Air Photo of Site

Source NSW Land Information Centre Run 5 flown 18/5/1994

Moonee Nature Reserve

Diggers Point

74-Site
Caravan Park
DA452/82

Existing Highway Access
vide DA 452/82

Pacific Highway

Emerald Beach

Emerald Beach
Caravan Park

Fiddamans

Existing Bridge

Creek

Fishermans

Drive

EMERALD BEACH
TOWNSHIP

G N

0 250 500m

3. PROPOSED DEVELOPMENT

Figure 3a illustrates the relationship of key components in the proposed development.

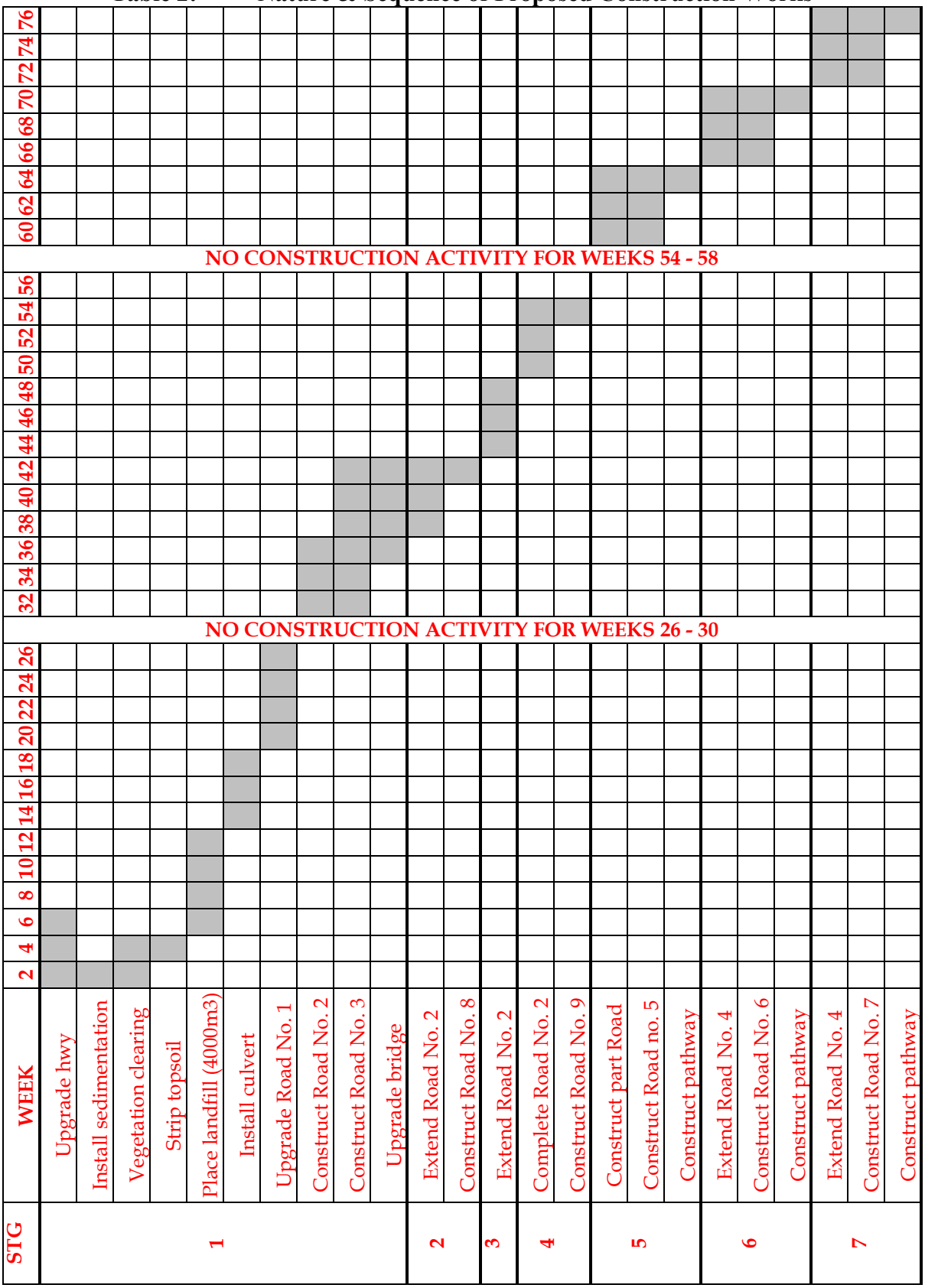
The Site Masterplan (Figure 3j) discloses the various development components in some detail. Table 3.1 below summarises the extent to which each component utilises the development site.

Table 1: Proposed Land Use Intensity across the Development Site

CATEGORY	PROPORTION OF DEVELOPMENT SITE	
Retained Bushland & Drainage Corridor	16.7ha	53.5%
Low Density Residential Lots	8.8ha	28.2%
Bio-retention (Stormwater Treatment) System	0.4ha	1.3%
Roadways	5.3ha	17.0%
TOTAL	31.2 hectares	**100.0%**

Up to 14.4ha of the site may be disturbed by construction works (see Figure 3b). Table 3.2 below summarises the nature and sequence of construction works that will occur.

Table 2: Nature & Sequence of Proposed Construction Works



3.1 EARTHWORKS

The extent of earthworks is dictated by a requirement to supply 'flood-free' land for dwellings and vehicular access to dwelling sites for most storm events. Consequently, a volume of approximately 4,000cu.m of fill material is proposed to be placed over an area of some 4.7ha (refer Figure 3c). Furthermore, a volume of approximately 3,000cu.m of gravel is proposed to be placed on the existing access road from the highway. An important component of earthworks activities will be the isolation of a conservation area beyond the north-western corner of the proposed residential area.

3.1.1 Interim Stormwater Management

Temporary sedimentation ponds will be established along the western perimeter of the area to be disturbed, so as to intercept upstream runoff from across the development area. Both runoff and sediment stored within the ponds will be monitored and treated as required before discharge into the drainage corridor.

Across the construction site, exposed ground surface areas will be progressively stabilised with a vegetative cover as landfilling processes are completed. A system of grass-lined swales will be established to treat and direct stormwater runoff across the site. These will form part of the estate's final stormwater management train.

At the completion of land-filling operations, the temporary sedimentation ponds will be transformed into 'bio-retention' systems to function as the final treatment process for intercepted stormwater runoff discharging from the development area.

The following equipment will be used in installing the interim stormwater management components: -

PROCEDURE	EQUIPMENT TO BE USED
Establish sed. ponds Stabilise exposed ground surfaces	Excavator, Bulldozer Tractor, Water Cart

3.1.2 Vegetation Clearing

The extent of vegetation to be cleared is shown on figure 3b, and comprises predominantly groundcover species. Once denuded of vegetation cover, exposed surfaces will be seeded with fast-growing annual species of grass as soon as practicable to minimise dust nuisance. Until the grass species become established, exposed surfaces will be kept moistened.

Cleared vegetation will be disposed by: -

- chipping or mulching for tree crowns and branches; and
- transportation to a waste transfer station.

No burning operations will occur on the site.

The following equipment will be used in clearing operations: -

PROCEDURE	EQUIPMENT TO BE USED
Clearing	Excavator, Bulldozer, Tractor
Chipping/Mulching	Excavator, Mobile Chipper/Mulcher, Dump Truck
Disposal	Excavator, Dump Truck
Stabilising	Tractor, Water Cart

3.1.3 Topsoil

Following clearing, topsoil will be stripped from the area to be filled and stockpiled in the form of bund walls for the temporary sedimentation ponds along the downstream side of land-filling activities, and to isolate the conservation area from construction activities. A bulldozer and an excavator will be used to form the bund walls.

The stockpiles will be seeded with fast-growing annual species of grass as soon as practicable to minimise dust nuisance. Until the grass species become established, the stockpiles will be kept moistened.

At the completion of the filling operations, the stockpiled topsoil will be spread across the bare ground and batter surfaces as described below.

The following equipment will be used in stripping and stockpiling topsoil: -

PROCEDURE	EQUIPMENT TO BE USED
Stripping & stockpiling topsoil	Excavator, Bulldozer
Stabilising stockpiled topsoil	Tractor, Water Cart

3.1.4 Land-fill

The extent of land-fill to be placed is shown on figure 3c. Fill will be placed across the site as follows: -

- up to 0.7 metres in depth above (at RL 3.4 AHD) the existing ground surface across an area of about 4.7 hectares, using imported sand. About 4000cu.m of fill material will be imported, involving about 700 truck movements over 22 working days. The sand will be compacted and shaped

to match a design surface that conforms to the stormwater management strategy shown in Figure 3e and to the site masterplan shown in Figure 3j. The bare surfaces of the sand-filled area will be spread with the stockpiled topsoil described above and seeded with fast-growing annual species of grass as soon as practicable to minimise dust nuisance. Until the grass species become established, the bare surfaces will be kept moistened.

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- up to 1.2 metres in depth above (at RL 3.2 AHD) the existing road surface along a strip of about 0.4 hectares, using imported gravel. About 3500cu.m of sub-base and base quality gravel material will be imported, involving about 700 truck movements over 22 working days. The gravel will be compacted and shaped to match the design surface of the road. The bare batter surfaces will be spread with topsoil and seeded with fast-growing annual species of grass. The roadway surface will be bitumen-sealed at the end of Stage 1 Subdivision works discussed below. Until the grass species and the bitumen seal become established, the bare surfaces will be kept moistened.

The following equipment will be used in land-filling operations: -

PROCEDURE	EQUIPMENT TO BE USED
Importing	Dump Trucks
Spreading, compacting & shaping of sand-filled area	Excavator, Bulldozer, Tractor
Spreading of topsoil over sand-filled area	Excavator, Bulldozer
Stabilising of sand-filled area	Tractor, Water Cart
Spreading, compacting & shaping of road	Excavator, Bulldozer, Grader, Roller
Spreading of topsoil over road batters	Excavator, Dump Truck
Stabilising of road	Trucks, Roller, Sweeper

3.1.4.1 Stormwater Drainage

The following Average Recurrence Intervals (ARI's) have been applied to the proposal: -

- 100 year ARI for the 'major' drainage system; and
- 5 year ARI for 'minor' drainage systems.

In summary, the 100 year ARI storm event will be captured within the road reserve areas proposed for the residential estate, and then transferred by combinations of piped systems and overland flow path systems to the drainage corridor linked to Fiddamans Creek. The details of this network will be determined at the design phase, but is shown both diagrammatically and schematically in Figure 3e.

The philosophy underlying the concept is to use surface flow systems to treat stormwater runoff originating from within the development area before discharge off-site. Accordingly, swales and bio-retention systems are essential components.

3.1.4.2 Vegetated Swales

The swales will be located adjacent to one-way crossfall roadways, and are oriented to best utilise the shallow site gradients of between 0.5% and 1%. They will be designed to convey up to the 2 year ARI storm event. Flows in excess of this will enter conventional piped stormwater systems. The swales are expected to be sized as shown on Figure 3e, and will be lined with groundcover vegetation that achieves up to 0.25m in height.

3.1.4.3 Bio-Retention Systems

The bio-retention systems will be located along the north-western perimeter of the development area as the final component in the stormwater management system immediately upstream of the discharge points to drainage corridor. The systems will have a maximum extended detention depth of 0.5m prior to overflowing, and will have a combined filter surface area of 3900m2.

The systems will be heavily planted to minimise visual impact and, more importantly, to promote continued infiltration of stormwater through the filter media that will be established across the bases of systems. The filter media will comprise sandy loam laid to a depth of 0.8m over a network of slotted pipes. The slotted pipes will drain the infiltrated discharges into drainage corridor that forms part of the Fiddamans Creek catchment.

In heavy rainfall events, the systems are expected to provide about 3 hours of detention capability.

3.2 CULVERT CONSTRUCTION

The existing highway access road (Road No. 1), elevated to RL 3.2 AHD and upgraded to include a 25-span concrete culvert, is the principal flood management component of the proposal. RL 3.2 AHD represents the peak of the predicted 1 in 20 year flood.

The location of the proposed culvert is shown on figure 3e. The culvert will be about 65 metres in length.

The primary function of the culvert is to control drainage through the subject land so that existing flood levels in the 1 in 100 year and 1 in 20 year storms are not exceeded on upstream and downstream properties.

The following equipment will be used in culvert construction operations: -

PROCEDURE	EQUIPMENT TO BE USED
Site preparation	Excavator, Dump Truck
Culvert installation	Excavator, Crane, Truck, Cement Mixer
Site stabilisation	Excavator, Dump Truck

3.3 BRIDGE CONSTRUCTION

The existing timber bridge over Fiddamans Creek will be upgraded to a single-span concrete bridge. The proposed bridge will be constructed on the same alignment and to the same levels as the existing bridge. The existing bridge is elevated above the predicted 1 in 100 year flood level for the location of RL 3.1 AHD.

Bridge construction will commence as the final component of Stage 1 Subdivision works, only after culvert construction is completed and bitumen access is available between the south-eastern corner of the site and the Pacific Highway. This will ensure continuity of access is available for patrons of the "Emerald Beach Caravan Park".

The following equipment will be used in land-filling operations: -