

Water Sensitive Urban Design Strategy

Tutt Bryant, Erskine Park

Lot 22, DP1178567
Tyrone Place
Erskine Park, NSW

PREPARED BY

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Document Control

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Introduction

Sparks & Partners have been engaged by Tubb & Associates on behalf of Fife Capital to provide civil engineering services to support the proposed Development Application for an industrial facility at Lot 22 DP1178567, Tyrone Place, Erskine Park NSW. The engineering services include the design and documentation of the concept stormwater drainage infrastructure, Water Sensitive Urban Design (WSUD) strategy and finished pavement levels for the proposed development.

Penrith City Council being the consent authority for the proposed development, require a WSUD strategy be prepared that takes into consideration the objectives and controls under Penrith Development Control Plan 2014 (PDCP) Part C3 Water Management. In response to this requirement Sparks and Partners has undertaken modelling of the proposed integrated water management measures and prepared this report to demonstrate that the proposed industrial development identifies and incorporates water conservation and stormwater management measures into its design and operation in accordance with the requirements of Part C3 of the PDCP.

Existing Site

The site is located at the western end of Tyrone Place, Erskine Park and is currently bounded by the Transpacific landfill facility to the south, a proposed environmental corridor to the west and north, and a proposed industrial facility to the east. The lot itself occupies an area of approximately 40,000m² and is currently vacant with no buildings or structures located on the site.

Proposed Development

The proposed industrial development consists of a building, hardstand, storage area, car park pavement area and landscaping and covers an approximate area of 8,000m². The site is located in the northern portion of Lot 22, with a current DA in place for the southern 32,000m² portion of the site. The proposed building is to be located in the southern portion of the site, running east-west and occupies an approximate area of 865m², the majority of the development consists predominately of pavement area occupying approximately 24,000m², with the remainder being occupied by landscaping. A portion of the site has been Detailed architectural plans have been prepared by ReidCampbell for the DA submission and are to be read in conjunction with this report.

The proposed stormwater management for the site is to incorporate WSUD strategies as per Council's DCP and policies. It is noted here that a separate DA (Ref: DA15/0907) has been lodged that details the subdivision and drainage channel works of the western environmental corridor. These works include stormwater infrastructure that is to service Lot 22 and the proposed development, and consists of a bio-retention/on-site detention basin. Reference is made to the submitted drawings for this DA prepared by Calibre Consulting ref: X03033.46 and that this WSUD strategy is to be read in conjunction with those plans. Further discussion on this proposed infrastructure is discussed further in the following sections.

Water Sensitive Urban Design

The objective of WSUD is to provide a strategy that brings together the different aspects of the water cycle as a whole rather than an ad hoc approach to water management. This includes the management aspects of freshwater, wastewater and stormwater. The following WUSD strategies have been considered and addressed for the proposed development:

- Employ an integrated water collection and recycling system for capturing and recycling roofwater;
- Control the quality of stormwater that is disposed from the site;
- Control the quantity of stormwater that is discharged for the site.

To demonstrate the above concept stormwater drainage plans and associated details have been prepared along with detailed modelling using the Council endorsed MUSIC software package. The concept stormwater drainage plans detail the location of the water management infrastructure including the pit and pipe network, rainwater tank, bio-retention/on-site detention (OSD) basin and are included in Appendix A.

Water Conservation

Water usage reduction is to be achieved throughout the development through the use of a minimum of 4 Star WELS rated water fixtures and rainwater reuse in accordance with the performance criteria under section 3.1 Water Conservation of the Penrith City Council WSUD Policy, December 2013.

Rainwater Reuse

Through the reuse of collected roofwater for non-potable reuse the proposed demand on potable water resources is reduced. The proposed development will capture roof water from the whole building roof area (865m²). This collected roofwater will be conveyed to an 18,000litre tank for storage and reuse throughout the development. Re-use purposes will primarily include toilet flushing and irrigation uses. A water balance of the proposed reuse system has been completed to model the effectiveness and efficiency of the system. The water balance model was constructed using the MUSIC software package with the following inputs:

- Penrith City Council MUSIClink files;
- Total approximate non-potable reuse of 0.257KL per day and 112KL per year based on:
 - Three (3) toilets with each using 0.1KL day for six (6) days of the week – 0.257KL/day;
 - 280m² of irrigated area requiring 0.4KL of irrigation per year – 112KL/year.

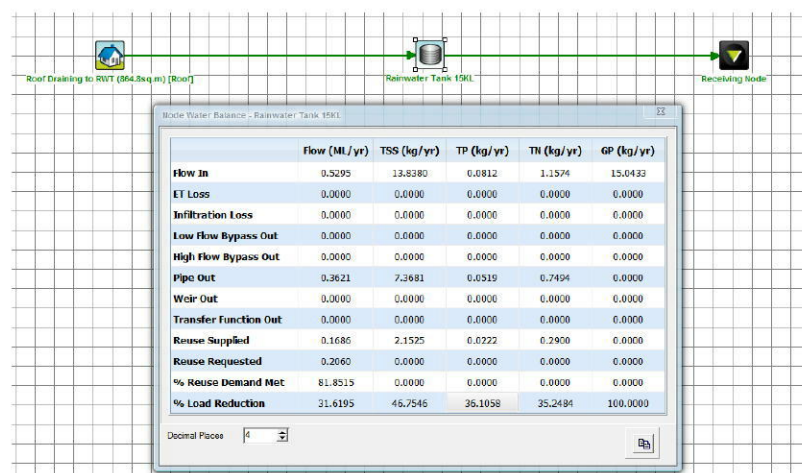


Figure 1 - MUSIC Water Balance

Using the above determined non-potable demand the MUSIC model determines the rainwater tank has an approximate efficiency of 81.85%. This demonstrates that the reuse efficiency meets the minimum 80% requirement in accordance with the performance criteria under section 3.1 Water Conservation of the Penrith City Council WSUD Policy, December 2013.

Stormwater Quality

To ensure the quality of stormwater leaving the site is acceptable and meets the performance criteria under section 3.2 Stormwater Quality of the Penrith City Council WSUD Policy, December 2013 specific water quality treatment measures are to be employed. These treatment measures are to treat the collected stormwater runoff prior to discharge to the environmental corridor. The treatment measures consist of a GPT, rainwater tank and bio-retention basin. The combination of these measures provides a treatment train approach to the treatment of stormwater runoff.

A bio-retention filter area size of 600m² with an extended detention depth of 0.3m has been nominated by Calibre Consulting as part of DA15/0907 to treat the stormwater runoff generated by the development of Lot 22. Refer to Appendix B for a copy of the plan showing the location of the basin. To verify this area and extended detention depth MUSIC modelling of the proposed treatment measures has been undertaken using the MUSIC software package version 6. The modelling inputs have been based on the MUSIClink meteorological template file for Penrith, the Penrith City Council standard source nodes, Council's WSUD Technical Guidelines Version 3-2015. The modelling results of the water quality achieved for the site is detailed in Table 1 – MUSIC Model Results below, along with a figure of the prepared model.

The modelling demonstrates that the proposed 600m² bio-retention filter with 0.3m extended detention depth provides the necessary treatment to ensure stormwater discharge from Lot 22 and the subject development meets Council's requirements.

	Source Load	Residual Load	% Reduction Achieved	PCC % Reduction Requirement	Compliance with PCC Requirement
Gross Pollutants (kg/yr)	631	25.5	96	90	Yes
Total Suspended Solids (kg/yr)	3,450	467	86.5	85	Yes
Total Phosphorus (kg/yr)	6.0	1.96	67.3	60	Yes
Total Nitrogen (kg/yr)	48.7	21.2	56.4	45	Yes

Table 1 - MUSIC Model Results

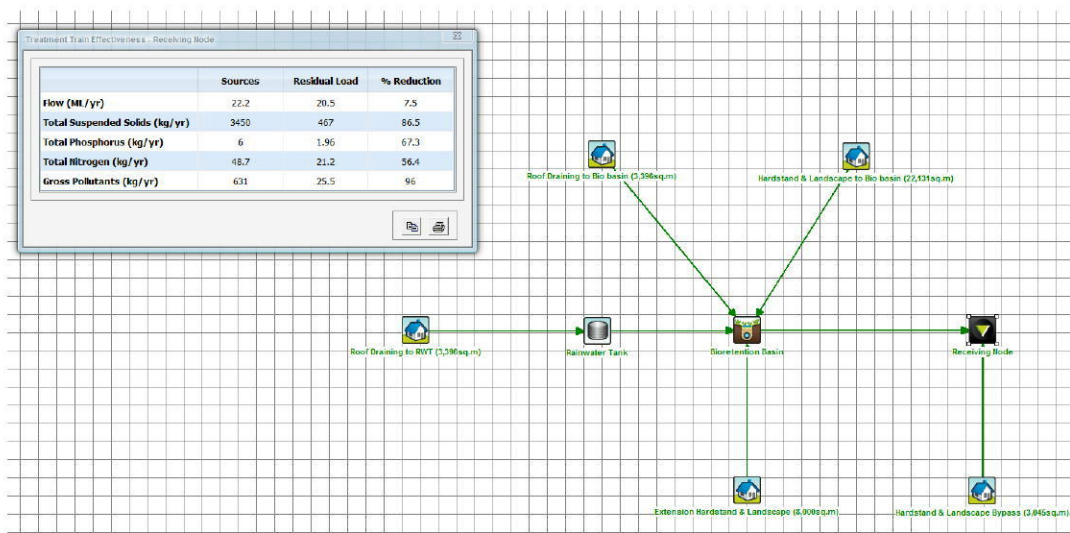


Figure 2 - Bio-retention Basin MUSIC Model

Stormwater Quantity

To control stormwater discharge from the site an OSD basin has been proposed as part of DA15/0907 to service the proposed development of Lot 22. This OSD is to provide an active detention volume of 1,000m³ plus the extended detention of 180m³ of the bio-retention component, and is designed to attenuate flows for storms ranging from the 2 year up to and including the 100year Average Recurrence Interval (ARI).

Calculations have been undertaken to verify the provided volume using the DRAINS software package. The input values have been based on the DRAINS recommended input values and Intensity Frequency Duration (IFD) data obtained from the Bureau of Meteorology (BOM). The results of the modelling are tabled below and detail the pre-developed and post developed storm flows from the site and the OSD basin.

ARI (Years)	Peak pre-developed discharge (m ³ /sec)	Peak post developed discharge (m ³ /sec)			OSD Storage Volume (m ³)	Post less than pre developed discharge
		OSD	Bypass	Total		
2	0.374	0.342	0.030	0.372	260	Yes
5	0.885	0.376	0.054	0.430	450	Yes
10	1.230	0.395	0.076	0.471	570	Yes
20	1.490	0.421	0.090	0.511	730	Yes
50	2.020	0.443	0.106	0.549	900	Yes
100	2.260	0.463	0.120	0.583	1,100	Yes

Table 2 - DRAINS OSD Model Results

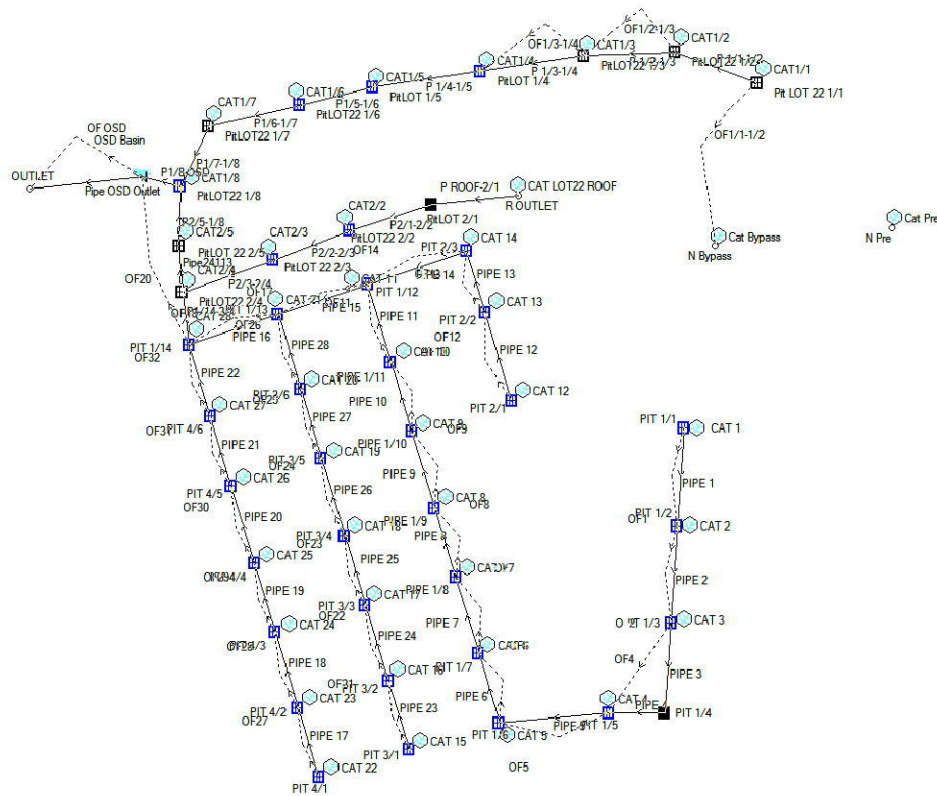


Figure 3 - DRAINS Model

The modelling results indicate that the proposed 1,000m³ active detention storage proposed for Lot 22 as part of DA15/0907 is sufficient in attenuating flows for storms ranging from the 2 year up to and including the 100 year ARI.

Maintenance and Monitoring

To ensure the continued efficient and correct operation of the proposed integrated water management infrastructure a concept 'maintenance and monitoring schedule' is included in the Appendix C of this plan. The schedule details the frequency of inspections, what is to be inspected and what rectifications to make if required for the water management infrastructure located within the proposed development. The schedule is to be implemented upon commissioning of the water management infrastructure and remain in place for the life of the development; with all records kept on site for inspection should the approval authority deem it necessary.

Conclusion

Based on the preparation of the concept stormwater drainage plans and MUSIC modeling results it is demonstrated that the principles of WSUD have been incorporated into the design and operation of the proposed development at Lot 22 DP1178567, Tyrone Pl, Erskine Park NSW in accordance with PDCP 20014 Part C3. It is demonstrated that the proposed development of Lot 22 achieves reductions in potable water import by capturing rainwater on site and reusing this for non-potable uses including irrigation and toilet flushing, achieves pollution reduction targets set by council, and employs OSD for the control of stormwater discharge from the site in accordance with targets set by council. It is also demonstrated that the proposed developments employed water conservation measures will continue to operate effectively and efficiently through the implementation and use of a monitoring and maintenance schedule ensuring the integrity of the system is maintained.

Appendix A – Concept Stormwater Drainage Plans

PROPOSED INDUSTRIAL FACILITY LOT 22 TYRONE PLACE, ERSKINE PARK CONCEPT STORMWATER MANAGEMENT

SITE WORKS - GENERAL

- ALL WORKS ARE TO BE UNDERTAKEN IN ACCORDANCE WITH LOCAL COUNCIL, AUSTRALIAN AND AUTHORITY STANDARDS.
- ALL TRENCHING WORKS ARE TO BE RESTORED TO ORIGINAL CONDITION.
- THE INTEGRITY OF ALL EXISTING AND NEW SERVICES IS TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
- ALL PLANS ARE TO BE READ IN CONJUNCTION WITH APPROVED ARCHITECTS, STRUCTURAL ENGINEERS AND OTHER CONSULTANT'S PLANS. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER FOR CLARIFICATION.

SEDIMENT AND EROSION CONTROL

- THE CONTRACTOR SHALL INSTIGATE ALL SEDIMENT AND EROSION CONTROL MEASURES IN ACCORDANCE WITH PENRITH CITY COUNCIL REQUIREMENTS AND THE "BLUE BOOK" (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION, PRODUCED BY THE DEPARTMENT OF HOUSING). THESE MEASURES ARE TO BE REGULARLY INSPECTED AND MAINTAINED.
- THE SEDIMENT & EROSION CONTROL PLAN PRESENTS CONCEPTS ONLY, THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT & MANAGEMENT OF A DETAILED SCHEME MEETING COUNCIL'S DESIGN, AND ALL OTHER REGULATORY AUTHORITY REQUIREMENTS.
- WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
 - INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ARE ADJACENT TO EACH OTHER THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE.
 - CONSTRUCT TEMPORARY STABILISED SITE ACCESS, INCLUDING SHAKE DOWN AND WASH PAD.
 - INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THESE SEDIMENT AND CONTROL PLANS (ONCE APPROVED)
- THE CONTRACTOR SHALL UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MINIMUM WORKABLE SIZE.
- AT ALL TIMES AND IN PARTICULAR DURING WINDY AND DRY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL. TACIFIERS MAY BE USED TO CONTROL DUST DURING EXTENDED PERIODS OF DRY WEATHER.
- ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) SHALL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
- WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN STABILISED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED OUT.
- TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES SHALL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE STABILISED / REHABILITATED.
- THE CONTRACTOR SHALL ALLOW FOR THE ESTABLISHMENT OF ANY OTHER EROSION PROTECTION MEASURES, (IF APPLICABLE)
- THE CONTRACTOR SHALL REGULARLY INSPECT (MINIMUM TWICE PER WEEK) ALL EROSION AND SEDIMENT CONTROL MEASURES TO ENSURE THEY ARE OPERATING EFFECTIVELY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN REGULARLY AND AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.
- ACCEPTABLE RECEPTORS SHALL BE USED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER. WASTE FROM THESE RECEPTORS SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS. PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.

SITE WORKS - ACCESS AND SAFETY

- ALL WORKS ARE TO BE UNDERTAKEN IN A SAFE MANNER IN ACCORDANCE WITH ALL STATUTORY AND INDUSTRIAL RELATION REQUIREMENTS.
- ACCESS TO ADJACENT BUILDINGS AND PROPERTIES SHALL BE MAINTAINED AT ALL TIMES.
- WHERE NECESSARY SAFE PASSAGE SHALL BE PROVIDED FOR VEHICLES AND PEDESTRIANS THROUGH OR ADJACENT TO THE SITE.

STORMWATER

- DESIGN CRITERIA.
 - ROOF DRAINAGE - 120YR ARI
 - PIPED DRAINAGE - 120YR ARI
 - OVERLAND FLOWS - GAP FLOW BETWEEN 120YR ARI & 1:100YR ARI
- WORKS SHOWN ARE CONCEPTUAL ONLY AND SUBJECT TO FINAL DESIGN AT CONSTRUCTION CERTIFICATE STAGE.
- ALL WORKS ARE TO BE UNDERTAKEN IN ACCORDANCE WITH THE FOLLOWING AUSTRALIAN STANDARDS AS2032, AS3500 AND AS3725 AS A MINIMUM.
- ALL PIPES LESS THAN OR EQUAL TO Ø300mm IN SIZE ARE TO BE SOLVENT WELD-JOINTED UPVC CLASS SN8 U.N.O.
- ALL PIPES Ø375mm OR GREATER IN SIZE ARE TO BE MIN. CLASS 2 REINFORCED CONCRETE PIPE (RCP) OR FIBRE REINFORCED CONCRETE (FRC) RUBBER RING JOINTED (RRJ) U.N.O.
- ALL PIPES ARE TO BE LAID AT MIN. 1.0% GRADE U.N.O.
- PIPE BEDDING IS TO BE H2 UNDER ROADS AND TRAFFICKED AREAS AND SHALL BE H2 IN LANDSCAPED AND PEDESTRIAN TRAFFICKED AREAS U.N.O.
- ALL PIPE BENDS AND JUNCTIONS ARE TO BE MADE WITH EITHER PURPOSE MADE FITTINGS OR STORMWATER DRAINAGE PITS.
- MINIMUM COVER FROM THE OVERTOP OF THE STORMWATER PIPE OF 300mm IS TO BE PROVIDED IN LANDSCAPED AREAS AND 600mm IN VEHICULAR TRAFFICKED AREAS U.N.O.
- WHERE MINIMUM COVER CANNOT BE ACHIEVED CONCRETE ENCASUREMENT OF THE AFFECTED PIPE IS MAY BE UNDERTAKEN WITH 20MPa CONCRETE WITH A MIN. COVER OF 150mm TO ALL SIDES OF THE PIPE. THE CONTRACTOR SHALL CONFIRM THIS REQUIREMENT WITH THE ENGINEER OR SUPERINTENDENT.
- LAID PIPELINES ARE TO HAVE THE FOLLOWING CONSTRUCTED TOLERANCES:
 - HORIZONTAL-1:300 ANGULAR DEVIATION FROM REQUIRED ALIGNMENT;
 - VERTICAL-1:300 ANGULAR DEVIATION FROM REQUIRED ALIGNMENT.
- ALL DRAINAGE PITS ARE TO BE CAST IN-SITU, PRECAST DRAINAGE PITS MAY BE USED WITH APPROVAL FROM THE ENGINEER. THE CONTRACTOR SHALL SUBMIT A PRECAST PIT INSTALLATION WORK METHOD STATEMENT FOR ASSESSMENT BY THE ENGINEER FOR APPROVAL.
- DRAINAGE PIT COVERS ARE TO BE EITHER GALVANISED STEEL OR CAST IRON CLASS 'B' IN LANDSCAPED AND PEDESTRIAN TRAFFICKED AREAS AND CLASS 'D' IN ALL VEHICULAR TRAFFICKED AREAS U.N.O.
- DRAINAGE PIT COVERS ARE TO BE 'HEELSAFE' TYPE IN ALL PEDESTRIAN TRAFFICKED AREAS U.N.O.
- EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED PRIOR TO COMMENCING WORKS ON SITE.
- PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
- DOWN PIPES CONNECTED DIRECT TO PIPES TO BE CONNECTED AT 45° TO THE FLOW DIRECTION WITH A CLEANING EYE PROVIDED AT GROUND LEVEL.

FINISHED LEVELS

- LEVELS BASED ON SURVEY PREPARED BY G.R. HAWKES AND ASSOCIATES PTY LTD. (REF: 1175, DATED: 20.03.2012) THE CONTRACTOR SHALL VERIFY LEVELS PRIOR TO CONSTRUCTION COMMENCEMENT, ANY DISCREPANCIES SHALL BE NOTIFIED TO THE ENGINEER OR SUPERINTENDENT FOR CLARIFICATION.
- FINISHED LEVELS SHOWN ARE CONCEPTUAL ONLY AND SUBJECT TO DETAILED DESIGN PRIOR TO CONSTRUCTION CERTIFICATE APPLICATION. FINAL FINISHED LEVELS TO BE +/- 0.5m FROM LEVELS SHOWN.
- CARPARK & SERVICE AREA LAYOUT AND GRADES TO COMPLY WITH AS2890.
- DRIVEWAY LAYOUT AND DESIGN TO COMPLY WITH PENRITH CITY COUNCIL ACCESS DRIVEWAY DESIGN AND CONSTRUCTION SPECIFICATION.
- ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
- PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
- ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL GRADE.
- ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS.

DRAWING SCHEDULE

- DA1.01 COVERSHEET, LOCALITY PLAN, AND DRAWING SCHEDULE
- DA2.01 CONCEPT SEDIMENT AND EROSION CONTROL PLAN & DETAILS
- DA4.01 CONCEPT STORMWATER MANAGEMENT AND FINISHED LEVELS PLAN
- DA4.05 CONCEPT CATCHMENT PLAN



LOCALITY PLAN

NOT TO SCALE - COURTESY OF SIX MAPS

1. DO NOT SCALE OFF THIS DRAWING. USE DIMENSIONS & ARCHITECTURAL DRAWINGS ONLY	CHECKED	DATE	NORTH POINT	DATE	No	AMENDMENT	INIT	REV	DATE	No	AMENDMENT	INIT	REV
2. DRAWINGS TO BE READ IN CONJUNCTION WITH SPECIFICATION.	APPROVED	DATE		09.06.16		ISSUED FOR APPROVAL	MW	1					
3. LEVELS ARE INDICATIVE ONLY AND ARE TO BE CHECKED PRIOR TO COMMENCEMENT OF ANY WORKS	PAGE	PLOT DATE											
4. AUTHORITIES MANS AND/OR EXISTING SERVICES ARE TO BE LOCATED AND CHECKED PRIOR TO COMMENCEMENT OF ANY WORKS	A1	June 9, 2016											
5. COMPLETION OF THE QUALITY RECORD IS EVIDENCE THAT THE DESIGN AND DRAWING HAVE BEEN VERIFIED.	FOR INFORMATION ONLY												
6. VERIFICATION OF THE DRAWING STATUS IS EVIDENCE THAT THE DESIGN HAS BEEN VERIFIED AS CONFORMING TO THE REQUIREMENTS OF THE PROJECT QUALITY PLAN	FOR CLIENT APPROVAL												
7. THE INFORMATION ON THIS DRAWING REMAINS THE PROPERTY OF SPARKS & PARTNERS CONSULTING ENGINEERS. REPRODUCTION OF THE WHOLE OR PART OF THIS DOCUMENT CONSTITUTES AN INFRINGEMENT OF COPYRIGHTS	FOR TENDER												
8. FOR INFORMATION ONLY	FOR CONSTRUCTION												

DATE	No	AMENDMENT	INIT	REV
09.06.16		ISSUED FOR APPROVAL	MW	1

DATE	No	AMENDMENT	INIT	REV

DATE	No	AMENDMENT	INIT	REV

DATE	No	AMENDMENT	INIT	REV

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Fax: 61 2 9554 4320 Web: www.reidcampbell.com

PROJECT

PROPOSED INDUSTRIAL FACILITY LOT 22
TYRONE PLACE, ERSKINE PARK

DRAWING TITLE

CIVIL DESIGN
COVERSHEET, LOCALITY PLAN,
AND DRAWING SCHEDULE

DA ISSUE

SPARKS+PARTNERS
CONSULTING ENGINEERS
HYDRAULIC | CIVIL | FIRE

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DATE

DESIGNED MW

DRAWN CC

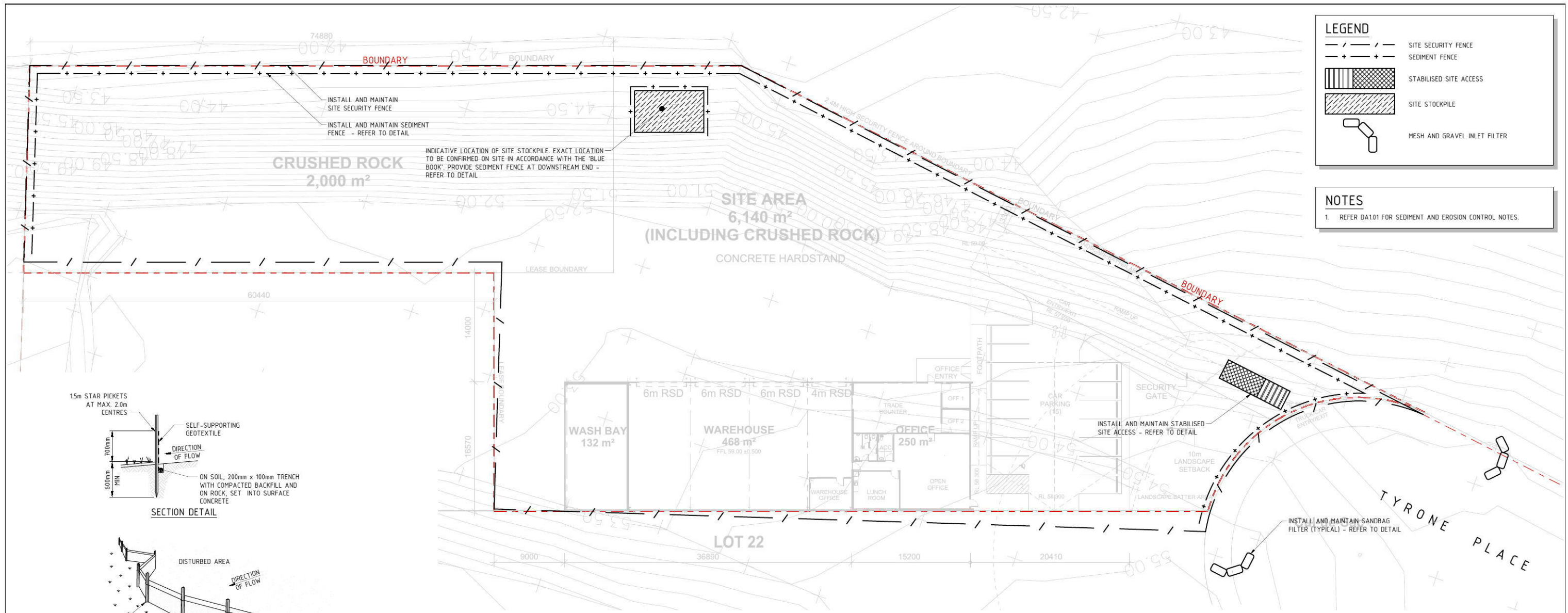
SCALE NTS

JOB No 16098

DA1.01

REV 1

DATE	DESIGNED	DRAWN	SCALE	JOB No	DA1.01	REV	1

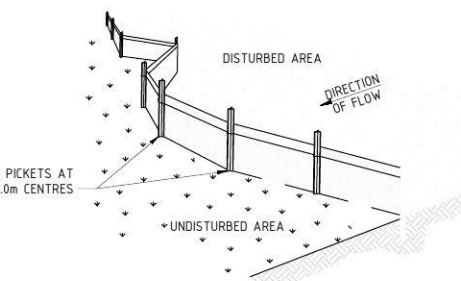
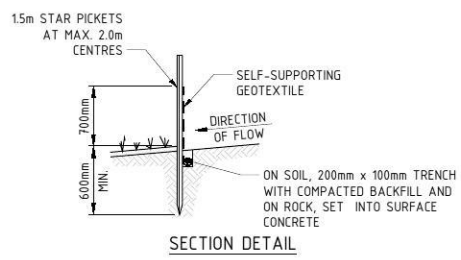


LEGEND

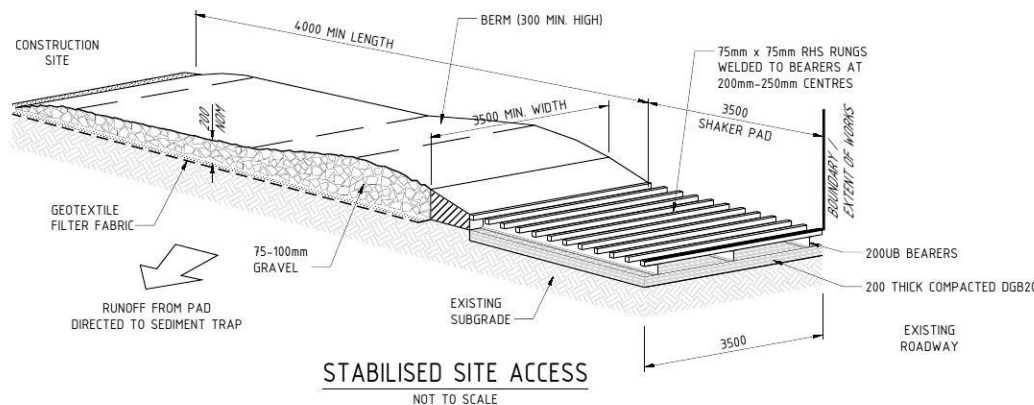
- SITE SECURITY FENCE
- - - SEDIMENT FENCE
- [Hatched Box] STABILISED SITE ACCESS
- [Hatched Box] SITE STOCKPILE
- [Symbol] MESH AND GRAVEL INLET FILTER

NOTES

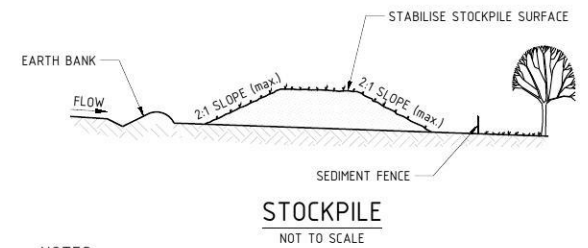
1. REFER DA1.01 FOR SEDIMENT AND EROSION CONTROL NOTES.



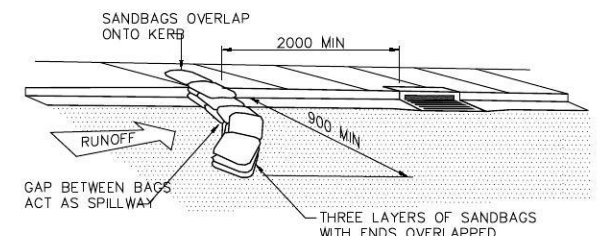
- NOTES:**
- CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50L/s IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
 - CUT A 200mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
 - DRIVE 15m LONG STAR PICKETS INTO GROUND AT 2.0m INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
 - FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
 - JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
 - BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.



- MAINTENANCE**
- THE TEMPORARY ACCESS SHALL BE MAINTAINED IN A CONDITION THAT PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY.
 - THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL GRAVEL AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
 - ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.
 - INSTALL BARRIER ON EITHER SIDE OF SHAKER PAD
 - TO ENSURE VEHICLES ARE GUIDED ON TO THE PAD.
 - INVERT OF SHAKER PAD TO BE DRAINED VIA AGRICULTURAL PIPE WRAPPED IN GEOTEXTILE FABRIC.



- NOTES:**
- PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
 - CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
 - WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT. 4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
 - CONSTRUCT EARTH BANKS ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES 1 TO 2 METRES DOWNSLOPE.



SEDIMENT TRAP FOR KERB INLET
(ON GRADE - SANDBAG)

NOT TO SCALE

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2. DRAWINGS TO BE READ IN CONJUNCTION WITH SPECIFICATION.

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DRAWN BY	DATE
CHECKED BY	DATE
APPROVED BY	DATE

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APPROVED	DATE	
PAGE	PLOT DATE	
A1	June 9, 2016	

DATE	No	AMENDMENT	INIT	REV
09.06.16		ISSUED FOR APPROVAL	MW	1

DATE	No	AMENDMENT	INIT	REV

PROJECT MANAGER

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PROJECT

PROPOSED INDUSTRIAL FACILITY LOT 22
TYRONE PLACE, ERSKINE PARK

DRAWING TITLE

CIVIL DESIGN
CONCEPT SEDIMENT AND EROSION
CONTROL PLAN & DETAILS

SPARKS+PARTNERS
CONSULTING ENGINEERS
HYDRAULIC CIVIL FIRE

Level 1, 91 George Street | Parramatta | NSW 2150
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DATE 16.06.16

SCALE 1:250 @ A1

JOB No 16098

DESIGNED BY MW

DRAWN BY CC

DATE 16.06.16

SCALE 1:250 @ A1

JOB No 16098

DA2.01

NO. IN SET 1

REV 1

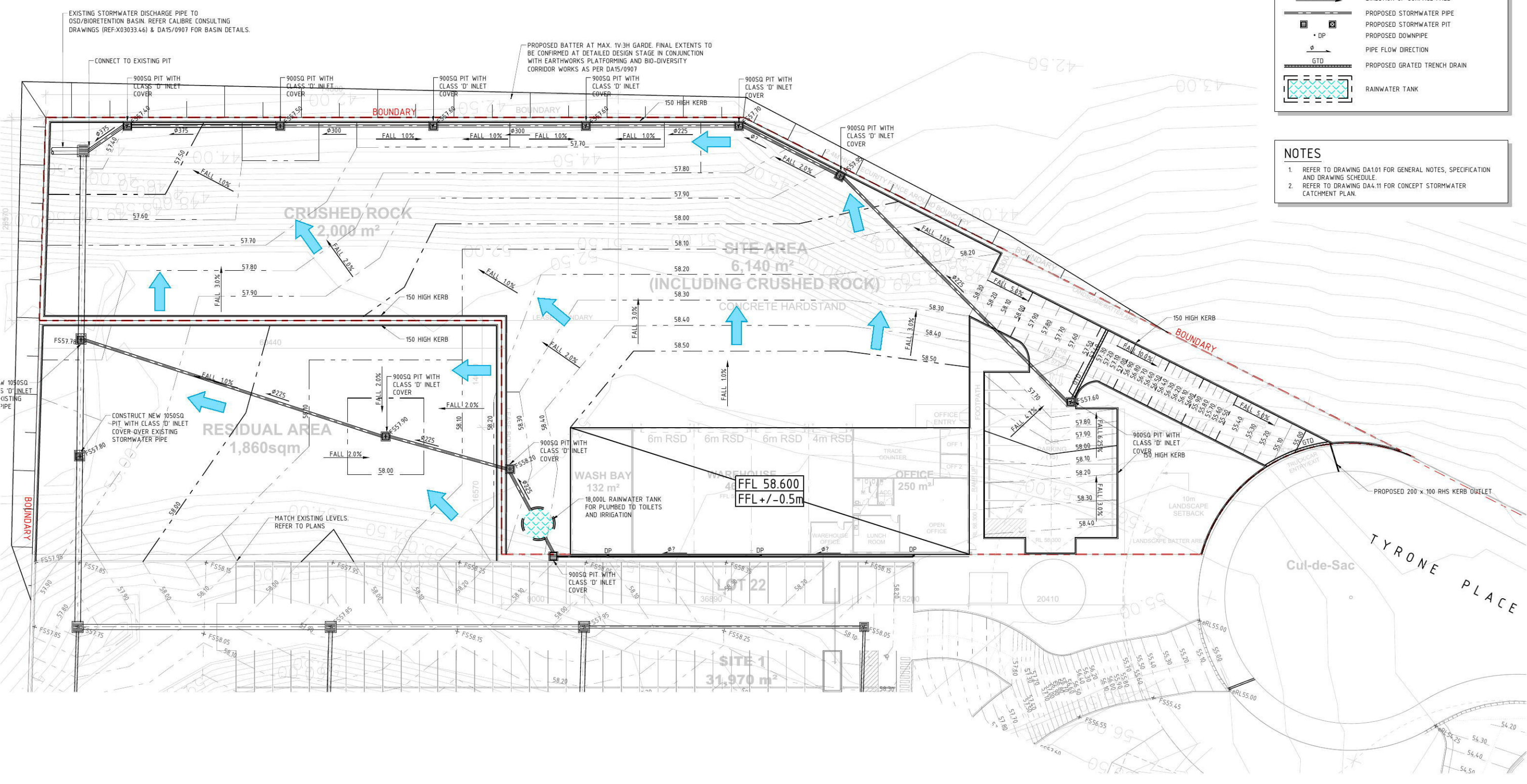
DA ISSUE

LEGEND

- PROPERTY BOUNDARY LINE
- 2100 — FINISHED SURFACE MAJOR CONTOUR LINE
- 210 — FINISHED SURFACE MINOR CONTOUR LINE
- FFL 58.60** FINISHED FLOOR LEVEL OF PROPOSED BUILDING
- + FS57.60 FINISHED SURFACE LEVEL
- FALL 1.0% DIRECTION OF SURFACE FALL
- PROPOSED STORMWATER PIPE
- DP PROPOSED STORMWATER PIT
- DP PROPOSED DOWNPIPE
- PIPE FLOW DIRECTION
- GTD PROPOSED GRATED TRENCH DRAIN
- RAINWATER TANK

NOTES

- REFER TO DRAWING DA1.01 FOR GENERAL NOTES, SPECIFICATION AND DRAWING SCHEDULE.
- REFER TO DRAWING DA4.11 FOR CONCEPT STORMWATER CATCHMENT PLAN.



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PAGE A1 PLOT DATE June 9, 2016

SCALE 0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 METERS

DATE	No	AMENDMENT	INIT	REV
27.05.16		ISSUED FOR COORDINATION	CC	1
09.06.16		ISSUED FOR APPROVAL	MW	2

PROJECT MANAGER

David Tubb
Tubb & Associates Pty Ltd

CLIENT

FIFECAPITAL

ARCHITECT

REIDCAMPBELL

PROJECT

PROPOSED INDUSTRIAL FACILITY LOT 22 TYRONE PLACE, ERSKINE PARK

DRAWING TITLE

CIVIL DESIGN CONCEPT STORMWATER MANAGEMENT AND FINISHED LEVELS PLAN

SPARKS+PARTNERS
CONSULTING ENGINEERS
HYDRAULIC CIVIL FIRE

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DATE: --- DESIGNED: MW
SCALE: 1:250 @ A1 DRAWN: CC
JOB No: 16098 DWG No: DA4.01 No. IN SET: 2 REV: --- OF: 2

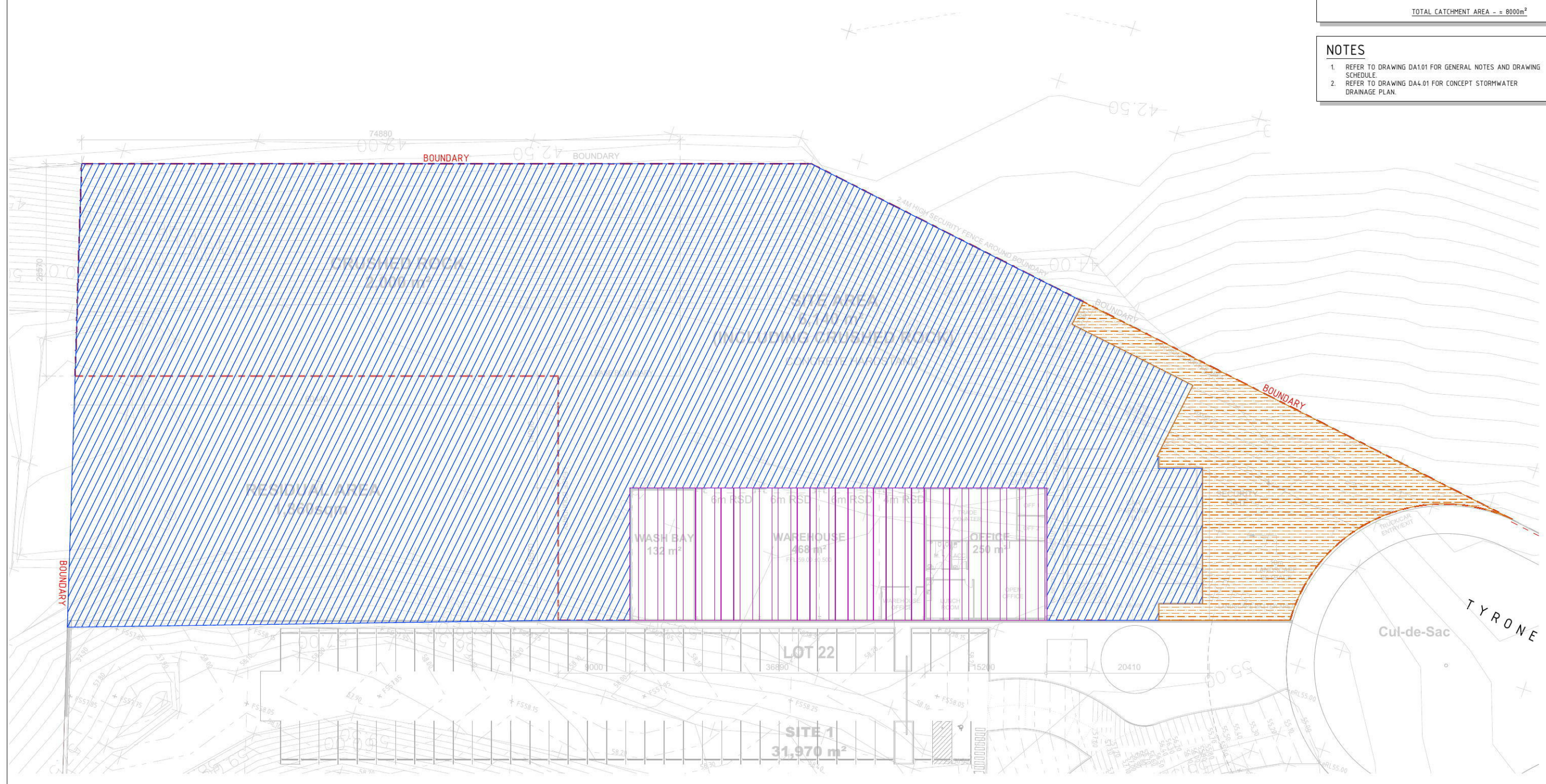
DA ISSUE

LEGEND

- IMPERVIOUS CATCHMENT AREA TO OSD/BIO-BASIN - 6,487m²
- ROOF CATCHMENT AREA TO RAINWATER REUSE TANK - 865m²
- BYPASS CATCHMENT AREA TO TYRONE PLACE (LANDSCAPING & DRIVEWAY) - 648m²
- TOTAL CATCHMENT AREA - = 8000m²

NOTES

- REFER TO DRAWING DA1.01 FOR GENERAL NOTES AND DRAWING SCHEDULE.
- REFER TO DRAWING DA4.01 FOR CONCEPT STORMWATER DRAINAGE PLAN.



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A1	June 9, 2016	
SCALE	NOT TO SCALE	

DATE	No	AMENDMENT	INIT	REV
09.06.16		ISSUED FOR APPROVAL	MW	1

DATE	No	AMENDMENT	INIT	REV

PROJECT MANAGER

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PROJECT

PROPOSED INDUSTRIAL FACILITY LOT 22
 TYRONE PLACE, ERSKINE PARK

DRAWING TITLE

CIVIL DESIGN
 CONCEPT CATCHMENT PLAN

DA ISSUE

SPARKS+PARTNERS
 CONSULTING ENGINEERS
 HYDRAULIC | CIVIL | FIRE

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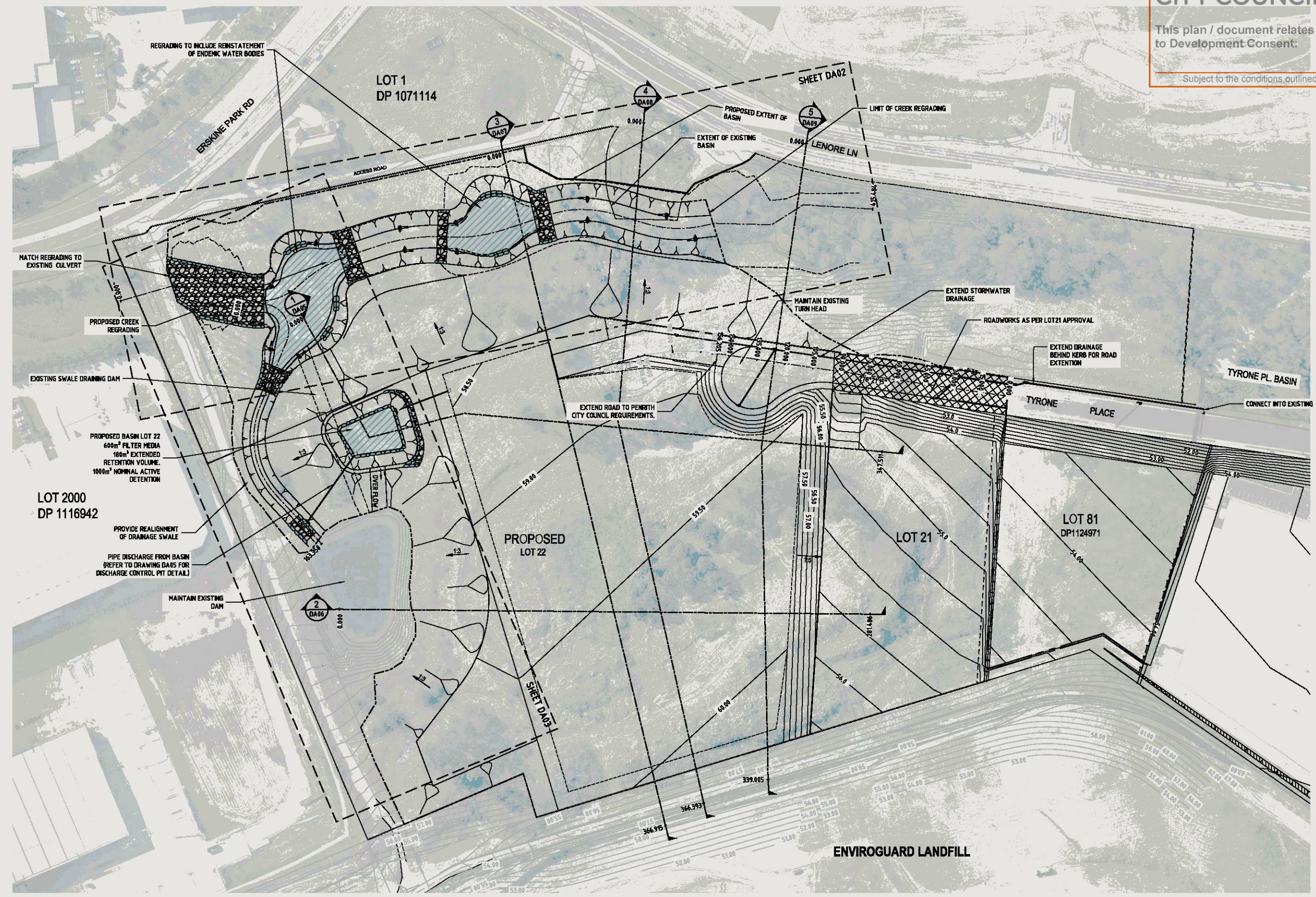
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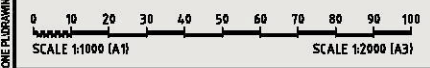
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 DWG No: DA4.05

Appendix B – Calibre Consulting Plan

COUNCIL DOES NOT ATTEST TO THE ACCURACY OF DETAILS IN PLANS



FILE: X03033346 LOT 22 TYRONE PL ERSKINE PARK DP 1071114 15-06-2015 11:40:10 LAST SAVED BY: PETER SPADARO



REV	DATE	DESCRIPTION	BY	VER	APP
04	11/11/2015	CLIENT COMMENTS	PS	SAG	
03	14/10/2015	AMENDED INTERIM FILL	PS	RP	
02	18/09/2015	ADDED INTERIM FILL	PS	RP	
01	31/08/2015	DEVELOPMENT APPLICATION	PS	RP	

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AUTHORISED FOR ISSUE
 BY: **STUART GREEN**
 FIEAust. CPEng,
 Manager - Urban Development
 SIGN: *[Signature]*
 DATE: *11/11/15*

Client: **CSR LIMITED**
 Project: **ERSKINE PARK TYRONE PLACE - PROPOSED LOT 22**

Drawing: **LOT 22 OVERALL SITE PLAN & GRADING STRATEGY**
 Drawing No: **DA01**

Scale(A1): **1:1000**
 Project No: **X03033.46**
 Revision: **04**

DEVELOPMENT APPLICATION

Appendix C – Maintenance & Monitoring Schedule

STORMWATER DRAINAGE SYSTEM MONITORING AND MAINTENANCE SCHEDULE

Author Name & Signature: _____

Date: _____

Tutt Bryant, Tyone Place, Erskine Park

General Notes:

- 1 - Maintenance is to be carried out with regard to relevant occupational health and safety guidelines and standards. This includes all confined space, traffic management, fall arrest and other requirements.
- 2 - Initial monitoring and inspections of the stormwater system post commissioning are to be carried out every 3 months for the first year of operation. The amount and type of debris is to be noted and recorded. This information shall be used to determine if modification of the frequency of inspections is required.
- 3 - The frequency of inspections shown in the stormwater maintenance schedule are the maximum periods. Inspection frequencies may be reduced upon completion of the initial monitoring and inspection program as noted in note 2.
- 4 - Blank copies of the maintenance schedule are to be made and filled out during each subsequent inspection with the details kept on site for future reference.

Inspected by:

Date of Inspection:

Date of Next Inspection:

Item to be Inspected	Frequency	Performed by	Inspected	Maintenance Required	Maintenance Procedure	Maintenance Completed
			Yes/No	Yes/No		Date
General						
Eaves/Box Guttering System and Downpipes	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect and remove any build up of sediment, debris, litter and vegetation within gutter system.	
Stormwater surface inlet and junction pits	Four Monthly/ After Major Storm	Owner / Maintenance Contractor			Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter and vegetation. (e.g. Vacuum/eductor truck) Inspect and ensure grate is clear of sediment, debris, litter and vegetation. Ensure flush placement of grate on refitment	
General inspection of complete stormwater drainage system (that's visible)	Bi-annually	Owner / Maintenance Contractor			Inspect all drainage structures noting any dilapidation, carry out required repairs.	
Rainwater Tank						
First Flush Device	6 Monthly	Owner / Maintenance Contractor			Inspect first flush device to ensure correct operation. Remove accumulated litter & debris. If device is not functioning properly repair or replace.	
Internal Inspection	6 Monthly	Owner / Maintenance Contractor			Check for evidence of access by animals, birds or insects including the presence of mosquito larvae. If present, identify access point and close. If evidence of algal growth, find and close points of light entry.	
Tank and tank roof	6 Monthly	Owner / Maintenance Contractor			Check structural integrity of tank including roof and access covers. Any dilapidation including holes or gaps are to be noted and repaired.	
Bio-retention/OSD basin						
Evidence of inlet surface erosion	6 Monthly	Maintenance Contractor			Check for scour of filter media at sedimentation chamber overflow. If scour present rake back filter media and provide scour protection.	
filter media	6 Monthly	Owner / Maintenance Contractor			Inspect for surface clogging/ponding in filter. If clogging or ponding present check subsoil drainage line for blockage and cleanout. If no blockage present in sub-soil drainage remove clogged filter media and replace with specified filter media.	
filter area	6 Monthly	Owner / Maintenance Contractor			Inspect filter area for build up of litter and debris, remove any litter present. Inspect filter for distribution of media, if required rake filter media to provide even depth through filter area.	
Outlet/overflow spillway	6 Monthly	Owner / Maintenance Contractor			Inspect spillway to ensure in good condition with no deterioration present. If required provide repairs.	
Trash Screen	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect trash screen to ensure correct operation. Remove accumulated litter & debris. If device is not functioning properly repair or replace.	
Orifice Plate	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect orifice plate to ensure correct operation. Check orifice diameter size is correct and no damage is present to orifice edge. Check orifice plate is securely fastened to wall with no gaps present between plate and face of wall. If gaps are present fill with sealant or mortar to provide water tight seal.	
Weep Holes in base of sump	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect weep holes in base of sump. Ensure weep holes are able to drain effectively and remove accumulated sediment and debris if present.	



NOTES

SITE ANALYSIS
 Site inspection and analysis has been undertaken. The site is void of any significant vegetation. The predominant vegetation comprises degraded pasture land with pasture weeds. It is likely that there is a substantial weed seed bank within site topsoils. Surrounding degraded pasture land will also continue to spread weeds across the site.
 Site soils have also been heavily modified. Visual topsoil inspection revealed compacted clays.
 Proposed garden areas will require appropriate soil and drainage works to ensure long term health of plant species.
 A vegetated floodway is located to the north of Tyrone Place. Inspection revealed a mix of indigenous and weed species. The site's frontage is well placed to support the floodway in terms of expanding indigenous vegetation and canopy tree planting.
 Due to the site's landform expansive northward views are afforded across the gully.
 Tyrone Place has recently undergone development with supporting landscapes of predominantly native and indigenous plant species.



Issue amendments		Client
No.	Date	
A	4.06.16	DA

Consultants	
STRUCTURAL	ELECTRICAL & LIGHTING
CONSERVATION ARCHITECTURE	WATER FEATURES

CIVIL	IRRIGATION
HERITAGE STONEMASONRY	ACCESS

PUBLIC ART	
QUANTITY SURVEYOR	

Designed by	SI
Drawn by	SI
Verified by	SI
Authorised by	<i>[Signature]</i>

eXimiadesign
 Landscape Architecture | Urban Design |
 Urban Horticulture | Arboriculture
 M: 0423414200
 E: scott.libbotson@eximiadesign.com.au

Project
**Industrial facility for Tutt Bryant
 Lot 22 Tyrone Place, Erskine Park,
 NSW**

Drawing Title
Landscape analysis plan

Scale **1:600@A1** Date **4-06-16**
 Proj. No. **1614** Drg. No. **DA-L01**

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NOTES

DESIGN STATEMENT

The landscape design seeks to provide a robust and resilient mix of plant species hardy to the site and local climate. The proposed landscape design seeks to utilise space provided to replenish the lost canopy through installation of locally indigenous tree species. Tree species to the property frontage will also assist in masking building bulk and scale whilst termination long views westward along Tyrone Place. Shrubs plantings are also comprised of indigenous species hardy to local conditions adding to local biodiversity. Structured in mass plantings of complementary groupings the large swathes of planting will generate ornamentality and presentation to the street and building surrounds. Species selection was undertaken after inspecting the site and local area and identifying species performing well in the often harsh conditions of commercial and industrial zonings. The streetscape landscape proposal seeks to continue the already established planting along Tyrone Place.

CONSULTANT COORDINATION

Consultant coordination has been undertaken to ensure proposed services have been captured within the landscape proposal.

WEED MANAGEMENT

Initially the Landscape Contractor shall remove all weed species remaining after bulk earthworks and building and civil construction. In the long term the landscape design seeks to create dense shrubbery that should substantially out-compete regenerating weeds for light, water, and nutrient, minimising weed establishment.

SOIL PREPARATION & DRAINAGE

Prior to undertaking soft landscape works eradicate all weed species. Trim levels to allow for topsoil installation. Rip all garden and lawn areas to a depth of 500mm to break up ground and assist water an oxygen exchange. For garden areas, import 150mm overlay of imported topsoil equal to Benedicts Special Blend Native Garden Mix Low 'P'. Cultivate imported topsoil into site topsoil to assist root interface. Cultivate to a depth of 300mm. Imported topsoils to conform with AS 4419 and AS 4454. All soft landscape areas are to drain freely. Where necessary subsoil drainage is to be installed to ensure excessive soil moisture is removed. Subsoil drainage is to be provided behind all new retaining walls. All underground services are to be located prior to any cultivation being undertaken.

FINISHED LEVELS

For finished levels refer architectural drawings. Finished garden levels (mulched surfaces) to be set at Flush with adjacent surfaces. Gardens to be graded between adjacent surfaces on a flat plane. Gardens abutting buildings must grade away from facades and toward drainage points.

EROSION AND SEDIMENT CONTROL

The Contractor must implement effective erosion and sedimentation control preventing the egress of turbid water and gross pollutants from entering the stormwater system. For banks greater than 1:3 install Jute Webbing.

PLANT SPECIES

Plant species installed are to be the species nominated in the plant schedule. Substitutes must not be installed without approval of Eximia Design. All plant species must be healthy with no evidence of pest, chemical deficiencies, poor pruning practice and girdling roots. Trees must have strong enough stems to support their own weight. Staking is therefore not required. Weed stemmed tree species will be detected and require replacement.

POT SIZES

Pot sizes shown are indicative. The contractor must advise of sizes sourced at tender. Smaller sizes are indicated to assist sourcing of indigenous stock, minimise excavations into clay site soils, and assist more rapid establishment. Pot sizes will be inspected at completion. Undersized plants from those approved will be detected.

PLANTING PROCEDURE

Ensure soils are moist prior to planting. Water plants immediately prior to installation to fully saturate root balls in pots. Leave plants in pots until immediately before planting. Do not expose root system to sun. Mud-in during planting operations. Place the top of the root ball flush the topsoil. DO NOT PLANT ANY LOWER OR HIGHER THAN THE POTTED SOIL SURFACE. DO NOT COVER THE TRUNK / MAIN STEM WITH MULCH. Hold mulch back away from the stem. Gently backfill around the plant by hand to fill air pockets. Additional to mudding in, water immediately after planting. THE CONTRACTOR MUST ROOT PRUNE ALL TREE SPECIES AT INSTALLATION BY TRIMMING THE POTTED ROOT BALL BY 10%. This is critical to prevent girdling root establishment. For shrub species tease out root systems to assist lateral root development.

NEW LAWN

New lawn to be CT2 couch (suggested supplier Grech's) on 100mm of imported topsoil equal to ANL turf underlay. Prior to installing lawn rip subsoil to 150mm depth.

MULCH

All garden areas must be mulched with hardwood chip to a depth of 75mm.

PLANT ESTABLISHMENT

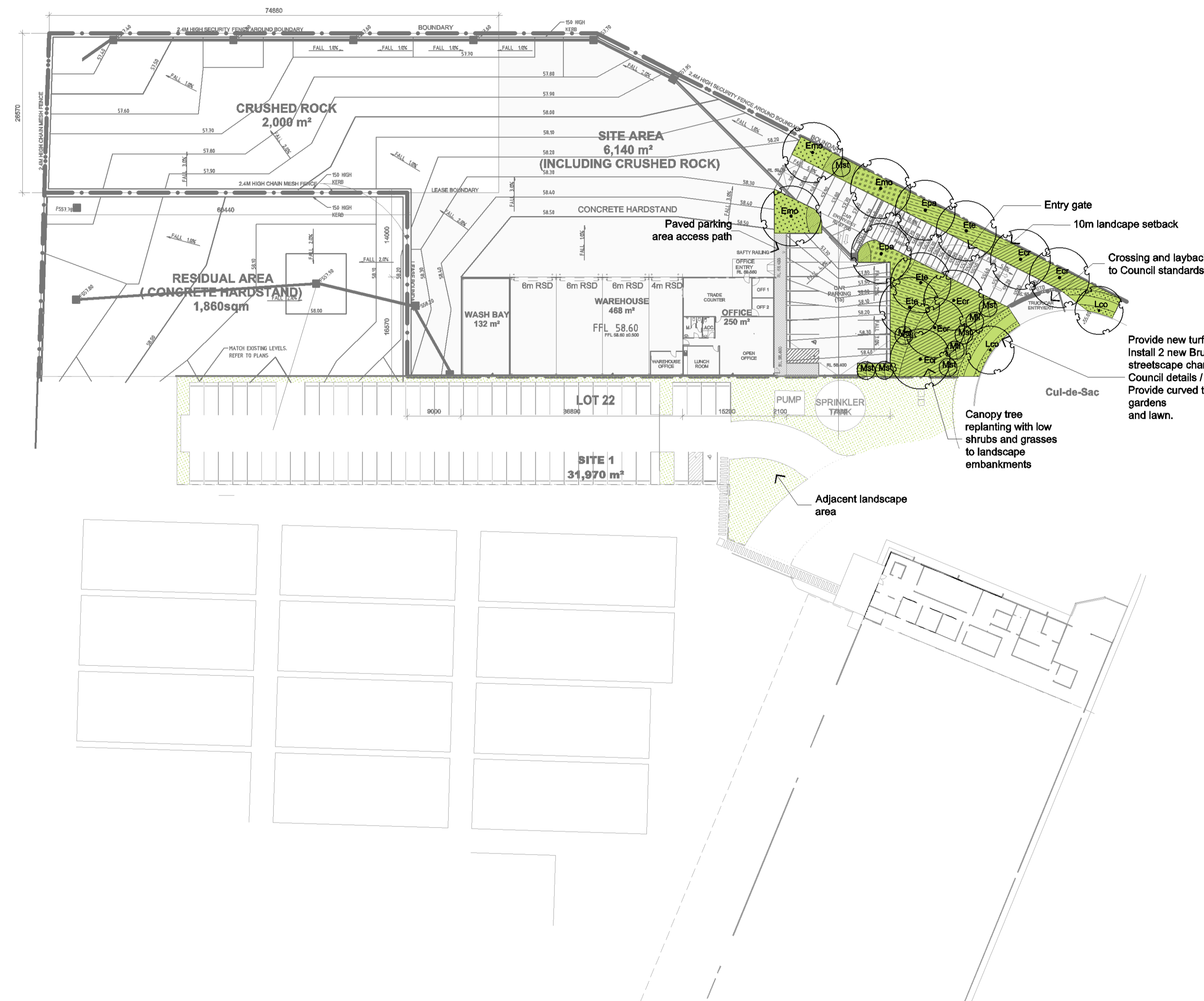
The Contractor is to maintain plants and general landscape areas for a period of 24 weeks to ensure the landscape establishes to a self sustaining point. Maintenance works must include: watering - ensure rates account for additional watering over summer months. Do not over-water. Test soil moisture prior to every watering session. Over watering is a common source of death in newly establishing planting areas. Fertilise twice with proprietary native plant fertiliser to manufacturers recommendation. Replace failed plants (same size). Continually suppress weed growth. Undertake informative pruning to establish healthy tree forms, and keeping the gardens neat and tidy. All maintenance works to be undertaken by a qualified horticulturist with a minimum of 3 years field experience under the supervision of a senior experienced horticulturist.

EVIDENCE OF WORKS

For certification purposes the contractor is to provide delivery docket evidence of materials supplied to the project.

CONSTRUCTION DOCUMENTATION

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Provide new turf to verge. Install 2 new Brush Box trees to match the existing streetscape character. Tree pits to be in accordance with Council details / specification. Provide curved timber edge along full boundary between gardens and lawn.

PLANTING LEGEND & SCHEDULE

NEW TREE PLANTINGS

Sym.	Botanical Name	Qty.	Pot Size
Eta	Eucalyptus terebinthia	3	200mm
Emo	Eucalyptus molluccana	3	200mm
Epa	Eucalyptus paniculata	1	200mm
Ecr	Eucalyptus crebra	5	200mm
Mil	Melaleuca linarifolia	2	200mm
Mst	Melaleuca stypelioides	7	200mm
Lco	Lophosiemon confertus	2	45 ltr

NEW SHRUB & GROUND COVER PLANTINGS

Sym.	Botanical Name	Pot Size	Spacing (all species)	Area m2	Qty.
Provide an even mix of:					
	Imperata cylindrica	Virocell	800mm	207	323
	Grevillea 'Ned Kelly'	150mm			
	Grevillea 'Scarlet Sprite'	150mm			
	Lomandra longifolia	150mm			
Provide an even mix of:					
	Thymecia australis	Virocell	600mm	159	441
	Poa labillardieri	Virocell	150mm		
	Grevillea juniperia 'Molonglo'	150mm			
	Senna odorata	Forest Tube	150mm		
	Melaleuca thymifolia	150mm			
Provide an even mix of:					
	Breynia oblongifolia	Forest Tube	800mm	57	89
	Indiophora australis	Forest Tube			
	Bursaria spinosa	Forest Tube			
	Dodonaea viscosa	Forest Tube			
Provide an even mix of:					
	Dianella revoluta	150mm	600mm	31	86
	Callistemon 'White Anzac'	150mm			
Provide an even mix of:					
	Melaleuca nodosa	Forest Tube	800mm	51	80
	Melaleuca linarifolia 'Snow Storm'	150mm			
	Lawn				39

Issue amendments		Client
No.	Date	Description
A	4.06.16	DA

Consultants				
STRUCTURAL	ELECTRICAL & LIGHTING	CIVIL	IRRIGATION	PUBLIC ART
CONSERVATION ARCHITECTURE	WATER FEATURES	HERITAGE STONEMASONRY	ACCESS	QUANTITY SURVEYOR

Designed by **SI**
 Drawn by **SI**
 Verified by **SI**
 Authorised by *[Signature]*

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Project: **Industrial facility for Tutt Bryant Lot 22 Tyrone Place, Erskine Park, NSW**

Drawing Title: **Landscape site plan**

Scale: **1:400@A1** Date: **4-06-16**

Proj. No: **1614** Drg. No: **DA-L02**

Issue: **A**