

Engineering Design Specification D04 Site Regrading

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Site Regrading

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1 General

1.1 Introduction

1.1.1 Worksection application

Description: This worksection is applicable to the design and documentation requirements for site regrading for both Council works and land development and subdivisions.

1.2 Responsibilities

1.2.1 General

Requirement: Provide design and documentation for site regrading works for land development and subdivisions.

1.3 Interpretation

1.3.1 Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- ARI: Average recurrence interval.
- EPA: Environmental protection agency.
- WAE: Work-as-executed.

1.3.2 Definitions

General: For the purposes of this worksection, the following definitions apply:

- Advanced plants (species): Plant species containerised and established in 300 mm containers but less than 45 L containers.
- Geotechnical Engineer - is an appropriately qualified Engineer, approved by Council for the specific project they are assessing

2 Pre-design planning

2.1 Planning

2.1.1 Site suitability

Improvement: The natural state of a site may not be suitable for the intended function. Site regrading may be required to:

- Alleviate flooding (Refer Council's DCP for Flood Liable Land).
- Fill gullies or create emergency flowpaths after installation of underground stormwater systems.
- Improve stormwater runoff.
- Reduce excessively steep slopes, to allow construction of economical foundation solutions.
- Allow effective recreational use or provide improved access.
- Fill local unwanted depressions.
- Improve ground conditions in areas where existing soils have plastic/reactive properties.

Contours: Review the natural surface contours and design finished surface levels to confirm land will be suitably prepared for use.

2.1.2 Land use restrictions

Constraints: Identify all constraints, natural or otherwise, which may apply to the site. These may ultimately be reflected by a legal 88B Instrument “Restriction as to User”, and/or by a Section 149 notation on the property.

2.2 Environmental investigation and planning

2.2.1 Development precinct investigation

Geotechnical investigation: To AS 1726.

Requirement: Prepare a survey and geotechnical report to establish locations of site features, levels and grade, and soil conditions.

Soil properties: Investigate the development precinct soil condition to determine the following:

- Chemical characteristics and compatibility of the soils when they are in contact with foundations of buildings, roads, sewers and services for the development and the appropriate precautions that can be taken.
- Acid sulfate soils.
- Climatic conditions, such as frost susceptibility, especially for road subgrade construction.
- Soil salinity: Evaluate existing soil conditions in known salt affected areas, or areas found to be salt affected by the geotechnical investigations.

Embankments: Determine the stability and base/top levels of embankment.

2.2.2 Potential environmental impacts

Requirement: Check the development area/precinct for potential environmental impacts by the development including the following:

- Heritage items.
- Effects on water quality and inundation.
- Endangered species requiring protection.
- Wildlife habitat.

Details of potential impacts: If there are potential impacts, provide details of the issues and proposed control measures for minimising the impact and protecting the surrounding environment before starting design. This may be in the form of an environmental impact statement (EIS), to be included in the Preliminary design report.

2.3 Consultation

2.3.1 Council and other Authorities

Requirement: Consult with the Council and other relevant authorities during the preparation of design.

Council consultation: Liaise with the Council’s officer(s) before starting design to identify design requirements, including the following:

- Haul routes: Consult to define acceptable routes for haulage and applicable load limits.
- Tree protection: Consult with the tree preservation officer to identify requirements and restrictions relating to tree protection and site clearing.
- Waste disposal: Consult and obtain approval for cleared/excavated materials disposal facilities.
- Fill materials: Consult to establish restrictions, if any.

Other authorities: Consult with and seek approval for the development from the following state government authorities:

- Land and water resources department: Consult the authority to identify areas requiring action to prevent salination.
- EPA: Consult the EPA on sedimentation, siltation, erosion and salination control requirements.

2.3.2 Utilities services plans

Existing services in the development area/precinct: Liaise with the utility authorities affected by the scheme and if required, obtain service plans from the authorities of the proposed development area for above ground and below ground services. Plot these services on the relevant drawings, including the plan and cross-sectional views.

Utility services location: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

2.3.3 Adjoining property owners

Protection of existing asset/infrastructure: Obtain drawings of existing infrastructure, including landscaping within and adjacent to the site. Consult with owners to identify protection requirements.

Property owner approval: After liaising with the EPA and obtaining approval from the Council for proposed sediment, siltation, erosion or salinity control measures, obtain written agreement from the adjoining property owners before carrying out construction work on their property.

Agreement records: Submit all agreements to the Council.

3 Design Criteria

3.1 General

3.1.1 Design objective

Requirement: Design site regrading works for the proposed development/subdivision to:

- Provide an efficient and economical design.
- Enhance the environment of the site and maintain the site's natural features.
- Provide safe conditions for construction.
- Provide equal building conditions for all residential development allotments.
- Minimise impact on existing natural environment, adjoining properties and other works.
- Minimise regrading in heavily treed areas.
- Maintain or improve drainage, overland flow paths, riparian zones and existing watercourses.

Natural environment: Consider the implications of site regrading for the existing natural environment. Minimise site regrading in heavily treed areas. These areas should be fenced to avoid damage during construction activities.

Haulage: For areas where site regrading is required, design regrading requirements in conjunction with the roadworks design, taking into consideration the following objectives:

- Balancing cut to fill.
- Achieving economical works.
- Minimising the haulage of imported fill or spoil.

- Minimising adverse effect of bulk haulage on adjacent developments and infrastructure.

3.1.2 Related design requirements

Control of erosion and sedimentation: To *D11 Control of erosion and sedimentation (Design)*.

Road system design: To *D05 Geometric Road Layout*

Balancing earthwork volumes for road vertical alignment: To the Austroads AGRD07 clause 4.3.2.

Drainage and run-off: To *D09 Stormwater drainage (Design)*.

3.1.3 Geotechnical design

Requirements: Incorporate all requirements and recommendations from the geotechnical investigation report.

3.1.4 Statutory performance requirements

Requirements: Define specific local performance requirements/policies/laws relating to site regrading.

Authority requirements: Draw attention to any specific requirements of other regulatory bodies.

3.1.5 Salination prevention

Regrading strategies: Allow for strategies aimed at lowering the groundwater table and measures to prevent extension of salination.

3.1.6 Approval

EPA: The designer shall refer to the State Environmental Protection Authority (EPA) with regard to any items requiring specific consideration when preparing a site regrading plan.

Measures: Make enquiries with EPA and subsequently obtain Council approval for any proposed sediment, siltation, erosion or salinity control devices/measures, with specific reference to the stage at which they are to be provided.

3.2 Drainage and runoff

3.2.1 General

Surface water drainage: Design site regrading so that surface water flow naturally to roads or drainage reserves, without excessive concentration. Minimise the use of underground drainage systems with surface inlet pits.

Overland flow paths: Provide depressions for overland flow from low points and over major drainage lines, to direct stormwater for storms of up to a 100 year ARI.

3.2.2 Flood prone areas

Refer to Council's DCP Flood Liable Land

3.2.3 Finished surface levels of building areas

Building area finished surface levels: Design surface gradients to the catchment area drainage system as follows:

- Desirable minimum surface grading: 1.5%.
- Absolute minimum surface grading: 1.0%.

Steep building areas: For building areas with natural ground slopes greater than 15%, obtain confirmation from a geotechnical engineer of the site's suitability for the proposed development. Include specific requirements on the drawings, address requirements included in **Site suitability for the proposed development**.

Piped gullies or depressions: Design finished surface levels to provide adequate cover depth over pipelines (if piped) and to direct surface stormwater flow to inlet pits (if depressions are retained in the finished surface contours).

3.2.4 Temporary diversion drains

Requirement: Design diversion drains to divert surface flows away from the regrading area, and minimise soil disturbance and material loss from the development site.

Control measures: Measures which can be used include but are not limited to the following:

- Trench stops at 30 m spacing along a trench with overtopping directed to the kerb.
- Blue metal bags placed along the kerb and gutter at maximum 30 m spacing.
- Blue metal bags placed around downstream drainage pits.
- Specific requirements for the control of erosion and sedimentation.

Construction requirements: To C04 Control of erosion and sedimentation (Construction) for further erosion and sediment control requirements.

3.2.5 Adjoining properties

Stormwater easement: If diverting or directing piped stormwater into adjoining properties is proposed, create drainage easement rights over adjoining lots to *D09 Stormwater drainage (Design)*.

Construction agreement: A written agreement shall also be sought to carry out construction work on adjoining properties and all such agreements shall be submitted to Council prior to approval of such works.

3.3 Clearing

3.3.1 Areas to be cleared

Requirement: Identify areas for clearing of the following:

- Low scrub.
- Fallen timber.
- Debris.
- Stumps.
- Large rocks.
- Roots and loose timber which may contribute to drain blockage.
- Trees the Council considers are approaching the end of their functional life or dangerous/hazardous for the proposed development.

Construction requirements: Refer to C05 Clearing and grubbing for clearing, grubbing and vegetation removal for site works.

Special requirements:

- All proposed vegetation removal and management shall be shown on the development application plans. Councils' Tree Preservation Order should be consulted when preparing these plans.

Document:

- Indicate special requirements of Council on the drawings.

3.3.2 Stripping and stockpiling

Stripping of topsoil: Design regrading so that topsoil stripping is minimised, taking into consideration the subsoil properties and earth moving plants required. For example, clay subsoil deteriorates when exposed to wet weather and quickly becomes unworkable.

Spoil stockpiling: Determine location and size of spoil stockpile, taking into consideration the following:

- The need to keep topsoil on site.
- Reusability of the topsoil.
- Locations where topsoil is to be replaced.
- Time period before topsoil is to be re-used. Topsoil can deteriorate if stockpiled for a long time, e.g. segregation by weathering or changes in internal water pressures from excessive stockpile height.
- Construction working areas.
- Slope stability.

Maximum topsoil stockpiling period: Check suitability of topsoil, if stockpiled for lengthy periods. State the maximum length of time, acceptable to Council, the topsoil may be stockpiled.

3.3.3 Disposal of cleared materials

Requirement: Identify materials for removal from the site, including all cleared materials, in the Waste Management Plan and allow for its disposal to regulatory requirements.

3.4 Filling and embankments

3.4.1 Slope stability

Stabilisation measures: Allow for stabilising measures, including retaining walls, as appropriate for the development site conditions. Consider future access and maintenance requirements.

Slope angle: Determine safe angles for slopes based on material properties under the worst site conditions possible.

3.4.2 Trees

Filling over tree butts: Where overfilling is required, allow for clearing/relocation of trees and replanting (with advanced species if cleared). Obtain approval from the Council for the type and number of trees for clearing, relocation and replanting.

Replanting: Allow for trees to be planted clear of probable future building locations, after filling is completed and graded. Include provisions for watering and maintenance during the contract period.

Trees requiring preservation: To AS 4970 for guidance on protecting trees on development sites. For trees selected for preservation, provide measures for protecting against damage caused by fill placement or other actions within the tree drip zone.

3.4.3 Fill

Properties: Sound clean material and free from large rock, stumps, organic matter and other debris.

Material selection: Select suitable fill materials based on following considerations:

- Purpose of embankment.
- Availability of local material.
- Consolidation and settlement properties of the fill material.
- Wet weather working.
- Plant equipment required on site.
- Fill material requirements to C06 Earthworks (Road reserve).

Placing of fill: Fill placement over prepared areas cannot start without Council's permission. Include in the development documentation, requirements for obtaining Council's approval before starting.

Quality and compaction: Conform to AS 3798, and AGPT08 section 4. Fill is to be placed in layers not exceeding 200mm compacted thickness. All fill is to be compacted to 95% standard dry density. Maximum particle size shall be 2/3 of the layer thickness.

Quantity: Design site regrading so that the balance between cut and fill is the most economical.

Restricted fill: If use of restricted fill is intended, obtain approval from the Council for material type and intended location before including in the development proposal. This is applicable to fill material comprising natural sands or industrial wastes/by-products.

It should be noted that failure to obtain the councils' approval may lead to an order for the removal of any material considered by the Council or other relevant authorities as unsuitable or in any way unfit for filling.

Certification:

- Stripping and filling shall be supervised by a geotechnical Engineer and certified with a lot classification.
- Section 88B notation: The presence, extent, depth and type of fill is to be detailed in the geotechnical report and referenced in the 88B instrument.

3.4.4 Lot Classification

For all residential subdivisions greater than 3 lots, the geotechnical lot classification.

Pursuant to AS2870 – Residential Slabs and Footings shall be incorporated into a Section 88B Instrument.

3.4.5 Top dressing

Landscaping: Identify areas where fill placement will be required. Allow for dressing of clean arable topsoil, fertilised and sown with suitable grasses.

Re-use of topsoil: If possible, retain existing topsoil from the site and re-use in the same location.

Construction requirements: To *C29 Landscape - road reserve and street trees* for further topsoil sowing and fertilisation requirements.

Topsoil stockpile period: 12 months

3.4.6 Retaining walls

Filling to the site boundary: If required, design retaining walls to sit fully inside the site. Submit the retaining wall design with site regrading design to the Council for approval.

Wall design: To be designed and certified by a Professional Structural Engineer.

Adjacent services: Design wall so that no imposed loads are applied directly to the adjacent service infrastructure. Make sure services are located outside the zone of influence of the wall.

4 Documentation

4.1 General

4.1.1 Actions and document content

Standard: Conform to the recommendations of AS 3798 Section 3 for details for documenting earthworks design.

4.2 Statutory documentation requirements

4.2.1 Approvals

Requirement: Document any prerequisite for approval of the development advised by the following authorities:

- Council for:
 - Haul routes.
 - Tree clearing or relocation.
 - Waste disposal, in accordance with the approved Waste Management Plan and EPA requirements. Consideration should be given to the EPA definitions of waste in the POEO Act (eg coal tar, asbestos, benzo(a)(pyrene), EPRM).
 - Fill materials.
 - Stormwater drainage and erosion and sediment control.
- Planning and water resources department for general land use and salination prevention measures.
- The EPA for other general environmental impact requirements.
- Utilities authority for any public or private utility affected by the development.

Authorities: Obtain approval from Council for any sediment, siltation or erosion control measures, prior to commencing work.

4.3 Drawings

4.3.1 General

Requirement: Provide drawings defining the earthworks areas and specific treatments required.

Geotechnical testing stage: Provide drawings that show the location of site features in relation to the site boundaries, monuments, and other features for the purpose of testing.

Requirements: All proposed vegetation removal and management shall be shown on the development application plans. Reference is to be made to the Waste Management plan, showing how all timber and other materials cleared from the lots will be managed.

4.3.2 Site regrading plan content

Requirements: Provide design drawings to include the following:

- Road longitudinal sections: With road construction details showing construction depths.
- Regrading layout: With finished levels as contours superimposed on existing ground contours. Include spot levels to clarify areas not covered by regrade contour and features associated with the regrading, such as retaining walls, banks or steps.
- Site cross section: Showing proposed and existing levels.
- Cut and fill areas: With cut areas clearly distinguished from the fill areas. Show the range of depth variations and earthwork quantities.
- EPA requirements: Incorporate sediment, siltation, erosion or salination control measures with references to the stage when measures will be provided. The responsibility shall rest with the designer to make enquiries with the EPA and subsequently obtain Council approval of the proposed measures.
- Haulage routes: Consideration needs to be given to haulage routes including the load limits for each route and the road network.
- Temporary diversion drains: Show the location of temporary drains required to divert surface flows away from the regrading area, including any erosion or sedimentation control treatment. Size drains to accommodate the volume of water to be diverted.
- Trees for preservation, removal, relocation and replanting.

4.3.3 Drawing presentation

Drawing format: State requirements for design drawings at different design stages, particularly final design drawings. For example, paper copy, number of paper copy sets, digital format (PDF or CAD version).

Drawing size: State required original drawing size or insert drawing sheet sizes to comply with AS 1100.101.

Drawing numbering and identification: State any special requirements for drawing numbering and titles.

Title block format: State any specific information which needs to be shown on the title block, e.g. Council's logo or consultants' details. Consider providing a title block template.

The consultant shall annotate on the site regrading plan, the site-specific details to be shown on the Work as Executed plan.

4.4 Supporting design documents

4.4.1 Design reports

Preliminary design report: Provide a report covering all geotechnical requirements, including the following:

- Site preparation and compaction requirements.
- Recommended minimum acceptable fill quality.
- Proposed regrading strategies.

Report guidelines: To Austroads AGRD07 section 2.5 for further guidelines on report content.

Environmental impact statement: Include details of potential impacts and measures adopted for minimising the impact.

4.4.2 Calculations

Requirements: Provide a design report incorporating calculations and references supporting the earthworks design.

4.4.3 Specifications

Requirement: Refer to Council's Engineering Construction Specifications.

4.4.4 Design certification

Certificate: Provide a signed and dated design certificate as evidence that a Professional Engineer has reviewed all the design documents, including program and plans for the development, and can verify that the site regrading requirements for the development site meet the Council and statutory requirements. Refer D02-Annexure A-Sect 3.1.1

4.4.5 Other documentation

Watercourses: Provide documentation necessary from the relevant authorities to support the filling of dams and watercourses.

4.5 Work-as-executed

4.5.1 Work-as-executed documents

Work-as-executed drawings: Provide an additional set of final construction drawings for the purpose of recording the work completed by the Contractor.

Refer “Work as Executed plans specification and attribute requirements” located on Council’s website.

4.5.2 Final certification of completed works

Requirement: State Council's requirements for final certification, e.g. inspections required by the designer.

Final certification of completed works: The supervising Geotechnical Engineer needs to carry out sufficient site inspections to validate the final certification of the proposed works.

4.5.3 Geotechnical report

Certification: Provide a geotechnical report certifying the development site with the proposed regrading works is suitable for the proposed development. Include any other supporting documents such as test results/certificates and survey data required to confirm this.

5 Annexure

5.1 Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1100		Technical drawing
AS 1100.101	1992	General principles
AS 1726	2017	Geotechnical site investigations
AS 2870	2011	Residential slabs and footings
AS 3798	2007	Guidelines on earthworks for commercial and residential developments
AS 4970	2009	Protection of trees on development sites
Austrroads AGPT		Guide to pavement technology
Austrroads AGPT08	2009	Pavement Construction
Austrroads AGRD		Guide to road design
Austrroads AGRD07	2008	Geotechnical investigation and design
Council’s DCP		Flood Liable Land