

CIVIL ENGINEERING REPORT SSD 10404

HORSLEY DV. BUSINESS PARK CFC: WETHERILL PARK NSW

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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Introduction.....	1
1.2	Scope and Project Description.....	1
2	SITE CHARACTERISTICS	3
2.1	Location	3
2.2	Proposed HDBP CFC Development.....	4
2.3	HDBP S2 Development (SSD7664 & Mod1)	5
3	SITE WORKS	8
3.1	Geotechnical and Geological Profile	8
3.2	Bulk Earthworks.....	8
3.3	Groundwater	8
3.4	Embankment Stability.....	9
3.5	Supervision of Earthworks.....	9
4	STORMWATER MANAGEMENT	10
4.1	Hydrologic Modelling and Analysis	10
4.1.1	General Design Principles.....	10
4.1.2	Minor/ Major System Design.....	10
4.1.3	Rainfall Data	10
4.1.4	Runoff Models	10
4.2	Hydraulics.....	11
4.2.1	General Requirements.....	11
4.2.2	Pit Freeboard.....	11
4.2.3	Public Safety	12
4.2.4	Inlet Pit Spacing.....	12
4.2.5	Overland Flow	12
4.3	Site Drainage	12
4.3.1	Existing & HDBP S2 Site Drainage	12
4.3.2	Proposed Site Drainage.....	13
4.4	External Catchments and Flooding.....	13
5	WATER QUANTITY MANAGEMENT	15

6	STORMWATER QUALITY, HARVESTING & MAINTENANCE	16
6.1	Stormwater Quality	16
6.2	Stormwater Harvesting	17
6.3	Maintenance and Monitoring	18
7	SOIL AND WATER MANAGEMENT PLAN	20
7.1	General Conditions	20
7.2	Land Disturbance.....	20
7.3	Erosion & Sediment Control Conditions.....	21
7.4	Pollution Control Conditions	22
7.5	Waste Management Conditions.....	22
7.6	Site Inspection and Maintenance.....	22
9	SEAR'S AND AGENCY RESPONSE ITEMS	25
10	CONCLUSION	44
11	REFERENCES	45
12	GLOSSARY	46

1 INTRODUCTION

1.1 Introduction

Costin Roe Consulting Pty Ltd has been commissioned by FDC Constructions Pty Ltd to prepare this Engineering Report in support of a proposed development application for a State Significant Development, SSD 10404 for an automated customer fulfilment centre (CFC) named as the *Horsley Drive Business Park CFC* (HDBP CFC).

The proposed development will be located on the southern portion of the Horsley Drive Business Park Stage 2 (HDBP S2) assessed as SSD 7664.

SSD 7664 was approved by The NSW Department of Planning & Environment (DPE) for development on 9 November 2017. A modification to the approved Masterplan (Mod1) was submitted in January 2020 by Charter Hall to facilitate a specific user on the southern development lots, and to enable a more functional intersections with the estate access road which is in the form of a roundabout located at the junction of Cowpasture Road and Trivet Street.

It is further noted that the development site will now be developed by Charter Hall under a leasehold arrangement with the Western Sydney Parkland Trust (owners of the land and previous SSD applicants).

1.2 Scope and Project Description

The site is located on the western side of Cowpasture Road and Trivet Street, in the suburb of Wetherill Park, NSW. The proposed development involves construction of an automated sorting and distribution CFC on the southern lots of The Horsley Drive Business Park Stage 2 development.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Earthworks & Retaining Walls;
- Stormwater Management including stormwater quantity and quality;
- Ecologically Sustainable Development (ESD); and
- Erosion & Sediment Control.

The engineering objectives for the development are to create a site which, based considers the proposed Masterplan Layout and SSD requirements, responds to the topography and site constraints, meets flood planning requirements and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design consistent with and exceeding the requirements of council's adopted stormwater management policy and water quality objectives.

A set of drawings have been prepared to show the proposed civil and stormwater management concept for the proposed industrial development. These drawings are for development approval only and subject to change during detail design. Assessment of flooding has also been completed by councils nominated flooding consultants as part of the development approval documentation.

The consent authority is The DPIE as the proposal considered a State Significant Development (SSD). However as the subject site is located within Fairfield City Council (FCC) local government area, the engineering and policy requirements of FCC have also been considered in the design and FCC has been consulted in the civil engineering design of the site.

The projects Planning Secretary's Environmental Assessment Requirements (SEAR's) and associated agency responses for SSD 10404 were provided on 18 December 2019. **Section 9** of this report provides specific responses to SEAR's *Item 6. Soil and Water*, and DPIE letter dated 18 November 2019, *Appendix A, Water and Soils Items 9 to 17*, WaterNSW letter dated 11 December 2019 *Soils and Water, Erosion and Sediment Control Plans and Earthworks* and Fairfield City Council letter dated 11 December 2019 *Catchment Branch Comments and Development Engineers Comments*. It is noted that the majority of items raised in the SEARs and associated agency letters will be managed and addressed via works and approved assessments already undertaken as part of the approved SSD 7664 (and associated SSD 7664 Mod1) development infrastructure works.

2 SITE CHARACTERISTICS

2.1 Location

The HDBP S2 estate is located on the western side of Cowpasture Road & Trivet Street in the suburb of Wetherill Park. The Mod2 development (HDBP CFC) is located on the southern portion of the HDBP S2 development area, as shown in **Figure 2.1**.

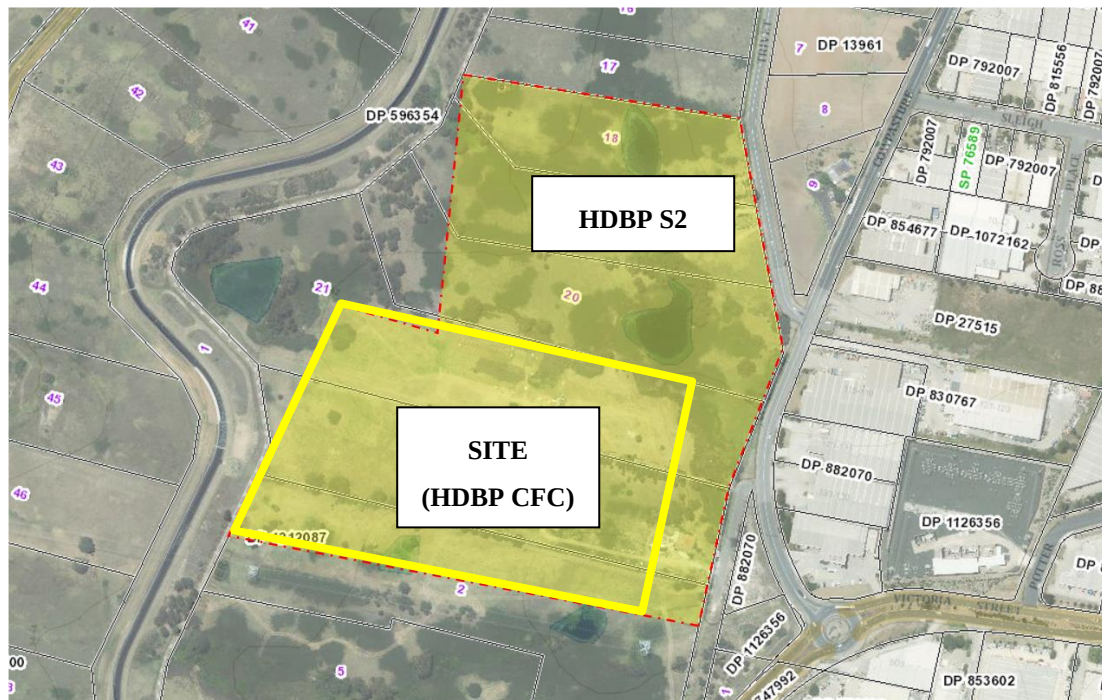


Figure 2.1 Locality Plan

The HDBP S2 site encompasses an area of 16.5 Ha and is comprised of Lots 18 to 22 of DP 13961. The HDBP CFC development comprises an area of approximately 8.8 Ha.

The HDBP S2 Site is bounded by leasehold urban farmland land to the north, Cowpasture Road on the east, *The Horsley Drive Business Park Stage 1* to the south and a Sydney Water supply canal and urban farmland land to the west.

The land on the eastern side of Cowpasture Road comprises industrial development known as the Wetherill Park Industrial Area.

Infrastructure works and earthworks will be completed as part of SSD 7664 and Mod1 approvals for the HDBP S2 Estate, as described in **Section 2.3** of this report. The following descriptions of pre-SSD7664 works are provided for information purposes only:

- The land use on the site is currently urban farmland and rural residential.
- No formal drainage systems or significant development is present on the land. Several natural gullies and overland flow paths are present on the site as are four residential dwellings which are proposed to be removed as part of the works. As the contributing catchment to these gullies are relatively small, they generally have little to no baseflow, only have flows during wet weather or during storm events. Two small dams are present within the gully from the north.

- No mapped waterways have been identified on the site. Confirmation of ecological significance of the existing gullies and overland flow paths are confirmed in the ecological assessment by Ecoplaning Pty Ltd, as contained in the development SSD7664 EIS.
- Review of survey information shows that the land falls from the north and north-west to the east and south-east corner of the site. The highest level on the site, at RL 77.0m AHD, is located at the north-east corner of the site and the lowest level is RL 57.5m AHD at the south-east corner. The low point of the property coincides with a culvert which connects the drainage paths to a trunk drainage culvert at the junction of Cowpasture Road and Victoria Road. This culvert is an asset of Fairfield City Council and collects stormwater flows from the site and downstream Wetherill Park Industrial Area.
- The grades over the site vary between 12.5% in the northern upstream parts of the site to 3% in the lower, downstream locations.
- Three dams are present on the site with the largest covering a combined area of approximately 0.25 Ha.

2.2 Proposed HDBP CFC Development

The proposed construction works for this HDBP CFC submission comprises a three-level specialist automated facility.

The development comprises the following elements:

- Steel framed ambient and chilled warehouse;
- Ancillary office space on the north-east corner of the warehouse building;
- At grade and lower level car parking on the eastern side of the property. Access to the carpark is made via the estate access road to the north. Carpark levels are designed to integrate into the topography of the land and to reduce retaining wall structures on the south-east of the HDBP S2;
- Truck circulation and loading areas on the southern, northern and western building facade;
- Fire brigade access around the full perimeter of the building and development site; and
- Stormwater drainage completed in accordance with the Business Park Stormwater Management Strategy.

Refer to **Figure 2.2** for the proposed site layout as produced by Leffler Simes Architects.

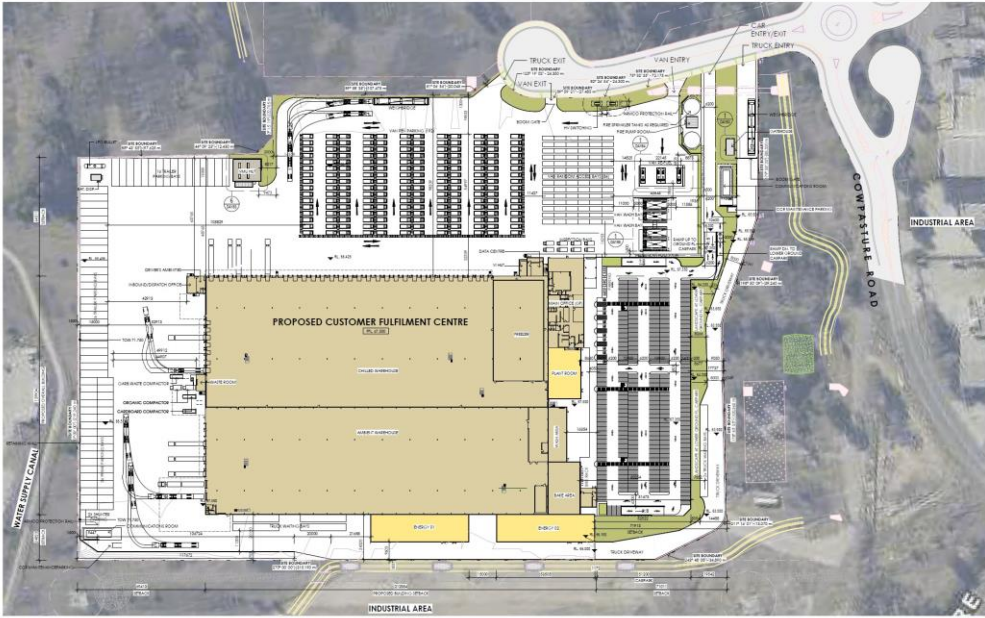


Figure 2.2. Proposed Development Layout

2.3 HDBP S2 Development (SSD7664 & Mod1)

As noted earlier in this report, an approval for development was granted by DPE for SSD7664 on 9 November 2017. A subsequent Modification (Mod1) has recently been submitted by the Developer (Charter Hall), to suit a change in Masterplan layout relating to the revised site intersections, and to facilitate the current SSDA HDBP CFC development. A brief discussion of the Mod1 development is provided for information.

The proposed development on the estate, as submitted SSD7664 Mod 1, will involve subdivision of the land and infrastructure works to facilitate future industrial warehouse and distribution type developments. The subdivision layout includes for 3 development lots, public road reserve and a drainage reserve over approximately 16.5 Ha. It is noted that the building development area is slightly less than the overall civil works footprint as defined in the masterplan, and agreed leasehold between Charter Hall and Western Sydney Parkland Trust.

Estate infrastructure works will include the following elements:

- Earthworks and retaining walls to facilitate flat pads for future warehouse/distribution type building development;
- External roadworks and a local subdivision access road;
- Attenuation and diversion of upstream drainage from the north, west and north-west around and through the estate;

- Internal and external Infrastructure works including stormwater, energy, telecommunications, water supply and sewer;
- Construction of stormwater management measures including provision of stormwater pollutant removal devices and bio-retention systems. Also the provision of an estate level detention basin; and
- Provision of drainage connections and servicing of individual development lots.

The proposed subdivision layout is shown in **Figure 2.3**. The approved SSD7664 Masterplan Layout is included for reference in **Figure 2.4**.

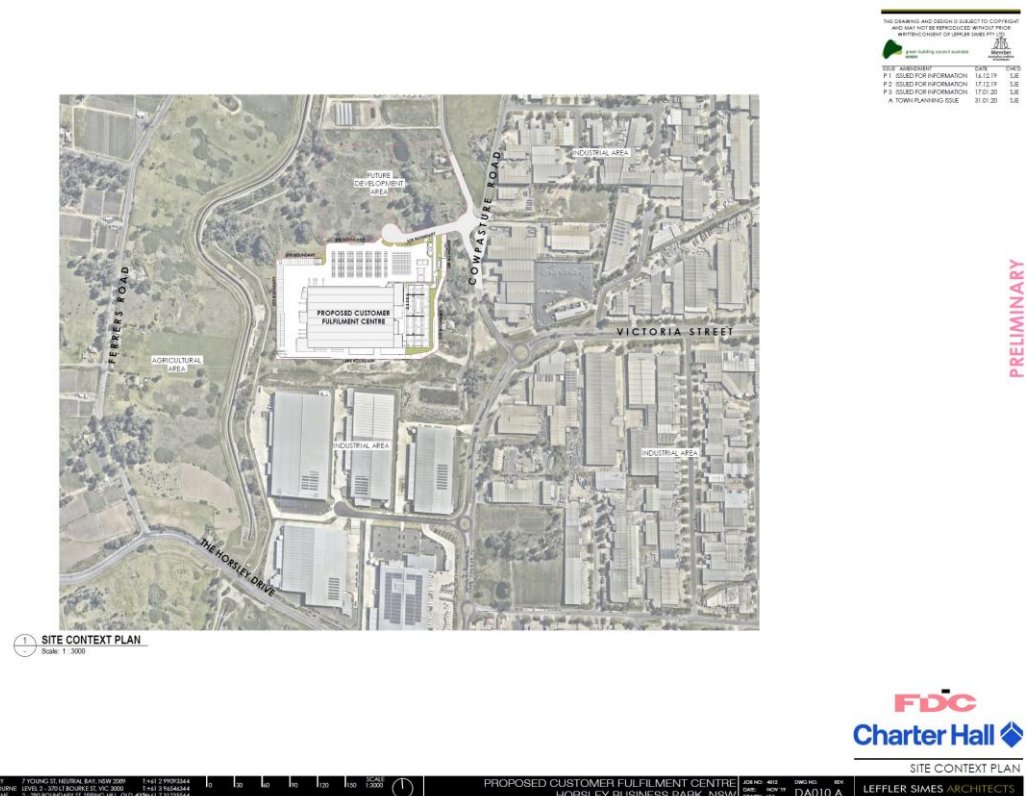


Figure 2.3 Proposed Mod1 Masterplan Layout

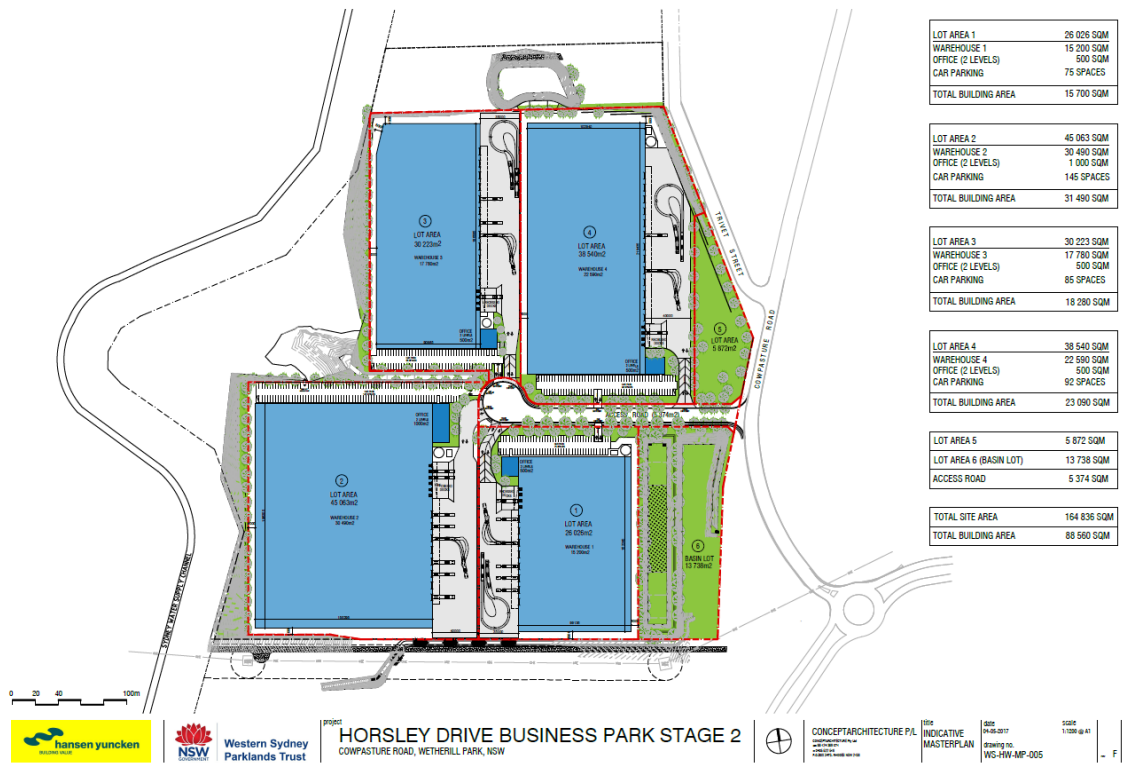


Figure 2.4. SSD7664 APPROVED Estate Subdivision Layout

3 SITE WORKS

3.1 Geotechnical and Geological Profile

The site is located within gently undulating regional topography consistent with Bringelly Shale Landscapes. Geotechnical investigations over the site have been made by Ground Technologies and confirmation of the geological profile has been made (Report Ref: GTE914-R001). Reference the Penrith 1:100,000 Geological Series Sheet indicates the site is underlain by shale, fine grained sandstone and laminate of the Bringelly Shale formation. This is generally consistent with the findings of geotechnical investigations made as part of the Horsley Drive Business Park Stage 1 Estate to the south of the current proposal.

The shale bedrock is overlain by residual clay soils in the range of 1.5 to 3m in depth, and above this topsoil in the 100mm to 400mm range. Engineering properties of the residual clay soils are that they will be moderately reactive, highly plastic subsoils with low permeability.

3.2 Bulk Earthworks

Extensive earthworks will be undertaken under the SSD7764 and SSD7764 Mod1 approvals for the HDBP S2. Minor earthworks only will be required as part of the HDBP CFC development works. These works would include final trimming and shaping of the site to suit the detailed architectural site layout, final pavement and coordination of subgrade levels with slab profiles and grading to suit drainage requirements.

Details of earthworks would be provided during detail design/ construction certificate stages of the development. Detailed assessment of the earthworks level will be completed during detailed design stage and some adjustment to the final pad and building floor levels (within +/-500mm) may be required subject to final geotechnical testing, topsoil assessments and bulking/compaction allowances.

Soil erosion and sediment control measures including sedimentation basins will also be provided for the development – please refer to the Soil and Water Management Plan in **Section 7** of this report.

3.3 Groundwater

The Ground Technologies report identified groundwater seepage in two locations over the site. The first of these was (TS2) identified as a perched water table at 0.3m below existing ground level. This perched water table is associated with existing dam overflow path and alluvium. The second location identified (TS18) is at 4.5m below ground level and identified as seepage. This coincides with the central gully and is located toward the low point of the site and this area will be within fill zones, with 2 to 3 meters of fill expected in these areas.

The impact on the overall groundwater system as a result of the proposed earthworks over the site is expected to be low. The identified water tables are within areas of fill. Groundwater has not been identified in cut areas and overall earthworks are consistent with industrial cut and fill depths, and the works completed on the adjacent Stage 1 of the Horsley Drive Business Park development site.

The effect on impact is considered to meet the requirements of the SEARS and initial responses by the NSW DPI.

3.4 Embankment Stability

To assist in maintaining embankment stability, permanent batter slopes will be no steeper than 3 horizontal to 1 vertical while temporary batters will be no steeper than 2 horizontal to 1 vertical. This is in accordance with the recommended maximum batter slopes for residual clays and shale which are present in the area.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Soil and Water Management Plan in **Section 9**.

3.5 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

4 STORMWATER MANAGEMENT

4.1 Hydrologic Modelling and Analysis

4.1.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Fairfield City Council and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI events have been assessed.

4.1.2 Minor/ Major System Design

In accordance with FCC Engineering Guide for Development and generally accepted engineering practice, the piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure for flows above the capacity of the piped system.

Where overland flow paths have not been available, the in-ground systems have been sized to accommodate the 1 in 100 year ARI flow, and allowing for 50% blockage of the inlet structure and pipe/culvert structure proposed to convey the flow.

4.1.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 5 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.1.4 Runoff Models

In accordance with the recommendations and standards of Fairfield City Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and parameters for the area and are as follows:

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 4.1. DRAINS Parameters

4.2 Hydraulics

4.2.1 General Requirements

Hydraulic calculations for the estate works have been carried out utilising DRAINS modelling software, see **Appendix C**. The hydraulic calculations for the individual lots will be carried out by DRAINS during the detail design stage. These calculations ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.2.2 Pit Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building/ development pads.

4.2.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.2.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.2.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the estate road system and to Estate Detention Basins.

4.3 **Site Drainage**

4.3.1 Existing & HDBP S2 Site Drainage

The pre-developed site is undeveloped rural land with undulating topography which slopes from the north and west to the south/south east corner of the site. Four upstream gullies currently drain through the site. These gullies only contain flow during wet or storm periods and, as the catchment sizes are relatively small do not contain baseflow.

The existing gullies drain to a series of culverts (three 900mm R.C.P. culverts) located at the intersection of Cowpasture Road and Victoria Street. Catchment C2 is part of a greater catchment of approximately 83.6 Ha which drains to this point. The greater catchment comprises agricultural land and Parkland Trust land.

A detention basin (Stage 1 - Basin 2) constructed as part of Stage 1 of the Horsley Drive Business Park is located to the south-east of the property. This basin attenuates stormwater from the newly constructed estate and discharges to the council trunk drainage system located to the north of the facility.

The proposed stormwater system for the HDBP S2 estate development is to consist of a major/ minor system which conveys surface water from the proposed development lots to in-ground drainage connection points to the estate infrastructure and combined water quality/ detention basin in the north-west corner of the site.

- Stormwater flows from upstream gullies will be conveyed through the site via inter-allotment drainage lines, size to accommodate the 1 in 100-year ARI event, and allowing for 50% blockage of the pits and pipes. Given the proposed development will result in removal of existing dams, it is proposed that reconstruction of one dam to the north, retention of one of the dams on the west of the property and a new detention system on the western side of the proposed development area. The proposed basin to the north of Lot 18 will include both passive and active storage

and result in reducing the post development flows by approximately one-third of the existing;

- Water quality and quantity for the development site stormwater will be managed by a combined bio-retention and detention basin located adjacent to the site discharge point at the south-eastern quadrant of the development site.
- Water quantity from upstream catchments will also be managed by two proposed basins located upstream of the development lots on the north and west of the development. These basins are also expected to provide passive water storage and active storage for attenuation of stormwater over the development sites which will be lost by the removal of existing dams which are within the development footprint. Runoff from all upstream catchments will bypass development lot drainage systems.

4.3.2 Proposed Site Drainage

The proposed stormwater system for the HDBP CFC development is to consist of a major/ minor system which conveys surface water from the proposed development lots to in-ground drainage connection points to the estate infrastructure and combined water quality/ detention basin in the north-west corner of the site.

A summary of the main stormwater management measures is provided as follows:

- In-ground drainage system designed to accommodate the 1 in 20 year ARI storm event.
- Overland flow paths to convey the 1 in 100-year ARI storm event from the HDBP CFC development site to the Estate Basin (located on the east of the development site).
- Vortech style gross pollutant trap located prior to discharge to the estate infrastructure on the east of the development site, as required of the estate stormwater management system;
- Discharge of stormwater to estate infrastructure and estate stormwater management basin to the east of the development site; and
- Rainwater reuse in accordance with the estate development.

Further discussion on the *Stormwater Management Strategy* is provided in **Section 5** and **Section 6** of this report. It is noted that key water quantity and quality management measures are provided via estate management systems.

Reference to drawings **Co11492.18-DA41, DA42, DA43 & DA44** shows the proposed drainage layout.

4.4 **External Catchments and Flooding**

The site, in its undeveloped state, is affected by overland flows from the north, west and south as set out in SSD7664 Mod1. The upstream catchments and provision for management of these flow paths has been accommodated for as part of the estate works and designs. The flow paths on the east and south of the site will be clear of the site and not required to be accommodated for in the design.

Allowance has been made in the drainage network to convey, attenuate and store runoff from the various upstream catchments.

The building is noted to be clear of any flow paths and achieves flood immunity to all overland flow paths and the adjoining estate detention basin (to the east of the development). It is noted that an overland flow path is located on the north-east of the site which is conveyed past the truck and car entry points through a series of box culverts. These culverts have been designed to accommodate the 1% AEP flow plus allowing for a 50% blockage of the culvert, and a minimum 0.5m freeboard to the pavement level. Otherwise all flood planning requirements set as part of the SSD 7664 and SSD 7664 Mod1 have been met.

5 WATER QUANTITY MANAGEMENT

Fairfield City Council limits the runoff discharged from private property into the underground piped drainage system. As part of the approved HDBP S2 Estate Stormwater Management Strategy for the SSD7664 development, On-site Detention (OSD) sizing has been designed and approved for the whole estate (including the current HDBP CFC development site) as per *Section 4.2* of Fairfield City Councils *Stormwater Management Policy 2017* for an urban area:

The maximum Permissible Site Discharges (PSD) need to be satisfied by the OSD:

- *The maximum PSD for the 9 hour 100 year ARI storm event is to be 140 l/s/ha; and*
- *The maximum PSD for the 5, 15, 30, 60, 180 and 540-minute duration storms for the post-development 5 & 100 year ARI storm events is to be limited to the pre-development site discharge.*

The modelling has shown that, with the provision of a storage volume of 5,000m³, at a maximum depth of 1.5m, that stormwater flows from the HDBP S2 Estate will be attenuated to predevelopment flows. Detention storage will be fully active and will be provided as above ground basins in open space and conservation areas. The proposed detention basin meets the policy requirements of Fairfield City Council and is consistent with the constructed basin in the Horsley Drive Business Park Stage 1 development.

Attenuation of the overland flow from the northern and western catchments described in the earlier sections of this report have been made to maximise attenuation during storm events, and to ensure that the effect of the removal of pre-existing dams are mitigated.

As all stormwater quantity measures are provided as part of the Estate Management Measures, no additional stormwater quantity management measures are necessary for individual development lots and as such none are proposed for this development site.

6 STORMWATER QUALITY, HARVESTING & MAINTENANCE

6.1 Stormwater Quality

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by FFCC.

As part of the SSD 7664 design process FCC requested that the pollution reduction targets nominated in Table 2-2 of the *Georges River Estuary Coastal Zone Management Plan – July 2013* be adopted for the estate and to be performed on a catchment wide basis. Council now has their *Stormwater Management Policy 2017* document in place which sets out requirements for WSUD and treatment objectives. It is noted that councils 2017 policy requirements (*Stormwater Management Policy 2017, Section 6.2, Table 7*) have slightly lower treatment objectives than those nominated in the *Georges River Estuary Coastal Zone Management Plan – July 2013* and approved SSD. We confirm the higher treatment objectives as listed below have been maintained per the approved SSD.

These are presented in terms of annual percentage pollutant reductions on a developed catchment and are as follows:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	60%
Total Nitrogen	45%
Total Hydrocarbons	90%
Free Oil and Grease	90%

It is noted that the required pollution reduction rates are consistent with those adopted for the adjacent *Horsley Drive Business Park Stage 1* development and generally considered best practice stormwater pollution reductions.

Development lots, verges and road areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area. The STM's for the development shall be based on a treatment train approach to ensure that all of the objectives above are met.

Components of the treatment train for the estate development are as follows:

- Treatment of gross pollutants will need to be provided on each development lot prior to discharging into the estate stormwater system. Site STM's will need to meet minimum removal rates of 80% of GP's, 70% of TSS, 15% of TP, 0% of TN and 60% of TH.

Treatment of runoff in this manner is required for pre-treatment of stormwater from development sites prior to discharge into the infrastructure drainage system. This will help to ensure that the estate system is free from gross pollutants and coarse sediments and to reduce the potential for early onset sedimentation of the estate bio-retention basin.

STM's for development site are to be specified based on individual use on each development lot. Typical examples of acceptable site STM's include end-of-line gross pollutants traps (GPT's) such as Ecosol RSF4000, Rocla CDS, Humeceptor and at source methods such as pit inserts equivalent to Stormwater360 Enviropods;

- Tertiary treatment of suspended solids, gross pollutants, hydrocarbons and nutrients is to be performed via a 1200 m² bio-retention system. The proposed bio-retention system is to be provided within a combined bio-retention and detention basin and will form an overall estate level treatment system;
- It is noted that stormwater from the upstream catchments will bypass treatment systems and are not included in the modelling; and
- A portion of the future building roofs will also provide a level of treatment via rainwater reuse and settlement within the rainwater tank. Given however that building layouts are not yet defined, allowance for rainwater tank within the MUSIC model has not been made. This can be included in future development applications and engineering designs as necessary for the individual building applications.

To ensure compliance of site pre-treatment, it is proposed to provide a vortech type GPT prior to discharge to the estate infrastructure system. For this development the proposed system is the Rocla CDS system. Refer to drawing **Co11492.18-DA44** for location and details.

6.2 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas only, or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for future development lots within this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the non-potable water demand for the individual future developments in the range of 50-80%.

In general terms the rainwater harvesting systems will be in-line tanks for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

Rainwater falling on roofs is soft, clear and generally low in microbial and chemical contamination. Any contamination of rainwater generally occurs during collection and storage. The use of simple and cost effective rainwater collection and treatment systems ensures reliable operation and water quality for non-potable use. The proposed rainwater treatment will be a first flush diverter in accordance with council engineering guidelines.

Indoor and outdoor water demand and rainwater tanks sizing will be based on individual site requirements and form part of separate future development applications over these development lots in accordance with Fairfield Council requirements and the targets nominated above. A nominal tank size of 20kL has been nominated on the development drawings however this is subject to detailed analysis during construction certificate stage by the Hydraulic Engineering Consultant.

6.3 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.5** below) to assist in the effective operation and maintenance of the various water quality components.

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

Table 6.5. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/ LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			Cut hole in fabric and revegetate.
RAINWATER TANKS			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet - leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
INLET & JUNCTION PITS			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of pits	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.

7 SOIL AND WATER MANAGEMENT PLAN

7.1 General Conditions

A Soil and Water Management Plan (SWMP) is included in submitted drawings **Co11492.18-DA20** and **DA25**. These plans show the works can proceed without polluting receiving waters. A detailed plan will be prepared after development consent is granted and before works commence, noting that the primary measures are provided as part of the SSD7664 Mod1 Infrastructure works.

1. The SWMP is to be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued by the site manager, council inspector or other authorised representative in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this report and constructed following the guidelines stated in *Managing Urban Stormwater, Soils and Construction "The Blue Book"* (Landcom 1998) and Fairfield City Council's specifications.
3. All subcontractors will be informed by the site manager of their responsibilities in minimising the potential for sedimentation and soil erosion.
4. Works in the proximity of the Sydney Water Canal will need to be completed in accordance with Sydney Water and WaterNSW requirements. All water flows from the site are to be directed away from the canal, consistent with the existing surface flow conditions.

7.2 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 7.1**.

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Temporary construction access	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. All site workers will comply with these restrictions.
Remaining lands	Entry prohibited except for essential management works	

Table 7.1. Limitations to access

7.3 Erosion & Sediment Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on drawing **Co11492.18-DA20** and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
2. Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils (landscaped areas only) remain on the surface at the completion of works.
3. The construction program should be scheduled so that period of time from starting land disturbance to stabilisation is minimised.
4. Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
5. Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as low a gradient as practical but not steeper than:
 - 2H:1V where slope length is less than 7 metres
 - 2.5H:1V where slope length is between 7 and 10 metres
 - 3H:1V where slope length is between 10 and 12 metres
 - 4H:1V where slope length is between 12 and 18 metres
 - 5H:1V where slope length is between 18 and 27 metres
 - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event of 1 in 2 year ARI (Q2).
9. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

7.4 Pollution Control Conditions

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways.
2. Sediment fences will:
 - a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.
 - b) Have a catchment area not exceeding 720 square metres, a storage depth (including both settling and settled zones) of at least 0.6 metres, and internal dimensions that provide maximum surface area for settling, and
 - c) Provide a return of 1 metre upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20 year t_c discharge.
3. Sediment removed from any trapping device will be disposed of in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
4. Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
5. Temporary soil and water management structures will be removed only after the lands they are protecting are fully stabilised.

7.5 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance services are to be provided by the respective contractors at least weekly.

7.6 Site Inspection and Maintenance

1. A self-auditing program will be established based on a check sheet (refer **Appendix D**). A site inspection using the check sheet will be made by the site manager:
 - At least weekly;
 - Immediately before site closure; and
 - Immediately following rainfall events in excess of 5mm in any 24 hour period.

The self-audit will include:

- Recording the condition of every sediment control device;
- Recording maintenance requirements (if any) for each sediment control device;

- Recording the volumes of sediment removed from sediment retention systems, where applicable;
 - Recording the site where sediment is disposed; and
 - Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their recording.
2. In addition, the site manager will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report to the superintendent. The responsible person will ensure that:
- The plan is being implemented correctly;
 - Repairs are undertaken as required; and
 - Essential modifications are made to the plan if and when necessary.

The report shall include a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. Proper drainage will be maintained. To this end, drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that:
- No low points exist that can fill and overtop in a large storm event;
 - Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams and installing additional diversion upslope; and
 - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 metres from hazard areas will be removed. Such hazard areas include areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.
6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good working condition. In particular, attention will be given to:
- a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them;
 - b) Degradable products to ensure they are replaced as required; and
 - c) Sediment removal, to ensure the design capacity remains in the settling zone.
9. Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.

10. Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.
11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site fully stabilised.
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

9 SEAR's AND AGENCY RESPONSE ITEMS

This section of the report covers items relating to the Planning SEAR's, dated 18 November 2019, and associated agency responses for SSD 10404.

We provide specific responses to SEAR's *Item 6. Soil and Water*, and from DPIE letter, *Appendix A, Water and Soils Items 9 to 17*, WaterNSW letter dated 11 December 2019 *Soils and Water, Erosion and Sediment Control Plans and Earthworks* and Fairfield City Council letter dated 11 December 2019 *Catchment Branch Comments and Development Engineers Comments*.

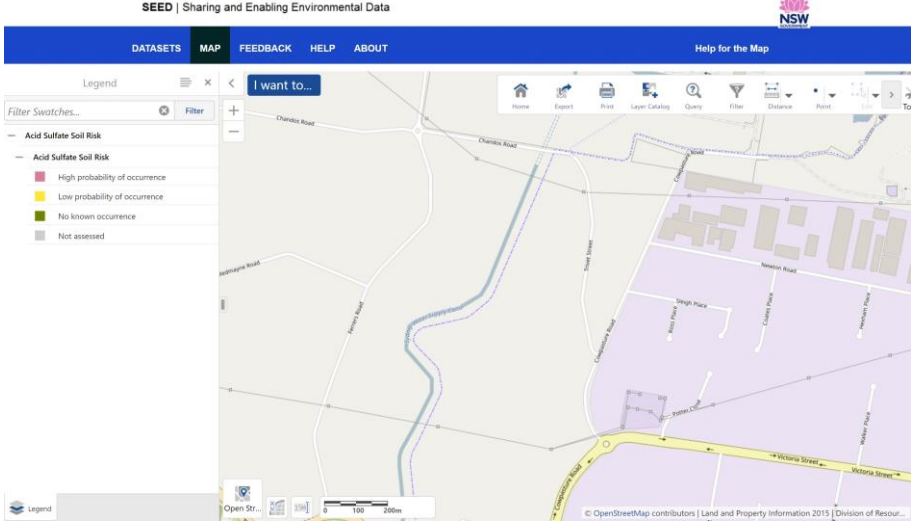
It is noted that the majority of items raised in the SEARs and associated agency letters will be managed and addressed via works and approved assessments already undertaken as part of the approved SSD 7664 (and associated SSD 7664 Mod1) development infrastructure works.

Further reference to the EIS should be made for confirmation of how the SEAR's have been addressed for non-civil engineering related items.

No.	Item & Response
SEARS Soils and Water	
Item 6	<i>A description of water demands of the development and a breakdown of water supplies</i> <u>Response</u> We confirm that water usage is consistent with a industrial developments typical of the area and approved under the parent estate SSD 7664 development. Water use will be required for toilet flushing, hand washing, employee showers, van washing, tote washing and irrigation with supply being made from Sydney Water. Water demand will be supplemented by rainwater harvesting with proposed reduction in non-potable demands as per the approved Horsley Drive Business Park Estate Stormwater Management Strategy (SSD7664), Fairfield City Council and the NSW Department of Environment and Conservation document <i>Managing Urban Stormwater: Harvesting and Reuse</i>, using a simple water balance analysis to balance the supply and demand.
	<i>Identify any water licensing requirements under the Water Act 1912 or Water Management Act 2000</i> <u>Response</u> We confirm that there are no water licensing requirements required or proposed as part of the facility proposal.
	<i>Details of proposed erosion and sediment controls during construction;</i> <u>Response</u>

No.	Item & Response
	An Erosion and Sediment Control Plan has been prepared in accordance with Fairfield Council requirements and <i>Managing Urban Stormwater, Soils and Construction “The Blue Book”</i> (Landcom 1998). The proposed erosion sediment controls are consistent with the overall estate masterplan strategy set out and approved under SSD 7664, and also consistent with recently submitted SSD 7664 Mod1. Refer to Section 7 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A.
	<i>Detailed plans and a description of the surface and stormwater management system, including on-site detention, designed in accordance with Water Sensitive Urban Design principles;</i> <u>Response</u> Detailed drawings, Co11492.18-DA40 to DA44, showing the proposed surface and stormwater management systems for the development have been included in Appendix A. Requirements for water quantity management, and water quality management have been discussed in Sections 5 and 6 of this Engineering Report respectively. Proposed stormwater management systems are consistent with the overall HDBP S2 strategy set out in the parent SSD 7664 estate approval and subsequent Mod 1 application, noting that an estate water quantity management basin manages detention requirements for individual development sites. The estate basin also completes all tertiary water quality management requirements, with individual sites requiring primary water quality management systems in the form of GPT’s or similar systems. Reuse of roofwater is also proposed to reduce the demand on non-potable water including toilet flushing and irrigation.
	<i>An assessment of potential flooding impacts;</i> <u>Response</u> The site falls within the HDBP S2 Masterplan extent approved under SSD 7664 and subsequent SSD 7664 Mod 1. As part of the approved SSD 7664, infrastructure works are proposed, including major cut to fill earthworks and trunk drainage infrastructure, to facilitate industrial development of the land and provide flood free development sites. A detailed flood assessment has been completed as part of the SSD 7664 and SSD 7664 Mod 1 approvals.

No.	Item & Response
	Based on SSD 7664 Mod 1 conditions, the HDBP CFC project is clear of any overland flow paths, trunk drainage infrastructure and achieves flood immunity to any adjacent overland flow paths. The development will not impact on, nor be impacted by, flooding or overland flow paths. Based on the above, a site-specific flood assessment is not required or proposed to be undertaken for the development. Refer SSD 7664 Mod 1 documents.
	<i>An assessment of potential impacts (including from potential spillage of materials) on surface and groundwater resources, drainage patterns, soil (stability, salinity and acid sulfate soils), related infrastructure, watercourses and riparian land and proposed mitigation measures.</i> <u>Response</u> No waterways or riparian corridors are located within proximity to the development site. Drainage and infrastructure requirements, including management of water quality and quantity have been completed in accordance with the approved SSD7664 management strategy. Any minor spills would be managed via proposed stormwater quality measures as set out in Section 6 of this Engineering Report. Any major spills would be managed by site specific operating procedures, including a stormwater system shut-off valve to contain firewater and other spills, set out in the EIS.
DPIE Water and Soils	
Item 9	<i>The EIS must map the following features relevant to water and soils including:</i>
Item 9 a)	<i>Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map).</i> <u>Response</u> Review of the NSW Acid Sulfate mapping shows the site to be clear of any areas with risk of Acid Sulfate Soils – refer excerpt below.

No.	Item & Response
	
Item 9 b)	<i>Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method).</i> <u>Response</u> No defined watercourses, wetlands or riparian land are within the development area. As such no watercourses, wetlands or riparian land will be affected by the proposed development. Assessments relating to these items are not relevant to the project. Reference to the ecological report prepared by Ecoplanning should be made for confirmation of the ecological value of water courses and existing overland flow paths.
Item 9 c)	<i>Wetlands as described in s4.2 of the Biodiversity Assessment Method.</i> <u>Response</u> No defined wetlands are within the development area. As such no wetlands will be affected by the proposed development. Assessments relating to this item is not relevant to the project.
Item 9 d)	<i>Groundwater.</i> <u>Response</u> Earthworks are proposed as part of SSD 7664 and SSD 7664 Mod 1 to facilitate industrial development and any assessments relating to groundwater would be covered under the parent estate development approval. Minor trimming and shaping only is required for the HDBP CFC project being assessed, hence there would be negligible change or effect on groundwater associated with this project assessment.

No.	Item & Response
	An assessment of groundwater is not relevant or proposed as part of the HDBP CFC project.
Item 9 e)	<i>Groundwater dependent ecosystems</i> <u>Response</u> Earthworks are proposed as part of SSD 7664 and SSD 7664 Mod 1 to facilitate industrial development and any assessments relating to groundwater would be covered under the parent estate development approval. Minor trimming and shaping only is required for the HDBP CFC project being assessed, hence there would be negligible change or effect on groundwater associated with this project assessment. An assessment of groundwater ecosystems is not relevant or proposed as part of the HDBP CFC project.
Item 9 f)	<i>Proposed intake and discharge locations.</i> <u>Response</u> Intake locations are not relevant to this industrial building development. Assessments as such are not required for this project. Discharge of stormwater is proposed from the site into drainage infrastructure (including detention basin and bio-retention basin) provided as part of SSD 7664 and SSD 7664 Mod1.
Item 10	<i>The EIS must describe background conditions for any water resource likely to be affected by the development, including:</i>
Item 10 a)	<i>Existing surface and groundwater.</i> <u>Response</u> Detailed drawings, Co11492.18-DA40 to DA44, showing the proposed surface water and stormwater management systems for the development have been included in Appendix A. Requirements for water quantity management, and water quality management have been discussed in Sections 5 and 6 of this Engineering Report respectively. Proposed stormwater management systems are consistent with the overall HDBP S2 strategy set out in the parent SSD 7664 estate approval and subsequent Mod 1 application, noting that an estate water quantity management basin manages detention requirements for individual development sites. The estate basin also completes all tertiary water quality management requirements, with individual sites

No.	Item & Response
	requiring primary water quality management systems in the form of GPT's or similar systems. In relation to groundwater, earthworks are proposed as part of SSD 7664 and SSD 7664 Mod 1 to facilitate industrial development and any assessments relating to groundwater would be covered under the parent estate development approval. Minor trimming and shaping of ground only is required for the HDBP CFC project being assessed, hence there would be negligible change or effect on groundwater associated with this project assessment. An assessment of groundwater is not relevant or proposed as part of the HDBP CFC project.
Item 10 b)	<i>Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations.</i> <u>Response</u> Detailed drawings, Co11492.18-DA40 to DA44, showing the proposed surface and stormwater management systems for the development have been included in Appendix A. Requirements for water quantity management, and water quality management have been discussed in Sections 5 and 6 of this Engineering Report respectively. Proposed stormwater management systems are consistent with the overall HDBP S2 strategy set out in the parent SSD 7664 estate approval and subsequent Mod 1 application, noting that an estate water quantity management basin manages detention requirements for individual development sites. The estate basin also completes all tertiary water quality management requirements, with individual sites requiring primary water quality management systems in the form of GPT's or similar systems. In relation to groundwater, minor trimming and shaping of ground levels only are required for the HDBP CFC project being assessed. Hence there would be negligible change or effect on groundwater associated with this project assessment. An assessment of groundwater is not relevant or proposed as part of the HDBP CFC project.
Item 10 c)	<i>Water Quality Objectives (as endorsed by the NSW Government http://www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters.</i>

No.	Item & Response												
	<u>Response</u> A water quality strategy, which matches and exceeds Fairfield Council LGA Stormwater Quality Objectives and meets NSW Government and best practice outcomes has been completed. The strategy and site-specific water quality requirements have been completed in accordance with SSD 7664 and SSD 7664 Mod1. Pollution reduction targets nominated in Table 2-2 of the <i>Georges River Estuary Coastal Zone Management Plan – July 2013</i> have been adopted for the estate (per SSD 7664) and to be performed on a catchment wide basis. The adopted pollution reduction targets exceed those set out in Council's <i>Stormwater Management Policy 2017</i> document. The adopted water quality targets for the estate are as follows (and also in Section 6 of this report) and are presented in terms of annual percentage pollutant reductions on a developed catchment: <table data-bbox="619 994 1085 1285"> <tbody> <tr> <td>Gross Pollutants</td><td>90%</td></tr> <tr> <td>Total Suspended Solids</td><td>85%</td></tr> <tr> <td>Total Phosphorus</td><td>60%</td></tr> <tr> <td>Total Nitrogen</td><td>45%</td></tr> <tr> <td>Total Hydrocarbons</td><td>90%</td></tr> <tr> <td>Free Oil and Grease</td><td>90%</td></tr> </tbody> </table> In order for the HDBP CFC Project to meet the overall stormwater management objectives, a GPT or other acceptable primary water quality improvement device is required prior to discharge from the site to estate infrastructure drainage systems. Refer Section 6 of this report and drawings, Co11492.18-DA40 to DA44.	Gross Pollutants	90%	Total Suspended Solids	85%	Total Phosphorus	60%	Total Nitrogen	45%	Total Hydrocarbons	90%	Free Oil and Grease	90%
Gross Pollutants	90%												
Total Suspended Solids	85%												
Total Phosphorus	60%												
Total Nitrogen	45%												
Total Hydrocarbons	90%												
Free Oil and Grease	90%												
Item 10 d)	<i>Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.</i> <u>Response</u> Relevant stormwater quality pollution reduction objectives for an industrial development have been adopted for the HDBP CFC project. These are based on reduction targets nominated in Table 2-2 of the <i>Georges River Estuary Coastal Zone Management Plan – July 2013</i>, as discussed and agreed with Council and DPIE as part of the SSD7664 consultation process.												

No.	Item & Response
Item 10 e)	<i>Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions</i> http://www.environment.nsw.gov.au/research-andpublications/publications-search/risk-based-framework-for-considering-waterwayhealth-outcomes-in-strategic-land-use-planning <u>Response</u> The HDBP CFC project forms part of the overall HDBP S2 approved under SSD7664 and SSD 7664 Mod1. Stormwater management systems have been designed in accordance with the approved estate management plan, which considers water quality and water quantity discharge. Waterway health and potential risks have been completed in accordance with the accepted water quality and quantity benchmarks as set out in the SSD 7664 approval and Mod 1 application. It is noted that discharge from the site, and HDBP S2 Estate is made directly to constructed drainage infrastructure (comprising existing large diameter pipe work, reinforced concrete box culverts and concrete lined open channels) and the existing Wetherill Park Industrial Area for a distance of approximately 3.5km downstream of the development site. Also, it is noted that no waterways have been identified on the property. Assessments relating to waterways are not considered required for this development site.
Item 11	<i>The EIS must assess the impacts of the development on water quality, including:</i>
Item 11 a)	<i>The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.</i> <u>Response</u> Refer to response Items 10(a) to 10(e) pertaining to proposed water quality objectives and triggers.
Item 11 b)	<i>Identification of proposed monitoring of water quality.</i> <u>Response</u> Monitoring of water quality is not required or proposed for the HDBP S2 Estate (per SSD 7664), and also not proposed for the HDBP CFC project.
Item 11	<i>Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan).</i>

No.	Item & Response
c)	<u>Response</u> Relevant stormwater quality pollution reduction objectives for an industrial development have been adopted for the HDBP CFC project. These are based on reduction targets nominated in Table 2-2 of the <i>Georges River Estuary Coastal Zone Management Plan – July 2013</i>, as discussed and agreed with Council and DPIE as part of the SSD7664 consultation process.
Item 12	<i>The EIS must assess the impact of the development on hydrology, including:</i>
Item 12 a)	<i>Water balance including quantity, quality and source.</i> <u>Response</u> We confirm that water usage is consistent with industrial developments typical of the area. Water use will be for toilet flushing, hand washing, employee showers, van washing, tote washing and irrigation with supply being made from Sydney Water. Water demand will be supplemented by rainwater harvesting with proposed reduction in non-potable demands as per the approved Horsley Drive Business Park Estate Stormwater Management Strategy, Fairfield City Council and the NSW Department of Environment and Conservation document <i>Managing Urban Stormwater: Harvesting and Reuse</i>, using a simple water balance analysis to balance the supply and demand.
Item 12 b)	<i>Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas.</i> <u>Response</u> The HDBP CFC project forms part of the overall HDBP S2 approved under SSD7664 and SSD 7664 Mod1. Stormwater management systems have been designed in accordance with the approved estate management plan, which considers water quality and water quantity discharge assessed and approved as being acceptable outcomes for the heavily urbanised receiving downstream system. It is noted that discharge from the site, and HDBP S2 Estate, is made directly to constructed drainage infrastructure (comprising existing large diameter pipe work, reinforced concrete box culverts and concrete lined open channels) and the existing Wetherill Park Industrial Area. These constructed systems extend for a distance of approximately 3.5km downstream of the development site before joining the upper reach of Prospect Creek and has a contributing catchment in excess of 650 Ha. Given the stormwater management measures proposed for the site and HDBP S2 Estate (as approved under SSD 7664), and the site comprising only 2% of the total contributing catchment, the effect of

No.	Item & Response
	the development on any downstream rivers, wetlands, estuaries, marine waters and floodplain areas is considered to be negligible. The negligible impact noted (in relation to downstream rivers, wetlands, estuaries, marine waters and floodplain areas) and reasons outlined above, would extend to water-dependent fauna and flora (per Item 12(c) below), impacts on natural processes (per item 12 (d) below).
Item 12 c)	<i>Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.</i> <u>Response</u> Refer Item 12(b) above.
Item 12 d)	<i>Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).</i> <u>Response</u> Refer Item 12(b) above.
Item 12 e)	<i>Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.</i> <u>Response</u> No changes to environmental water availability are proposed as part of the HDBP CFC project.
Item 12 f)	<i>Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.</i> <u>Response</u> During construction an Erosion and Sediment Control program is proposed to be implemented. An Erosion and Sediment Control Plan has been prepared in accordance with Fairfield Council requirements and <i>Managing Urban Stormwater, Soils and Construction “The Blue Book”</i> (Landcom 1998). The proposed erosion sediment controls are consistent with the overall estate masterplan strategy set out and approved under SSD 7664, and also consistent with recently submitted SSD 7664 Mod1. Refer to Section 7 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A. Detailed drawings, Co11492.18-DA40 to DA44, showing the proposed surface and stormwater management systems for the development during the operational phase have been included in Appendix A.

No.	Item & Response
	Requirements for water quantity management, and water quality management have been discussed in Sections 5 and 6 of this Engineering Report respectively. Proposed stormwater management systems are consistent with the overall HDBP S2 strategy set out in the parent SSD 7664 estate approval and subsequent Mod 1 application, noting that an estate water quantity management basin manages detention requirements for individual development sites. The estate basin also completes all tertiary water quality management requirements, with individual sites requiring primary water quality management systems in the form of GPT's or similar systems. Reuse of roofwater is also proposed to reduce the demand on non-potable water including toilet flushing and irrigation.
Item 12 g)	<i>Identification of proposed monitoring of hydrological attributes.</i> <u>Response</u> Monitoring of water quality is not required or proposed for the HDBP S2 Estate (per SSD 7664), and also not proposed for the HDBP CFC project.
DPIE Flooding and coastal hazards	
Item 13	<i>The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:</i>
Item 13 a)	<i>Flood prone land.</i> <u>Response</u> The site falls within the HDBP S2 Masterplan extent approved under SSD 7664 and subsequent SSD 7664 Mod 1. As part of the approved SSD 7664, infrastructure works are proposed, including major cut to fill earthworks and trunk drainage infrastructure, to facilitate industrial development of the land and provide flood free development sites. A detailed flood assessment has been completed as part of the SSD 7664 and SSD 7664 Mod 1 approvals. The flood and overland flow assessment confirms flood prone land, flood planning levels, overland flow paths, effect of development on flood conditions and effect of flooding on the development. Based on SSD 7664 Mod 1 and the assessment completed as part of the Masterplan application submission, the HDBP CFC project is clear of any overland flow paths, trunk drainage infrastructure and achieves

No.	Item & Response
	flood immunity to any adjacent overland flow paths. The development will not impact on, nor be impacted by, flooding or overland flow paths. Based on the above, a site-specific flood assessment is not required or proposed to be undertaken for the development. Refer SSD 7664 Mod 1 documents.
Item 13 b)	<i>Flood planning area, the area below the flood planning level.</i> <u>Response</u> Refer Item 13(a) response.
Item 13 c)	<i>Hydraulic categorisation (floodways and flood storage areas)</i> <u>Response</u> Refer Item 13(a) response.
Item 13 d)	<i>Flood Hazard.</i> <u>Response</u> Refer Item 13(a) response.
Item 14	<i>The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 5% Annual Exceedance Probability (AEP), 1% AEP, flood levels and the probable maximum flood, or an equivalent extreme event.</i> <u>Response</u> Refer Item 13(a) response.
Item 15	<i>The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:</i>
Item 15 a)	<i>Current flood behaviour for a range of design events as identified in 14 above. This includes the 0.5% and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.</i> <u>Response</u> Refer Item 13(a) response.
Item 16	<i>Modelling in the EIS must consider and document:</i>
Item 16 a)	<i>Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.</i> <u>Response</u>

No.	Item & Response
	Refer Item 13(a) response. It is noted that the flood modelling has been completed utilising existing council flood study and completed by a consultant from a pre-approved list provided by Council.
Item 16 b)	<i>The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood, or an equivalent extreme flood.</i> <u>Response</u> Refer Item 13(a) response.
Item 16 c)	<i>Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories</i> <u>Response</u> Refer Item 13(a) response.
Item 16 d)	<i>Relevant provisions of the NSW Floodplain Development Manual 2005</i> <u>Response</u> Refer Item 13(a) response.
Item 17	<i>The EIS must assess the impacts on the proposed development on flood behaviour, including:</i>
Item 17 a)	<i>Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure.</i> <u>Response</u> Refer Item 13(a) response.
Item 17 b)	<i>Consistency with Council floodplain risk management plans.</i> <u>Response</u> Refer Item 13(a) response.
Item 17 c)	<i>Consistency with any Rural Floodplain Management Plans.</i> <u>Response</u> Refer Item 13(a) response.
Item 17	<i>Compatibility with the flood hazard of the land.</i>

No.	Item & Response
d)	<u>Response</u> Refer Item 13(a) response.
Item 17 e)	<i>Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.</i> <u>Response</u> Refer Item 13(a) response.
Item 17 f)	<i>Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.</i> <u>Response</u> Refer Item 13(a) response.
Item 17 g)	<i>Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.</i> <u>Response</u> Refer Item 13(a) response. It is further noted that the downstream receiving waters are substantially urbanised for a distance of greater than 3.5km and a large contributing urbanised catchment. Refer to Item 12(b) response for further substantiation. As such, affect on erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses would be very low to negligible.
Item 17 h)	<i>Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSWSES and Council.</i> <u>Response</u> The proposed HDBP CFC project will not impact on emergency management arrangements for flooding. The assessment completed as part of SSD 7664 shows a slight reduction in flood levels within Cowpasture Road during the 1% AEP storm event, hence overall a minor improvement in flood conditions would be realised.
Item 17 i)	<i>Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.</i> <u>Response</u>

No.	Item & Response
	The HDBP CFC project is noted to be clear of 1% AEP and PMF flooding from surrounding overland flow paths. On-site refuge is available for the site. Flood Risk and safety is noted to be addressed as part of the overall SSD7664 HDBP S2 Estate.
Item 17 j)	<i>Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES.</i> <u>Response</u> Refer Item 17(i) response.
Item 17 k)	<i>Any impacts the development may have on the social and economic costs to the community as consequence of flooding.</i> <u>Response</u> The proposed HDBP CFC project will not impact on the flood conditions confirmed in the assessment completed as part of SSD 7664. The SSD7664 assessment shows a slight reduction in flood levels within Cowpasture Road during the 1% AEP storm event, hence overall a minor improvement in flood conditions would be realised, and as such a minor improvement in relation to social and economic costs would also be realised.
WaterNSW letter dated 11 December 2019	
Soil and Water Item 1	<i>Surface water is currently conveyed through a series of flumes and culverts across the corridor and then flows onto the subject site. The EIS should demonstrate how stormwater systems for the development will be designed to accommodate and not impede any upstream flows from systems that convey stormwater across, along or under the Upper Canal. The stormwater management system should ensure it makes allowance for all flow emanating from land to the west of the Upper Canal as well as from the corridor itself.</i> <u>Response</u> The site falls within the HDBP S2 Masterplan extent approved under SSD 7664 and currently under assessment SSD 7664 Mod 1. As part of the approved SSD 7664 and Mod1, infrastructure works are proposed, including major cut to fill earthworks and trunk drainage infrastructure, to facilitate industrial development of the land and provide flood free development sites. A detailed surface water assessment (including hydrological, hydraulic and a detailed flood assessment) has been completed as part of the SSD 7664 and SSD 7664 Mod 1 approvals. The design and assessments for

No.	Item & Response
	the SSD 7664 including management of the upstream flows described by WaterNSW above. This assessment shows that flow paths are catered for and not impeded, and that there would be no affect on the WaterNSW Canal as part of the overall SSD 7664 development. The stormwater design for the HDBP CFC project is noted to be completed based on stormwater management strategy assessed and approved for the SSD7664 and per the under assessment SSD 7664 Mod 1. The site is noted to be clear of any overland flow paths, trunk drainage infrastructure and achieves flood immunity to any adjacent overland flow paths. The development will not impact on, nor be impacted by, flooding or overland flow paths. Based on the above, requirements pertaining to conveyance of overland flows and the WaterNSW Canal are considered to be met.
Item 2	<i>Should the ground level of the development site be raised, the EIS may also need to show how stormwater management systems will retain stormwater within the development site and prevent any flows from entering the Upper Canal corridor. All stormwater structures associated with the development should be kept within the development site.</i> <u>Response</u> Refer to <i>Soil and Water Item 1</i> response. We also confirm that all stormwater structures are proposed to be contained within the subject development site and clear of any WaterNSW property.
Item 3	<i>In order to manage the environmental impacts that may arise from dam dewatering, the EIS should consider the quality and quantity of the water to be released; the fate of the water; any impacts to native, threatened or protected species; relocation of displaced native fauna; and the spread of nuisance flora and fauna species.</i> <u>Response</u> Water discharge would be completed in accordance with Landcom Blue Book and EPA requirements. Refer to EIS relating to commentary regarding flora and fauna.
Item 4	<i>Erosion and Sediment control plans – the EIS should consider any impacts from sediment or polluted run-off, and airborne dust emissions on the quality of the water in the Upper Canal. This should include mitigation measures for the prevention of impacts on the corridor and the open waters of the Upper Canal.</i> <u>Response</u> During construction an Erosion and Sediment Control program is proposed to be implemented. An Erosion and Sediment Control Plan

No.	Item & Response
	has been prepared in accordance with Fairfield Council requirements and <i>Managing Urban Stormwater, Soils and Construction “The Blue Book”</i> (Landcom 1998). The proposed erosion sediment controls are consistent with the overall estate masterplan strategy set out and approved under SSD 7664, and also consistent with recently submitted SSD 7664 Mod1. Refer to Section 7 of this <i>Engineering Report for Soil and Water Management</i> requirements and associated Erosion and Sediment Control drawings included in Appendix A.
<i>Earthworks</i> <i>Item 1</i>	<i>The EIS should detail the measures being taken to prevent any impacts on the Upper Canal corridor from any earthworks occurring adjacent to the boundary, including how sediment or polluted run-off will be reverted from entering the corridor, and dust suppression measures to prevent dust blowing into the open waters of the Upper Canal.</i> <u>Response</u>
<i>Item 2</i>	<i>WaterNSW requires the proponent outlines plans in the EIS for any retaining walls or similar structures where they are planned to be installed along the boundary with the Upper Canal for WaterNSW assessment.</i> <u>Response</u> Details of proposed walls are provided as part of the SSD7664 mod1 application. The HDBP CFC project does not propose any walls in proximity to WaterNSW boundaries.
Fairfield City Council letter dated 11 December 2019	
<i>Catchment Branch Comments</i> <i>Item 1</i>	<i>The Site Plan prepared by Leffler Simes Architects drawing no. SK-01 dated October 2019 shows that stormwater management systems have been removed as part of the development including the major drainage channel to the south of the site and the stormwater quality improvement and stormwater detention to the eastern side of the site.</i> <u>Response</u> Estate Stormwater Management Systems are proposed and assessed as part of SSD7664 and SSD 7664 Mod1 applications. Site specific measures proposed for the HDBP CFC project are provided in Detailed drawings, Co11492.18-DA40 to DA44, showing the proposed surface and stormwater management systems for the development during the operational phase have been included in Appendix A.

No.	Item & Response
	Requirements for water quantity management, and water quality management have been discussed in Sections 5 and 6 of this Engineering Report respectively. Proposed stormwater management systems are consistent with the overall HDBP S2 strategy set out in the parent SSD 7664 estate approval and subsequent Mod 1 application, noting that an estate water quantity management basin manages detention requirements for individual development sites. The estate basin also completes all tertiary water quality management requirements, with individual sites requiring primary water quality management systems in the form of GPT's or similar systems.
Item 2	<i>The stormwater management systems included as part of the concept plan are critical to resolve the flooding issues on site and impact on adjoining sites. The location of the stormwater quality improvement and stormwater detention must be reinstated in the location and designed to accommodate the new layout of the development. If this is not undertaken, a full modelling assessment of flood impacts is required.</i> <u>Response</u> Refer Catchment Branch Comments Item 1 response.
Item 3	<i>Furthermore, the overland flood flows were being passed through the centre of the site in a westerly direction towards a stormwater detention basin. The flowpath for these flows have not been accommodated in this design, and must be included as part of the development</i> <u>Response</u> Refer Catchment Branch Comments Item 1 response.
Development Engineers Comments	<i>Due to the flood affectation of the site a Flood Risk Management Report prepared by a qualified consultant shall be included in the submission to demonstrate that the proposal fully complies with Chapter 11 of Council's DCP. In particular, a Flood Impact Assessment Report prepared by an engineer based on Council's adopted flood model shall be submitted to Council. Proposed overland flow path through the site shall be superimposed on the site plan.</i> <u>Response</u> The site falls within the HDBP S2 Masterplan extent approved under SSD 7664 and subsequent SSD 7664 Mod 1. As part of the approved SSD 7664, infrastructure works are proposed, including major cut to fill earthworks and trunk drainage infrastructure, to facilitate industrial development of the land and provide flood free development sites.

No.	Item & Response
	A detailed flood assessment has been completed as part of the SSD 7664 and SSD 7664 Mod 1 approvals. The flood and overland flow assessment confirms flood prone land, flood planning levels, overland flow paths, effect of development on flood conditions and effect of flooding on the development. It is noted that the flood modelling has been completed utilising existing council flood study and completed by a consultant from a pre-approved list provided by Council. Based on SSD 7664 Mod 1 and the assessment completed as part of the Masterplan application submission, the HDBP CFC project is clear of any overland flow paths, trunk drainage infrastructure and achieves flood immunity to any adjacent overland flow paths. The development will not impact on, nor be impacted by, flooding or overland flow paths. Based on the above, a site-specific flood assessment is not required or proposed to be undertaken for the development. Refer SSD 7664 Mod 1 documents.

10 CONCLUSION

This Civil Engineering Details Report has been prepared to support the SSD10404 development application for a new customer fulfillment centre, within the SSD7664 approved industrial estate, 'Horsley Drive Business Park Stage 2' at Cowpasture Road, Wetherill Park.

A civil engineering and infrastructure strategy for the site has been developed which provides a best fit solution within the constraints of the proposed Horsley Drive Business Park Estate and the Stormwater Management Strategy approved under SSD 7664. The proposed engineering strategy for this development has been completed consistent with the approved Business Park development.

During construction stage, Erosion and Sediment Control Measures are proposed for the site to ensure that all receiving waters are protected from undue pollution and sediment laden stormwater runoff. The site-specific strategy has been completed in conjunction with the broader strategy for the Horsley Drive Business Park Estate included in SSD 7764. The strategy comprises erosion control measures consistent with Fairfield City Council Policy and the Landcom document Managing Urban Stormwater, Soils and Construction (1998). Provided measures include sediment basins, diversion drains, batter control and site construction entries.

During operational phase the stormwater quality will be performed by a treatment train approach of primary treatment of hardstand and other paved surfaces prior to tertiary treatment within bio-retention systems provided in The Business Park Stage 2 Stormwater Management Basins. Stormwater quantity management (detention) will also be provided at an estate level within the Business Park Stage 2 Stormwater Management Basins.

It is recommended that the management strategies mentioned in this report be incorporated into the future detailed design. Detailed design may result in changes to the concept however design criteria will be followed.

It is recommended the management strategies (consistent with those already approved under SSD7664) in this report be approved and incorporated into the future detailed design.

11 REFERENCES

- Fairfield City Council Development Control Plan.
- Fairfield City Council Stormwater Management Plan 2017.
- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
- Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
- Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
- Managing Urban Stormwater: Soils & Construction – 2004(LANDCOM);
- WSUD: Basic Procedures for ‘Source Control of Stormwater’, John R Argue, 2008.
- Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS Australia Pty Ltd, May 2004

12 GLOSSARY

Afflux	The rise in water level upstream of a hydraulic structure such as a bridge or culvert, caused by losses incurred from the hydraulic structure. The change in flood surface or depth as a result in a modification or change to the hydraulic flood model scenario.
Australian Height Datum (AHD)	National survey datum corresponding approximately to mean sea level.
Annual Exceedance Probability (AEP)	The chance of a flood of a given size or larger occurring in any one year, generally expressed as percentage probability. For example, a 100 year ARI flood is a 1% AEP flood. An important implication is that when a 1% AEP flood occurs, there is still a 1% probability that it could occur the following year.
Average Recurrence Interval (ARI)	Is statistically the long term average number of years between the occurrence of a flood as big as, or larger than the selected flood event. An ARI is the reciprocal of the AEP.
Catchment	The catchment at a particular point is the area of land which drains to that point.
Depth to velocity value (DV)	A ratio of flow depth and velocity used as a measure of safety for pedestrians and vehicles subject to flood water. Normally a maximum DV of 0.4 is recommended for pedestrian safety and 0.6 for vehicles.
Design floor level	The minimum (lowest) floor level specified for a building.
Design flood	A hypothetical flood representing a specific likelihood of occurrence (for example the 100 year or 1% probability flood). The design flood may comprise two or more single source dominated floods.
Development	Existing or proposed works which may or may not impact upon flooding. Typical works are filling of land, and the construction of roads, floodways and buildings.
Discharge	The rate of flow of water measured in terms of volume over time. It is not the velocity of flow which is a measure of how fast the water is moving rather than how much is moving. Discharge and flow are interchangeable.
Digital Terrain Model (DTM)	A three-dimensional model of the ground surface that can be represented as a series of grids with each cell representing an

	elevation (DEM) or a series of interconnected triangles with elevations (TIN).
Effective warning time	The available time that a community has from receiving a flood warning to when the flood reaches their location.
First Flush	The initial surface runoff of a rainstorm. During this phase, water pollution in areas with high proportions of impervious surfaces is typically more concentrated compared to the remainder of the storm.
Flood	Above average river, creek, channel or other flows which overtop banks and inundate floodplains or urban areas.
Flood awareness	An appreciation of the likely threats and consequences of flooding and an understanding of any flood warning and evacuation procedures. Communities with a high degree of flood awareness respond to flood warnings promptly and efficiently, greatly reducing the potential for damage and loss of life and limb. Communities with a low degree of flood awareness may not fully appreciate the importance of flood warnings and flood preparedness and consequently suffer greater personal and economic losses.
Flood behaviour	The pattern / characteristics / nature of a flood.
Flooding	The State Emergency Service uses the following definitions in flood warnings: <i>Minor flooding:</i> causes inconvenience such as closing of minor roads and the submergence of low level bridges <i>Moderate flooding:</i> low-lying areas inundated requiring removal of stock and/or evacuation of some houses. Main traffic bridges may be covered. <i>Major flooding:</i> extensive rural areas are flooded with properties, villages and towns isolated and/or appreciable urban areas are flooded.
Flood frequency analysis	An analysis of historical flood records to determine estimates of design flood flows.
Flood fringe	Land which may be affected by flooding but is not designated as a floodway or flood storage.
Flood hazard	The potential threat to property or persons due to flooding.

Flood level	The height or elevation of flood waters relative to a datum (typically the Australian Height Datum). Also referred to as “stage”.
Flood liable land	Land inundated up to the probable maximum flood – flood prone land.
Floodplain	Land adjacent to a river or creek which is inundated by floods up to the probable maximum flood that is designated as flood prone land.
Flood Planning Levels (FPL)	Are the combinations of flood levels and freeboards selected for planning purposes to account for uncertainty in the estimate of the flood level.
Flood proofing	Measures taken to improve or modify the design, construction and alteration of buildings to minimise or eliminate flood damages and threats to life and limb.
Floodplain Management	The coordinated management of activities which occur on flood liable land.
Floodplain Management Manual	A document by the NSW Government (2001) that provides a guideline for the management of flood liable land. This document describes the process of a floodplain risk management study.
Flood source	The source of the flood waters.
Floodplain Management	A set of conditions and policies which define the benchmark from standard which floodplain management options are compared and assessed.
Flood standard	The flood selected for planning and floodplain management activities. The flood may be an historical or design flood. It should be based on an understanding of the flood behaviour and the associated flood hazard. It should also take into account social, economic and ecological considerations.
Flood storages	Floodplain areas which are important for the temporary storage of flood waters during a flood.
Floodways	Those areas of the floodplain where a significant discharge of flow occurs during floods. They are often aligned with naturally defined channels or overland flow paths. Floodways are areas that, even if they are partially blocked, would cause significant redistribution of flood flows, or a significant increase in flood levels.

Freeboard	A factor of safety usually expressed as a height above the flood standard. Freeboard tends to compensate for the factors such as wave action, localised hydraulic effects, uncertainties in the hydrology, uncertainties in the flood modelling and uncertainties in the design flood levels.
Geographical Information System (GIS)	A form of computer software developed for mapping applications and data storage. Useful for generating terrain models and processing data for input into flood estimation models.
High hazard	Danger to life and limb; evacuation difficult; potential for structural damage, high social disruption and economic losses. High hazard areas are those areas subject to a combination of flood depth and flow velocity that are deemed to cause the above issues to persons or property.
Historical flood	A flood which has actually occurred – Flood of Record.
Hydraulic	The term given to the study of water flow.
Hydrograph	A graph showing how flow rate changes with time.
Hydrology	The term given to the study of the rain-runoff process in catchments.
Low hazard	Flood depths and velocities are sufficiently low that people and their possessions can be evacuated.
Map Grid of Australia (MGA)	A national coordinate system used for the mapping of features on a representation of the earth's surface. Based on the geographic coordinate system 'Geodetic Datum of Australia 1994'.
Peak flood level, flow or velocity	The maximum flood level, flow or velocity occurring during a flood event.
MUSIC	Acronym for Model for Urban Stormwater Improvement Conceptualisation. A computer model which is used to simulate rainfall runoff, associated pollutants within the runoff and expected treatment of the pollutants using different treatment measures.
Probable Maximum Flood (PMF)	An extreme flood deemed to be the maximum statistical flood likely to occur at a particular location.

Probable Maximum Precipitation (PMP)	The greatest statistical depth of rainfall for a given duration meteorologically possible over a particular location. Used to estimate the probable maximum flood.
Probability	A statistical measure of the likely frequency or occurrence of flooding.
Riparian Zone	Areas that are located adjacent to watercourses. Their definition is vague and can be characterised by landform, vegetation, legislation or their function.
Runoff	The amount of rainfall from a catchment which actually ends up as flowing water in the river or creek.
Stage	Equivalent to water level above a specific datum- see flood level.
Treatment train	A term used to describe a series of water quality measures which act in conjunction with one another to provide a combined water quality outcome.
Triangular Irregular Network (TIN)	A mass of interconnected triangles used to model three-dimensional surfaces such as the ground (see DTM) and the surface of a flood.
Velocity	The speed at which the flood waters are moving. Typically, modelled velocities in a river or creek are quoted as the depth and width averaged velocity, i.e. the average velocity across the whole river or creek section

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED DISTRIBUTION CENTRE
HORSLEY DRIVE BUSINESS PARK
WETHERILL PARK NSW

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
CO11492.18-DA10	DRAWING LIST & GENERAL NOTES
CO11492.18-DA20	EROSION & SEDIMENT CONTROL PLAN
CO11492.18-DA25	EROSION & SEDIMENT CONTROL DETAILS
CO11492.18-DA40	DRAWING KEY PLAN
CO11492.18-DA41	CONCEPT STORMWATER PLAN - SHEET 1
CO11492.18-DA42	CONCEPT STORMWATER PLAN - SHEET 2
CO11492.18-DA43	CONCEPT STORMWATER PLAN - SHEET 3
CO11492.18-DA44	CONCEPT STORMWATER PLAN - SHEET 3
CO11492.18-DA45	CONCEPT STORMWATER DETAILS
CO11492.18-DA51	FINISHED LEVELS PLAN - SHEET 1
CO11492.18-DA52	FINISHED LEVELS PLAN - SHEET 2
CO11492.18-DA53	FINISHED LEVELS PLAN - SHEET 3
CO11492.18-DA54	FINISHED LEVELS PLAN - SHEET 4

GENERAL NOTES:

- G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
- G2 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
- G3 ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE. ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS. ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT. REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
- G4 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
- G5 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
- G6 ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

SURVEY NOTE:

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY 160136A_02 BY MONTEATH & POWYS SURVEYORS 12.10.16 COORDINATES BASED ON MGA COORDINATES AS NOMINATED ON SURVEY DRAWING.

SAFETY NOTE:

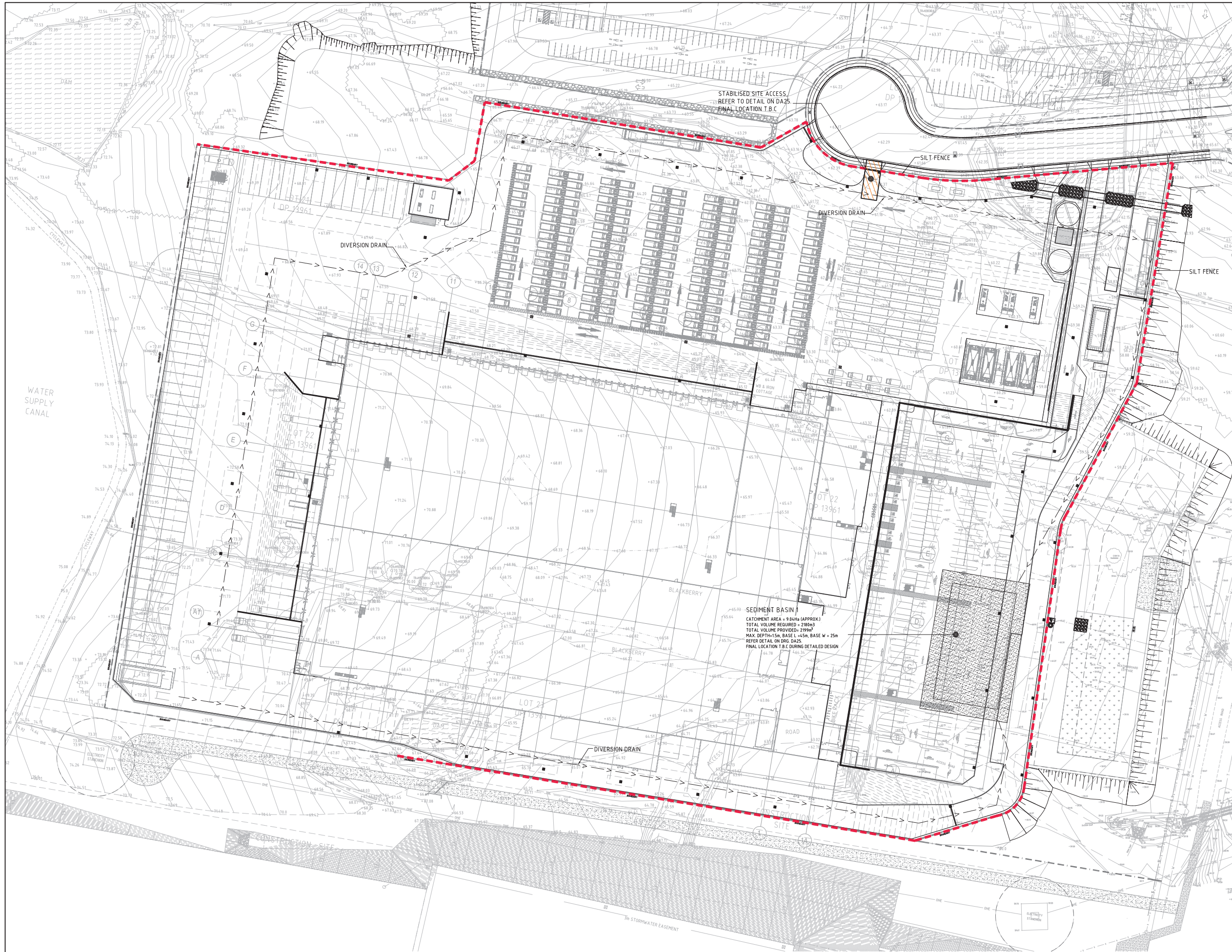
EARTHWORKS TO SOUTHERN EXTENT OF SITE ARE LOCATED WITHIN AN ELECTRICAL EASEMENT & ASSOCIATED HIGH VOLTAGE TRANSMISSION LINES. ALL WORKS WITHIN THIS ZONE TO BE PERFORMED IN ACCORDANCE WITH THE RELEVANT SERVICE PROVIDERS GUIDELINES. THE CONTRACTOR IS TO ENSURE ALL NECESSARY OH&S MEASURES ARE ALLOWED FOR AND IMPLEMENTED DURING WORKS IN THIS ZONE.



LOCALITY PLAN
NOT TO SCALE

FOR DEVELOPMENT APPLICATION

									 BUILDING SERVICES PTY LIMITED 22-24 Junction Street, Forest Lodge NSW 2037 Ph: (02) 9556 2822 Fax: (02) 9556 2900 ACN 055 267 788			ARCHITECT  LEFFLER SIMES ARCHITECTS			DEVELOPER  Charter Hall			PROJECT PROPOSED DISTRIBUTION CENTRE HORSLEY DRIVE BUSINESS PARK WETHERILL PARK, NSW  CONSULT AUSTRALIA			Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Widdowall Street Wahah Bay, Sydney NSW 2000 Tel: (02) 8551-7899 Fax: (02) 8541-3721 email: mail@costinroe.com.au ©			 Costin Roe Consulting			DRAWING TITLE DRAWING LIST & GENERAL NOTES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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EROSION CONTROL NOTES

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY EARTH BERM, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200MM.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C011492.18-DA25.

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'. CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 85th PERCENTILE INTENSITY (32.2mm).

APPROXIMATE AREA OF DISTURBED SITE = 19.3 Ha

SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE TO BE MADE DURING BENCHING OF SITE TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASINS.

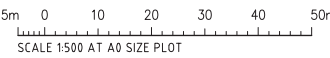
NOTES:

1. ASSUME TYPE D SOIL (CLAY/SILTY CLAY)
 2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)
- SOIL TYPE ASSESSED FROM GEOTECHNICAL REPORT PROVIDED BY PSM TITLED PSM 1869-009R DATED 10 MAY 2012.

LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- DENOTES DIRECTION OF OVERLAND FLOW
- DENOTES SILT FENCE WITH CATCH DRAIN
- DENOTES SILT FENCE ONLY
- DENOTES DIVERSION DRAIN
- SGGP, SINGLE GRATED GULLY PIT
- S-JP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.00m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.25m INTERVALS



EROSION AND SEDIMENT CONTROL PLAN
SCALE 1:500

FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION	29.01.20	A							
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS

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BUILDING SERVICES PTY LIMITED
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PH: (02) 9556 2822 FAX: (02) 9556 2900
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ARCHITECT
LEFFLER SIMES ARCHITECTS

DEVELOPER
Charter Hall

PROJECT
PROPOSED DISTRIBUTION CENTRE
HORSLEY DRIVE BUSINESS PARK
WETHERILL PARK, NSW

DESIGNED: M.C. M.C. DATE: DEC 19 CHECKED: M.W. SIZE: A0 SCALE: AS SHOWN CAD REF: C011492.18-DA20



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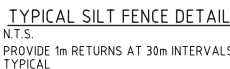
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DRAWING TITLE
EROSION AND SEDIMENT
CONTROL PLAN

DRAWING No
C011492.18- DA20

ISSUE
A



- NOTES:**
- ALL EROSION & SEDIMENT CONTROL MEASURES TO BE INSPECTED & MAINTAINED DAILY BY SITE MANAGER.
- MINIMISE DISTURBED AREAS.
- ROADS & FOOTPATHS TO BE SWEEPED DAILY.
- 12m TURF TO BE PLACED BEHIND KERBS.
- DUST MINIMISATION CONTROL BY WATERING TO BE IMPLEMENTED BY SITE MANAGER AS REQUIRED OR AS DIRECTED BY THE EPA.

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[illegible]

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY
INFORMATION PROVIDED BY MONTEATH & POWYS DATED 20.06.16.

-  - SGGP, SINGLE GRATED GULLY PIT
-  - SJP, SEALED JUNCTION PIT
-  - KIP, KERB INLET PIT
-  - DRAINAGE LINE
-  - ESTATE DRAINAGE LINE
-  - OVERLAND FLOW PATH

- 50.00 — — - FINISHED PAVEMENT CONTOUR (MAJOR)
0.5m INTERVALS
- 50.10 — — - FINISHED PAVEMENT CONTOUR (MINOR)
0.1m INTERVALS

BREAKLINE - REFER TO DRAWING DA43 FOR CONTINUATION

CONCEPT STORMWATER PLAN - SHEET 1
SCALE 1:250

FOR DEVELOPMENT APPLICATION

[illegible]

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LEFFLER SIMES ARCHITECTS

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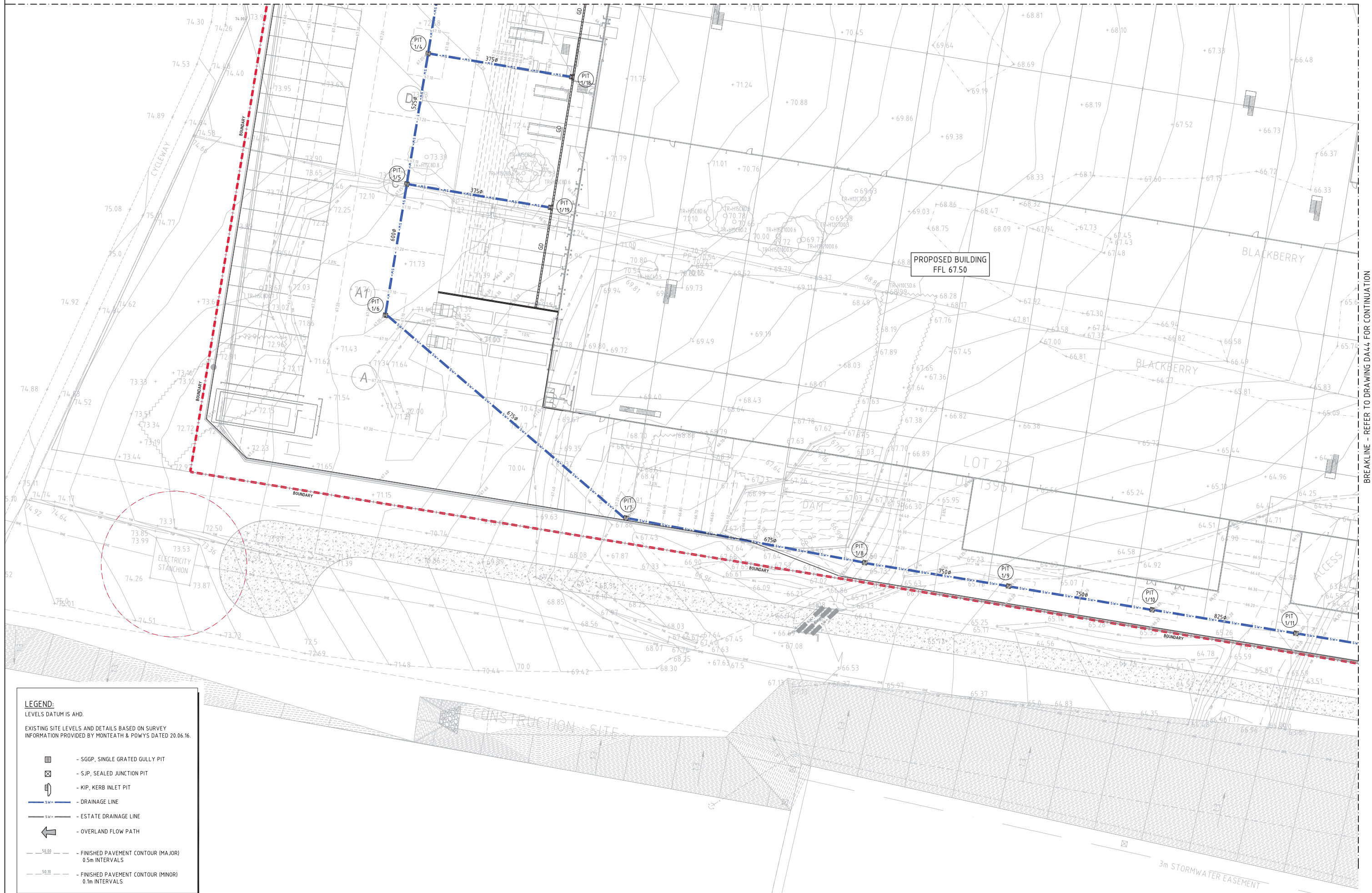
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DRAWING TITLE
CONCEPT STORMWATER PLAN
SHEET 1

DRAWING No	Co11492.18- DA41	ISSU
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BRIEFING - REFER TO DRAWING DA44 FOR CONTINUATION



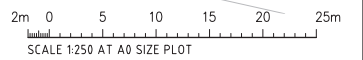
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY
INFORMATION PROVIDED BY MONTEATH & POWYS DATED 20.06.16

- | | |
|---|---|
|  | - SGGP, SINGLE GRATED GULLY PIT |
|  | - SJP, SEALED JUNCTION PIT |
|  | - KIP, KERB INLET PIT |
|  | - DRAINAGE LINE |
|  | - ESTATE DRAINAGE LINE |
|  | - OVERLAND FLOW PATH |
|  | - FINISHED PAVEMENT CONTOUR (M)
0.5m INTERVALS |
|  | - FINISHED PAVEMENT CONTOUR (M)
0.1m INTERVALS |

CONCEPT STORMWATER PLAN - SHEET 3
SCALE 1:250

FOR DEVELOPMENT APPLICATION



												 BUILDING SERVICES PTY LIMITED 22-24 Junction Street, Forest Lodge, NSW 2037 Ph: (02) 9551 7999 Fax: (02) 9551 3721 A/N 555 267 798												ARCHITECT  LEFFLER SIMES ARCHITECTS												DEVELOPER  Charter Hall												PROJECT PROPOSED DISTRIBUTION CENTRE HORSLEY DRIVE BUSINESS PARK WETHERILL PARK, NSW  Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahbi Bay, Sydney NSW 2000 Tel: (02) 9551-7999 Fax: (02) 9541-3721 email: mail@costinroe.com.au ©												 Costin Roe Consulting												DRAWING TITLE CONCEPT STORMWATER PLAN SHEET 3																																			
FOR DEVELOPMENT APPLICATION												29.01.20												B																																																																																			
FOR INFORMATION ONLY												A												22.12.19												A																																																																							
AMENDMENTS												DATE												ISSUE												AMENDMENTS												DATE												ISSUE												AMENDMENTS												DATE												ISSUE											

BREAKLINE - REFER TO DRAWING DA42 FOR CONTINUATION

BREAKLINE - REFER TO DRAWING DA43 FOR CONTINUATION



- LEGEND:**
LEVELS DATUM IS AHD.
EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY MONTEATH & POW'S DATED 20.06.16.
- SGGP, SINGLE GRATED GULLY PIT
 - SJP, SEALED JUNCTION PIT
 - KIP, KERB INLET PIT
 - DRAINAGE LINE
 - ESTATE DRAINAGE LINE
 - OVERLAND FLOW PATH
 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE PLOT



CONCEPT STORMWATER PLAN - SHEET 4
SCALE 1:250

FOR DEVELOPMENT APPLICATION

FOR DEVELOPMENT APPLICATION	29.01.20	B
FOR INFORMATION ONLY	20.12.19	A
AMENDMENTS	DATE	ISSUE
AMENDMENTS	DATE	ISSUE

FDC
BUILDING SERVICES PTY LIMITED
22-24 Junction Street, Forest Lodge NSW 2037
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DEVELOPER
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PROJECT
PROPOSED DISTRIBUTION CENTRE
HORSLEY DRIVE BUSINESS PARK
WETHERILL PARK, NSW

DESIGNED: M.C. DATE: DEC 19 CHECKED: M.W. SIZE: A0 SCALE: AS SHOWN CAD REF: C0114.92.18-DA44

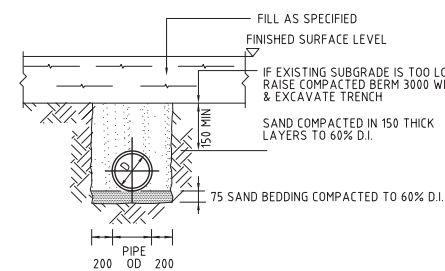
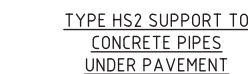
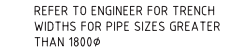
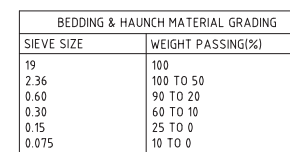
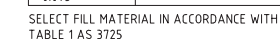
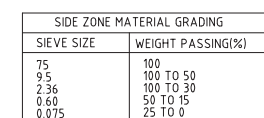
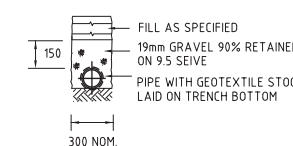
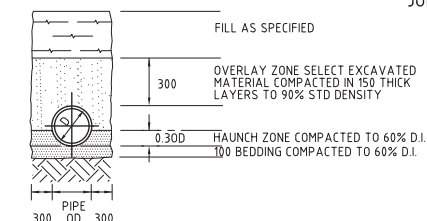
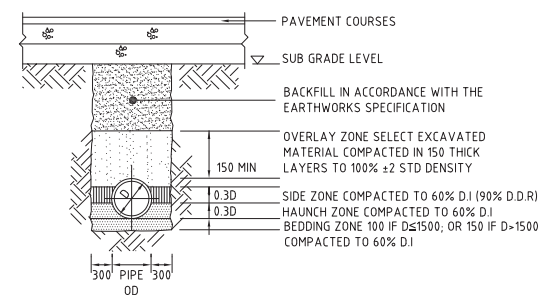
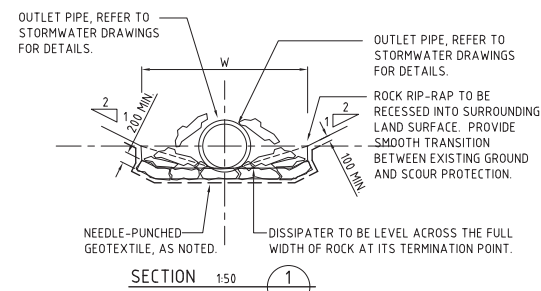
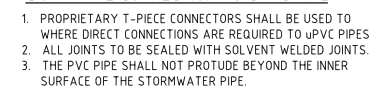
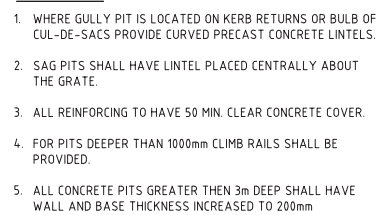
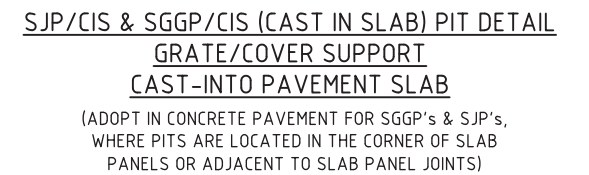
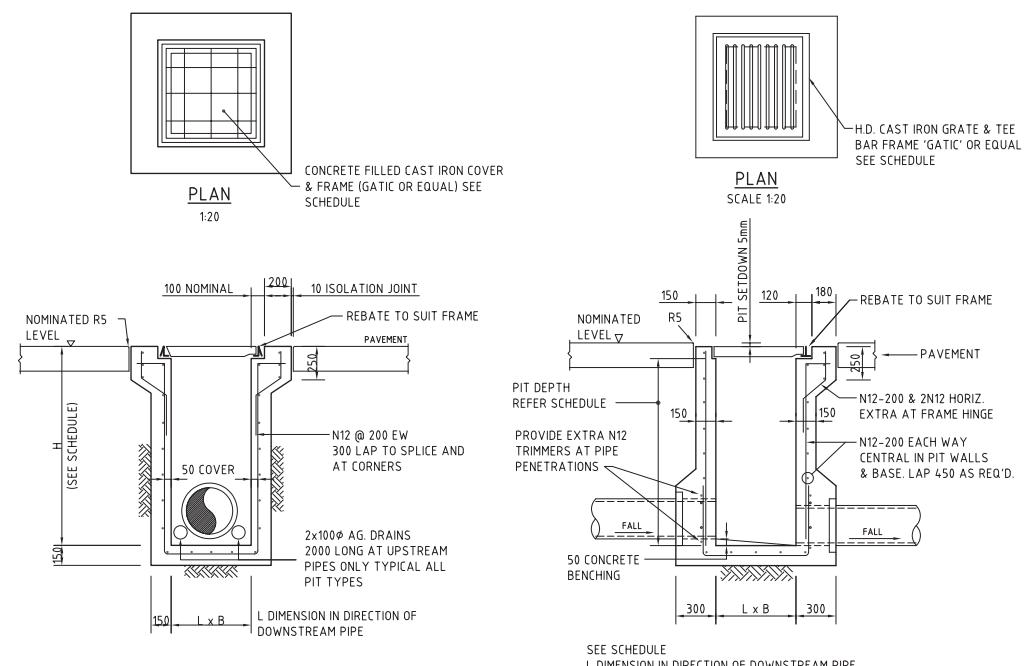
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PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
CONCEPT STORMWATER PLAN
SHEET 4

DRAWING No C0114.92.18- DA44 ISSUE B



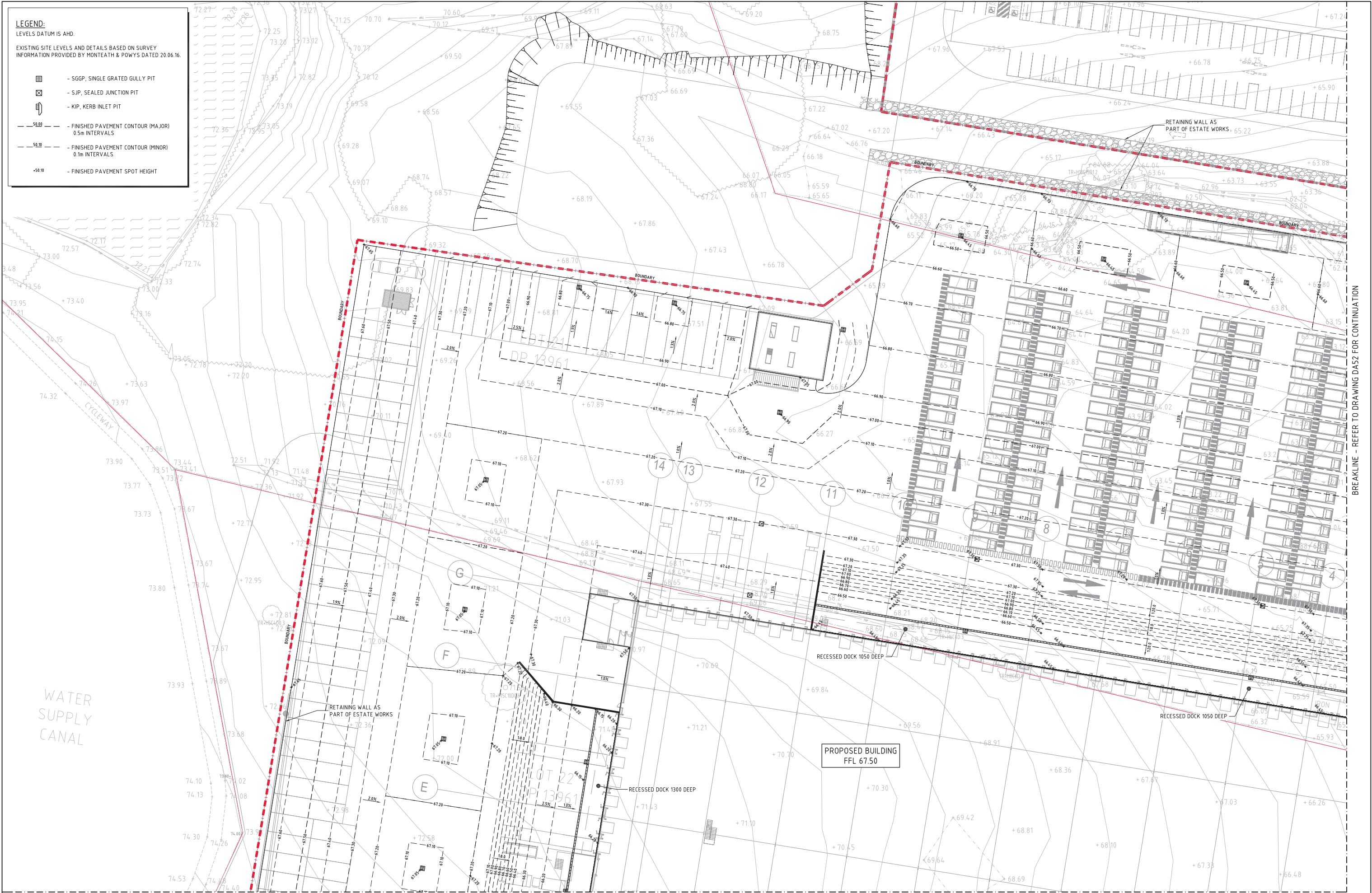
1. ALIGN STRUCTURE EVENLY WITH BANK.
2. LOCATE STRUCTURE AT INVERT LEVEL OF STREAM AND POINT IN A DOWNSTREAM DIRECTION.
3. PIPE TO REST ON, AND BE PACKED IN, BY RIP-RAP (SIZE AS NOTED).
4. DISCHARGE INTO STREAM WHERE BEDROCK IS PRESENT, OTHERWISE SCOUR PROTECT AS REQUIRED.
5. SCOUR PROTECT THE OPPOSITE BANK AS REQUIRED. SCOUR PROTECTION TO BE PROVIDED WHERE OPPOSITE BANK IS WITHIN 12-14 TIMES THE PIPE DIAMETER.
6. RIP-RAP TO CONSIST OF ANGULAR RUN-OF-QUARRY ROCK (d50= 300mm MINIMUM) AS NOTED IN THE SCHEDULE. RIP-RAP TO BE MINIMUM THICKNESS OF RIP-RAP LAYER TO BE 1.6x AVERAGE ROCK SIZE (d50).
7. RIP-RAP IS TO BE PLACED OVER A 200mm LAYER OF 140mm COBBLES OVER NEEDLE-PUNCHED GEOFAB A4.4.
8. PLACE ROCK SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROCK WITH A MINIMUM OF Voids. THE FINISHED RIP-RAP SURFACE SHOULD BE FREE OF POCKETS OF SMALL ROCK OR CLUSTERS OF LARGE ROCKS.
9. GAPS IN RIP-RAP TO BE HAND PACKED WITH TOPSOIL & PLANTED WITH NATIVE SEDGES & RUSHES TO PROVIDE. THE INTENT IS FOR THERE TO BE NO VOIDS BETWEEN RIP-RAP BOULDERS.
10. ENSURE THE FINISHED ROCK SURFACE BLENDS WITH THE SURROUNDING GROUND LEVELS, NO OVERFALL OR PROTRUSION OF ROCK SHOULD BE APPARENT.
11. ENSURE THAT STORMWATER FROM SURROUNDING GROUND IS FREE TO ENTER THE STRUCTURE WITHOUT CAUSING UNDESIRABLE PONDING OR SCOUR.

DISSIPATER SCHEDULE				
DISCHARGE POINT	d	La	W	RIP-RAP
OUTLET TYPE 1	1200	5000	3500	500

FOR DEVELOPMENT APPLICATION

PIPE LAYING DETAILS

DRAWING TITLE		CONCEPT STORMWATER DETAILS	
DRAWING No	Co11492 18- DA45	ISSUE	A



BREAKLINE - REFER TO DRAWING DA53 FOR CONTINUATION



FINISHED LEVELS PLAN - SHEET 1
SCALE 1:250

FOR DEVELOPMENT APPLICATION

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE PLOT

FOR DEVELOPMENT APPLICATION	29.01.20	B
FOR INFORMATION ONLY	20.12.19	A
AMENDMENTS	DATE	ISSUE
AMENDMENTS	DATE	ISSUE

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ARCHITECT
LEFFLER SIMES ARCHITECTS

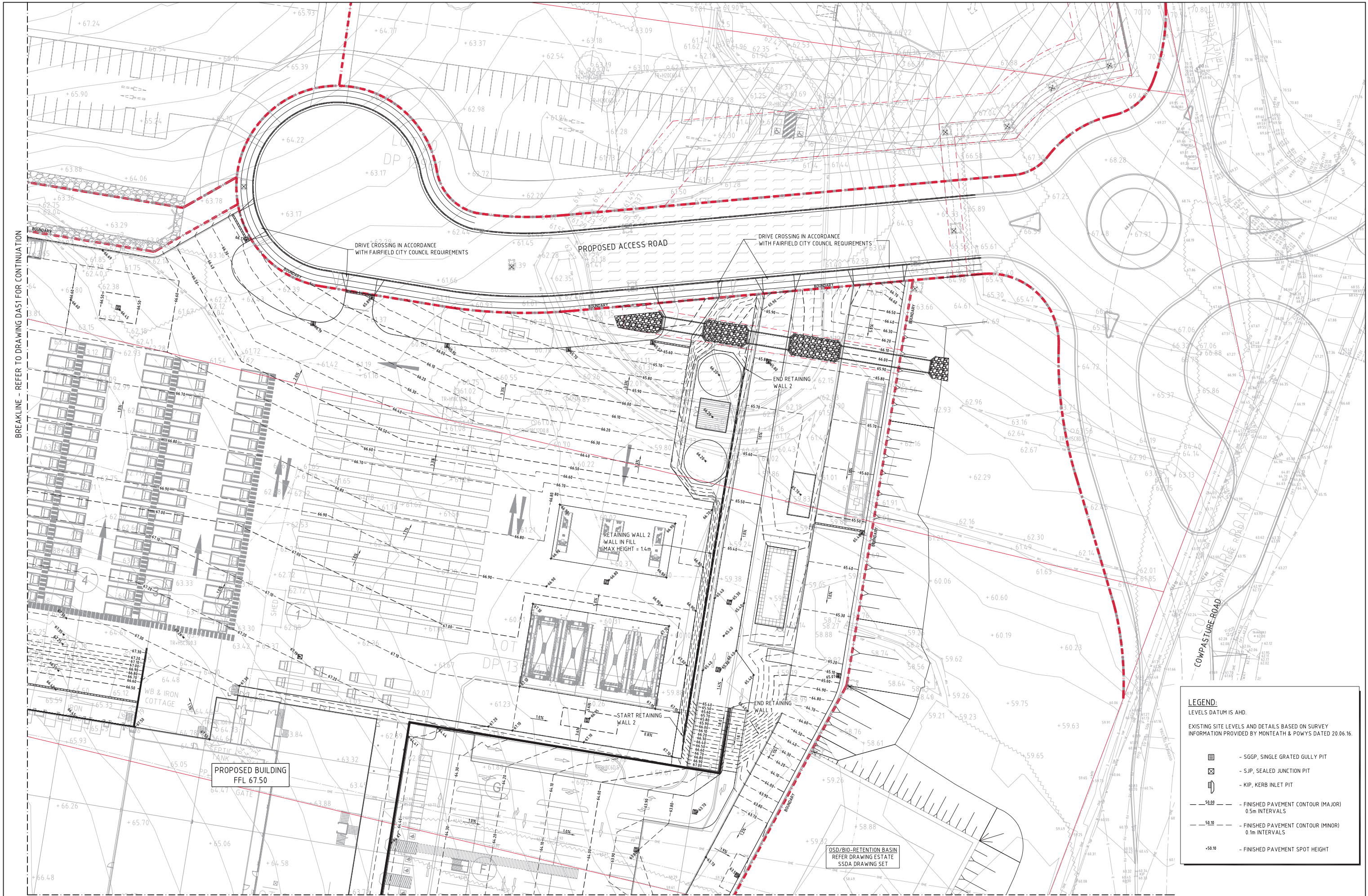
DEVELOPER
Charter Hall

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HORSLEY DRIVE BUSINESS PARK
WETHERILL PARK, NSW

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PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
FINISHED LEVELS PLAN
SHEET 1
DRAWING No
Co114.92.18- DA51
ISSUE
B



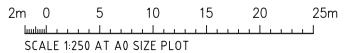
BREAKLINE - REFER TO DRAWING DA51 FOR CONTINUATION

BREAKLINE - REFER TO DRAWING DA54 FOR CONTINUATION

LEGEND:
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY
INFORMATION PROVIDED BY MONTEATH & POWYS DATED 20.06.16.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- FINISHED PAVEMENT SPOT HEIGHT



FOR DEVELOPMENT APPLICATION	29.01.20	B
FOR INFORMATION ONLY	28.12.19	A
AMENDMENTS	DATE	ISSUE
AMENDMENTS	DATE	ISSUE

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DRAWING TITLE
FINISHED LEVELS PLAN
SHEET 2
DRAWING No C0114.92.18- DA52

BREAKLINE - REFER TO DRAWING DA51 FOR CONTINUATION

BREAKLINE - REFER TO DRAWING DA54 FOR CONTINUATION



LEGEND:
LEVELS DATUM IS AHD.

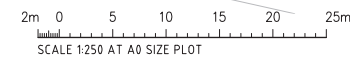
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- KIP, KERB INLET PIT
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- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- FINISHED PAVEMENT SPOT HEIGHT



FINISHED LEVELS PLAN - SHEET 3
SCALE 1:250

FOR DEVELOPMENT APPLICATION



FOR DEVELOPMENT APPLICATION	29.01.20	B
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DRAWING TITLE
FINISHED LEVELS PLAN
SHEET 3
DRAWING No Co114.92.18- DA53
ISSUE B

BREAKLINE - REFER TO DRAWING DA52 FOR CONTINUATION

BREAKLINE - REFER TO DRAWING DA53 FOR CONTINUATION



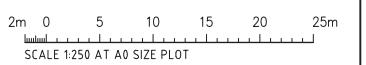
LEGEND:
LEVELS DATUM IS AHD.

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- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- FINISHED PAVEMENT SPOT HEIGHT

FINISHES LEVELS PLAN - SHEET 4
SCALE 1:250

FOR DEVELOPMENT APPLICATION



										 BUILDING SERVICES PTY LIMITED 22-24 Junction Street, Forest Lodge nsw 2037 Ph: (02) 9568 1000 Fax: (02) 9568 2900		ARCHITECT  LEFFLER SIMES ARCHITECTS		DEVELOPER  Charter Hall		PROJECT PROPOSED DISTRIBUTION CENTRE HORSLEY DRIVE BUSINESS PARK WETHERILL PARK, NSW		 Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahbi Bay, Sydney NSW 2000 Tel: (02) 8551-7000 Fax: (02) 8541-3721 email: mail@costinroe.com.au		 Costin Roe Consulting				DRAWING TITLE FINISHED LEVELS PLAN SHEET 4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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Appendix B

EROSION CONTROL CHECK SHEET

EROSION AND SEDIMENT CONTROL

WEEKLY SITE INSPECTION SHEET

LOCATION

INSPECTION OFFICER **DATE**

SIGNATURE

Legend: ☐ OK ☐ Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope “clean” water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of “rill” erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing “around” the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....