Appendix 7

Sediment Basin Storage Requirement Calculations

prepared by

R.W. Corkey & Co. Pty Limited

(Total No. of pages including blank pages = 12)

This page has intentionally been left blank

1. SEDIMENT BASIN CALCULATIONS

1.1 BASIN TYPE

Based on the sediment type generated in the disturbed catchment, the basin should be designed as a Type D/F (Water Retention) Basin. These are also referred to as 'fill and spill' structures as they are designed to retain all in-flows to allow for settlement of sediment before the water is discharged after the total suspended solids of the water is reduced to criteria level (50mg/L).

1.2 CATCHMENT SIZE

A single catchment (the "Operational Disturbance Area Catchment") has been identified for the Strontian Quarry (see **Figure A**). Runoff within the "Extraction Area Catchment" would be diverted into the pit and would not be discharged. The effective catchment reporting to the sediment basin is 5.5ha. Capacity requirements for the sediment basin for this catchment is required.

1.3 RAINFALL DATA

Volume 2E of the Blue Book identifies that the design rainfall event to be used to determine the sediment storage and water settlement zones as either:

- 5-day 90th percentile event for standard receiving environments; or
- 5-day 95th percentile for sensitive receiving environments.

A 'sensitive' receiving environment is defined by Volume 2E of the Blue Book as "*one that has a high conservation value, or supports human uses of water that are particularly sensitive to degraded water quality*". At this stage it is assumed that the receiving environment does not fit this definition. Therefore, the design rainfall event to be used to determine storage and settlement criteria is the **5-day 90th percentile event**.

Rainfall data was extracted for the site from SILO (scientific data for landowners) database. The calculated 5-day 90th percentile event from SILO data is **25.4mm**. Similarly, the Blue Book Table 6.3a gives the rainfall depth of a 5-day 90th percentile event for the nearest town (i.e. Griffith) as **25.4mm**.

1.4 EROSION DATA

1.4.1 Rainfall Erosivity (R-Factor)

The rainfall erosivity (R-factor) of a location influences the likely soil loss (erosion). The Quarry Site has a lower R-Factor of 920 which was calculated using the following formula (Landcom, 2004) where S is the 2-year ARI, 6-hour ARI rainfall event (mm) i.e. 5.56mm.

$$R = 164.74(1.1177)^{S} S^{0.6444}$$

1.4.2 Erodibility (K) Factor

A conservative K-factor of **0.05** is adopted in line with the recommendations of Volume 2E of the Blue Book.

1.4.3 Length / Gradient (LS) Factor

The local topography is generally 3:1 (H:V) (~30%), with the length of slopes within each catchment generally between 60m and 80m. There is currently no plan to bench these slopes to modify the LS Factor. The slope length, gradients and LS Factors have been calculated for the catchment is as follows:

- Catchment gradient = 16%, length = 80m – LS Factor = 5.52

1.5 SOIL HYDROLOGIC GROUP AND RUNOFF COEFFICIENTS

For cleared catchments, i.e. those without significant vegetation or other cover likely to slow the flow of water and reduce runoff, the runoff coefficient is largely a factor of the permeability and saturation of the soil or surface. *Appendix F* of Landcom (2004) identifies four Soil Hydrologic Groups, derived by USDA (1993) through consideration of infiltration and permeability characteristics.

- Group A: very low runoff potential. Water moves into and through these soil materials relatively quickly, when thoroughly wetted. Usually, they consist of deep (>1.0m), well-drained sandy loams, sands or gravels. They shed runoff only in extreme storm events.
- Group B: low to moderate runoff potential. Water moves into and through these soil materials at a moderate rate when thoroughly wetted. Usually, they consist of moderately deep (>0.5m), well-drained soils with medium, loamy textures or clay loams with moderate structure. They shed runoff only infrequently.
- Group C: moderate to high runoff potential. Water moves into and through these soil materials at slow to moderate rates when thoroughly wetted. Usually, they consist of soils that have:
  - moderately fine (clay loam) to fine (clay) texture;
  - weak to moderate structure; and/or
  - a layer near the surface that impedes free downward movement of water.

  They regularly shed runoff from moderate rainfall events.
- Group D: very high runoff potential. Water moves into and through these soils very slowly when thoroughly wetted. Usually, they consist of soils:
  - that are fine-textured (clay), poorly structured, surface-sealed or have high shrink/swell properties, and/or
  - with a permanent high water table, and/or
  - with a layer near the surface that is nearly impervious.

  They shed runoff from most rainfall events.

Considering the catchment for which sediment basin is required, the catchment is considered most likely representative of Soil Hydrologic Group B. That is also supported by the Soil Profile Report of the nearest location given on NSW soil and land information system (Ref: Strontian Road Survey (1000441)). That report provides the soil hydrology as a profile which is moderately permeable and imperfectly drained which represents Soil Hydrologic Group B.

With reference to *Table F2* of the Blue Book, the volumetric runoff coefficient (C_v) for the 5-day 90th percentile rainfall event for the catchments will be 0.19 (~20% of rainfall accumulates as runoff).

1.6 SETTLEMENT AND STORAGE VOLUME REQUIREMENTS

Considering the likely volume of runoff and sediment load under a 5-day 90th percentile rainfall event, **Table A** provides the minimum water settlement and sediment storage zone requirements for the sediment basin. The size of the sediment basin will vary according to the size of the extraction area. In the initial stage, due to vegetation clearing for the extended extraction area, the operational disturbance area will be around 5.5ha (**Figure A**). The volumetric requirement of the sediment basin will be about 495 m^3 (**Figure A**). The volumetric requirement will be reduced to 135 m^3 when the extraction area will be fully developed (**Figure B**).

Table A
Settlement and Storage Volume Requirements

Basin	Water Settlement Zone (m^3)	Sediment Storage Zone (m^3)	Total (m^3)
Sediment Basin – Quarry Development	231	264	495
Sediment Basin – Final Design	63	72	135

The worksheet used estimate these minimum capacities are provided as **Attachment 1**.

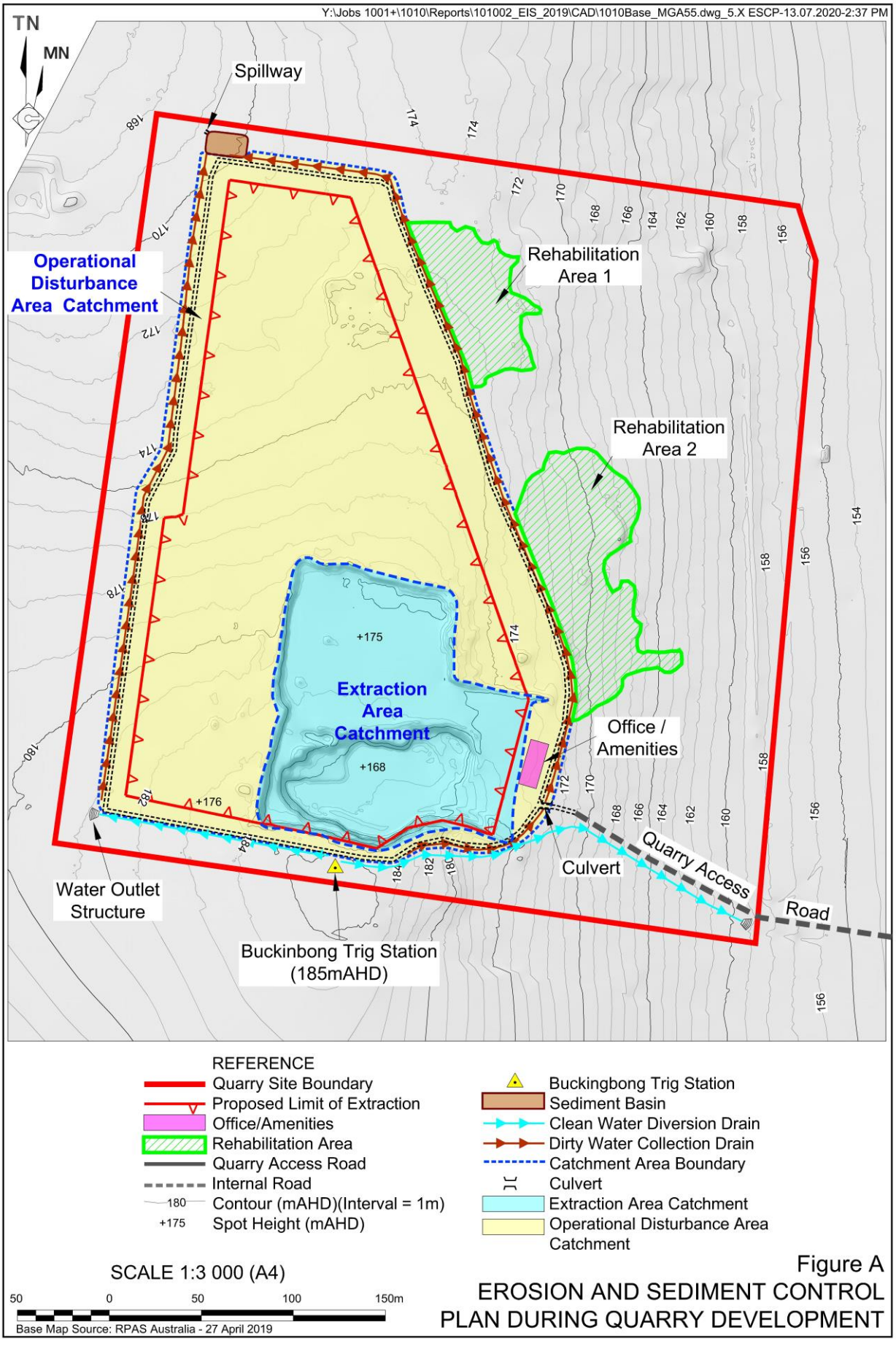

Figure A
EROSION AND SEDIMENT CONTROL PLAN DURING QUARRY DEVELOPMENT

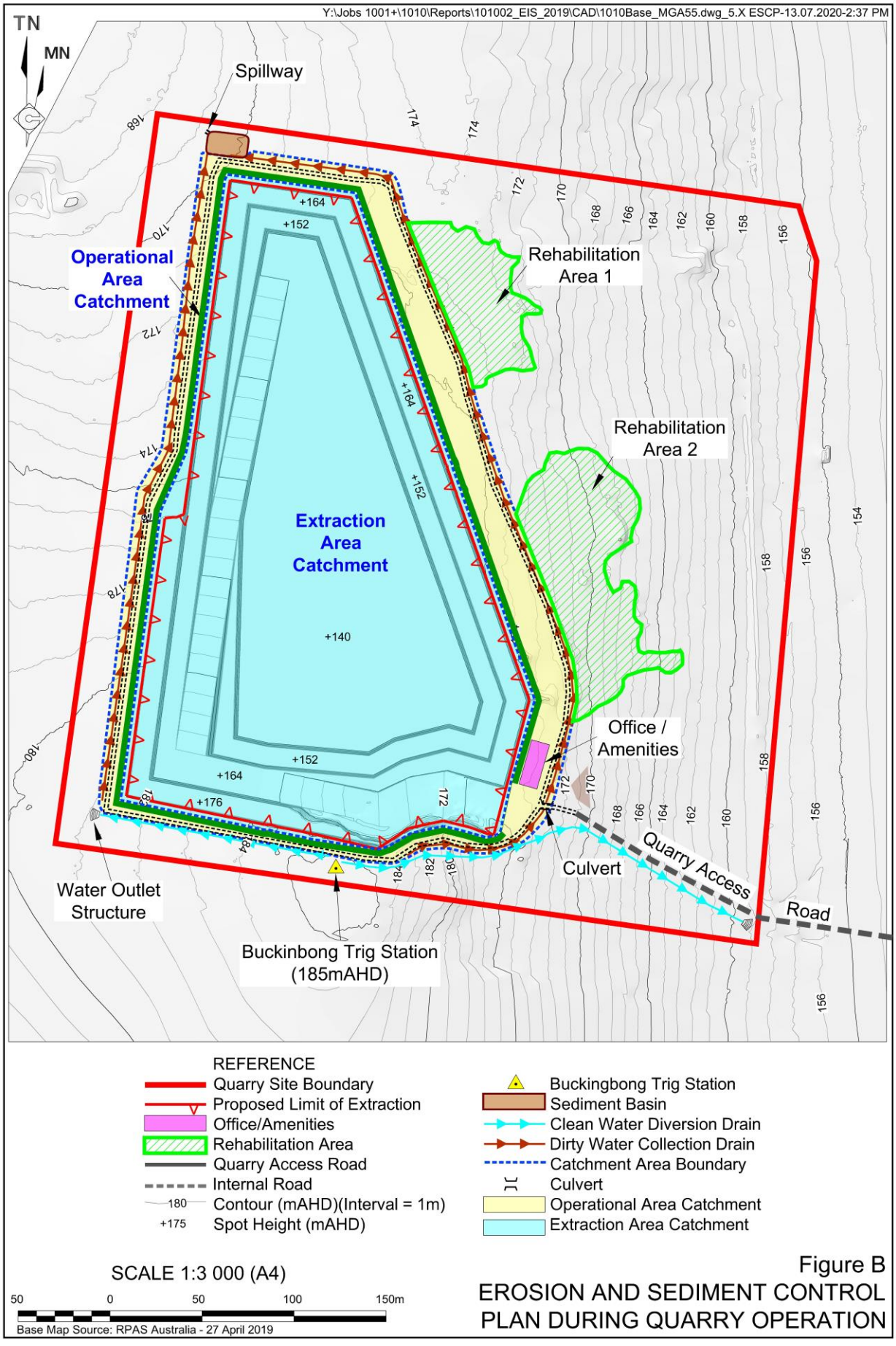

Figure B
EROSION AND SEDIMENT CONTROL PLAN DURING QUARRY OPERATION

This page has intentionally been left blank

Attachment 1

Erosion Hazard and Sediment Basin Calculations

(Total No. of pages including blank pages = 4)

This page has intentionally been left blank

1. Erosion Hazard and Sediment Basins

Site Name: Strontian Quarry

Site Location:

Precinct/Stage:

Other Details:

Site area	Sub-catchment or Name of						Notes
	Stage1	Stage2					
Total catchment area (ha)	5.47	1.5					
Disturbed catchment area (ha)	5.47	1.5					
Soil analysis (enter sediment type if known, or laboratory particle size data)							
Sediment Type (C, F or D) if	F	F	F	F	F	F	From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each
% silt (fraction 0.002 to 0.02 mm)							soil fraction. E.g. enter 10 for
clay (fraction finer than 0.002 mm)							10%
Dispersion percentage							E.g. enter 10 for dispersion of
% of whole soil dispersible							See Section 6.3.3(e). Auto-
Soil Texture Group	F	F	F	F	F	F	Automatic calculation from
Rainfall data							
Design rainfall depth (no of days)	5	5					See Section 6.3.4 and,
Design rainfall depth (percentile)	90	90					particularly, Table 6.3 on
x-day, y-percentile rainfall event	25.4	25.4					pages 6-24 and 6-25.
Rainfall R-factor (if known)							Only need to enter one or the
IFD: 2-year, 6-hour storm (if	5.56	5.56					other here
RUSLE Factors							
Rainfall erosivity (R-factor)	920	920					Auto-filled from above
Soil erodibility (K-factor)	0.05	0.05					
Slope length (m)	80	80					
Slope gradient (%)	16	16					RUSLE LS factor calculated
Length/gradient (LS-factor)	5.52	5.52					for a high rill/interrill ratio.
Erosion control practice (P-	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C-factor)	1	1	1	1	1	1	
Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)							
Storage (soil) zone design (no of	2	2					Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.19	0.19					See Table F2, page F-4 in
Calculations and Type D/F Sediment Basin Volumes							
Soil loss (t/ha/yr)	330	330					
Soil Loss Class	3	3					See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	254	254					Conversion to cubic metres
Sediment basin storage (soil)	231	63					See Sections 6.3.4(i) for
Sediment basin settling (water)	264	72					See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	495	135					

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

This page has intentionally been left blank