Hanson Construction Materials

Concept Stormwater Management Strategy:

Concept Plan for the redevelopment of Lot 11 DP558723, Lot 1 DP400697 and Lot 2 DP262213 Eastern Creek, NSW.

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martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

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PROJECT MANAGEMENT

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1 Introduction

1.1 Background

Hanson Australia Pty Ltd have commissioned this report for the purposes of supporting a proposed redevelopment of the Hanson owned Eastern Creek Quarry land industrial property. The report provides advice regarding stormwater management requirements of the proposed development.

The land relevant to the redevelopment proposal is identified as Lot 11 DP 558723, Lot 1 DP 400697 and Lot 2 DP 262213. Indicative development layout plans have been supplied by Hanson Australia and these have been relied upon for the purposes of stormwater quality modelling. In this report 'the site' refers to those areas of the identified property to be developed for industrial or associated (sediment / detention pond) purposes only. Areas in the south of the site to be unmodified through this development are not addressed by this study.

1.2 Development Proposal Overview

The proposed development relocates and restructures the current operation uses into a small, consolidated area and introduces more efficient industrial operational methods. The proposed redevelopment of the Eastern Creek Quarry is outlined in Table 1.

Table 1: Proposed land use and development areas.

Proposed Use	Indicative Land Area within each use is distributed (m^2)	Indicative Building and Plant Footprint (m^2)
Concrete Batching Plant	11,770	Office – 180 Workshop – 200 Fixed Plant Envelope – 3000
Concrete Recycling Plant	34,200	3000
Asphalt and Emulsion Plant	37,000	Office and Lab – 300 Workshop – 700 Asphalt Plant – 7000 Emulsion Plant – 2000
Materials Storage and Transfer Depot	12,100	6000
Concrete Masonry Plant	34,600	3200
Office and Laboratory	5,600	2000

Logistic Operation and Workshop	17,600	1400
Minor road realignment and internal roads	20,000	-

The proposed new uses within the redevelopment of the site are the emulsion plant and concrete masonry plant. Part of the redevelopment also involves the realignment of the existing internal roads and site boundaries. The proposed new allotment is irregular in shape and has an area of approximately 27 hectares.

The proposed redevelopment will also include the reconfiguration of the existing sedimentation basins / dams on the site, reducing their number from twelve (12) to one (1).

1.3 Project Scope

This report identifies stormwater management issues and establishes suitable measures for addressing these issues. This assessment draws from field investigations, modelling, relevant guidelines, standards and best practice management techniques to develop an ecologically sustainable concept stormwater management strategy for the proposed development. Detailed design advice is beyond the scope of these works.

Importantly, whilst the concept stormwater management strategy has been developed with the view of delivering ecologically sustainable development, it should be recognised that the layout of the development and location of stormwater structures is subject to change in accordance with the final adopted development plan.

1.4 Study Objectives

A concept stormwater management plan has been developed for the preliminary site layout supplied at the time of report preparation. This has been developed in accordance with observed site conditions, local topography, soils and local surface water quality management requirements.

This document has been developed to address the specific requirements of the Director General (Planning) requirements for the project including addressing a range of state and local policies and site specific requirements as detailed in the Eastern Creek Precinct Plan. Primary objectives of the concept stormwater management plan include:

1. To achieve acceptable water quality outcomes for the site. Pollutant retention rates specified in relevant BCC guidelines are to be addressed.

2. That stormwater ultimately released from the site does not detrimentally impact downstream receiving waters. In this case, particular regard is given to stormwater release points to the natural environment.

3. That the site is ultimately developed in accordance with the objectives of Water Sensitive Urban Design (WSUD) and the requirements set out relevant site specific guidelines.

1.5 Relevant Planning Controls, Policy Objectives and Guiding Principles

A number of specific planning controls, policy objectives and design principals have been considered in the development of this concept stormwater management plan. These policies and principles underlie all components and conceptual designs outlined in this report and are central to the sustainability of the proposed development. They are as follows.

1. Eastern Creek Precinct Plan (BCC, December, 2005)
   This document provides the specific requirements for an area of land at Eastern Creek of which the site forms a part. The specific requirements for stormwater management are included in Section 5 of this precinct plan with mitigation measures detailed in Section 5.4.

2. Blacktown City Council Stormwater Quality Control Policy (June, 2005)
   This policy is identified by the Precinct Plan and contains water quality system objectives and general and specific information regarding means of managing stormwater quality.

3. Engineering Guide for Development (BCC, February 2005)
   This document outlines specific objectives and technical design requirements for stormwater management in the Blacktown City Council Area. Relevant water quality design objectives include:

   - *To maintain or replicate the pre-development water cycle through the use of design techniques to create a functionally equivalent hydrological landscape, i.e. optimising greywater re-use, rainwater re-use and reduction of demand for potable water.*

4. Development Control Plan 2006 Part E – Development in Industrial Zones (BCC, May 2006)
   This document details general requirements relating to stormwater quality and quantity and generally compliments the engineering guide. Relevant stormwater drainage design objectives for this conceptual stormwater management plan are as follows:

- *Adequate provision to be made for the collection and disposal of surface and roofwater run-off.*

- *To control and treat the flow of stormwater to achieve acceptable standards prior to discharge to receiving waters. Where the premises are subject to licensing under the* Protection of the Environment Operations Act 1997, *any conditions on such licences will form part of any building approval.*

- *Where any development will result in an increase in stormwater run-off, satisfactory arrangements for the efficient disposal of stormwater from the site to be provided. These arrangements may include (but not be limited to) on-site detention of stormwater and/or appropriate augmentation of Council's stormwater disposal system.*

5. Managing Urban Stormwater: Treatment Techniques (NSW EPA, 1997)
   This document forms part of a package of documents on managing urban stormwater published by NSW Government agencies in the late 1990's. This guideline aims specifically to provide guidance to stormwater planners and designers on the selection and functional (or conceptual) design of a range of structural stormwater quality management practices. The stormwater management plan presented in this report has been designed with consideration of this guideline.

6. Managing Urban Stormwater: Council Handbook (NSW EPA 1997)
   This handbook was prepared to assist local Council's in their preparation of Stormwater Management Plans (SMP's). Two objectives from Appendix H of this document are considered specifically relevant to the management of stormwater for the proposed development. That is, appropriate stormwater management should ensure:

   - *Implementation of 'best practice' stormwater management techniques; and*

   - *No net increase in the average annual load of the key pollutants, above that occurring under existing conditions.*

7. National Water Quality Management Strategy. Australian Guidelines for Urban Stormwater Management (ANZECC, 2000)
   This document provides a strategic framework for the appropriate integrated management of urban stormwater

quality for the protection of public health and the environment. The main objective of this strategy is

"to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development."

8. State Environmental Planning Policy (Building Sustainability Index: BASIX)
   While not yet directly applicable to this type of development as yet, this development has been designed in line with the aims and objectives of the BASIX scheme, that is, to "*encourage sustainable residential development*" through the introduction of the BASIX scheme.

9. Water Sensitive Urban Design (WSUD)
   Water Sensitive Urban Design (WSUD) is a philosophical approach to urban planning and design that aims to minimise the hydrological impacts of urban development on the surrounding environment. Stormwater management is an integral part of WSUD, directed at flood control, flow management, water quality improvements and opportunities to harvest stormwater and implement water conservation measures. Wastewater management is also a central WSUD component.

   Key planning and design objectives encapsulated in Best Practice Water Sensitive Urban Design are to:

   - *Protect and enhance natural water systems.*
   - *Integrate stormwater treatment into the landscape by incorporating multiple use corridors that maximise the visual and recreational amenity of the development.*
   - *Protect water quality draining from developments.*
   - *Reduce runoff and peak flows from developments by employing local detention measures and minimising impervious areas.*
   - *Add value while minimising drainage infrastructure development costs.*
   - *Provide an effective water conservation strategy, with consideration to wastewater and stormwater re-use and water demand reduction measures.*

Relevant WSUD documents referred to in the development of this conceptual stormwater management plan include:

- *CRC for Catchment Hydrology (Report 00/1 Aug 2000), Water Sensitive Road Design – Design options for improving stormwater quality of road runoff.*
- *CRC for Catchment Hydrology (Report 02/10 Sept. 2002), Water Sensitive Urban Design – A stormwater Management Perspective.*
- *Upper Parramatta River Catchment Trust (May, 2004), Water Sensitive Urban Design – Technical Guidelines for Western Sydney.*
- *Urban Water Resource Centre (November, 2004), Water Sensitive Urban Design: Basic Procedures for 'Source Control' of stormwater.*
- *Melbourne Water (June, 2004), WSUD Engineering procedures.*
- *Australian Institute of Engineers (2003), Australian Runoff Quality.*

2 Site Description

2.1 Location and Existing Land-use

The proposed redevelopment is located on Archbold Road and is situated within the Blacktown City Council local government area (LGA). The site is situated approximately 0.9 km north of Old Wallgrove Road and approximately 1.5 km south of the M4 motorway at Eastern Creek (Figure 1).

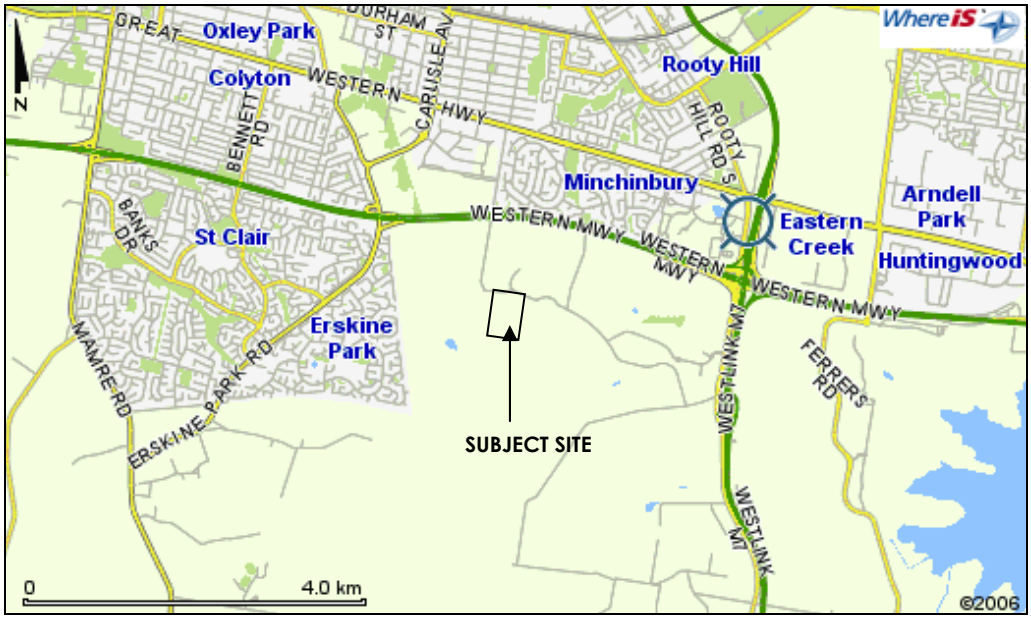

Figure 1: Location of subject site within the local context (www.whereis.com.au, 22/9/2006).

The site is characterised by mixed industrial operations, predominantly asphalt and concrete plants, and includes several areas for stockpiling of materials and plant machinery. A detailed site plan showing the proposed development plan is provided in Attachment A.

2.2 Field Investigations

Three site inspections were undertaken on 2nd and 9th of July and 6th of September 2006. Works conducted during field investigations include:

- General walkover inspection of the site and surrounding areas to examine local geology, slope stability and sedimentology.
- Local soil exposures were inspected to visually assess local soil properties relevant to the design of any stormwater

management systems (eg. soil type, depth, structure and permeability).

- Inspection of existing site sedimentation ponds / dams, intermittent watercourses, overland flow paths and stormwater infrastructure.

2.3 Topography and Slopes

Supplied survey data indicates that the site is a regraded side slope within the Ropes Creek catchment. Slopes are generally uniform with aspect to the south. The majority of the site maintains grades of between 0 to 5 %. A survey plan showing local topography is provided in Attachment A.

2.4 Geology

The Penrith 1:100,000 Geological Sheet 9030 (1991) describes the bedrock geology of the site as Bringelly Shale (Wianamatta Group, Liverpool Sub-group) with some sandstone beds and with alluvium gravel, sand, silt and clay buffering Eastern Creek. Andesite is present in the north of the study area.

The depth of soil across the site is variable due to previous extensive earthworks and regrading of the site. The only natural soils unaffected by current and proposed site uses are located in the southern portion of the site surrounding the sedimentation ponds/dams (Attachment A).

2.5 Groundwater

Groundwater investigation was not a component of initial site inspections. Based on the topography and geology of the area, we conservatively estimate that the permanent groundwater table is > 2m deep across the site.

2.6 Surface Water Hydrology

Two intermittent watercourses have been previously identified in topographic mapping of the site, recent site surveys and field investigations. The first watercourse (southern watercourse) is an upper tributary of Ropes Creek which starts from the catchment south of the site and flows from the property immediately to the south of the site and on to the south west corner of the site.

The second watercourse (eastern watercourse) is a local stormwater drainage depression which flows from properties to the east, across the eastern edge of the site, into the south eastern corner of the site and into one of the site's sedimentation ponds. Flows from the upper portion of the site also flow into this pond. Flow from this structure is directed via three (3) further detention ponds to the southern watercourse in the

south western corner of the site. This watercourse then drains westwards across a small portion of the site to a point approximately 40m from the site's south western corner.

2.6.1 *Current Stormwater Management*

Stormwater is currently managed by directing the site surface flows into the existing dam system, consisting of twelve sedimentation ponds of varying size. The dam system is described as follows:

- A 'Top Dam' adjacent to the current site office and crusher receives pumped flows from the pit area and the crushing plant.
- Several 'Middle Dams' receive flows from the Top Dam via an open channel (grassed) for secondary settlement consisting of a system of basins interconnected by channels, pipes and weirs.
- The 'Major Sedimentation Dam' located in the south western portion of the site receives combined pit, process effluent and stormwater runoff via a 2:1 batter drain.

All excess flows from the 'Major' sedimentation pond flow into a 'Minor' sedimentation pond via a spillway and then into a final three (3) detention ponds. Water is then released from this system into the natural watercourse (Ropes Creek) once it has been treated by a flocculate and had time to settle out the suspended solids.

There is currently a pump on the major sedimentation pond which pumps water back to the top pond/dam. All ponds contain varying amounts of silt and mine tailings. The following table lists the size, depth and quantity of silt currently in each pond/dam.

Table 2: Siltation characteristics of the existing dams to be reconfigured.

Pond	Area (m^2)	Average Water Depth (m)	Average Silt Thickness (m)	Approximate Volume of Water (m^3)
Major Pond/Dam	7200	1.8	2.0	12,960
Minor Pond/Dam	2258	0.3	0.2	677
1	124	0.5	0.2	62
2	330	0.9	0.1	297
3	727	0.9	0.1	654

Table 3: Overview of study area watercourses.

Water Course	Location	Description	Order
Southern	Southern part of subject site.	Generally a variable width of 2 – 3.5 m (bankfull), moderate grade and low sinuosity. Watercourse depth ranges from 0.5 – 0.9 m. Banks and bed show little evidence of recent erosion or instability. At the time of inspection, surface dampness and some minor shallow (< 20 mm) ponding was visible (attributed to the flow from the Hanson site via the last three detention ponds). Vegetation cover over channel banks consists of kikuyu, couch grasses and swamp oaks (*Casuarina spp.*). Bed vegetation consists of dense reeds of 1.0 – 1.5 m in height. Flows to Ropes Creek from the site and maintains similar channel morphology and vegetation to that which is on site.	1
Eastern	Eastern boundary	This is only a minor stormwater drainage depression with a very small contributing catchment. This watercourse has been dammed on the adjacent site and on subject site. Watercourse appears to flow infrequently. No formed bed of banks. Vegetation consists of grasses with reeds observed in the lower reach adjacent to the dam due to standing water.	0

Notes: [1] Order class refers to DIPNR stream classification as documented in Landcom (2004).

3 Stormwater Quality

3.1 Approach and Methodology

3.1.1 Modelling Overview

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 3.0) developed by the CRC for Catchment Hydrology was utilised to evaluate pollutant loads and concentrations from the site. Whilst this model is not in itself a precise engineering design tool, it provides a useful mechanism through which the performance of a stormwater management scheme can be investigated and refined in order that best management practices are achieved for a given site.

In accordance with Blacktown City Council's Stormwater Quality Control Policy (2005) the following modelling scenarios were considered:
The site development layout without any water quality control structures / measures.

1. The site development layout with water quality management measures. Proposed measures include "Humeceptor" hydrocarbon and sediment traps, grassed swales and a renewed sedimentation / water quality control pond.

Analysis of development water quality control structure requirements was an iterative process in order that site water quality and stormwater management objectives could be met.

Pollutant event mean concentrations (EMC) adopted for the modelling exercise were derived on the basis of Australian Runoff Quality (2006) and Landcom (March 2004).

Table 4: Adopted event mean and dry weather concentrations from various land-uses.

Pollutant	Catchment		
	Industrial / Plant	Roads and Car Parks	Landscaped
TSS (mg/L)	150	195	110
TP (mg/L)	0.30	0.26	0.22
TN (mg/L)	2.5	2.1	2.0

All EMC values are sourced from Australian Runoff Quality (Engineers Australia, 2006)

MUSIC layout details and output files are provided in Attachment A.

3.1.2 Specific Modelling Water Quality Objectives

As required by the Eastern Creek Precinct Plan the water quality objectives of BCC (2005) where adopted for the site. A summary of these reported objectives (as provided in Table 2 of that document) is as follows:

- 90% retention of annual gross pollutant load; and
- 80% retention of annual coarse sediment load; and50% retention of annual fine sediment load; and
- 45% retention of annual nutrient load; and
- 90% retention of annual hydrocarbon load; or
- Total discharge of TPH <10 mg/L at all times.

In developing the site stormwater management strategy the three priority pollutants (coarse sediments, hydrocarbons and litter) have been targeted with nutrients and fine sediments also assessed in accordance with BCC (2005) policies.

3.2 Proposed Stormwater Quality Management System

The propped stormwater management system has been developed to address identified site priority pollutants (BCC, 2005) and to achieve the stated BCC (2005) stormwater quality objectives for the site. Measures included in the proposed development layout are briefly described as follows:

1. Grassed treatment swales – located along roads and carpark fringes these are provided to maximise infiltration and pre-treatment of stormwater flows. These act to remove sediments (coarse and fine), litter and nutrients.
2. Humeceptors – these treat flows from the entire developed area of the site. They primarily remove sediment (and associated nutrient) and hydrocarbons.
3. Site sedimentation basin – all flows from developed site areas pass to the sedimentation basin. The basin removed residual pollutants including sediments, litter and nutrients. Water is also reclaimed from this point and used on-site for industrial purposes.

3.3 Performance of Stormwater Management System

MUSIC modelling results of the stormwater management system for the proposed development are set out in Table 5 and Table 6.

Table 5: MUSIC water quality modelling results presented as mean annual pollutant loads at the receiving node.

Parameter	Development without WQ measures	Development with WQ measures	Difference	% Retention
TSS (kg/yr)	99800	4980	94820	95
TP (kg/yr)	105	31.5	73.5	70
TN (kg/yr)	742	393	349	47
Gross Pollutants (kg/yr)	6220	0	6220	100

Table 6: Water quality modelling results presented as average daily loads at the receiving node.

Parameter	Development without WQ measures	Development with WQ measures	Difference	% Retention
TSS (kg/d)	273	13.7	259.3	95
TP (kg/d)	0.287	0.086	0.201	70
TN (kg/d)	2.03	1.08	0.95	47
Gross Pollutants (kg/d)	17	0	17	100

The modelling of hydrocarbons is not possible within the MUSIC program. Therefore a first principles assessment of the site hydrocarbon yield and retention performance is undertaken. Likely generation rates for hydrocarbons are reported to be up to 100 mg/l for site landuse (Figure 3.7 of Australian Runoff Quality). As all catchment pass through Humeceptors with a reported removal efficiency of 97 % (which of itself complies with BCC (2005) policy retention standards) the maximum EMC for the site after Humeceptor treatment would be 3 mg/L. This is also below the specified performance criteria of BCC (2005) stormwater quality policy.

In summary, the proposed stormwater quality control measures achieve all of the prescriptive design criteria of BCC (2005) Stormwater Quality Policy.

4 Stormwater Quantity

4.1 Overview

The Eastern Creek Precinct Plan includes conceptual design for a series of regional stormwater detention basins. This conceptual design includes a basin located on the site in the vicinity of the largest of the existing site basins.

A site specific analysis of OSD requirements has been undertaken to design an on-site detention facility which shall provide for adequate detention to achieve the stated objectives of Section 5.6.5 of the Precinct plan. The Precinct Plan identifies a need to attenuate post development flows to levels equal to the corresponding frequency runoff event from a "rural' landscape (Section 5.5). A detailed RAFTS modelling exercise has therefore been undertaken to assess the requirements for site on-site detention (OSD).

The requirements of the Precinct plans are mirrored in the BCC (2005) Stormwater Quality Control Policy which identifies the 1 in 2 yr ARI event as being critical for channel morphological stability.

The collection and transfer of site stormwater to the site OSD basin is evaluated through the development of a DRAINS hydrological model of the site. This model is used to design a drainage network in accordance with relevant aspects of the Precinct Plan and BCC guidelines.

4.2 Objectives

The objectives of the site stormwater system design are summarised as follows:

1. Determine the necessary OSD volume for the effective attenuation of critical duration storm events for the range of recurrence intervals from 2 yr to 100 yr ARI in accordance with Precinct Plan and BCC (2005).

2. Provide preliminary design recommendations for the implementation of the required OSD on-site.

3. Provide a safe and effective site drainage system. The minor flow system (I in 20 yr) is to be a piped system with a major event (1 in 100 yr) system comprising piped and overland flow components

4.3 OSD Modelling Set-up and Results

For the purposes of OSD assessment and design site hydrology has been assessed for both a pre-development "rural" landscape and as the developed landscape as shown in development plans. An iterative modelling approach was then used to determine the required volume for the site OSD to achieve specified design objectives.

The proposed OSD is to be located within the same structure as the site sedimentation and rainwater harvesting dam. This dam has a storage capacity of 6.2 ML for rainwater harvesting. In line with recommendations of the Upper Parramatta River Catchment Management Trust (2004) 'On-site Stormwater Detention Handbook' 40% of the capacity of the stormwater harvesting basin has been assumed to be available for OSD purposes.

For the purposes of this analysis the OSD outlet has been assumed to be three 600 mm pipes. The flow from the OSD has been evaluated for storms from the 1 in 2 yr ARI to the 1 in 100 yr ARI event. Results of this analysis are provided in Table 7.

Table 7: Results of RAFTS analysis of proposed OSD dam.

Storm Recurrence Interval	Storm Duration[1]	Pre-development Peak Flow (m^3/h)	Unattenuated Post Development Peak Flow (m^3/h)	Post Development Peak Flow (m^3/h)	Maximum Required Volume (KL)	Maximum Stage (m)[2]
2 yr	120 min	1.11	4.86	0.84	1215	0.24
5 yr	120 min	1.69	6.20	1.39	1905	0.38
10 yr	120 min	2.01	6.95	1.67	2434	0.49
20 yr	120 min	2.46	8.00	2.03	3212	0.64
50 yr	120 min	2.94	8.69	2.32	3975	0.8
100 yr	120 min	3.37	9.67	2.59	4753	0.95

Notes: [1]Critical duration storm event. [2] Measured from water level at 6.2 ML stormwater retention capacity.

A site OSD with the following general characteristics is capable of sufficiently attenuating post-development flows to achieve the stated objectives of the Precinct Plan and Council's Stormwater Quality Policy:

- Surface area of 5000 m^2 co-located with the site sedimentation / stormwater harvesting basin.
- Outlet constructed of three 600 mm pipes.

- Design retention capacity of 4.75 ML
- Minimum operating stage of approx 1.0 m.
- Spillway (not yet engineered) at 1.0 m above outlet invert sized to pass PMF flow.
- Nominal free board of 0.5 m

4.4 DRAINS Modelling Set-up and Results

DRAINS is a comprehensive, multi-purpose Windows program for designing and analysing catchments and urban stormwater drainage systems. DRAINS has been used to calculate pipe sizes and pipe and pit invert levels for the proposed development. The results are presented in the Plan Set Sheet 3. It is noted that preliminary site levels were used and may be subject to change at CC stage of the development.

Table 4 lists the preliminary stormwater infrastructure required for the development.

Table 8: Stormwater Infrastructure Requirements.

Concrete Pipe	**Length(m)**
375 mm	541
450 mm	287
525 mm	487
600 mm	142
675 mm	106
750 mm	215
825 mm	19
900 mm	35
1050 mm	93
1200 mm	36
1350 mm	147
1650 mm	74
1800mm	138
Letterbox Pit	**Quantity**
1800mm x 1800mm	3
2400mm x 2400mm	41

5 Stormwater Management Plan

5.1 Stormwater Management Measures

A range of stormwater management devices or 'structures' have been incorporated into this concept stormwater management plan. These are addressed in the following sections.

5.1.1 Stormwater Runoff Collection

We understand that runoff from all future internal site buildings, parking areas, roads and stockpile areas shall be directed to the site sedimentation pond via treatment structures detailed below. The arrangement of local topography allows for all stormwater runoff from site roads to be adequately discharged by the above means.

5.1.2 Watercourses Riparian Zones

Given the condition and ecological habitat value of the existing site watercourses, a core riparian zone (CRZ) of 20 m would be appropriate in light of specifications and requirements of Landcom (2004). However, the 'Ropes Creek Tributary' is specifically identified in the Eastern Creek Precinct Plan and has been afforded a 40 m riparian corridor (Figures 11 and 12 of Precinct Plan), in addition a 10 m buffer to these RMZs has been provided in Section 5.6.1 (e) of the Precinct Plan. No development works are proposed within these areas to permit future full implementation of the Precinct plans riparian zone and buffers.

The overland flow path which runs from east to west across the southern area of the site (identified in Precinct Plan as an 'overland flow path' NOT a significant creek) does not require a riparian management zone (on the basis of either Landcom (2004) or the Precinct Plan). To minimise the risk of toe erosion to the existing site earthen embankment this flow path is to be relocated to the eastern then southern property boundaries as part of the site's development. Where possible within the design constraints the relocated flow path shall be revegetated with native species.

5.1.3 Drainage Swales

Grassed drainage / treatment swales shall be used to collect and convey surface runoff from site roads and car parking areas as well as the proposed asphalt plant area. Surface flows from the grassed swales would then be directed to pipes located beneath the swale via drainage pits.

5.1.4 *Oil and Sediment Traps*

It is proposed that Humeceptor (or similar) oil and sediment traps be incorporated into the site stormwater drainage system to address the two highest priority pollutants from BCC (2005) stormwater policy.

The Humeceptor™ is a hydrodynamic source control device for the capture and retention of a range of contaminants from stormwater runoff generated from impervious surfaces. These contaminants include free and floating oils, grease, hydrocarbon and petroleum products, fine suspended solids (including 10-100 µm) as well as the absorbed contaminants usually transported by the fine suspended solids such as heavy metals, hydrocarbons and petroleum products.

It provides careful control of flow rates and operational velocities to prevent the resuspension and loss of fine suspended solids material and emulsification of collected hydrocarbons during infrequent high flow rates. The performance of the Humeceptor™ to deliver a water quality outcome has been extensively verified by independent third party regulatory authorities under field conditions. More information can be found at http://www.humes.com.au/ProdsServices/EnvWaterSolns/humeceptor.shtml.

As outlined in Attachment A all stormwater from the redevelopment area of the site will be directed to the sedimentation ponds via two suitably sized Humeceptor™. The determination of size will need to be investigated at CC stage of the proposal.

5.1.5 *Detention, Sedimentation and Harvesting Structure*

Existing site sedimentation basins are to be reconfigured, with most to be filled. A new basin shall be constructed in the south western corner of the site to achieve a range of water quality and quantity requirements. This basin shall provide up to 6.2 ML of stormwater retention for re-use as well as providing OSD capacity of 4.75 ML. General Design Characteristics for this basin are as follows:

- Surface area of 5000 m^2 located as shown on site plans.
- Outlet constructed of three 600 mm pipes located 1.25 m from the base of the basin.
- Spillway located 2.25 m above basin floor to be designed to pass PMF flow.
- Nominal free board of 0.5 m above the engineered PMF spillway.

5.1.6 Stormwater Release Points

Suitably designed outlet and energy dissipation structures are required for the stormwater drainage outlets into existing watercourses. Detailed design of the basin outlet shall be undertaken with reference to relevant DNR design guidelines and are to be designed to be sympathetic to the areas proposed use as a Riparian Management Zone.

5.2 Stormwater Re-use

Refer to Martens and Associates report REF: P0601396JR05_v1for detail.

5.3 Benefits of the Stormwater Management Approach

The proposed stormwater management strategy is practical, cost effective and if implemented and appropriately maintained will reduce key stormwater pollutants in line with the design objectives outlined in this report. Design of stormwater management structures achieve stated objectives regarding flow attenuation and ensure future stability of downstream water courses. The reclamation and re-use of stormwater is an integral part of the sites water cycle management plan and minimisation of potable water demands shall be achieved through their implementation.

5.4 Recommended Further Works

Detailed design of a number of the stormwater management components shall be required at later detailed design stages. These include.

1. Detailed design of the stormwater sedimentation / detention structures in accordance with relevant Council design standards. Where possible the incorporation of 'naturalised' areas such as shallow water macrophyte zones is to be included in the final design.

2. Detailed stream design of site overland flow paths and further hydraulic assessment at construction certificate stage. These works shall focus on achieving a stream design outcome which:
   - Achieves stable post-development channel form.
   - Maintains stream capacity.
   - Results in no increased inundation of adjacent properties.

3. All necessary stormwater inlets shall be designed in accordance with DNR design guidelines.

4. Where possible riparian vegetation shall be used to prevent bed and bank erosion by decreasing flow velocities and reducing turbulence through the suppression of eddies

5. Significant bank stabilisation of the new channel will be provided through the revegetation of creek bed and banks.

6. The channel capacity is sufficient to convey larger flows without significantly altering the local flood regime.

7. Channel and banks of the re-constructed creek reach will be vegetated where possible, providing enhanced riparian corridor connectivity across the site.

6 Recommendations

The following is a summary of recommendations of the site Stormwater Management Strategy:

1. Stormwater management systems as detailed in this report are to be provided to ensure compliance with Blacktown Council (2005) stormwater quality Control Policy.

2. A stormwater collection basin is to be provided to allow for the treatment and harvesting of site runoff from the entire development area on the site. Collected runoff is to be used for non-potable site water uses. The capacity of the site sedimentation / harvesting basin is to be 6 200 KL.

3. An on-site detention basis is to be provided to achieve the attenuation of post development flows to 'rural' catchment flows for critical storms from the 1 in 2 to 1 in 100 yr ARI event. An OSD capacity of 7.25 ML. Where co-located with the 6.2 ML harvesting basin the OSD capacity may be reduced to 5.0 ML.

4. Detailed design of site stormwater quality systems is to be undertaken. This detailed design is to ensure compliance with stormwater quality criteria specified in this report. The use of treatment swales, sediment / hydrocarbon traps and a major sedimentation basin as outlined in this report are recommended.

5. No development works (other than approved regrading and landscaping) is to be undertaken with the nominated riparian corridor and 10 m buffer areas.

6. Detailed design of sedimentation / OSD basin and redirected site overland flow path are to include as far as possible natural revegetation.

7. The site stormwater drainage system is to be designed to relevant council policies to achieve a safe and effective means of draining the site.

7 References

ANZECC, 2000. *National Water Quality Management Strategy (NWQMS) Australian Water Quality Guidelines for Fresh and Marine Waters*.

Australian / New Zealand Standard 1547, 2000. *On-site Domestic Wastewater Management*.

Blacktown City Council, February 2005. *Engineering Guide for Development*.

Department of Local Government, NSW Environment Protection Authority, NSW Health Department, NSW Department of Land and Water Conservation and the NSW Department of Urban Affairs and Planning, 1998. *Environment and Health Protection Guidelines, On-site Sewage Management for Single Households.*

Institute of Engineers Australia, 2006. *Australian Runoff Quality*.

Landcom, 2004. *Managing Urban Stormwater – Soils and Construction*

NSW Environment Protection Authority, 1995. *The Utilisation of Treated Effluent by Irrigation, Draft Environmental Guidelines for Industry*.

NSW Environment Protection Authority, 1997/a. *Managing Urban Stormwater: Treatment Techniques (DRAFT)*.

NSW Environment Protection Authority, 1997/b. *Managing Urban Stormwater: Council Handbook (DRAFT)*.

Upper Parramatta River Catchment Trust (May, 2004). *Water Sensitive Urban Design – Technical Guidelines for Western Sydney*

Upper Parramatta River Catchment Trust (May, 2004). *On-site Stormwater Detention Handbook*

8 Attachment A – Plan Set

CONCEPT STORMWATER MANAGEMENT PLAN

PROPOSED REDEVELOPMENT OF HANSON EASTERN CREEK QUARRY, NSW.

INDEX

SHEET 1	COVER
SHEET 2	SITE SURVEY PLAN
SHEET 3	PROPOSED DEVELOPMENT LAYOUT PLAN
SHEET 4	PRE-DEVELOPMENT MUSIC MODEL LAYOUT
SHEET 5	POST-DEVELOPMENT MUSIC MODEL LAYOUT

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CLIENT/ PROJECT
HANSON CONSTRUCTION MATERIALS
EASTERN CREEK QUARRY

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

TITLE
COVER SHEET

PROJECT MANAGER:
Dr. DANIEL MARTENS

DRAWING NUMBER:
P0601396JD06_V2

DESIGNED: MD	DATUM: NA	SHEET 1 OF 5 SHEETS	
DRAWN: SA	HORIZONTAL RATIO: NA		
REVIEWED: DM	VERTICAL RATIO: NA	PAPER SIZE: A1 / A3	

REV.	DESCRIPTION	DATE	ISSUED
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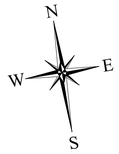
2.0	STORMWATER MANAGEMENT PLAN - FINAL	03.10.2006	DM



LOT 1
DP 400697
20.63 ha
"PIONEER CONCRETE"

LOT W
DP 419612
8.54 ha
"PIONEER CONCRETE"

LOT 1
DP 650179
23.59 ha
"SUMY P/L"

LOT 122
DP 1049623
117.4 ha
"HARTFORD LANE"

LOT 2
DP 262213
93.77ha
"RAY FITZPATRICK P/L"
(VALAD COMMERCIAL MANAGEMENT
& VALAD FUNDS MANAGEMENT-CAVEATOR)

DP 558723
20.9 ha
"PIONEER CONCRETE"

LOT 122
DP 1049623
"HARTFORD LANE"

FIGURE 7

NOTES

- BOUNDARY DIMENSIONS AND AREAS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE AT LPI. NSW AND ARE SUBJECT TO FINAL SURVEY.
- CONTOURS IF SHOWN ARE AN INDICATION OF THE TOPOGRAPHY AND SHOULD ONLY BE USED FOR PLANNING PURPOSES. IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED.
- DO NOT SCALE OFF THIS PLAN - RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A BOUNDARY SURVEY.
- NO SERVICES SEARCH HAS BEEN UNDERTAKEN. SERVICES SHOWN ARE BASED ON SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY DURING FIELD SURVEY & CHARTED AS A GUIDE TO THE POSITION & NATURE OF THE SERVICE.
- THE POSITIONS OF ANY UNDERGROUND SERVICES, INCLUDING FIBRE OPTIC CABLE, HAVE NOT BEEN DETERMINED.
- NO "DIAL BEFORE YOU DIG" SEARCH HAS BEEN UNDERTAKEN. CONTACT "DIAL BEFORE YOU DIG" ON Ph: 1100 PRIOR TO COMMENCING WORK ON SITE.

PAGE BAR SCALE

0 40 80 120 160 200

UNITS - METRES

SCALE - 1:2000 @ A1 1:4000 @ A3

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TITLE
SITE SURVEY PLAN

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PROJECT MANAGER: Dr. DANIEL MARTENS

DRAWING NUMBER: P0601396JD06_V2

DESIGNED: MD
DRAWN: SA
REVIEWED: DM

DATUM: mAHD
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VERTICAL RATIO: 1:2000 @ A1 1:4000 @ A3

SHEET 2 OF 5 SHEETS

PAPER SIZE: A1 / A3

REV.	DESCRIPTION	DATE	ISSUED
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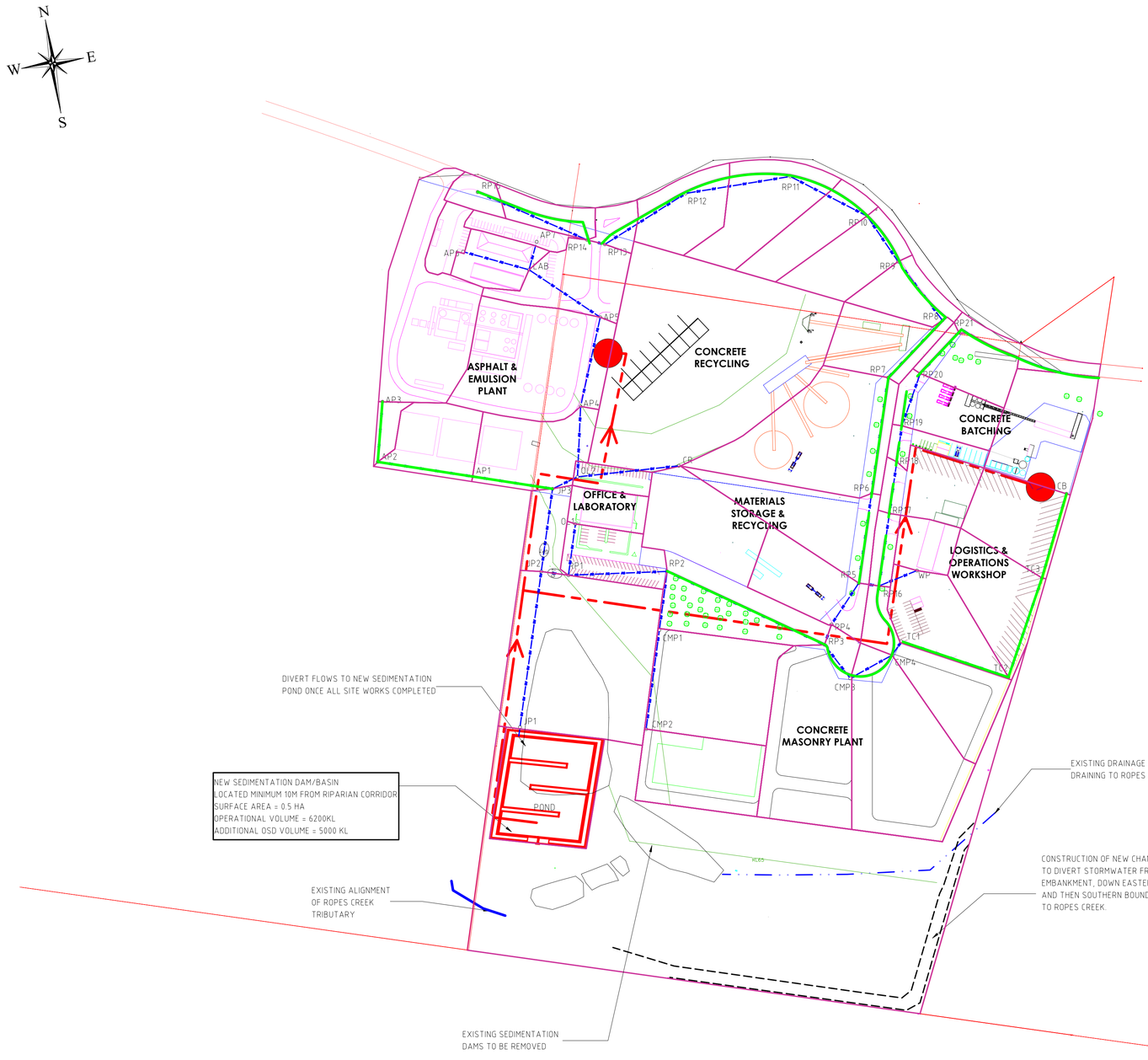
2.0	STORMWATER MANAGEMENT PLAN - FINAL	03.10.2006	GT



LEGEND

- TREATED WATER DISTRIBUTION LINE
- SUB-CATCHMENT BOUNDARIES
- CATCHMENT BOUNDARIES
- APPROXIMATE LOCATION OF EXISTING DRAINAGE DEPRESSION
- UPPER TRIBUTARY OF ROPES CREEK
- EXISTING DAM FOOTPRINT
- NEW SEDIMENTATION DAM/BASIN
- PROPOSED NEW CHANNEL
- TOP OF BANK NEW CHANNEL

PAGE BAR SCALE

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TITLE
PROPOSED DEVELOPMENT LAYOUT PLAN

PROJECT MANAGER:
Dr. DANIEL MARTENS

DRAWING NUMBER:
P0601396JD06_V4

DESIGNED:	MD
DRAWN:	SA/GT/MD
REVIEWED:	DM
DATUM:	mAHD
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VERTICAL RATIO:	1:2000 @ A1 1:4000 @ A3
SHEET	3 OF 5 SHEETS
PAPER SIZE:	A1 / A3

REV.	DESCRIPT
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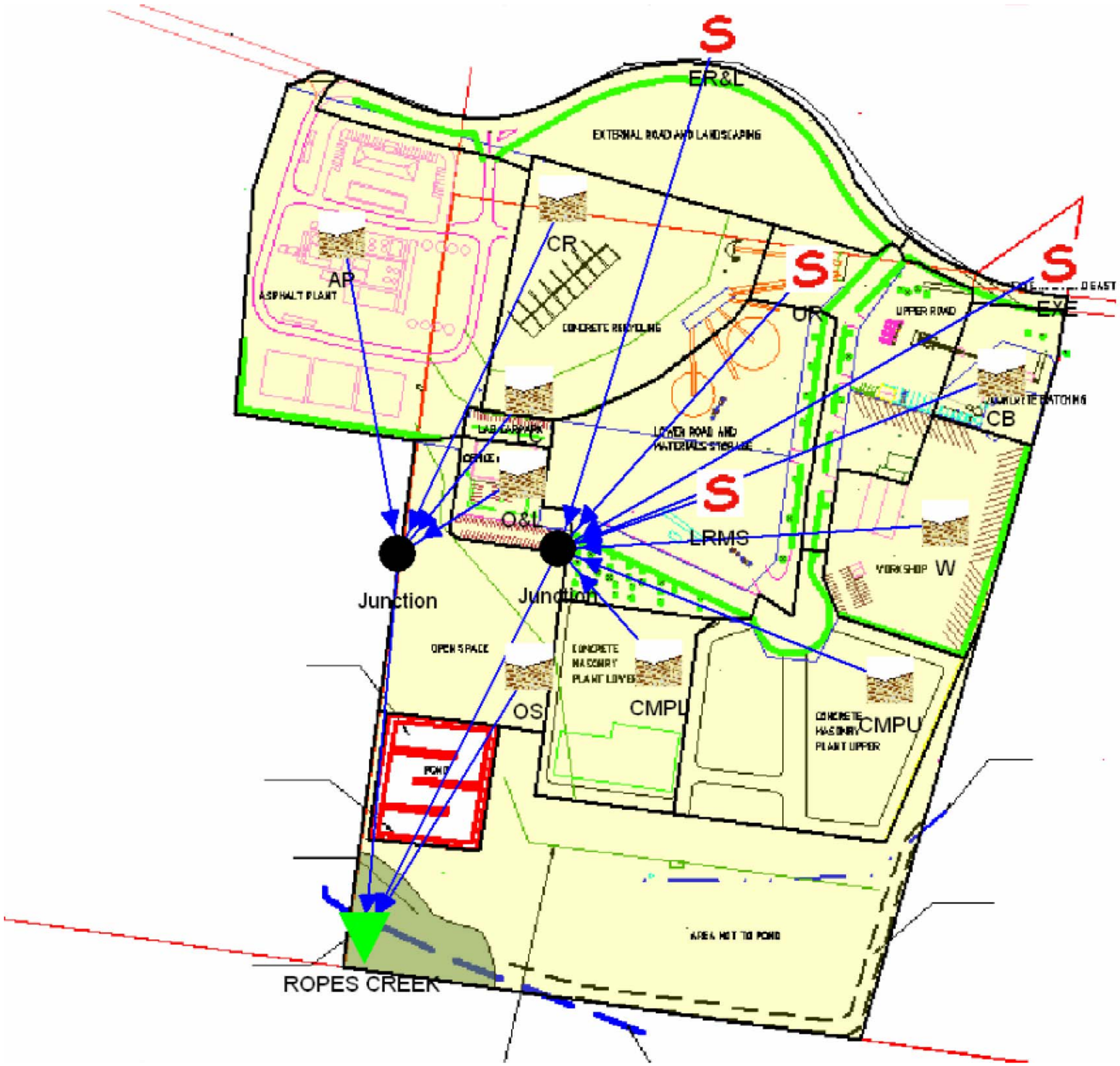
3.0	LAYOUT F
4.0	LAYOUT R



NOTE: NOT TO SCALE

CATCHMENT	ABBREVIATION
CONCRETE MASONRY PLANT UPPER	CMPU
CONCRETE MASONRY PLANT LOWER	CMPL
OPEN SPACE	OS
LOWER ROAD AND MATERIALS STORAGE	LRMS
OFFICE AND LAB	O&L
LAB CARPARK	LC
CONCRETE RECYCLING	CR
ASPHALT PLANT	AP
WORKSHOP	W
CONCRETE BATCHING	CB
UPPER ROAD	UR
EXTERNAL ROAD EAST	ERE
EXTERNAL ROAD AND LANDSCAPING	ER&L

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TITLE
POST DEVELOPMENT MUSIC MODEL - NO TREATMENT

PROJECT MANAGER: Dr. DANIEL MARTENS

DRAWING NUMBER: P0601396JD06_V2

DESIGNED: MD
DRAWN: SA
REVIEWED: DM
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VERTICAL RATIO: NA
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SHEET 4 OF 5 SHEETS

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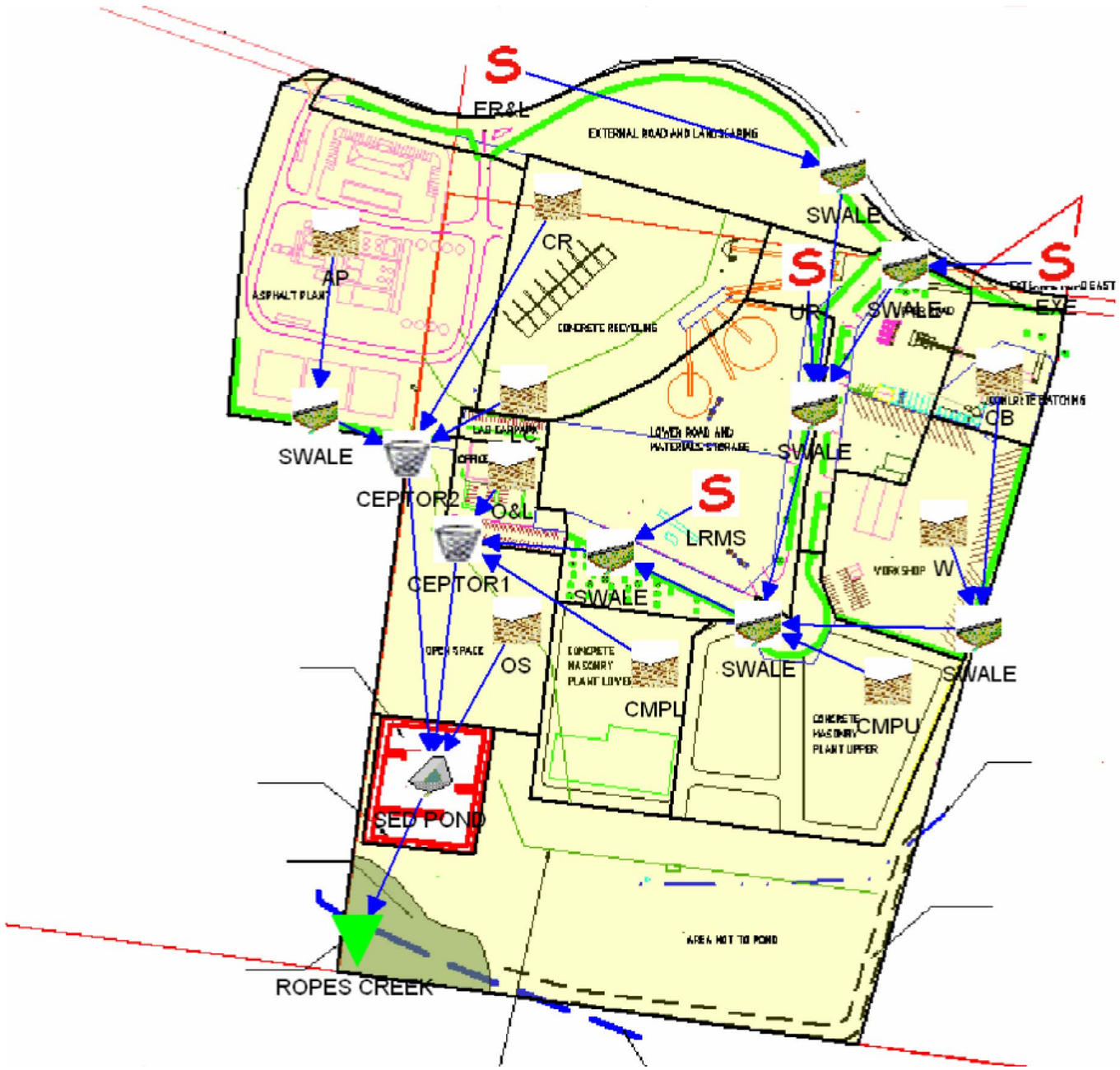
3.0	MODELLING REVISED	15.11.2006	GT



NOTE: NOT TO SCALE

CATCHMENT	ABBREVIATION
CONCRETE MASONRY PLANT UPPER	CMPU
CONCRETE MASONRY PLANT LOWER	CMPL
OPEN SPACE	OS
LOWER ROAD AND MATERIALS STORAGE	LRMS
OFFICE AND LAB	O&L
LAB CARPARK	LC
CONCRETE RECYCLING	CR
ASPHALT PLANT	AP
WORKSHOP	W
CONCRETE BATCHING	CB
UPPER ROAD	UR
EXTERNAL ROAD EAST	ERE
EXTERNAL ROAD AND LANDSCAPING	ER&L

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TITLE
POST-DEVELOPMENT MUSIC MODEL - TREATMENT INCLUDED

PROJECT MANAGER: Dr. DANIEL MARTENS

DRAWING NUMBER: P0601396JD06_V2

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4.0	MODEL REVISED	15.11.2006	GT