

Appendix B - Erosion and Sediment Control Hazard Assessment Form



Erosion Hazard Assessment Form

| Condition | Points | Score | Trigger value |
|---|------------------------------|-----------|---------------|
| AVERAGE SLOPE OF DISTURBANCE AREA [1] <ul style="list-style-type: none"> not more than 3% [3% . 33H:1V] more than 3% but not more than 5% [5% = 20H:1V] more than 5% but not more than 10% [10% = 10H:1V] more than 10% but not more than 15% [15% . 6.7H:1V] more than 15% | 0 1 2 4 6 | 4 | 4 |
| SOIL CLASSIFICATION GROUP (AS1726) [2] <ul style="list-style-type: none"> GW, GP, GM, GC SW, SP, OL, OH SM, SC, MH, CH ML, CL, or if <i>imported fill</i> is used, or if soils are untested | 0 1 2 3 | 3 | |
| EMERSON (DISPERSION) CLASS NUMBER [3] <ul style="list-style-type: none"> Class 4, 6, 7, or 8 Class 5 Class 3, (default value if soils are untested) Class 1 or 2 | 0 2 4 6 | 4 | 6 |
| DURATION OF SOIL DISTURBANCE [4] <ul style="list-style-type: none"> not more than 1 month more than 1 month but not more than 4 months more than 4 months but not more than 6 months more than 6 months | 0 2 4 6 | 0 | 6 |
| AREA OF DISTURBANCE [5] <ul style="list-style-type: none"> not more than 1000 m² more than 1000 m² but not more than 5000 m² more than 5000 m² but not more than 1 ha more than 1 ha but not more than 4 ha more than 4 ha | 0 1 2 4 6 | 0 | 4 |
| WATERWAY DISTURBANCE [6] <ul style="list-style-type: none"> No disturbance to a watercourse, open drain, or channel Involves disturbance to a constructed open drain or channel Involves disturbance to a natural watercourse | 0 1 2 | 0 | 2 |
| REHABILITATION METHOD [7] Percentage of area (relative to total disturbance) revegetated by seeding without light mulching (i.e. worst-case revegetation method). <ul style="list-style-type: none"> not more than 1% more than 1% but not more than 5% more than 5% but not more than 10% more than 10% | 0 1 2 4 | 0 | |
| RECEIVING WATERS [8] <ul style="list-style-type: none"> Saline waters only Freshwater body (e.g. creek or freshwater lake or river) | 0 2 | 0 | |
| SUBSOIL EXPOSURE [9] <ul style="list-style-type: none"> No subsoil exposure except of service trenches Subsoils are likely to be exposed | 0 2 | 2 | |
| EXTERNAL CATCHMENTS [10] <ul style="list-style-type: none"> No external catchment External catchment diverted around the soil disturbance External catchment not diverted around the soil disturbance | 0 1 2 | 0 | |
| ROAD CONSTRUCTION [11] <ul style="list-style-type: none"> No road construction Involves road construction works | 0 2 | 0 | |
| pH OF SOILS TO BE REVEGETATED [12] <ul style="list-style-type: none"> more than pH 5.5 but less than pH 8 other pH values, or if soils are untested | 0 1 | 1 | |
| Total Score ^[13] | | 14 | |

Explanatory notes

Requirements: Specific issues or actions required by the proponent.

Warnings: Issues that should be considered by the proponent.

Comments: General information relating to the topic.

[1] **REQUIREMENTS:**

For sites with an average slope of proposed land disturbance greater than 10%, a preliminary ESCP must be submitted to the regulatory authority for approval during planning negotiations.

Proponents must demonstrate that adequate erosion and sediment control measures can be implemented on-site to effectively protect downstream environmental values.

If site or financial constraints suggest that it is not reasonable or practicable for the prescribed water quality objectives to be achieved for the proposal, then the proponent must demonstrate that alternative designs or construction techniques (e.g. pole homes, suspended slab) cannot reasonably be implemented on the site.

WARNINGS:

Steep sites usually require more stringent drainage and erosion controls than flatter grade sites.

COMMENTS:

The steeper the land, the greater the need for adequate drainage controls to prevent soil and mulch from being washed from the site.

[2] **REQUIREMENTS:**

If the actual soil K-factor is known from soil testing, then the Score shall be determined from Table 1.

If a preliminary ESCP is required during planning negotiations, then it must be demonstrated that adequate space is available for the construction and operation of any major sediment traps, including the provision for any sediment basins and their associated embankments and spillways. It must also be demonstrated that all reasonable and practicable measures can be taken to divert the maximum quantity of sediment-laden runoff (up to the specified design storm) to these sediment traps throughout the construction phase and until the contributing catchment is adequately stabilised against erosion.

WARNINGS:

The higher the point score, the greater the need to protect the soil from raindrop impact and thus the greater the need for effective erosion control measures. A point score of 2 or greater will require a greater emphasis to be placed on revegetation techniques that do not expose the soil to direct rainfall contact during vegetation establishment, e.g. turfing and *Hydromulching*.

COMMENTS:

Table 2 provides an *indication* of soil conditions likely to be associated with a particular Soil group based on a statistical analysis of soil testing across NSW. This table provides only an initial estimate of the likely soil conditions.

The left-hand-side of the table provides an indication of the type of sediment basin that will be required (Type C, F or D). The right-hand-side of the table provides an indication of the likely erodibility of the soil based on the Revised Universal Soil Loss Equation (RUSLE) K-factor.

Table 3 provides some general comments on the erosion potential of the various soil groups.

Table 1 – Score if soil K-factor is known

| | RUSLE soil erodibility K-factor | | | |
|--------------|---------------------------------|-------------|-------------|----------|
| | K < 0.02 | 0.02<K<0.04 | 0.04<K<0.06 | K > 0.06 |
| Score | 0 | 1 | 2 | 3 |

Table 2 – Statistical analysis of NSW soil data^[1]

| Unified Soil Class System | Likely sediment basin classification (%) | | | Probable soil erodibility K-factor (%) ^[2] | | | |
|---------------------------|--|-----------|-----------|---|-------------|-------------|-----------|
| | Dry | Wet | | Low | Moderate | High | Very High |
| | Type C | Type F | Type D | K < 0.02 | 0.02<K<0.04 | 0.04<K<0.06 | K > 0.06 |
| GM | 30 | 58 | 12 | 12 | 51 | 26 | 12 |
| GC | 42 | 33 | 25 | 13 | 71 | 17 | 0 |
| SW | 40 | 48 | 12 | 49 | 39 | 12 | 0 |
| SP | 53 | 32 | 15 | 76 | 18 | 5 | 1 |
| SM | 21 | 67 | 12 | 26 | 48 | 25 | 1 |
| SC | 26 | 50 | 24 | 16 | 64 | 18 | 2 |
| ML | 5 | 63 | 32 | 4 | 35 | 45 | 16 |
| CL | 9 | 51 | 39 | 12 | 56 | 19 | 13 |
| OL | 2 | 80 | 18 | 34 | 61 | 5 | 1 |
| MH | 12 | 41 | 48 | 15 | 19 | 41 | 25 |
| CH | 5 | 44 | 51 | 39 | 43 | 11 | 7 |

Notes: [1] Analysis of soil data presented in Landcom (2004).

[2] Soil erodibility based on Revised Universal Soil Loss Equation (RUSLE) K-factor.

Unified Soil Classification System (USCS)

GW Well graded gravels, gravel-sand mixtures, little or no fines

GP Poorly graded gravels, gravel-sand mixture, little or no fines

GM Silty gravels, poorly graded gravel-sand-silt mixtures

GC Clayey gravels, poorly graded gravel-sand-clay mixtures

SW Well graded sands, gravelly sands, little or no fines

SP Poorly graded sands, gravelly sands, little or no fines

SM Silty sands, poorly graded sand-silt mixtures

SC Clayey sands, poorly graded sand-clay mixtures

ML Inorganic silts & very fine sands, rock flour, silty or clayey fine sands with slight plasticity

CL Inorganic clays, low–medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

OL Organic silts and organic silt-clays of low plasticity

MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts

CH Inorganic clays of high plasticity, fat clays

OH Organic clays of medium to high plasticity

Table 3 – Typical properties of various soil groups ^[1]

| Soil Groups | Typical properties ^[2] |
|-------------|--|
| GW, GP | <ul style="list-style-type: none"> • Low erodibility potential. |
| GM, GC | <ul style="list-style-type: none"> • Low to medium erodibility potential. • May create turbid runoff if disturbed as a result of the release of silt and clay particles. |
| SW, SP | <ul style="list-style-type: none"> • Low to medium erodibility potential. |
| SM, SC | <ul style="list-style-type: none"> • Medium erodibility potential. • May create turbid runoff if disturbed as a result of the release of silt and clay particles. |
| MH, CH | <ul style="list-style-type: none"> • Highly variable (low to high) erodibility potential. • Will generally create turbid runoff if disturbed. |
| ML, CL | <ul style="list-style-type: none"> • High erodibility potential. • Tendency to be dispersive. • May create some turbidity in runoff if disturbed. |

Note: [1] After Soil Services & NSW DLWC (1998).

[2] Any soil can represent a high erosion risk if the binding clays or silts are unstable.

Table 4 provides **general** guidelines on the suitability of various soil groups to various engineering applications.

Table 4 – Engineering suitability based on Unified Soil Classification ^[1]

| Unified Soil Class | USC Group | Embankments | | Fill | Slope stability | Untreated roads |
|----------------------|-----------|-------------------------|---------------------|------------|-----------------|-----------------|
| | | Water retaining | Non water retaining | | | |
| Well graded gravels | GW | Unsuitable | Excellent | Excellent | Excellent | Average |
| Poorly graded gravel | GP | Unsuitable | Average | Excellent | Average | Unsuitable |
| Silty gravels | GM | Unsuitable | Average | Good | Average | Average |
| Clayey gravels | GC | Suitable | Average | Good | Average | Excellent |
| Well graded sands | SW | Unsuitable | Excellent | Excellent | Excellent | Average |
| Poorly graded sands | SP | Unsuitable | Average | Good | Average | Unsuitable |
| Silty sands | SM | Suitable ^[2] | Average | Average | Average | Poor |
| Clayey sands | SC | Suitable | Average | Average | Average | Good |
| Inorganic silts | ML | Unsuitable | Poor | Average | Poor | Unsuitable |
| Inorganic clays | CL | Suitable ^[2] | Good | Average | Good | Poor |
| Organic silts | OL | Unsuitable | Unsuitable | Poor | Unsuitable | Unsuitable |
| Inorganic silts | MH | Unsuitable | Poor | Poor | Poor | Unsuitable |
| Inorganic clays | CH | Suitable ^[2] | Average | Unsuitable | Average | Unsuitable |
| Organic clays | OH | Unsuitable | Unsuitable | Unsuitable | Unsuitable | Unsuitable |
| Highly organic soils | Pt | Unsuitable | Unsuitable | Unsuitable | Unsuitable | Unsuitable |

Notes: [1] Modified from Hazelton & Murphy (1992)

[2] Suitable only after modifications to soil such as compaction and/or erosion protection

- [3] If the soils have not been tested for Emerson Class, then adopt a score of 4.

REQUIREMENTS:

Works proposed on sites containing Emerson Class 1 or 2 soils have a very high pollution potential and must submit a conceptual ESCP to the regulatory authority for review and/or approval (as required by the authority) during planning negotiations.

WARNINGS:

Class 3 and 5 soils disturbed by cut and fill operations or construction traffic are highly likely to discolour stormwater (i.e. cause turbid runoff). Chemical stabilisation will likely be required if these soils are placed immediately adjacent to a retaining wall. Any disturbed Class 1, 2, 3 and 5 soils that are to be revegetated must be covered with a non-dispersive topsoil as soon as possible (unless otherwise agreed by the regulatory authority).

Class 1 and 2 soils are highly likely to discolour (pollute) stormwater if exposed to rainfall or flowing water. Treatment of these soils with gypsum (or other suitable substance) will most likely be required. These soils should not be placed directly behind a retaining wall unless it has been adequately treated (stabilised) or covered with a non-dispersible soil.

- [4] The duration of disturbance refers to the total duration of soil exposure to rainfall up until a time when there is at least 70% coverage of all areas of soil.

REQUIREMENTS:

All land developments with an expected soil disturbance period greater than 6 months must submit a conceptual ESCP to the regulatory authority for review and/or approval (as required by the authority) during planning negotiations.

COMMENTS:

Construction periods greater than 3 months will generally experience at least some significant storm events, independent of the time of year that the construction (soil disturbance) occurs.

- [5] **REQUIREMENTS:**

Development proposals with an expected soil disturbance in excess of 1ha must submit a conceptual ESCP to the regulatory authority for review and/or approval (as required by the regulatory authority) during planning negotiations.

The area of disturbance refers to the total area of soil exposed to rainfall or dust-producing winds either as a result of:

- (a) the removal of ground cover vegetation, mulch or sealed surfaces;
- (b) past land management practices;
- (c) natural conditions.

WARNINGS:

A *Sediment Basin* will usually be required if the disturbed area exceeds 0.25ha (2500m²) within any sub-catchment (i.e. land flowing to one outlet point).

COMMENTS:

For soil disturbances greater than 0.25ha, the revegetation phase should be staged to minimise the duration for which soils are exposed to wind, rain and concentrated runoff.

[6] REQUIREMENTS:

All developments that involve earthworks or construction within a natural watercourse (whether that watercourse is in a natural or modified condition) must submit a conceptual ESCP to the regulatory authority for review and/or approval (as required by the regulatory authority) during planning negotiations.

Permits and/or licences may be required from the State Government, including possible submission of the ESCP to the relevant Government department.

[7] REQUIREMENTS:

No areas of soil disturbance shall be left exposed to rainfall or dust-producing winds at the end of a development without an adequate degree of protection and/or an appropriate action plan for the establishment of at least 70% cover.

COMMENTS:

Grass seeding without the application of a light mulch cover is considered the least favourable revegetation technique. A light mulch cover is required to protect the soil from raindrop impact, excessive temperature fluctuations, and the loss of essential soil moisture.

[8] COMMENTS:

All receiving waters can be adversely affected by unnatural quantities of sediment-laden runoff. Freshwater ecosystems are generally more susceptible to ecological harm resulting from the inflow of fine or dispersible clays than saline water bodies. The further inland a land disturbance is, the greater the potential for the released sediment to cause environmental harm as this sediment travels towards the coast.

For the purpose of this clause it is assumed that all sediment-laden runoff will eventually flow into saline waters. Thus, sediment-laden discharges that flow first into freshwater are likely to adversely affect both fresh and saline water bodies and are therefore considered potentially more damaging to the environment.

This clause does **not** imply that sediment-laden runoff will not cause harm to saline waters.

[9] COMMENTS:

This clause refers to subsoils exposed during the construction phase either as a result of past land practices or proposed construction activities. The exposure of subsoils resulting from the excavation of minor service trenches should not be considered.

[10] WARNINGS:

The greater the extent of external catchment, the greater the need to divert up-slope stormwater runoff around any soil disturbance.

COMMENTS:

The ability to separate "clean" (i.e. external catchment) stormwater runoff from "dirty" site runoff can have a significant effect on the size, efficiency and cost of the temporary drainage, erosion, and sediment control measures.

[11] REQUIREMENTS:

Permission must be obtained from the owner of a road reserve before placing any erosion and sediment control measures within the road reserve.

WARNINGS:

Few sediment control techniques work efficiently when placed on a road and/or around roadside stormwater inlets. Great care must be taken if sediment control measures are located on a public roadway, specifically:

- safety issues relating to road users;
- the risk of causing flooding on the road or within private property.

The construction of roads (whether temporary or permanent) will usually modify the flow path of stormwater runoff. This can affect how “dirty” site runoff is directed to the sediment control measures.

COMMENTS:

“On-road” sediment control devices are at best viewed as secondary or supplementary sediment control measures. Only in special cases and/or on very small projects (e.g. kerb and channel replacement) might these controls be considered as the “primary” sediment control measure.

[12] WARNINGS:

Soils with a pH less than 5.5 or greater than 8 will usually require treatment in order to achieve satisfactory revegetation. Soils with a pH of less than 5 (whether naturally acidic or in acid sulfate soil areas) may also limit the choice of chemical flocculants (e.g. Alum) for use in the flocculation of *Sediment Basins*.

[13] REQUIREMENTS:

A preliminary ESCP must be submitted to the local government for approval during the planning phase for any development that obtains a total point score of 17 or greater or when any trigger value is scored or exceeded.