (with the exception of the alluvial deposits), hence the vegetation cover may be sparse. Bare areas on steeper slopes are prone to erosion and hence these areas would benefit from stabilization.

LAND UNIT **Disturbed Land – Deposited Materials** Map Symbol DD

General: The nature of material deposited varies and includes large rocks and boulders extracted from the quarries as well as rubble, particularly from construction sites, deposited in tip areas. There are also some deposits of sand and fine texture material.

Slopes (range): Flat to vertical

Soils: There are no soils covering these deposits.

Erosion Risk: Site specific

Permeability of Soil: Site specific

Site Drainage: Site specific

Flood Risk: Nil Site specific

Shrink-swell Potential: Nil

Comments: The rubble at the tip site on the southern bank near the Cranwell Reserve appears to be potentially unstable.

LAND UNIT **Disturbed Land – Deposited Material: Vegetated** Map Symbol DDV

General: All terrain with deposited material and now vegetated with essentially volunteer species is mapped in this unit, irrespective of type of deposit and slope. In some places, the deposits consist of rock rubble used to infill areas, such as pipelines, after construction. In most places, however, the deposited material is of uncertain origin.

Slopes (range):

Soils: No soils developed in-situ occur in this unit. This material that has been used to cover deposits seems quite variable. In general, material appeared to be of poor quality for plant growth.

Erosion Risk: Site specific

Permeability of Soil: Site specific

Site Drainage: Site specific

Flood Risk: Nil Site specific

Shrink-swell Potential: Site specific

Comments:

LAND UNIT **Disturbed Land - Managed** Map Symbol DM

General: This unit contains areas such as golf courses, recreation ovals and well-managed parks. The land has been disturbed compared with its original condition, through levelling or topsoil addition and is now intensively managed.

Slopes (range):

Soils:

Erosion Risk: Site specific

Permeability of Soil: Site specific

Site Drainage: Site specific

Flood Risk: Nil Site specific

Shrink-swell Potential: Site specific

Comments:

Appendix 1

Guidelines

The prevention of Soil Erosion

The risk of soil erosion in the Lower Maribyrnong area varies markedly and depends upon soil type, slope of land and amount of overland flow during and after rainfall.

Land types identified in the study area have been assigned erosion risk classes in Section 2 of this report. The classes indicate, on a scale of 1 to 5, the risk of erosion which will accompany land disturbance. Erosion risk increases from Class 1, which is very low through to Class 5, which has a severe erosion risk.

From this, it follows that land types with erosion risk classes of 4 and 5 are critical areas requiring a very high level of management both during construction and in follow-up maintenance.

Land disturbing activities associated with park development will increase the risk of soil erosion by:

- removing protective vegetative cover and exposing soil to erosion by water.
- increasing rates of runoff by the compaction of soils and the development of paved surfaces.

The development of facilities therefore requires erosion and sediment control. These will need to be planned taking into account specific details of the land types involved. The Soil Conservation Authority will provide assistance in planning, design and management to minimise erosion.

General guidelines, which indicate the considerations which are involved in developing erosion and sediment control program are included below.

General Guidelines for Minimising Soil Erosion during Land Disturbance

Construction activities in the Maribyrnong Park which involve land disturbance will be cheaper, more efficient and less harmful to the environment if attention is given to erosion and sediment control in the planning and design phases of a project rather than only during construction.

Basic considerations in erosion and sediment control are:

- Bare soils will erode more rapidly than vegetated, mulched or paved areas,
- Erosion rates are significantly influenced by the amount of overland flow which in turn is effected by surface infiltration rates.
- Sand and silt sized materials is removed easily from drainage waters; however, it is usually impractical to remove the fine particles that contribute to turbidity of drainage waters.

An erosion and sediment control program is based upon the following principles:

1. Site facilities in areas of low erosion risk as far as practicable.
2. Keep the area of soil exposed to a minimum.
3. Minimise the time the soil is exposed and as far as possible avoid having the soil exposed during periods when high intensity or prolonged rain is prevalent.
4. Carry out earthworks in a manner that allows fro the different erodibility and fertility of topsoils and subsoils.
5. Trap eroded soil before it damages downslope land, structure or waterways.
6. Where revegetation of bared areas is to be undertaken, the following measures should be followed:

6.1 The surface of the subsoil should be loosened and/or roughened prior to topsoil spreading;

6.2 Topsoil should be moist when spread and a depth o 5 to 10 cm is desirable;

6.3 Area should be sown with grasses and legumes – specific recommendations for seed and fertilizer mixtures can be provided by the Soil Conservation Authority;

6.4 In critical areas such as batters, steep areas or drainage lines, early stability can be assisted by chemical, organic or mesh mulchers;

6.5 Follow-up waterings, fertilizing and mowing may be necessary to establish and maintain a persistent and dense vegetative cover.

7. Road, parking areas and footpaths for heavy use should be paved as early as practicable.

8. Control of surface drainage. Either temporary, or preferably permanent work is necessary from the start of development. Interception banks and/or channels should be used to divert upslope drainage away from bared areas. Cut-off drains to intercept groundwater flow may be required above cut batters. Cross drains and/or channels and/or pipes should be established as necessary along tracks and within construction areas to prevent the uncontrolled concentration of surface drainage.

9. Drains should be designed and should discharge in a manner that will not cause scouring and erosion. Pipes, paved or grassed channels may be needed to convey water down steep slopes and batters. Prevention of erosion from drain outlets may require level-spreaders and concrete or rip rap aprons.

10. The settleable fraction of eroded material in water draining bared areas should be removed by passing the water through sediment basins or over grass filter strips before it enters the river of other drainage lines or causes siltation of downslope land or structures. Sediment removal is generally easier if only small volumes of water are involved.

Appendix 2

Information supplied to MMBW on Erosion Risk

A small scale map of the land units, with those with an erosion risk class of 3, 4 or 5 coloured appropriately, was supplied to the MMBW along with the following information on the erosion risk classes and with the comments on a trail network.

Erosion Risk Classes

Class	Erosion Risk	General limitations and requirements
1	None to very slight	Erosion risk does not occur or is very slight. Standard designs and installation techniques and normal site preparation and management are acceptable.
2	Slight	Slight erosion risk. Careful site selection and use of standard specifications for site preparation, construction and follow up management should be satisfactory to minimise erosion.
3	Moderate	Moderate to high erosion risk which may lead to difficulties during and after construction but which can be overcome. Careful site selection, specialized design, construction techniques and follow-up management are necessary to minimise erosion.
4	High	High erosion risk. Erosion is likely during and after construction and long term problems including off-site damage to adjoining land may occur. Extensively modified design and installation techniques, exceptionally careful site selection and preparation and management are necessary to minimise erosion.
5	Severe	Severe erosion risk. Any development will cause instability which cannot be practically overcome. Continuing land degradation and off-site damage will result from disturbance of this land.
Miscellaneous Disturbed		Some disturbed areas are highly unstable, e.g. pit faces in extraction areas and some unstable deposits, particularly rubbish dumps where there is risk of slope failure.

Comments On Trail Network

Siting:

Tracks should be sited as far as possible, on land of low erosion risk. Within the Maribyrnong River Valley, this is mostly the flat to undulating land on alluvium – the river terraces. Slopes with basaltic soils (c units) are suitable provided there is batter and surface stabilization and also adequate provision for drainage.

Tracks need to be sited away from creek banks which should be stabilized with vegetation where possible.

Tracks should avoid class 4 and class 5 land. If essential, class 4 could be traversed provided the track is of a high design standard and that a high degree of care is taken in site selection, during construction and in maintenance.*

* It could be possible to have tracks of different design standard where the standard used is appropriate to the land type and level of use.

Surface Stabilization

The alluvial soils are susceptible to compaction, particularly when wet. Tracks on alluvium require weather proof surface, e.g., crushed rock.

One of the major problems with tracks on the basaltic soils is their stickiness when wet. This can be overcome by surfacing with crushed rock.

Where tracks are for use by horses, a higher degree of surface stabilization will be required.

Note: *Wheeled traffic, e.g. trail bikes, cause compaction and mechanical disturbance which predispose the soil to erosion. Worked out quarries may provide some potential for the development of areas for use by bikes. The floors of these quarries generally have minimal erosion risk and erosion which does occur can be contained within the site. The use of these areas would divert trail bike pressure from the more sensitive areas within the valley.*