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SECTION 4 - EARTHWORKS

4.1 DESCRIPTION

This section covers the requirements for stripping topsoil, forming and grading of earthworks including excavation, placement and compaction of filling, disposal of surplus and unsuitable materials, and the trimming and shaping to alignments, grades, levels and cross sections shown on the drawings or as directed by the Superintendent.

This section also covers the cutting, filling, shaping and compaction of allotments and reserves as indicated on the drawings.

4.2 DEFINITIONS

Formation:

The finished surface after completion of the earthworks, excluding any cut or fill batters.

Subgrade:

The trimmed or prepared portion of the formation on which pavement and shoulders are constructed.

Boxing:

The space above the subgrade between shoulders or verges, within which the pavement will be constructed.

Batter:

The uniform side slope of a cut or fill.

Batter Point:

The intersection of the batter with the natural surface disregarding any batter rounding.

Table Drain:

A surface drain adjacent to the shoulder, or verge and generally with invert lower than the subgrade.

Catch Drain:

A surface drain above a cut batter or below a fill batter.

Verge:

The portion of the formation between the shoulder and the batter.

Unsuitable Material:

Those materials specified as such or which are soft, excessively wet, or unstable or otherwise not suitable for the specified use.

Pavement:

Unless otherwise specified or detailed on the drawings, pavement shall consist of subbase, base and bituminous surfacing courses.

4.3 CONFORMITY WITH DRAWINGS

Earthworks shall be finished to conform within the following limits to the levels, lines, grades and cross sections specified or shown on the drawings:

(a) Formation Width and Alignment

The widths measured on each side from the specified centreline or design line to the toes of cut batters and/or the tops of fill batters shall be not less than the widths specified or shown on the drawings, and no portion of cut batters shall encroach within these widths.

(b) Boxing Width and Alignment

The boxing width shall not be less than specified or shown on the drawings and the edge of boxing shall not deviate by more than 100 mm from the designed offset from the centreline or design line.

(c) Formation Level and Shape (Outside Subgrade Width)

Prior to topsoiling, the level at any point on the finished surface outside those areas to be paved shall not differ by more than 50 mm from the specified level and the surface shall be free from depressions capable of retaining water. No point on the surface shall lie more than 25 mm below a 3 m straightedge laid on the surface.

(d) Subgrade Level and Shape

The level at any point on the subgrade shall not differ by more than 10 mm above or 30 mm below the specified level and no point shall lie more than 20 mm below a 3 m straightedge laid in any direction, except across a crown.

(e) Batter Slope and Shape

At any cross section the batter slope shall not be steeper than the slope specified. The batter face shall be finished to uniform shape.

(f) Batter Line

Cut batters shall be so constructed that the batter point is not more than 10% of the batter height outside the calculated batter line.

Fill batters shall be so constructed that the toe of the batter is not more than 10% of the batter height outside the calculated batter line.

Notwithstanding the above, in built up areas and on sections beneath bridges, and on other sections where it becomes necessary to confine the lateral spread of the earthworks to closer limits due to site constraints, the tops of cut batters and the toes of fill batters shall be not more than 300 mm outside the calculated batter lines.

(g) Drain Level

Surface drain invert and side slopes shall be finished to within 50 mm of the specified level at any point and shall be free from depressions capable of retaining water.

(h) Kerb and Channel

Where kerbing and channelling is to be constructed, the Contractor shall excavate the road pavement bed to the underside of the road pavement for the full width to provide a clear 300 mm space behind kerbs on each side of the road bed.

4.4 STRIPPING OF TOPSOIL

In cut and fill areas, the Contractor shall remove a sufficient quantity of the best topsoil available from the site before commencing excavation to be used as topsoil for the naturestrips, batters, easements and disturbed areas.

The Contractor shall be responsible for ensuring that there is sufficient topsoil to reinstate and topsoil all areas as required. If sufficient topsoil is not available on-site, the Contractor shall import topsoil at the Contractor's expense.

Topsoil shall be fertile, dark coloured loam, friable soil containing organic matter and shall be free from subsoil, refuse, tree roots, noxious weeds, clay lumps and stones.

Unless otherwise specified, topsoil shall be stripped from cut and fill areas:

- (a) between the limits of the batters as defined by the line through batter points extended to include any rounding;
- (b) by means which do not increase the extent of unstable areas; and

(c) be placed in stockpile or prepared areas.

The Contractor shall treat and manage site topsoil before stripping, and after spreading, to remove and/or minimise the spread of weeds and other pathogens and pest organisms throughout the site.

Stripped topsoil shall not be mixed with subsoil. Stockpiles shall be maintained in a neat, well shaped state capable of shedding water.

Stripped surfaces which are to be surveyed for measurement purposes shall be graded to an even self-draining surface.

On completion of the works, fill areas, easements and naturestrips shall be surfaced with a 75 mm minimum depth of topsoil. Naturestrips shall be neatly raked and trimmed on an even grade from building line to back of kerb.

4.5 SITE EXCAVATION

(a) General

Excavation of roadways, allotments or reserves shall consist of:

- (i) excavation, removal and satisfactory disposal of all materials from within the limits of the works; and
- (ii) all shaping and sloping for the construction, preparation and completion of the design surface, subgrade, shoulders, batters, catch drains, intersections or reserves, approaches and private entrances;

to the required alignments, grade and cross sections shown on the drawings or established by the Superintendent.

Where specified, pavement materials shall be salvaged from existing pavements and spread or stockpiled as directed.

Surplus excavated material shall be disposed of in accordance with clause 4.7 below.

(b) Excavation Operations

The Contractor shall so conduct the operations that the area outside the limits of the excavation is not unduly disturbed. Any falls or slips of material that occur due to the Contractor's negligence or use of inappropriate methods shall be removed and the area reinstated by the Contractor and no additional payment will be made for this work.

Loose and unstable rock on cut batters shall be removed immediately.

(c) Treatment of Subgrade

Unless otherwise specified, where the excavation at subgrade level is rocky material, the subgrade shall be loosened and rocks or boulders removed to a depth of at least 150 mm below subgrade level in areas on which pavement is to be placed. Any resulting depressions shall be backfilled with approved material properly compacted and drained to suitable outfalls, or in the case of isolated boulders, with properly compacted material similar to the surrounding in situ material.

No additional payment will be made for this work.

Where removal of material below subgrade level is not required the surface shall not be disturbed by ploughing or scarifying below formation levels as indicated on cross section plans.

(d) Cut to Fill Zones

Unless otherwise specified:

- (i) the excavation in cut to fill zones shall be continued, in the form of transverse benching, across the cut/fill interface for a distance sufficient to ensure that a minimum thickness of fill of 600 mm is achieved across the full width of the formation except that such distance shall not exceed 30 m on the fill side of the interface;
- (ii) in sideling country the cut shall be excavated to a depth of 600 mm below subgrade level for the full cut width of the subgrade.

No additional payment will be made for any work required to comply with this sub-clause.

(e) Rock Excavation

Blasting will not be permitted without the written approval of the Superintendent.

(f) Groundwater

HP Where groundwater or seepage is encountered the Contractor shall notify the Superintendent and any action to be taken shall, unless otherwise specified, be submitted to the Superintendent for review.

(g) Surface Finish of Cut Batters

Unless otherwise specified, cut batter surfaces to be topsoiled shall be lightly scarified or otherwise grooved horizontally.

(h) Table Drains

All table drains in cuttings shall be constructed as shown on the plans. On the outside of curves in cuttings, the depth of the table drain shall be increased sufficiently to maintain a suitable fall. Table drains shall be evenly graded without lodgement or obstruction, and shall be diverted where directed into side drains or culverts, such diversion drains being made with proper fall.

4.6 REMOVAL OF SOFT SPOTS OR UNSUITABLE MATERIALS

(a) General

Where directed by the Superintendent, the Contractor shall remove or treat any soft, wet or unsuitable material in accordance with this clause by means which do not increase the extent of unstable areas.

(b) Cuts

In cuts, unsuitable materials which exist or develop during construction immediately below subgrade level, or the level of the bottom of any select subgrade or capping layer fill, shall be treated in situ or be excavated and replaced with suitable material which shall be spread and compacted as specified in layers not exceeding a compacted thickness of 150 mm.

Where material:

- (i) is unsuitable and does not exceed 150 mm in depth, it shall be treated in situ or excavated and replaced and no additional payment will be made for this work;
- (ii) is unsuitable and exceeds 150 mm in depth, it shall be treated in situ or excavated and replaced and the Contractor will be paid an extra for such excavation and backfilling at the rate set out on the tender form or, where no such rate exists, the Superintendent will value the work in accordance with the provisions of the General Conditions of Contract;
- (iii) has become unsuitable to any depth due to the Contractor's negligence or use of inappropriate methods it shall be treated in situ or excavated and replaced and no additional payment will be made for this work.

(c) Areas Upon Which Fill is to be Placed

After completion of clearing, grubbing and stripping of areas upon which fill is to be placed, any unsuitable material immediately below these areas shall be treated in situ or be excavated and replaced with suitable material which shall be spread and compacted as specified.

The Contractor will be paid an extra for such excavation and backfilling at the rate set out on the tender form or, where no such rate exists, the Superintendent will value the work in accordance with the provisions of the General Conditions of Contract except that, where material has become

unsuitable due to the Contractor's negligence or use of inappropriate methods, no additional payment will be made for this work.

(d) Treatment of Unsuitable Materials

HP Where unsuitable material is encountered the Contractor shall submit to the Superintendent for review the proposed in situ treatment or extent of excavation.

(e) Fills

Unsuitable materials in fills shall be treated in situ or be excavated and replaced. No additional payment will be made for this work.

4.7 DISPOSAL OF SURPLUS OR UNUSABLE EXCAVATED MATERIAL

Surplus or unusable excavated material is material which is surplus to the total quantity of excavated material required for the work under the Contract.

The Contractor shall notify the Superintendent of any requirement to dispose of surplus or unusable excavated material.

The Superintendent may direct the Contractor to dispose of any or all surplus spoil within a lead of 5 km from the site of the works. Where not directed by the Superintendent, the Contractor shall be required to dispose of any surplus spoil off the site of the works. The Contractor shall comply with all regulations and by-laws and pay all fees and charges to all parties relating to the transport and placement of the surplus material.

On no account shall any surplus spoil be deposited on private land, without the written permission of the landowner. Should any such spoil be placed on property not owned by the Contractor, then the Superintendent shall require the Contractor to obtain a clearance in writing from the owner of the property on which spoil has been placed before making the final payment. No spoil shall be dumped on reserves or roadsides without prior written permission of the Superintendent.

4.8 BORROW EXCAVATION FROM SOURCES NOMINATED BY THE CONTRACTOR

Borrow excavation shall be limited to the quantity of material necessary to complete the work under the Contract and will not be permitted where sufficient suitable material from within the limits of site excavation is available.

Where borrow material is required to complete the work under the Contract it may be obtained from one or more sources.

The Contractor shall submit details of borrow areas and samples of materials to be obtained from each area to the Superintendent for approval. The Superintendent may prohibit the use of any materials and may require that particular materials be used in particular locations.

No material shall be borrowed from within the road reserve but the Superintendent may approve material being obtained from within the road reserve as follows:

- (a) by uniform widening of the formation in cutting;
- (b) by uniform flattening of cut batters;
- (c) by uniform grading of selected areas within the road reserve.

4.9 FILLING

(a) General

Fill construction includes the preparation of areas upon which fills are to be constructed and the selection, placement, and compaction of fill.

Material to be used for fill construction shall consist of approved materials, free from logs, stumps and weeds, or other perishable matter.

(b) Areas upon which Fills are to be Constructed

Areas upon which fills are to be constructed shall first be cleared and grubbed, as specified.

After completion of clearing, grubbing and stripping of areas upon which filling is to be placed, and prior to filling, the surface of the prepared area shall be test rolled in accordance with the Contractor's approved test rolling method and any unstable areas detected by test rolling shall be rectified by the Contractor using methods agreed to by the Superintendent and shall be re-presented for test rolling.

Where the height of fill to be placed over the stripped surface is less than 1.0 m, material immediately below the surface exposed after stripping of topsoil or removal of existing pavements shall be scarified to a depth of not less than 150 mm and compacted to meet the specified requirements.

Existing pavements which are not required to be salvaged shall be scarified to a depth of not less than 150 mm and compacted as specified.

HP Where groundwater or seepage is encountered the Contractor shall notify the Superintendent and any action to be taken shall, unless otherwise specified, be submitted to the Superintendent for review.

HP The Contractor shall not commence placing any fill on the prepared areas until the Superintendent has inspected these areas and has given consent to proceed.

(c) Benching

Where a fill is to be constructed on hillsides or against existing fills, or where new fills are constructed part width at a time, surfaces on or against which the fill is to be constructed which have a slope steeper than 4 horizontally to 1 vertically shall, unless otherwise specified be cut progressively in the form of benches over the full area to be covered by new fill. The width of each bench shall be such as to permit safe and effective operation of plant but shall be not less than 2 m.

Material excavated during benching may be used in the fill if it is of the quality specified for the purpose.

No additional payment will be made for any work required to comply with this sub-clause.

(d) Placing of Fill

(i) General

Fill shall be placed and spread in uniform layers and shall be compacted to meet the specified requirements.

The Contractor shall ensure that an adequate bond will develop between each layer of fill.

Any rocky material present in the fill for any layer shall be uniformly distributed within the layer and the whole shall be compacted as specified.

During the placement of fill the surface of each layer shall be kept generally parallel to the surface of the subgrade. Prior to the cessation of work each day, the top of the fill shall be shaped and compacted to minimise damage resulting from wet weather.

The Contractor shall construct all embankments so that after shrinkage and settlement and at the time of acceptance of the project they shall have the required grade, width and cross section at all points.

(ii) Common Fill

Common fill shall be placed in locations shown on the drawings.

Unless otherwise specified the compacted thickness of each layer shall not exceed 150 mm except where rocky material containing by volume 25% or more of material which will not break down significantly during compaction and which is too large to be compacted in layers 150 mm thick is used. Such rocky material shall be confined to the lower layers of fills as far as is practical and at least 200 mm below subgrade level, and below the finished surface of verges and batters.

Unless otherwise specified, the loose thickness of layers of rocky material shall not exceed the maximum size of the rock and not exceed 500 mm and the size of the material shall not exceed 80% of the loose thickness of the layer. The interstices around the rock in each layer shall then be filled to the greatest extent possible, with earth or other fine materials, and the whole layer compacted until there is no visible evidence of further consolidation of the material being compacted.

4.10 FILL AT STRUCTURES

(a) General

This clause covers the requirements for the placement and compaction of fill adjacent to or preparatory to the construction of structures such as bridge abutments, retaining walls, wing walls and large culverts that are not otherwise provided for in this Section or any other special provision in the Contract. Such fill shall be placed at locations as specified or shown on the drawings.

(b) Fill at Structures

Filling over and around pipes, culverts, bridges and other structures shall be compacted in such a manner that will avoid unbalanced loading and that will not cause movement or place undue strain on any structures.

HP No fill shall be placed within 3 m of a structure until the foundation for the fill has been reviewed by the Superintendent.

No fill shall be placed against concrete within 14 days of casting.

Unless a geotextile material is specified as a drainage medium or unless otherwise specified, material to be placed within 300 mm of bridge abutments, retaining walls, wing walls or large culverts shall consist of permeable fill. The permeable fill shall be placed in conjunction with the adjacent fill in layers not exceeding 150 mm compacted thickness and compacted to refusal using hand held mechanical equipment. The bottom of the permeable fill or any geotextile material shall be connected to suitable drainage outfalls as shown on the drawings or as otherwise specified.

Material to be placed between the permeable fill or geotextile material and 3 m from the face of such structures shall, unless otherwise specified be structural fill. Such material shall be spread in horizontal layers not exceeding 150 mm compacted thickness and compacted as specified.

(c) Fill Placed Prior to Erection of Structures

Material placed within 3 m of any future structure shown on the drawings shall, unless otherwise specified, be structural fill.

4.11 FILLING OF ALLOTMENTS

Where filling of allotments is less than 300 mm for clayey soils and 600 mm for sandy soils, fill should be rolled with at least 6 passes of a suitably sized roller. Where filling on allotments is more than 300 mm for clayey soils and 600 mm for sandy soils, the fill should be placed and compacted in a controlled manner so as to satisfy table 5.1 of AS 2870.1 – 1998.

The Contractor shall engage a geotechnical testing authority registered with the National Association of Testing Authorities (NATA) to carry out appropriate field compaction tests to ensure that the fill is placed in accordance with AS 3798 – 1990. The frequency of testing shall not be less than specified in Table 8 of AS 3798 – 1990.

On the completion of filling, the geotechnical testing authority shall provide a report setting out the inspections, sampling and testing carried out, and locations of results thereof. The geotechnical testing authority shall also provide a report expressing an opinion that the works comply with the requirements of the specifications and drawing and that the filled area is suitable for the intended use.

Two copies of the results and the fill report shall be forwarded to the Frankston City Council at the completion of the works.

4.12 EARTHWORKS PLANT & EQUIPMENT

The Contractor shall provide and operate sufficient earthworks plant and equipment of suitable type and mass to carry out the works in accordance with the specification.

4.13 COMPACTION OF EARTHWORKS

Compaction of earthworks shall include the compaction of the subgrade in cuttings, the compaction of areas upon which fills are to be placed, and the compaction of all material to the standards indicated hereunder.

- (a) The top 150 mm of the subgrade in cuttings shall be compacted to produce a dry density not less than 95% of the maximum value obtained in the Standard Compaction Test, in accordance with AS 1289 – 1993.
- (b) Areas upon which fill is to be placed shall be compacted to produce a dry density not less than 95% of the maximum value obtained in the Standard Compaction Test, in accordance with AS 1289 – 1993.
- (c) All fill material shall be compacted to produce a dry density not less than 95% of the maximum value obtained in the Standard Compaction Test, in accordance with AS 1289 – 1993.

The Contractor shall carry out testing at a frequency as specified in Clause 4.14.

Unless otherwise specified, filling shall have during compaction a moisture content within the range 85% - 120% of the optimum moisture content as determined in the Standard Compaction Test, in accordance with AS 1289 – 1993.

After completion of compaction of a layer, the moisture content of the material in the layer shall be maintained within the range specified until the layer has been test rolled.

Construction equipment and traffic shall not be allowed on the subgrade or fill while it is in a wet condition. Material which has become wetted beyond 130% of optimum moisture content shall be dried or removed from the site and replaced by material of suitable moisture content for compaction at the Contractor's expense.

The formation shall receive a final shaping with grading machine, supplemented with handwork where necessary, to ensure a smooth surface and uniform cross sections. When final shaping is complete, the surface of the subgrade shall conform accurately to the line, grade and cross section shown on the plans, and no roots, sod or other deleterious matter or stones which would fail to pass a 75 mm ring shall be in the top 150 mm of the subgrade.

4.14 MINIMUM TESTING REQUIREMENTS

The work shall be tested in lots, a lot consisting of a single layer of work which represents an area equivalent to a days production. For work to be tested for compliance with Table 4.14.1 the number of tests per lot shall be a minimum of six (6).

Table 4.14.1

Material	Density Ratio	Assessment
Fill material placed anywhere in earthworks, and the top 150 mm of areas under fill where specified.	Not less than 95%	Accept lot
	93.5% to 94.9%	Re-roll as agreed with Superintendent
	Less than 93.5%	Reject lot

4.15 TEST ROLLING

HP The Contractor shall submit to the Superintendent for review a test rolling procedure to be used where specified or directed. The procedure submitted by the Contractor shall include details of when test rolling will be undertaken, the method of preparing an area for test rolling and the extent of test rolling.

Areas upon which fills are to be constructed, all layers of fill, and material within 150 mm of subgrade level in cuts, shall be compacted so as to be capable of withstanding test rolling with a smooth steel wheel roller or pneumatic tyred roller ballasted to comply with the following;

- (a) Steel wheeled – not less than 12 tonne mass with a load intensity on the rear wheels of not less than 6 tonne per metre width;
- (b) Pneumatic tyred – not less than 4.5 tonne per tyre with tyres inflated to 700 kPa.

The moisture content of the compacted material being test rolled shall be as specified in Clause 4.13. Each layer should be test rolled immediately following completion of compaction but if test rolled at some later date the surface shall be watered and given not less than eight coverages of the testing roller by the Contractor before test rolling commences.

HP Test rolling shall be undertaken in accordance with the accepted procedure in the presence of the Superintendent.

Compliance with compaction requirements shall be when an area withstands test rolling without visible deformation or springing.

The Superintendent reserves the right to direct the Contractor to undertake further test rolling on any layer prior to it being covered by a successive layer. No additional payment will be made for any requirement to carry out such further test rolling.

4.16 PREPARATION OF SUBGRADE

The subgrade surface shall be prepared to the design shape and within the design tolerances to produce a smooth, hard, tightly bound surface, free from depressions capable of holding water.

HP The pavement subgrade shall be inspected and approved by the Superintendent prior to the placing of any road pavement material.

Unless otherwise specified, material within 150 mm of the subgrade shall have a moisture ratio not less than 70% as determined by test using Standard compactive effort immediately prior to the placement of any subsequent pavement. Where this material has a swell equal to or greater than 2.5 percent the moisture ratio shall be maintained at a characteristic moisture ratio of not less than 90% between the completion of rolling and the placement of the overlying layer.

4.17 TOPSOILING

Unless otherwise specified, all unpaved cut and fill areas within the limits of the batters, including roundings, and any other area disturbed by the Contractor's operations, but excluding cut batters in rock and the subgrade, shall be topsoiled to the following compacted thicknesses measured normal to the slope:

- (a) mulched planting bed areas - 300 mm
- (b) all areas to be grassed (hydroseeding) - 75 mm.

After placing, the topsoil shall be firmly compacted. Topsoiled batters shall be left roughened to reduce rilling.

All stockpile sites shall be left in a neat, well graded state on completion of topsoiling.

4.18 BATTERS FOR ROAD FORMATION WORKS

Batter slopes in filling shall generally be 1 in 5 and in cutting shall generally be 1 in 3, except where otherwise directed or specified. All batters, in cut and fill, shall be neatly trimmed.

The table drains and upper edges of embankments shall be ranged in lines, strictly in conformity with the centre line of formation.

Cut and fill batters less than 600 mm in height shall be uniformly graded, to meet the natural surface along the property boundary where clearing permits, or at a slope not steeper than 1 in 5.

Protection works as directed and specified by the Superintendent shall be carried out on all batters steeper than 1 in 3.

4.19 TABLE AND SIDE DRAINS FOR ROAD FORMATIONS

Any table drains in cuttings shall be formed and evenly graded parallel to the centre line of the road, without lodgement or obstruction, and shall be diverted where indicated on the plans, into side drains or culverts, such diversion drains being made with proper fall and not less than 300 mm deep and one metre wide on the surface.

Side drains shall be excavated to the widths and depths shown on plans, evenly graded, parallel to the centre line of the formation, not nearer than one metre to the fence lines, with sides neatly battered as indicated or directed, and diverted into outlet drains or waterways.

If so ordered, the excavated material shall be used in the formation, or banked on the low side of the drain, leaving a 500 mm margin.

4.20 MODIFICATIONS AND/OR ADJUSTMENTS TO INTERSECTIONS

The Superintendent reserves the right to require the details of the type sections to be modified or adjusted, as necessary at intersections, or other such places, and directions given by the Superintendent in such matters must be given immediate effect by the Contractor.

If in any case such directions necessitate the provision of extra materials or the carrying out of further excavations over and above those necessary otherwise, such will be paid for in accordance with the relevant provisions of the General Conditions of Contract.

4.21 PRIVATE ENTRANCES

All existing entries shall be re-established and vehicle access shall be provided to all properties as set out below.

All allotments must be accessible at the title boundary at a maximum grade of 1 in 5. Where the grade of such access is unobtainable within the road reserve and the construction work must be extended into the property to achieve an acceptable grade, the Contractor shall contact the property owner and obtain agreement with the property owner as to the extent of the works required prior to commencement.

If such agreement cannot be obtained, the Contractor shall refer the matter to the Superintendent for resolution.

Concrete vehicle crossings as detailed in Standard Drawing SD 310 shall be constructed where shown on the drawings.

If no concrete vehicle crossings are to be constructed, a compacted crushed rock driveway of 150 mm compacted thickness of 20 mm Class 3 Fine Crushed Rock shall be constructed where shown on the drawings:

- (i) from the building line to the back of kerb; or
- (j) from the building line to the edge of seal, including the installation of a culvert crossing (if required) as per Frankston City Council Standard Drawing SD 311;

of a width to match the gateway or a minimum of 3 metres.

Nature strip beside any driveway shall be shaped to match the driveway at a grade suitable for mowing.

4.22 LOCATION OF STOCKPILES

Stockpiles shall be located in nominated areas only. Stockpiles shall not be located in areas of existing vegetation or groundcovers or near drainage lines and shall be protected from erosion by seeding with sterile annual grass or other protective measures.