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PRECISION | COMMUNICATION | ACCOUNTABILITY

STORMWATER MANAGEMENT PLAN
SSD 7628

MOOREBANK LOGISTIC PARK
PRECINCT EAST - STAGE 2
BALANCE OF SITE
STORMWATER MANAGEMENT PLAN
MOOREBANK AVENUE
MOOREBANK NSW

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1 INTRODUCTION

1.1 Introduction

Costin Roe Consulting Pty Ltd has been commissioned by Qube Holdings Limited (Qube) to prepare this Stormwater Management Plan (SMP) for construction of the 71 Ha Moorebank Intermodal Precinct East (MPE) Stage 2 site as approved by the NSW Department of Planning and Environment (DP&E) under SSD_7628 (January 2018).

The submission of the SMP for approval by DP&E has been staged in accordance with condition of consent (CoC) A14 and A15, as approved by DP&E on 2 July 2018 (refer **Appendix A**). The subject area of this management plan comprises the balance of the Stage 2 development as approved under SSD_7628 that is outside the initial Warehouse 1 Precinct (W1P).

This staged SMP is associated with the approximate 47.4 Ha residual development zone outside of W1P which includes proposed Warehouses 2, 3, 4, 6 & 7, and the eastern half of Warehouses 5 & 8. All of which drain east to Drainage Discharge Points "*Outlet A*" and "*Outlet B" (*as defined in the approved MPE Stage 2 Stormwater Management Plan – Stage W1P (by Arcadis, 28 June 2018). Areas of the MPE Stage 2 development which drain to the west, including SIMTA Stage 1 and W1P are not included in this report.

For the purpose of this staged SMP, we define areas within MPE Stage 2 which drain to the west (not part of this staged SMP) as MPE Stage 2, and those which drain to the east (as included in this Staged SMP) as MPE Stage 2 Balance of Site (BoS).

1.2 Scope

This SMP provides a summary of the following design principles and operational requirements of the stormwater management for MPE Stage 2 BoS in accordance with the requirements of Condition A23 & B40 of SSD_7628:

- Management of stormwater quantity
- Management of stormwater quality; and
- Flooding Considerations.

The engineering objectives for the development are to create a site which responds to the existing site topography and site constraints, and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives and takes into consideration previously approved engineering strategies over the land.

The consent authority is the DP&E. As the site is located within the Liverpool City Council local government area, the requirements of the Liverpool City Council (LCC) *Development Control Plan 2018* are to be considered for the development.

1.3 Consent Conditions

The report and associated design have been completed in accordance with the approved stormwater management strategy defined by Arcadis and approved by DP&E in SSD_7628.

We provide the following table which confirms how and where, within the report or respective drawings and models, each of the requirements of SSD_7628 Conditions A23, B40, B41 and B42 have been met:

A23	***<u>Condition A23 – Water Sensitive Urban Design</u>***
	Prior to the commencement of early works and fill importation, the Applicant must prepare amended ***WSUD plans*** *that incorporate water sensitive urban design principles, be generally in accordance with relevant Council Policies, plans and specifications and address Condition B40, to ensure that:*
A23 Item (a)	*The stormwater and drainage systems for the development will operate independently of any works proposed as part of the MPW Stage 2 development application (SSD 7709) that have not been incorporated in this development, unless development consent has been granted to those works under SSD 7709 prior to commencement of early works and fill importation;*
	<u>Response</u>
	This Stage 2 BoS SMP covers drainage which is conveyed from eastern catchments to the east. As such, these systems will be completely independent to any systems within the MPW Stage 2 & W1P development areas.
A23 Item (b)	*Adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% AEP rainfall event;*
	<u>Response</u>
	Consideration for storms in excess of the 1% AEP has been made such that overland flow will be conveyed either along roadways, or hardstand areas between buildings to the respective existing discharge location, and or flood compensation zones.
	Refer drawings **Co13455.04-C411 & C412** which show building floor levels and confirmation of freeboard being achieved to overland flow paths.
A23	*On site detention basins are visually unobtrusive*
Item (c)	<u>Response</u>
	On-site detention is proposed as either open landscaped systems with 1v:4h batters, or small landscaped boulder terraces, or as underground tanks. The open basins will be visually unobtrusive and provide good integration with the surrounding industrial development and associated landscape features.
	Refer **Section 4 & 5** for further details and drawings **Co13455.04-C411 &**

C412.

A23 Item (d) *That the design of the basins, and, associated setbacks and fencing, ensures public safety.*

Response

The design of the basins includes fencing which restricts public access. In addition, flood and on-site detention warning signs will be provided at appropriate locations to ensure adequate public (and site personnel) safety.

A23 Item (e) *Adequate site area has been provided for stormwater treatment;*

Response

A minimum area of 1% of the contributing catchment has been made for bio-retention systems throughout the development.

Refer **Section 5** of this report for Water Quantity Management and confirmation of peak flows and storages. Refer drawings **Co13455.04-C411** & **C412** for bio-retention system locations, and **Co13455.04-C421** to **C424** which confirm configuration of the bio-retention systems.

A23 Item (f) *Design of stormwater treatment systems minimises the risk of failure; and*

Response

Stormwater treatment systems have been proposed which, following suitable and recommended maintenance regime, have low risk of failure. Refer Section 6 of the SMP for Maintenance and Monitoring requirements.

A23 Item (g) *Setback of drainage work and fencing has been finalised in consultation with RMS.*

Response

The set back of drainage works and boundaries has been completed in consultation with the RMS by Tactical Group.

B40 ***Condition B40 – Stormwater Management Plan***

Prior to the commencement of early works and fill importation, an amended Stormwater Management Plan must be submitted and approved by the Secretary. The plans must be prepared by a suitably qualified person, and independently reviewed to ensure it meets the following criteria for:

B40 ***Drainage***

Item (a) *(i) convey flows from low order events (up to and including the 10% AEP event) from the main part of the site within the formal drainage system, with flows from rarer events (up to the 1% AEP event) conveyed in controlled overland flow paths;*

Response

The in-ground drainage system has been designed to cater for the 5% AEP event.

Overland flows up to the 1% will be catered for in dedicated overland flow paths with freeboard to the buildings.

Consideration of overland flow for greater events has been considered such that overland flow will be conveyed either along roadways, or hardstand areas between buildings to the respective existing discharge location, and or flood compensation zones.

(ii) show the location and width of controlled overland flow paths; and

Response

Refer drawings **Co13455.04-C411 & C412** which show overland flow path locations.

(iii) provide levels to AHD confirming building floor levels are a minimum of 150 mm above the maximum design flow path levels.

Response

Refer drawings **Co13455.04-C411 & C412** which show building floor levels and confirmation of freeboard being achieved to overland flow paths.

B40 ***Water Sensitive Urban Design (WSUD):***

Item (b) *(i) incorporate water sensitive urban design principles, be generally in accordance with relevant Council policies, plans and specifications*

Response

The design has been completed with consideration to WSUD principles. The design incorporates open landscaped detention systems with rain-gardens/bio-retention systems. Further, a treatment train of primary and tertiary treatments via proprietary systems and raingardens has been proposed to ensure the required pollution reduction objectives have been met per the consent conditions, council policy and best practice engineering.

(ii) ensure that adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% ARI rainfall event;

Response

Refer Condition A23, Item (b) response.

(iii) ensure on site detention basins are visually unobtrusive and ensure public safety;

Response

Refer Condition A23, Item (c) response.

(iv) ensure rainwater harvesting is provided for each warehouse;

Response

Rainwater tanks for each warehouse will be provided and documented as part of future detail designs. Storage and capture requirements are to be based on the requirements as set out in the approval documents by Arcadis as referenced in Section 5.5 of the SMP.

Details for the rainwater tanks will be provided as part of individual development construction certificate applications.

(v) ensure adequate site area has been provided for stormwater treatment;

Response

Refer Condition A23, Item (e) response.

(vi) ensure design of stormwater treatment systems minimises the risk of failure; and

Response

Refer Condition A23, Item (f) response.

(vii) develop concept options for how 20% of the average annual volume of stormwater from the site can be reused via rainwater capture and reuse for activities including but not limited to:

- *irrigation,*
- *all internal non-potable uses,*
- *washdown,*
- *cooling towers,*
- *heating, ventilation, and air conditioning, and*
- *ground source heat exchange.*

The Applicant is to brief the Department on how these initiatives will be implemented prior to the completion of the Stormwater Management Plan.

Response

Rainwater tanks for each warehouse will be provided, based on the requirements as set out in the approval documents. Details for the rainwater tanks will be provided as part of individual development construction certificate applications.

B40 ***Water quantity:***

Item (c) *(i) on site detention is to be provided to attenuate peak flows from the development such that both the:*

- *1 in 1-year ARI event post development peak discharge rate is equivalent to the pre-development (un-developed catchment) 1 in 1-year ARI event*

- *1 in 100-year ARI event post development peak discharge rate is equivalent to the predevelopment (un-developed catchment) 1 in 100-year ARI event*

Response

On-site detention has been provided to limit post development rates to predevelopment for storm events between the above noted ARI storm events.

Refer **Section 4** of this report for Water Quantity Management and confirmation of peak flows and storages. Refer drawings **Co13455.04-C411** & **C412** for detention system locations, and **Co13455.04-C421** to **C424** which confirm configuration of the drainage detention systems.

(ii) no new drainage infrastructure work within the Defence Joint Logistics Unit (DJLU) site

Response

No new drainage infrastructure works are proposed within the DJLU site.

(iii) all on site detention basins to have maximum batter slopes of 1V:4H or, for works immediately adjacent to the Moorebank Avenue upgrade, an alternate slope gradient agreed to by RMS;

Response

We confirm that open basins will have maximum batter slopes of 1V:4H for both Basins 1 and 2. Refer drawings **Co13455.04-C411** & **C412** and **Co13455.04-C421** to **C424.**

(iv) siting and design of on-site detention basins to eliminate/ minimise excavation within the southern ordinance burial pits; and

Response

The siting of the detention system limits excavation within the southern ordinance burial pits.

(v) maintenance access to be provided to each on site detention basin.

Response

Refer drawings **Co13455.04-C411** & **C412** and **Co13455.04-C421** to **C424.** Open basins have 1:4 batters with gravel track for maintenance access to detention basins.

B40 *Connection to natural creek-lines:*

Item (d) *(i) on site detention basin outlets to natural drainage lines must be constructed of natural materials to facilitate natural geomorphic processes and to include vegetation as necessary (gabion baskets and gabion mattresses are not acceptable).*

Response

Connections to natural creek lines will be provided using natural energy dissipaters in accordance with NSW Office of Water outlets to riparian corridor set of documents, refer typical details on drawing **Co13455.04-C452**, and **Section 3.6** of the SMP.

B40 *Stormwater Quality*

Item (e) *(i) have a stormwater quality treatment train comprised of gross pollutant traps and biofiltration/bioretention systems designed to meet the following criteria compared to a base case if there were no treatment systems in place:*

- *reduce the average annual load of total nitrogen by 45%;*
- *reduce the average annual load of total phosphorus by 65%; and*
- *reduce the average annual load of total suspended solids by 85%.*

Response

The design has been completed to meet the above referenced pollution reductions using MUSIC for both final and interim conditions. The water quality reductions have been met through a treatment train of industry adopted methods including bio-retention, gross pollutant traps, at source pit inserts, filtration systems.

Refer **Section 5** of this report and drawings **Co13455.04-C411 & C412** for details and locations of proposed measures.

(ii) all stormwater quality elements are to be modelled in MUSIC as per the NSW MUSIC Modelling Guide

Response

MUSIC modelling has been completed per NSW Music Modelling Guide, and per Liverpool City Council MUSIC Link.

(iii) all stormwater quality elements are to be installed upstream of stormwater detention basins, unless it can be demonstrated that biofiltration/ bioretention systems within the OSD basins will not suffer damage from design flows and can be maintained to achieve the water quality criteria.

Response

All primary treatment elements have been provided upstream of the OSD basins and systems.

Bio-retention systems are proposed within each of the open basin detention systems. Several measures have been employed to ensure the bio-retention can operate effectively including:

- water depths within the bio-retention section of the basin have been set such that a maximum water depth of 1.5m is maintained to the detention system in major storm events.

- Flow spreaders have been provided to spread flows around the system, reducing velocity and risk of local scour, and also ensuring filtration is spread throughout the whole of the system.

- High flow bypass of stormwater around bio-retention elements has been provided where possible to reduce the risk of scouring of bio-retention systems do not occur during major storm events and design flows in excess of that required to be managed and following first flush runoff.

Further noting that >90% of all stormwater runoff volume will be generated by low/ minor storm events.

(iv) the area of biofiltration / bioretention systems is to be at least 1% of the catchment draining to the system, to ensure there is no short-circuiting of the system.

Response

A minimum bio-retention area of 1% of the contributing catchment area draining to the bio-retention system has been provided. Refer **Section 5** of this report for confirmation.

(v) bioretention systems which are greater than 1,000m^2 in area, are to be divided into cells with no individual cell greater than1,000m^2

Response

Bio-retention greater than 1000m^2 in area have been separated into cells per the condition. Refer drawings **Co13455.04-C423 & C424** for details.

(vi) all filter media used in stormwater treatment measures must:

- *be loamy sand with an appropriately high permeability under compaction and must be free of rubbish, deleterious material, toxicants, declared plants and local weeds, and must not be hydrophobic;*
- *have an hydraulic conductivity = 100-300 mm/hr, as measured using the ASTM F1815-06 method*
- *have an organic matter content less than 5% (w/w)*
- *be provided adequate solar access, considering the design and orientation of OSD basins.*

Response

Refer drawings **Co13455.04-C452** for details and specifications for bio-retention systems, designed in accordance with recommendations from Monash University and as noted per the above condition.

A copy of the independent review must be submitted with the Plan. A statement from the reviewer confirming their independence and declaring any actual, potential or perceived conflicts of interest must be provided as part of the reporting of the findings and recommendations of the review.

Response

An independent review has been completed by Northrop Consulting Engineers. Please refer to Northrop review.

B41 ***Condition B41***

Notwithstanding condition B40, the Stormwater Management Plan does not require the Secretary to approve drainage works that would be designed, approved by RMS, and delivered, in accordance with condition B13. However, the Stormwater Management Plan must:

B41 Item (a) *Include confirmation that any such works are proposed to be designed and delivered in accordance with condition B13; and*

Response

The design provided as part of this MPE Stage 2 BoS development does not include specific details of B13 RMS road works as the MPE Stage 2 BoS SMP catchments do not include runoff from roadworks specified in B13. The strategy allows for the runoff and contributing catchments of future RMS roads and drainage for both water quantity and quantity.

B41 Item (b) *Incorporate, and be designed in consideration of, preliminary principles for that road drainage.*

Response

The design provided as part of this MPE Stage 2 BoS development does not include specific details of B13 RMS road works as the MPE Stage 2 BoS SMP catchments do not include runoff from roadworks specified in B13.

B42 *The amended numerical models are to be submitted to the Secretary with the Stormwater Management Plan.*

Response

Refer to MUSIC (Ref: *Co13455.03-MUSIC Rev1.sqz*) and DRAINS Models (*Co13455.04-DRAINS Rev1.drn*)

2 DEVELOPMENT SITE

2.1 Site Description

MPE Stage 2 development zone covers an area of 71 Ha. The MPE Stage 2 BoS development zone, as covered in this SMP (refer **Section 1**), is approximately 47.4 Ha in area, generally rectangular in shape and located within Liverpool City Council Local Government Area.

The development is located on the eastern side of Moorebank Avenue in the suburb of Moorebank, NSW approximately 800m south of the intersection of Moorebank Avenue with the M5 Motorway as shown in **Figure 2.1**.

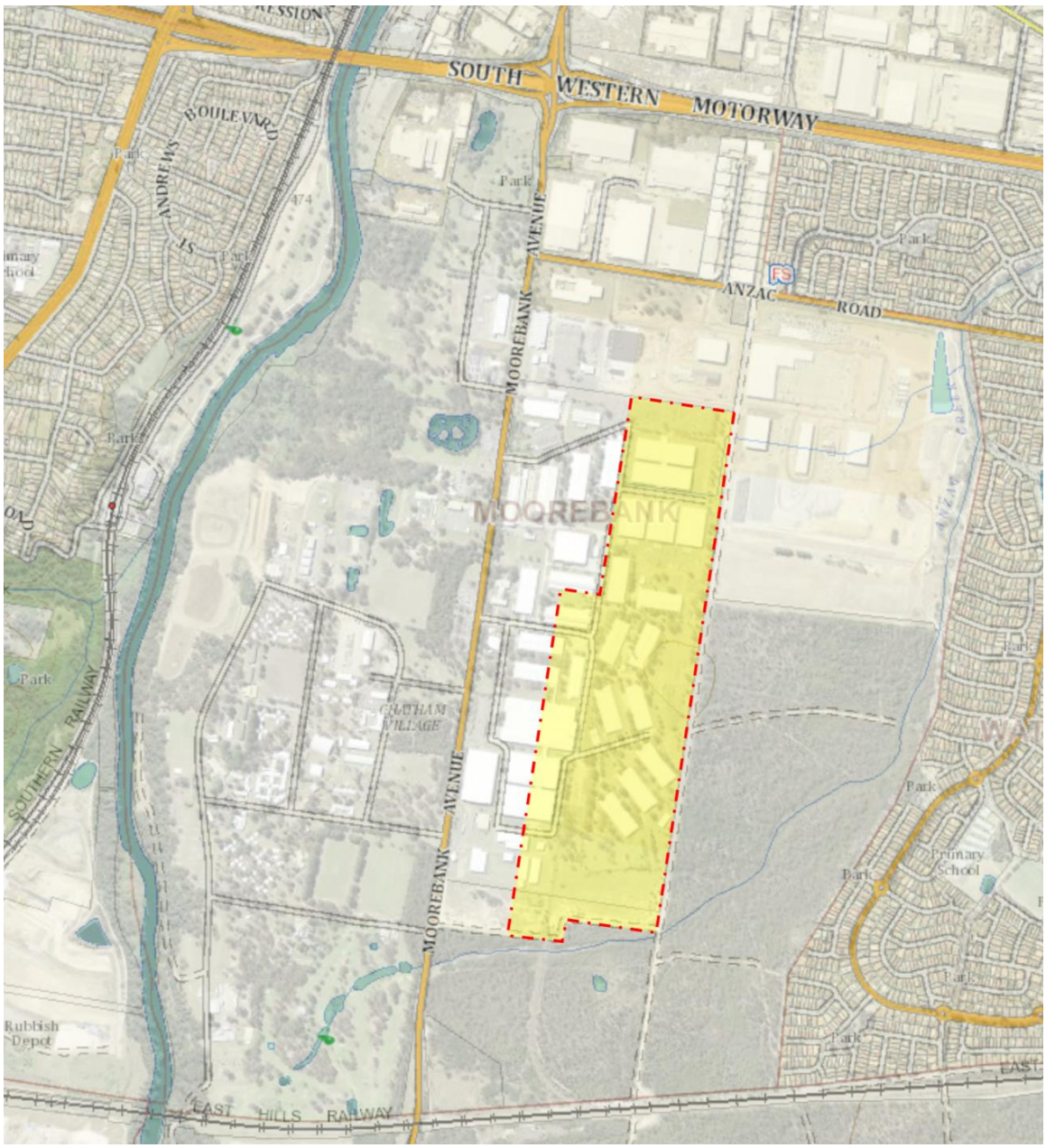


Figure 2.1 Locality Plan (Source: SIX Maps 2018)

The site is bounded on the north by existing defence land, to the east by existing industrial land and heavily vegetated bushland on crown land, heavily vegetated land to the south, and MPE Stage 1 and Moorebank Precinct West (MPW) to the west.

Access to the site is via Moorebank Avenue.

The MPE Stage 2 BoS site comprises two existing catchments of 20.9 Ha and 27.45 Ha. Reference to Arcadis *Figure 4-1: Existing Catchments of the MPE Site* confirm catchment layouts for Ex.A1 (20.9Ha) to *Outlet A* at the north of the development area and Ex.A2 (27.45 Ha) to *Outlet B* at the south of the development area. Further discussion relating to catchments is made in **Section 3**: **Stormwater Drainage** of this report.

2.2 Proposed Development

MPE Stage 2 is located within the 243 Ha Moorebank Logistics Park (MLP) development, which as referenced on Qube MLP website, will be the largest intermodal freight precinct in Australia.

The MLP development will consist of the construction and operation of an IMEX terminal and an interstate terminal with capacity to transport up to 1.05 million TEU (twenty-foot equivalent units) a year of import-export freight and another 0.5 million TEU of interstate freight per year.

Moorebank Logistics Park will have related logistics activities including 850,000 square metres of high specification warehousing, as well as auxiliary services including retail and service offerings.

A rail connection to the Southern Sydney Freight Line (SSFL) will be built that has direct access to the park, with the M5 and M7 arterial roads minutes away providing a complete supply chain solution driving savings in time and costs for onsite tenants.

The proposed MPE Stage 2 development proposes the construction of eight (8) industrial warehouse buildings over the 41 Ha development area (noting this SMP - refer **Section 1.1** - includes stormwater management for Stage 2 BoS and catchments draining to the east only). It is further noted this report and design allows for interim and ultimate conditions for the Stage 2 BoS building developments. This allows for Warehouse 2 to be constructed in approximately 4-5 years' time due to tenant lease requirements within three existing buildings within the Warehouse 2 footprint.

The use for the warehouse buildings will be for distribution and logistics type use as defined in the Environmental Impact Statement (EIS) approved under the MPE Stage 2 SSD_7628 Development Consent (31 January 2018).

Typically, each of the buildings will comprise a single level steel framed warehouse, ancillary office space, car parking areas, truck circulation and loading zones, fire brigade perimeter access and landscaping. Connection to the MPE Stage 1 rail siding and staging area is made via dedicated private service roads. Buildings vary in size from circa 23,500m^2, 53,400m^2 and 62,500m^2. The proposed development layout is shown on Estate Masterplan drawings by Reid Campbell Architects as shown in **Figure 2.2**.

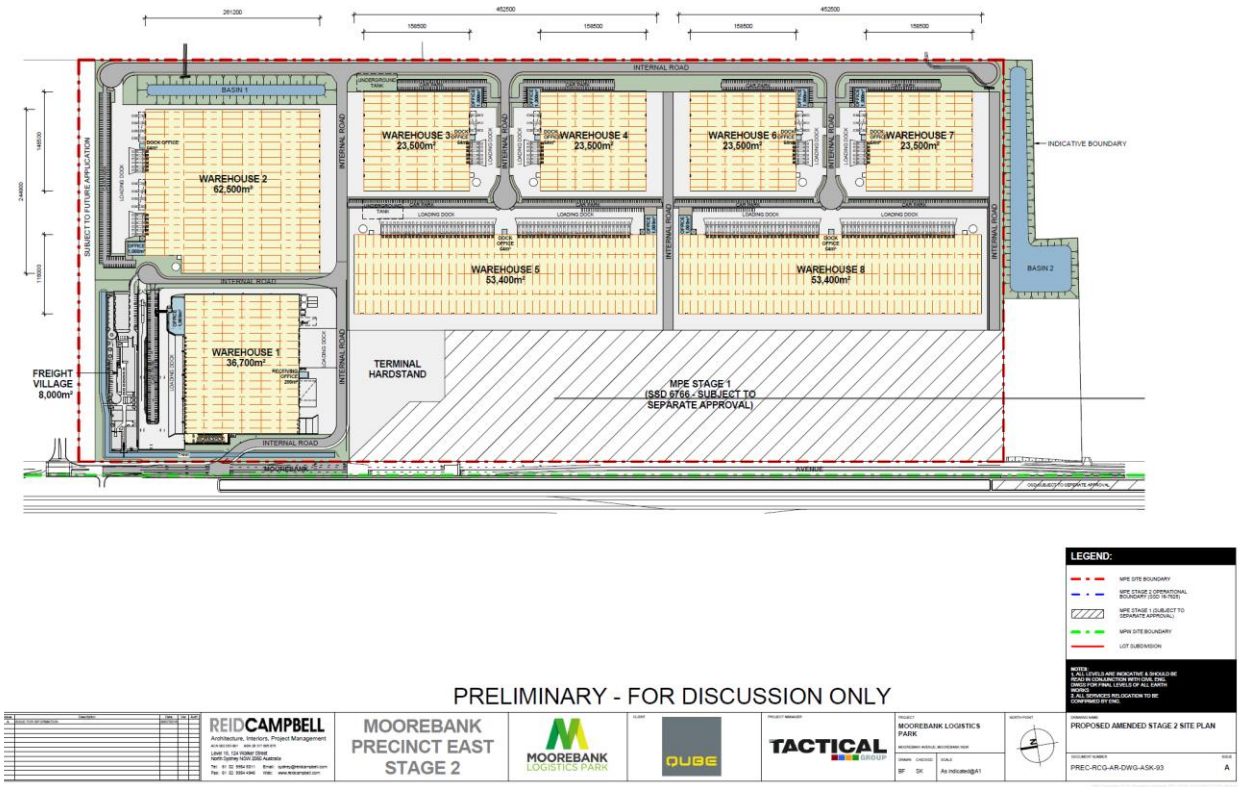


Figure 2.2 Proposed MPE Stage 2 Development Layout

3 STORMWATER & WATER SENSITIVE URBAN DESIGN (WSUD)

3.1 Water Sensitive Urban Design

As required of Condition A23, WSUD principles are to be incorporated within the design.

A number of WSUD measures have been included in the stormwater management strategy and designs, which are set out in this report and the attached drawings. The following key WSUD considerations, specific to stormwater, have been included in the design:

- *Stormwater Quantity Management* (Refer **Section 4**)
- *Stormwater Quality Management* (Refer **Section 5**)
- *Flood Management & Large Rainfall Events*
- *Rainwater Reuse*

A brief summary of the management objectives are described below:

- *Stormwater Quantity Management (Refer **Section 4**)*

  The intent of this criterion is to reduce the impact of urban development on existing drainage system by limiting post-development discharge within the receiving waters to the pre-development peak, and to ensure no affectation of upstream, downstream or adjacent properties.

  Attenuation of stormwater runoff from the development is proposed to be managed via a series of measures including detention tanks and open basins provided in strategic locations for each of the development catchments. As per the consent conditions the objective is to attenuate stormwater flow from the development to pre-developed flows, and to ensure no affectation to upstream, downstream and adjoining properties as a result of the development.

  Sizing of the basin systems has been completed using DRAINS modelling software in accordance with the Liverpool City Council Policy for the 1 in 1-year ARI to 1 in 100-year ARI storms for various durations. The modelling accounts for the drainage system provided for the adjacent sites.

  Refer to **Section 4** of the document for detailed sizing of detention systems.

- *Stormwater Quality Management*

  There is a need to target pollutants that are present in stormwater runoff to minimise the adverse impact these pollutants could have on downstream receiving waters.

  The required load-based reduction targets for the development can be seen below:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%
Total Hydrocarbons	90%

  Reference to *Section 5* of this document should be made for detailed Stormwater Quality modelling and measures.

- *Flood Management and Large Rainfall Events*

  The proposed development considered flooding and large rainfall events, both from the adjacent Georges River, and from site generated runoff.

  The following measures have been incorporated in the design:

  - All buildings are sited 500mm above the 1% AEP design flood level of the Georges River.
  - Flood storage compensation has been provided where filling in localised pre-developed flood affected areas occurs;
  - Stormwater detention measures have been included to manage pre and post development runoff as discussed above and in Section 4; and
  - Overland flow paths to manage runoff in large storm events have been made including achieving at least 150mm freeboard to building levels from the flow paths.
- *Rainwater Reuse*

  Rainwater reuse measures will be provided as part of future building development designs. Rainwater reuse will be completed in accordance with approved strategy as prepared by Arcadis. The requirement is to reduce demand on water for non-potable uses such as toilet flushing and irrigation. The intent is to utilise 20% of runoff volume for reuse applications. Refer Arcadis documents for details relating to rainwater reuse.

3.2 Site Drainage

3.2.1 Pre-Existing and Current Site Drainage

Until recently, the MPE site was operating as the Defence National Storage and Distribution Centre (DNSDC); however, the Department of Defence have vacated the site and relocated this operation to the Defence Joint Logistics Unit (DJLU), immediately north of the MPE site.

As part of the previous uses on the site, existing remnant in-ground drainage structures are present. These systems will generally become redundant, other than existing drainage discharge locations.

As noted previously two main catchments drain to the east, being ExA1 (20.9 Ha) and Ex A2 (27.45 Ha), as depicted in the approved SWMP *Figure 4-1* by Arcadis and reproduced as *Figure 3.1* below. Refer also to drawing **Co13455.04-C401**.

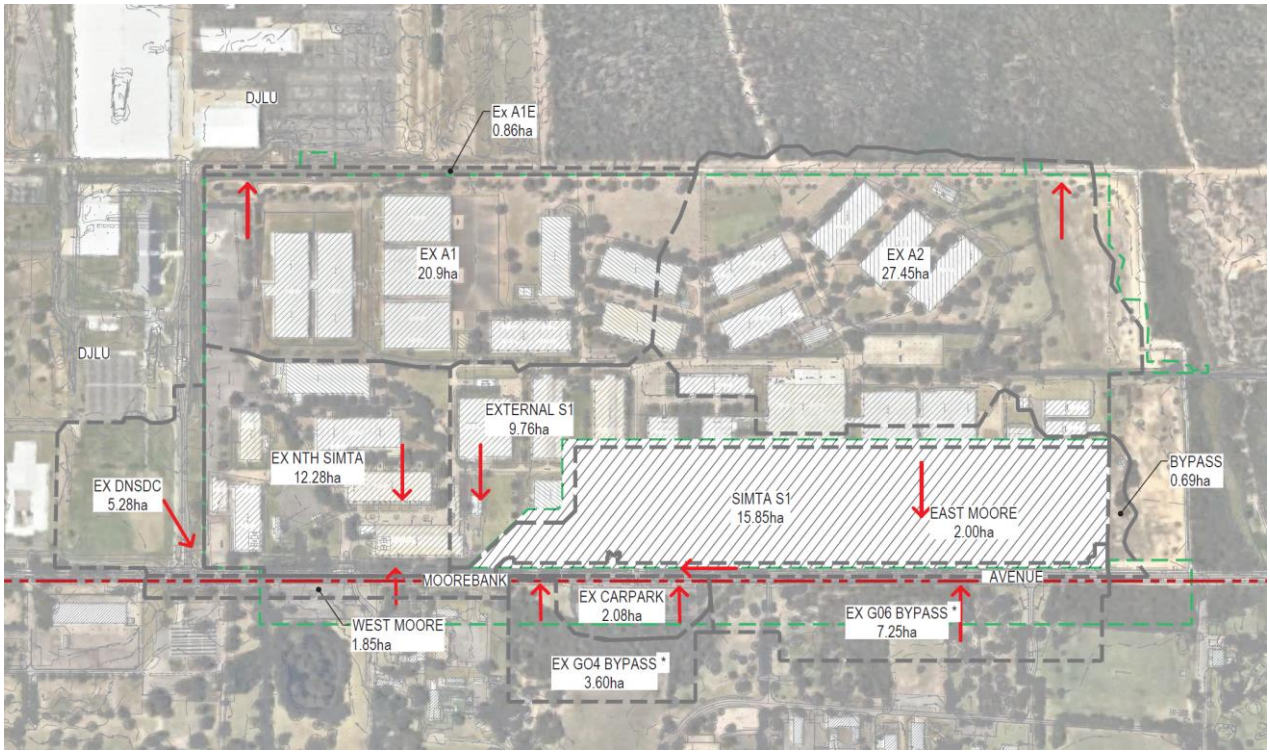


Figure 3.1. Existing Catchments (Source: SSD7628 SWMP Fig 4-1 Arcadis 2016)

Both catchments drain to Anzac Creek, a system which conveys flows from the subject site to the north-east and north, ultimately to Georges River. Catchment ExA1 drains to Outlet A which consists of four 1.2m x 0.375m RCBC culverts under Greenhill Road. Catchment ExA2 also drains under Greenhills Road to Outlet B and Anzac Creek via a small diameter (0.45m) RCP.

3.2.2 Proposed Stage 2 BoS Infrastructure Drainage

As per general engineering practice, and with reference to LCC guidelines, the proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 5% AEP or 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the 5% AEP event. The major system through new paved areas has been designed to cater for storms up to and including the 1% AEP or 1 in 100-year ARI storm event (Q100). The major system employs the use of defined overland flow paths to safely convey excess run-off from the site to the two discharge points allowing for 500mm of freeboard to building levels, as shown on drawing Co13455.04-C415. Further consideration of overland flow for events greater than 1% AEP, or in the event of blockage has been made in the design as required of *Conditions A23* and *B40*. This includes ensuring a minimum 100mm freeboard is maintained for events greater than 1% AEP, or in the event of blockage.

The overall stormwater management objectives, including catchment breakdown, water quality objectives and water quantity discharge rates, remain consistent with the approved

Arcadis MPE Stage 2 SMP (for W1P) (28 June 2018). It is noted, however, that the proposed water quantity and quality management measures proposed for construction vary from the approved layout. The proposed measures are described below, noting the introduction of two underground detention tanks (and associated proprietary treatment devices) has been made, and OSD 2 has been relocated within the land to the southern end of the MPE Stage 2 building development area within the tract of land known as "the butcher's knife". These changes have been made to achieve detention basins with 1V:4H batter slopes as required of *CoC B40*.

A summary of the main stormwater measures for the MPE Stage 2 BoS precinct development, with reference to catchment plans **Co13455.04-C402** & **C403/C404**, and layout plans **Co13455.04-C411 & C412**, is as follows:

Outlet A (North-East Discharge)

- A total of 22.8 Ha will be conveyed to *Outlet A*. The developed catchment will be further divided into three sub-catchments, A1, A2 and A3as described in the following sections.

Catchment A1 (5.281 Ha)

- *Catchment A1* comprises 5.281Ha managing the eastern roof water of Warehouse 5 and Warehouse 5 hardstand.
- Water quantity will be managed by a 2,500m^3 underground detention tank. The tank will be located within the hardstand at the north-east corner of the building development area.
- Primary water quality will be managed by a vortech style gross pollutant trap (Rocla CDS or approved equivalent) which treats hydrocarbons/ oil and grease, gross pollutants, sediments, some nutrients and litter.
- Tertiary water quality will be managed via a bio-retention system (within Detention Basin 1) which will further target hydrocarbons, fine sediments and nutrients.

Catchment A2 (4.075 Ha)

- *Catchment A2* comprises 4.075Ha managing Warehouse 3 roofwater and Warehouse 3 hardstand/ parking zones.
- Water quantity will be managed by a 2,000m^3 underground detention tank. The tank will be located within the landscape setback at the north-east corner of the building development area.
- Primary water quality will be managed by a vortech style gross pollutant trap (Rocla CDS or approved equivalent) which treats hydrocarbons/ oil and grease, gross pollutants, sediments, some nutrients and litter.
- Tertiary water quality will be managed via a bio-retention system (within Detention Basin 1) which will further target hydrocarbons, fine sediments and nutrients.

Catchment A3 (12.126 Ha)

- *Catchment A3* comprises 12.126Ha managing Warehouse 2 roofwater and Warehouse 2 hardstand/ parking zones.
- Water quantity will be managed by a 7,600m^3 above ground basin. The basin will be located within landscape setback to the east of the proposed Warehouse 2.

- Primary water quality will be managed by two vortech style gross pollutant trap (Rocla CDS or approved equivalent) which treats hydrocarbons/ oil and grease, gross pollutants, sediments, some nutrients and litter.
- Tertiary water quality will be managed via a bio-retention system (within Detention Basin 1) which will further target hydrocarbons, fine sediments and nutrients. This system is designed such that high flows bypass the bio-retention component of the system; water depths will be limited to 1.5m and flow velocity of 0.4m/s maximum and each bio-retention cell is limited to 1000m^2. This will ensure the ongoing effectiveness of the system, ensuring that the concurrent water quality and quantity objectives can be maintained over the medium term. This system also allows to perform final treatment of Catchments A1 and A2.
- Detention basin will have 1V:4H batter slopes, as required of CoC B40, and a low-height landscaped terrace around the base of the system.
- The design allows for 3000m^3 of existing flood storage, over and above the above noted storage volumes.

The proposed separation of detention systems allows for the progressive construction of the site, cognisant of the existing tenanted areas, and provision of 1V:4H batter slopes around open basins.

Outlet B (South-East Discharge)

- A total of 24.6 Ha will be conveyed to *Outlet B*.
- Water quantity will be managed by a 26,000m^3 above ground basin (Basin 2). The basin will be located within the land described as “the butcher’s knife”, being land controlled by Qube and included within the approved construction and operation footprint for MPE Stage 2 SSD_7628.
- Primary water quality will be managed by one vortech style gross pollutant trap (Rocla CDS or approved equivalent) which treats hydrocarbons/ oil and grease, gross pollutants, sediments, some nutrients and litter.
- Tertiary water quality will be managed via a bio-retention system (within Detention Basin 2) which will further target hydrocarbons, fine sediments and nutrients. This system is designed such that high flows bypass the system; water depths will be limited to 1.5m and flow velocity of 0.4m/s maximum and each bio-retention cell is limited to 1000m^2. This will provide the ongoing effectiveness of the system, enabling the concurrent water quality and quantity objectives to be sustained over the medium term.
- Detention Basin 2 will have 1V:4H batter slopes, as required under CoC B40.
- The system allows for 15,000m^3 of flood compensation storage from displaced flood storage. This storage is in addition to the storage requirements for stormwater attenuation.

3.3 Hydrologic Modelling and Analysis

3.3.1 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, LCC and accepted engineering practice.

Specifically, the design will be based on:

- 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) – It is noted that a design principle is not yet in place for on-site detention systems using AR&R 2016 data;
- LCC *Development Control Plan*,
- *LCC On-site detention Technical Specification*,
- New South Wales *Development Design Specification D5 Stormwater Drainage Design* (LCC January 2003)*;*
- Storm events for the 2 to 100 Year ARI event have been assessed.

3.3.2 Minor/ Major System Design

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.

3.3.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for ILSAX and RAFTS modelling for the 2 to 100 Year ARI events, was taken from Liverpool City Council *Stormwater Drainage Handbook*.

3.3.4 Runoff Models

In accordance with the recommendations and standards of Liverpool City Council, the calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS. The ILSAX hydrological model component will be utilised for the post-development site and the RAFTS model component for broad scale catchments. This will be in accordance with previous studies and approvals for land in the area.

The design parameters for the ILSAX model are to be based on the recommendations as defined by LCC 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 (Post Development)	5	mm
	Grassed (Pervious) Area Depression Storage (Pre-Development)	15	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 3.1. DRAINS ILSAX Parameters

3.4 Hydraulics

3.4.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to verify that all surface and subsurface drainage systems perform to or exceed the required standard.

3.4.2 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 level, for the peak runoff from the Minor System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

Freeboard of 500mm has been achieved to building levels during the Major Storm Event as shown on drawing **Co13455.04-C415**.

3.4.3 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.

3.4.4 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).

3.4.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI to the OSD Basins. These flow paths will convey stormwater from the site to the estate road system and ultimately to the OSD Basins as shown on drawing **Co13455.04-C415**.

3.5 External Catchments and Flooding

MPE Stage 2 is not affected by any overland flow paths or external catchments. As such no allowance for conveyance of upstream catchments is required in this SWMP.

The pre-developed site has some areas of know flood affectation. Flood storage compensation as set out in this report has been included in the design as reference in **Section 3.2** and **Section 4** of the SMP.

3.6 Site Discharge Configuration

The design of the proposed outlet structures has been assessed in accordance with the NSW Office of Water document *Controlled Activities: Guidelines for Outlet Structures.* The discharge arrangements are proposed to utilise existing discharge points with modifications as required to achieve natural outlet structures as noted.

The established points to Anzac Creek are along the eastern side of the development site at the north-east and south-east corners of the MPE Stage 2 BoS development area. The established and proposed discharge points are shown on drawings **Co13455.04-C411 & C412**.

The stormwater outlet consists of new and existing drainage structures. The new system at Outlet B will comprise a ‘natural’ energy dissipater. The outlet is aligned with the creek to remove the potential for bank scour and shall include rip rap energy dissipaters constructed in accordance with the *Outlet Structures Guidelines* as published by the Department of Water & Energy and The Landcom Blue Book. This is shown figuratively below in **Figure 3.1** below. Further construction details regarding the configuration of dimensions, rock size and scour protection can be seen on drawing **Co13455.04-C452**.

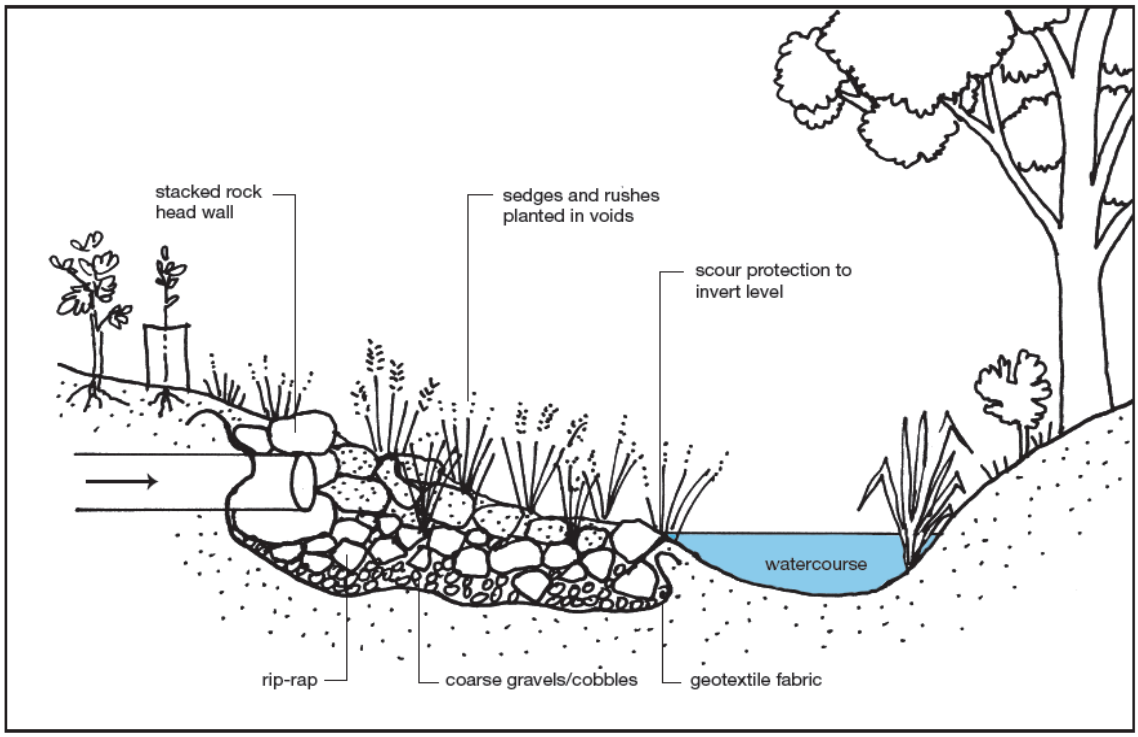


Figure 3.1. Outlet Structure – Typical Arrangement

4 STORMWATER QUANTITY MANAGEMENT

4.1 Introduction

LCC requires water quantity management, or stormwater detention, to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by development.

The CoC B40 requires post development runoff to meet predevelopment runoff, as discussed in **Section 1.3** of the SMP.

Attenuation of stormwater runoff from the development is proposed to be managed via a series of measures including detention tanks and open basins provided in strategic locations for each of the development catchments. As per the CoC the objective is to attenuate stormwater flow from the development to pre-developed flows, and to ensure no affectation to upstream, downstream and adjoining properties as a result of the development.

Sizing of the basin systems has been completed using DRAINS modelling software in accordance with the LCC Stormwater Detention Technical Handbook for the 1 in 1-year ARI to 1 in 100-year ARI storms for various durations. The modelling accounts for the drainage system provided for the adjacent sites.

An assessment of the required drainage attenuation storage requirement has been made for this MPE Stage 2 BoS SMP. The following sections confirm the hydrological and hydraulic performance of the detention systems. Details and locations of each of the systems are shown on drawings **Co13455.04-C411, C412, and C421 through C424**.

The methodology employed to determine the attenuation requirements are based on assessing storms for the 1 in 1-year ARI to the 1 in 100-year ARI for the pre and post development phases. The pre-developed flows are based on the approved assessment completed by Arcadis and included in *Table 4-1* of the approved MPE Stage 2 SMP (W1P).

4.2 Existing & Post Development Peak Flows

Intensity/Frequency/Duration (IFD) data was adopted from the Bureau of Meteorology and councils Development Guidelines used in conjunction with DRAINS ILSAX modelling to estimate peak flows for the site and surrounding catchments.

The pre and post development site discharge rates for Systems draining to Outlet A and Outlet B are provided in **Tables 4.1 & 4.2** below.

ARI	Design Storm Duration	Peak Flow (m3/s)		
		Pre-Developed	**Post-Development**	**Post-Development**
		North-Eastern Catchment	**Outlet A Site (No Attenuation)**	**Outlet A Site (Attenuation)**
2	5 mins	1.305	2.536	0.291
	25 mins	2.854	5.200	0.845
	45 mins	2.628	4.438	0.929
	1 hr	2.815	4.268	0.965
	1.5 hr	2.797	4.281	0.974
	2 hr	**2.860**	4.512	**0.986**
	3 hr	2.223	3.104	0.954
	4.5 hr	1.940	2.695	0.950
	6 hr	1.679	1.981	0.947
	9 hr	1.527	1.738	0.919
	12 hr	1.525	1.726	0.882
	18 hr	0.964	1.160	0.790
20	5 mins	2.474	4.341	0.569
	25 mins	3.683	8.460	1.090
	45 mins	3.712	7.270	1.230
	1 hr	**3.762**	7.000	1.350
	1.5 hr	3.715	6.990	1.450
	2 hr	3.738	7.430	**1.530**
	3 hr	3.497	5.138	1.440
	4.5 hr	3.373	4.541	1.360
	6 hr	2.979	3.309	1.430
	9 hr	2.682	2.916	1.330
	12 hr	2.701	2.933	1.200
	18 hr	1.798	2.002	1.060

100	5 mins	3.032	5.680	0.746
	25 mins	3.971	10.000	1.310
	45 mins	4.017	8.940	2.040
	1 hr	**4.065**	8.530	2.280
	1.5 hr	4.021	8.480	2.270
	2 hr	4.001	9.020	**2.320**
	3 hr	3.776	6.190	2.200
	4.5 hr	3.708	5.480	2.240
	6 hr	3.436	4.013	2.170
	9 hr	3.201	3.550	2.170
	12 hr	3.229	3.571	1.850
	18 hr	2.241	2.463	1.340

Table 4.1. Stage 2 BoS (Outlet A) Pre/Post-Development Flows

ARI	Design Storm Duration	Peak Flow (m3/s)		
		Pre-Developed	Post-Development	Post-Development
		South-Eastern Catchment	Outlet B Site (No Attenuation)	Outlet B Site (Attenuation)
2	5 mins	0.069	1.990	0.040
	25 mins	0.093	4.740	0.085
	45 mins	0.099	4.370	0.097
	1 hr	0.115	4.520	0.103
	1.5 hr	0.135	4.200	0.110
	2 hr	0.148	4.130	0.116
	3 hr	0.166	3.330	0.123
	4.5 hr	0.171	2.900	0.129
	6 hr	0.180	2.80	0.134
	9 hr	0.209	1.910	0.140
	12 hr	**0.218**	1.910	0.146
	18 hr	0.197	1.280	**0.164**
20	5 mins	0.082	3.400	0.067
	25 mins	0.176	7.780	0.109
	45 mins	0.235	7.130	0.124
	1 hr	0.265	7.410	0.131
	1.5 hr	0.298	6.910	0.140
	2 hr	0.525	6.820	0.147
	3 hr	0.783	5.550	0.365
	4.5 hr	0.812	4.910	0.600
	6 hr	0.796	3.650	0.706
	9 hr	**1.544**	3.220	1.060
	12 hr	1.448	3.240	**1.250**
	18 hr	0.936	2.220	1.060

100	5 mins	0.091	4.450	0.077
	25 mins	0.247	9.490	0.123
	45 mins	0.555	8.840	0.139
	1 hr	0.945	9.090	0.147
	1.5 hr	1.465	8.430	0.481
	2 hr	1.660	8.360	0.763
	3 hr	1.681	6.710	1.070
	4.5 hr	1.642	5.940	1.180
	6 hr	2.017	4.430	1.220
	9 hr	**2.990**	3.920	**2.110**
	12 hr	2.827	3.950	1.840
	18 hr	1.664	2.720	1.530

Table 4.2. Stage 2 BoS (Outlet B) Pre/Post-Development Flows

Post development site discharge volumes, as well as the provided detention volumes and depths for the different open basin and tanked detention systems are provided in **Table 4.3 to 4.6** below.

ARI	Duration (mins)	Peak Flow (m^3/s)					Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation					
			Orifice	Weir	Emergency	Total		
2	2 Hr	2.94	0.557	0	0	0.557	750	3,059
20	2 Hr	4.78	0.704	0.133	0	0.837	1,120	5,345
100	2 Hr	5.67	0.767	0.411	0	1.178	1,430	6,627

Table 4.3. Detention System 1 Flow and Storage Volumes – Basin A3 (Outlet A)

ARI	Duration (mins)	Peak Flow (m^3/s)					Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation					
			Orifice	Weir	Emergency	Total		
2	2 Hr	1.25	0.250	0	0	0.250	920	1,152
20	2 Hr	2.03	0.332	0.071	0	0.403	1,630	2,040
100	2 Hr	2.40	0.356	0.341	0	0.697	1,880	2,346

Table 4.4. Detention System 1 Flow and Storage Volumes – Tank A1 (Outlet A)

ARI	Duration (mins)	Peak Flow (m^3/s)					Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation					
			Orifice	Weir	Emergency	Total		
2	2 Hr	1.01	0.183	0	0	0.183	910	913
20	2 Hr	1.65	0.243	0.059	0	0.302	1,620	1,617
100	2 Hr	1.93	0.258	0.280	0	0.537	1,830	1,830

Table 4.5. Detention System 1 Flow and Storage Volumes – Tank A2 (Outlet A)

ARI	Duration (mins)	Peak Flow (m^3/s)					Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation					
			Orifice	Weir	Emergency	Total		
2	18 Hr	4.74	0.164	0	0	0.164	1,320	16,617
20	12 Hr	7.78	0.157	1.09	0	1.25	1,620	21,346
100	9 Hr	9.49	0.162	1.95	0	2.11	1,780	23,854

Table 4.6. Detention System 2 Flow and Storage Volumes – Basin B (Outlet B)

As shown in **Tables 4.3 to 4.6** above, an active detention storage of 34,657m^3 is required in, Tank A1 & A2, Basins A3 and Basin B to attenuate the post development flows to pre-development flows for the Outlet A & B catchments respectively. The provided storage and attenuation of pre and post flows meets the requirements of CoC B40.

Additional storage for flood compensation is also provided, as referenced on associated drawings **Co13455.04-C421 to C424**.

5 STORMWATER QUALITY CONTROLS

5.1 Stormwater Management Objectives

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that may be present in the stormwater so as to minimise the potential adverse impact these pollutants may have on receiving waters and to also meet the requirements specified by the Liverpool City Council and DP&E Consent CoC A23 and CoC B40.

Stormwater quality will comprise a treatment train which meets the percentage-based pollution reduction objectives as per the consent condition, noting these reductions are greater than those required of Liverpool City Council DCP which require lesser reduction of Total Suspended Solids (80%) and Total Phosphorus (45%).

The water quality objectives for the entire development are presented in terms of annual percentage pollutant reductions on a developed catchment per CoC B40:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%
Total Hydrocarbons	90%

Water quality for the catchment will require provision of a treatment train including gross pollutant traps to surface drainage systems and filtration systems for final water polishing. Water quality measures will need to be provided for the whole of catchment in accordance with this document and the approved MPE Stage 2 SMP (W1P) by Arcadis (June 2018).

5.2 Proposed Stormwater Treatment System

Roof, hardstand, car parking, roads, other paved areas and landscaping 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 of the development. The STM's for the development shall be based on a treatment train approach to ensure that all of the objectives above are met. A concept for the treatment of each building has been presented which would need to be confirmed at detail design stage to meet the load-based objectives noted above.

Components of the treatment train for the development will comprise the following elements:

- Primary treatment to roofs, parking, truck hardstand and loading areas, and connecting roads is to be performed by vortech type gross pollutant traps (GPT). The specified system is the Rocla CDS and these have been designed to treat a minimum 6-month ARI flow;
- Tertiary treatment is to be provided via estate-servicing bio-retention system located within the dual-purpose open detention and bio-retention basins. As discussed previously the bio-retention systems have been designed with measures to enable these to remain effective whilst being located within the detention system. Measures include limiting depths of water to 1.5m in the 1% AEP event, providing flow spreaders, bypass high flows around bio-retention elements, limit cell size to 1000m^2 and maintain flow velocity to less than 0.4m/s. The specified bio-retention systems have been sized through MUSIC, and achieve the prescribed minimum area of 1% of the contributing catchment area being treated in the system;
- A portion of the roof will also be treated via rainwater reuse and settlement within building rainwater tanks. It is noted that we have not included rainwater reuse in the MUSIC model.
- Hydrocarbon removal to be achieved through treatment within the GPT and further within the bio-retention system as discussed in **Section 5.4**.

In order to estimate the bio-retention filtration area and GPT sizing required to meet the requirements of load-based pollution reduction objectives, a MUSIC model has been prepared based on the current approved masterplan layout. It is noted that there will be an interim period where the final bio-retention system will not be in place until construction of Warehouse 2, to occur after the north-eastern corner of the site is vacated by existing tenants.

5.3 Stormwater Quality Modelling

5.3.1 Introduction

The MUSIC model was required under CoC B40(e)(ii) to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria nominated in **Section 5.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model "*13455.04-MPE Stage 2B-Rev0.sqz*" was set up to examine the effectiveness of the water quality treatment train and to predict the load-based pollution reduction requirements have been achieved for development. Refer drawing **Co13455.04-C413** which shows the interim condition layout.

The models were set up using the latest Liverpool City Council *MUSICLINK* parameters, and in accordance with the NSW MUSIC Modelling Guide. The layout of the MUSIC model is presented in **Appendix C**.

5.3.2 Rainfall Data

Six-minute pluviographic data was provided by LCC which has been sourced from the Bureau of Meteorology (BOM) as nominated below. Evapo-transpiration data for the period was sourced from the Sydney Monthly Areal PET data set supplied with the MUSIC software.

Input	**Data Used**
Rainfall Station	67035 Liverpool (Whitlam)
Rainfall Period	1 January 1967 – 31 December 1976 (10 years)
Mean Annual Rainfall (mm)	857
Evapotanspiration	Sydney Monthly Areal PET
Model Timestep	6 minutes

5.3.3 Rainfall Runoff Parameters

Parameter	**Value**
Rainfall Threshold	1.40
Soil Storage Capacity (mm)	170
Initial Storage (% capacity)	30
Field Capacity (mm)	70
Infiltration Capacity Coefficient a	210
Infiltration Capacity exponent b	4.7
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Baseflow Rate (%)	4
Daily Seepage Rate (%)	0

5.3.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on BCC land use parameters as per the **Table 5.1**.:

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	1.20	0.17	-0.85	0.19	0.11	0.12
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
	Landscaping	1.2	0.17	-0.85	0.19	0.11	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19
	Landscaping	2.15	0.32	-0.6	0.25	0.30	0.19

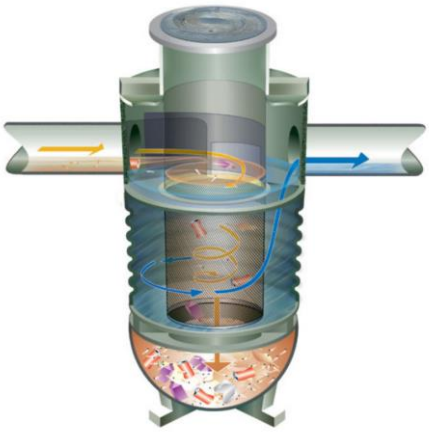
Table 5.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 5.1** above and the catchments shown in **Table 5.2**.

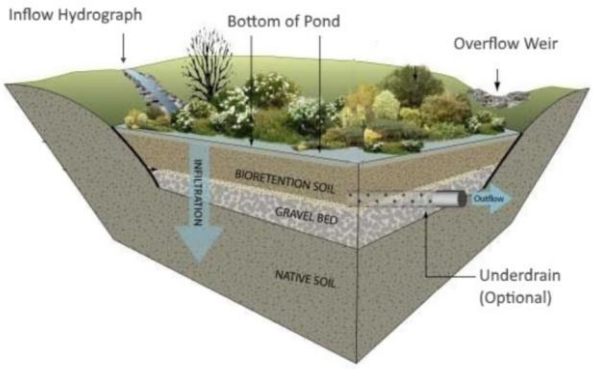
The relevant stormwater catchment sizes are shown figuratively in **Appendix C** and **Figure 5.1** below.

5.3.5 Treatment Nodes

Rocla CDS, Bio-Retention Basin nodes have been used in the modelling of the development. Typical visual representation of the treatment measures is shown in **Figure 5.1** below and MUSIC nodes in **Figure 5.2**.



Rocla CDS GPT



Bio-retention System

Figure 5.1. Visual Representation of Treatment Measures

5.4 Modelling Layout

The model layout is included in **Figure 5.2** below.

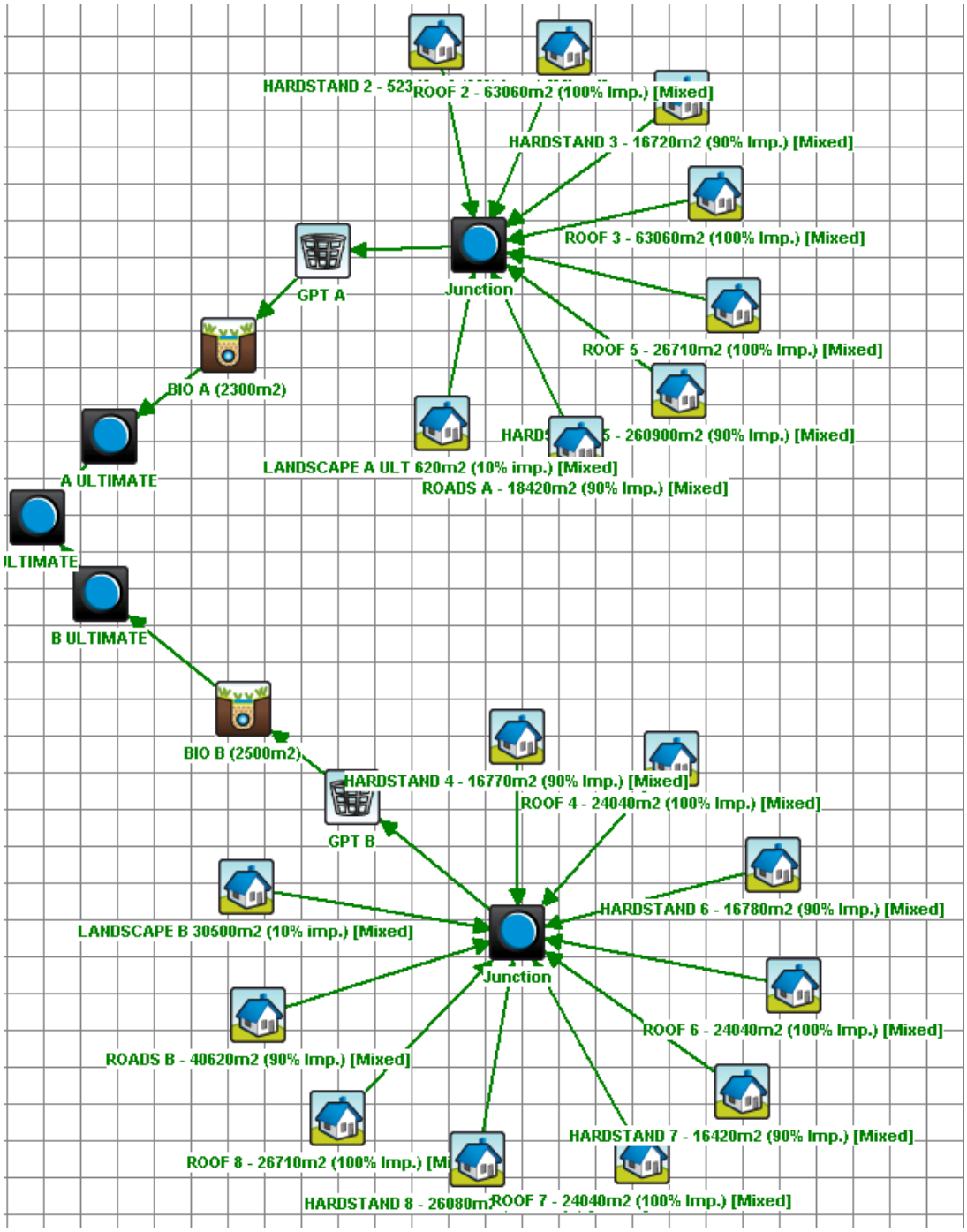


Figure 5.2. MUSIC Model Layout

5.5 Modelling Results

5.5.1 Results

Table 5.3 shows the results of the MUSIC analysis for the development.

The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment over the modelled catchment.

	Source	Residual Load	% Reduction	Target Met
Flow (ML/yr)	348	337	3.2	NA
Total Suspended Solids (kg/yr)	59600	6390	89.3	Y
Total Phosphorus (kg/yr)	121	36.6	69.8	Y
Total Nitrogen (kg/yr)	793	403	49.1	Y
Gross Pollutants (kg/yr)	9080	0	100	Y

Table 5.3. MUSIC analysis results

5.5.2 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements have been met.

The model results in **Table 5.3** indicate that, through the use of the STM's in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of consent.

As can be seen, the proposed treatment train achieves reductions greater than the required pollutant reduction objectives. This will any ensure any variance in assumed arrangements in the final building layouts will not affect the overall outcomes of the solution, and also to ensure overall reduction values are met.

Hydrocarbon reduction values, although not modelled, will achieve 90% reduction in the interim and ultimate conditions. Further discussion on hydrocarbon removal which is not readily modelled in MUSIC is provided in **Section 5.4** as follows.

5.6 Hydrocarbon Removal

The proposed distribution/ storage facility would be expected to produce relatively low source loadings of hydrocarbons. Potential sources of hydrocarbons would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (carparking only). The potential for hydrocarbon pollution is low and published data from the CSIRO indicates that average concentrations from Industrial sites are in the order of 10mg/L and we would expect source loading from this site to be near to or below this concentration as further discussed below.

Hydrocarbon removal cannot be readily modelled with MUSIC software however there is sufficient information on the expected source loads and treatment.

5.6.1 *Hydrocarbon Sources*

The average storm flow concentration of hydrocarbons in an industrial facility is 9.5mg/L (3 & 30mg/L 95% confidence limits) sourced from Fletcher T, Duncan H, Poelsma P & Lloyd S, 2004: *Stormwater Flow and Quality, and the Effectiveness of Non-Proprietary Stormwater Treatment Measures - A review and Gap Analysis. Cooperative Research Centre for Catchment Hydrology, Technical Report 04/8*;

5.6.2 *Bio-retention Treatment*

Removal of hydrocarbons within bio-retention systems is shown to occur due to several mechanisms.

Removal of oil, grease and hydrocarbons will take place due to entrainment to sediments within the bio-retention basin.

Research by Hseih (2005) has also shown that 97% of hydrocarbons are trapped and contained in the first few centimetres of a filtration system (i.e. filter swales and bio-retention systems). These are then broken down via organic processes in a period of 2-3 days.

Review of the volume of water and hydrocarbons treated by a bio-retention system with various extended detention depths has been undertaken by our office. An extended detention depth of 300mm results in treated volume of water and hydrocarbons of 67%.

5.6.3 *Rocla CDS Treatment*

The Rocla CDS GPT is reported to provide between 82-94% reduction in hydrocarbons and free oils.

The following information relating to the performance of the CDS GPT has been provided by the product manufacturers, Rocla:

> *As with nutrient capture there is also a high correlation of oils and grease removal with sediment capture in CDS Units.*
>
> *UCLA have reported 50-80% of oil and grease may be attached to sediments.*
>
> *Hoffman 1982: "Our data confirm the observations of the workers in that hydrocarbons are primarily associated with particulate material (83 – 93%)".*
>
> *CRCCH 1999: "Colwill found 70% of oil and approximately 85% PAH to be associated with solids in stormwater. That study subsequently demonstrated that over a period of dry weather conditions, increasing concentrations of oil become associated with particulates with the highest oil content found in the sediment range of 200µm to 400µm.*
>
> *CSIRO 1999: In the category of "attached pollutants" CDS Units were the only GPT device to even be considered capable of capturing anything.*

CDS Units can also capture free floating oil spills. However, when most of the oil is associated with fine particulates and sediments, CDS Units remove very high levels of oils and greases due to their very high capture rate of those fine particles.

5.6.4 Hydrocarbon Treatment Conclusion

Overall, when combining a treatment train of Rocla CDS and bio-retention systems, a reduction of greater than 90% of hydrocarbons is achieved with an extended detention depth of 300mm within the bio-retention system, and the hydrocarbon removal could be achieved with the CDS alone.

Given the expected low source loadings of hydrocarbons and removal efficiencies of the treatment devices we consider that the requirements of the consent have been met for both the interim and MPE Stage 2 CoC.

5.7 Stormwater Harvesting

Stormwater harvesting refers to the collection of storm-water 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, or stormwater where the flow is from all areas of the development.

Rainwater harvesting is proposed for 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 water demand for the development and to utilise 20% of stormwater runoff volume for non-potable uses.

The rainwater reuse strategy has been completed by Arcadis and reference to the MPE Stage 2 SMP W1P should be made in relation to the requirements for future buildings in relation to rainwater reuse.

6 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, a stormwater system maintenance schedule has been prepared (refer to **Section 6.3**).

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the maintenance requirements below it is also recommended that inspections are made following heavy rainfall or major storm events. Event heavy rain inspections should be carried out as soon as practicable following an intense period of rainfall, (i.e. greater than 100mm over 48 hours), as measured at the Horsley Park or Prospect Reservoir weather stations.

6.1 Types of Maintenance

Water Sensitive Urban Design (WSUD) assets require both proactive and reactive maintenance to ensure long term system health and performance.

Proactive maintenance refers to regular scheduled maintenance tasks, whereas reactive maintenance is required to address unscheduled maintenance issues. If an asset is not functioning as intended, then rectification may be required to restore the asset back to its intended functionality.

The preferred and recommended approach is for proactive maintenance.

6.1.1 Proactive Maintenance

Proactive maintenance is a set of scheduled tasks to ensure that the WSUD asset is operating as designed.

Proactive maintenance involves:

- Regular inspections of the WSUD asset;
- Scheduled maintenance tasks for issues that are known to require regular attention (e.g. litter removal, weed control); and
- Responsive maintenance tasks following inspections for issues which require irregular attention (e.g. sediment removal, mulching, and scour management).

Proactive maintenance in the first two years after the establishment period (construction and planting phases) are the most intensive and important to the long-term success of the treatment asset.

Proactive maintenance is a cost-effective means of reducing the long-term costs associated with operating stormwater treatment assets.

Maintenance activities specific to each WSUD asset type are detailed in the inspection and maintenance schedules and checklists provided in the report. The frequency of scheduled maintenance depends on the asset type and the issue being managed.

As a general guide, scheduled maintenance should be completed on a three to four-month cycle. The checklists provided should be used as a minimum guide to scheduled

maintenance tasks and should be amended to suit site conditions and maintenance requirements.

Treatment assets should also be inspected at least once a year during or immediately after a significant rainfall event. This is important to confirm that the treatment system is functioning correctly under wet conditions.

A higher level of scheduled maintenance may be arranged for some treatment assets. This is often the case for treatment assets which are located in high profile locations (e.g. streetscapes and parklands), and where public amenity is considered to be a high priority. In these cases, a more frequent maintenance regime may be required to remove litter and weeds and to ensure vegetation health and cover is maintained to a high level.

6.1.2 Reactive Maintenance

Reactive maintenance is undertaken when a problem or fault is identified that is beyond the scope of proactive maintenance. Reactive maintenance may occur following a complaint about the WSUD asset (e.g. excessive odours or litter). Reactive maintenance often requires a swift response and may involve specialist equipment or skills.

6.1.3 Rectification

Rectification of a WSUD asset is undertaken when the system is not functioning as intended, and proactive and reactive maintenance activities are unable to return the asset to functional condition.

The lack of functional performance and therefore failure of a stormwater treatment asset may be related to many factors including inappropriate design, poor construction, and lack of regular maintenance or end of life cycle. In many cases, the design of assets has not included adequate consideration of the maintenance requirements, in terms of the system's ability to cope with catchment pollutant loads (i.e. sediments) and the frequency of maintenance required to maintain the system at a functional level.

Maintenance planning at the design phase is therefore crucial to both the long-term operating costs and the expected life cycle of the treatment system. In general, the expected lifecycle of a stormwater treatment asset (e.g. a bio-retention system) that has been well designed and constructed and is regularly maintained should be at least 15-20 years.

However, the lifecycle for each treatment system will be different and related to:

- whether the system has been designed, constructed and maintained according to best practice;
- catchment characteristics (influences the quality of the stormwater);
- the age and general health of the system; and
- the type of plants that have been used in the system.

Regular asset condition assessments should be undertaken to monitor the system condition and to inform where an asset is in terms of its expected lifecycle. Renewal of a system refers to replacing the main elements of the system including:

- infrastructure;

- removing deposited sediment, removing and replacing the top soil (or filter media in the case of a bio-retention system) and profiling the top soil level back to the design levels;
- re-planting; and
- pavement and sub-layers (in the case of permeable pavements).

A WSUD specialist may be required to assess whether a treatment system has reached the end of its life cycle and to provide advice on the renewal works.

Asset condition assessments can also identify assets that need to be rectified. The decision to continue with an increased maintenance regime or to rectify an asset, and over what timeframe, can be a difficult one to make. This is because certain maintenance items are more important to overall system function than others. For example, extended ponding on the surface of a bio-retention system or persistent scouring of a swale should be addressed more rapidly than recurrent weed problems.

6.2 Routine Inspections and Maintenance Schedule for General Stormwater System

Routine inspections are to be carried out to assess the need for maintenance and are primarily concerned with checking the functionality of the stormwater drainage facilities; items such as drains, drainage pits, box culverts, detention tanks and rainwater reuse tank systems. Maintenance of these items is vitally important for the ongoing drainage and treatment of stormwater.

Should the inspection reveal that maintenance of any item is required, this is to be reported to the building management for action.

Items that are to be subject to Routine Inspections for Maintenance may comprise, but not be limited to those listed in the table below. This table is to be read in conjunction with the Stormwater design drawings.

It is vitally important that each component of the stormwater system is properly operated and maintained. In order to achieve the modelled and design treatment outcomes, a maintenance schedule has been prepared (below) to assist in the effective operation and maintenance of the various drainage and water quality components.

6.3 Stormwater 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. Cut hole in fabric and revegetate.
RAINWATER TANK			
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

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			maximum allowable depth as specified by the hydraulic consultant
INLET & JUNCTION PITS			
Inside Pit	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of Pit	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.
OSD SYSTEM			
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve is clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			gaps if required.
Check orifice diameter is correct and retains sharp edge.	Five yearly	Maintenance Contractor	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged.
Check screen for corrosion	Annually	Maintenance Contractor	Remove grate and screen and examine for rust or corrosion, especially at corners or welds.
Inspect overflow weir and remove any blockage	Six monthly	Maintenance Contractor/ Owner	Ensure weir is free of blockage.
Inspect walls for cracks or spalling	Annually	Maintenance Contractor	Remove grate to inspect internal walls, repair as necessary.
Check step irons	Annually	Maintenance Contractor	Ensure fixings are secure and irons are free from corrosion.
BIORETENTION BASIN/ SWALES			
Check all items nominated for SWALES/ LANDSCAPED AREAS above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above
Check for sediment accumulation at inflow points	Six monthly/ After Major Storm	Maintenance Contractor	Remove sediment and dispose in accordance with local authorities' requirements.
Check for erosion at inlet or other key structures.	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed profile is maintained

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Check for evidence of dumping (litter, building waste or other).	Six monthly	Maintenance Contractor	Remove waste and litter and dispose in accordance with local authorities' requirements.
Check condition of vegetation is satisfactory (density, weeds, watering, replating, mowing/ slashing etc)	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Check for evidence of prolonged ponding, surface clogging or clogging of drainage structures	Six monthly/ After Major Storm 5-10 years	Maintenance Contractor	Remove sediment and dispose in accordance with local authorities' requirements. Replace filter media & planting – refer to appropriately qualified engineer or stormwater specialist
Check stormwater pipes and pits	Six monthly/ After Major Storm	Maintenance Contractor	Refer to INLET/ JUNCTION PIT section.
GROSS POLLUTANT TRAPS – ROCLA CDS			
Refer manufacturers Operation and Maintenance Manual – refer Appendix	Refer manufacturers Operation and Maintenance Manual – refer Appendix	Maintenance Contractor	Refer manufacturers Operation and Maintenance Manual – refer Appendix

Routine Inspections for Maintenance shall be carried out over the life of the development.

The inspections shall occur on a monthly frequency during the construction period, and shall continue on a regular basis as per the frequency specified above in perpetuity.

In addition to the normal inspection frequency nominated inspections should also be carried out following heavy rain events. Event heavy rain inspections should be carried out as soon as practicable following an intense period of rainfall, (i.e. greater than 100mm over 48 hours), as measured at Prospect Dam Weather Station No. 67019. A process to establish when periods of high rainfall occur should be put in place with Estate Management.

6.4 Records

Records detailing each of the routine inspections for maintenance should be completed during the inspection, and describe in detail any required maintenance. The inspection records are to be provided to Estate or Building Management for action and then filed appropriately.

Records of any maintenance carried out as a result of the inspection should be completed immediately after the works have been finalised, and filed appropriately with estate management services.

6.5 Personnel

Routine inspections for maintenance are required to establish the need for basic maintenance, as described above. On this basis, such inspections do not require professional engineering knowledge and may be carried out by any responsible person, including property management staff or maintenance staff.

7 CONCLUSION

This Stormwater Management Plan has been prepared for the Moorebank Logistic Park development Moorebank Precinct East Stage 2 SSD 7628, specifically relating to the operation of stormwater within MPE Stage 2 BoS.

This report provides information to confirm the requirements of State Significant Development Application SSD 7628, Conditions A23, B40, B41 and B42 have been met.

A civil engineering strategy for the MPE Stage 2 BoS works has been developed which provides a best practice solution within the constraints of the existing landform and proposed subdivision layout. Within this design a stormwater quantity management strategy has been developed to reduce peak flows leaving this site to remain consistent with the existing flows as a permanent fixture.

The proposed building development considers the infrastructure and site servicing designs completed and submitted as part of separate development approvals to DP&E including earthworks and erosion and sediment controls.

8 REFERENCES

- Development Control Plan (2014), Liverpool City Council
- Design Specification Series D1-D9, Liverpool City Council
- Water Sensitive Urban Design – Technical Guidelines for Western Sydney (May 2004), URS Australia Pty Ltd
- Managing Urban Stormwater, Soils and Construction (1998) – The Blue Book, Landcom
- Managing Urban Stormwater: Soils and Construction – Installation of Services, Volume 2A (OEH 2008)
- Managing Urban Stormwater: Soils and Construction – Main Road Construction, Volume 2D (OEH 2008)
- 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)

9 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: *Minor flooding:* causes inconvenience such as closing of minor roads and the submergence of low-level bridges *Moderate flooding*: low-lying areas inundated requiring removal of stock and/or evacuation of some houses. Main traffic bridges may be covered. *Major flooding*: 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 of 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

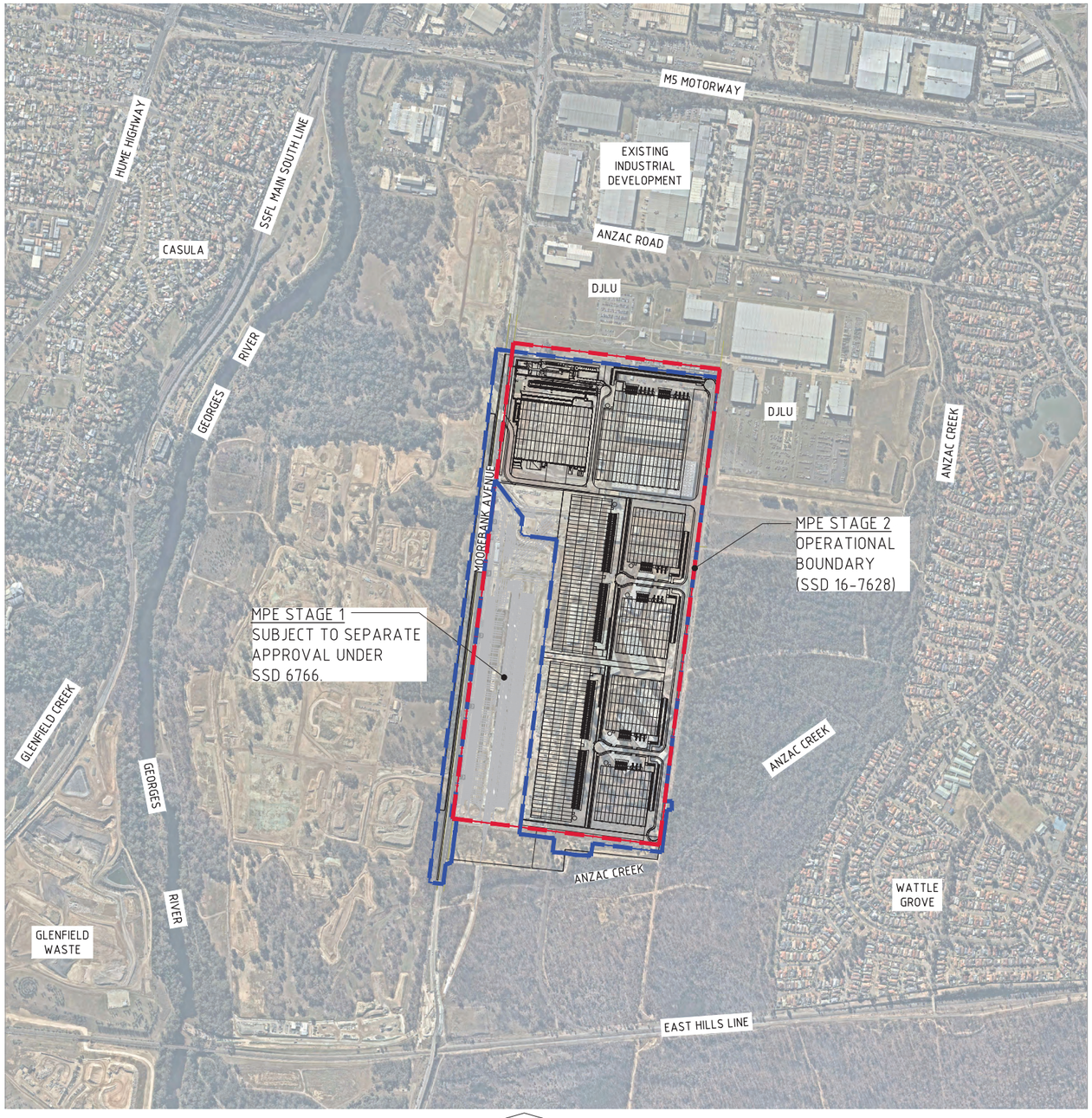
Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

MOOREBANK LOGISTIC PARK
MOOREBANK PRECINCT EAST (MPE) STAGE 2
MOOREBANK AVENUE, MOOREBANK, NSW
STAGE 2 BALANCE OF SITE - STORMWATER PACKAGE - SSD 7628

DRAWING LIST

DRAWING NO.	DRAWING TITLE
C013455.04-C100	MPE STAGE 2B - DRAWING LIST & LOCALITY PLAN
C013455.04-C110	MPE STAGE 2B - GENERAL NOTES
C013455.04-C401	MPE STAGE 2B - STORMWATER CATCHMENT PLAN - PRE-DEVELOPMENT
C013455.04-C402	MPE STAGE 2B - STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT
C013455.04-C403	MPE STAGE 2B - STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT (NORTH-EAST)
C013455.04-C404	MPE STAGE 2B - STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT (SOUTH-EAST)
C013455.04-C411	MPE STAGE 2B - STORMWATER DRAINAGE PLAN - SHEET 1
C013455.04-C412	MPE STAGE 2B - STORMWATER DRAINAGE PLAN - SHEET 2
C013455.04-C415	MPE STAGE 2B - STORMWATER DRAINAGE PLAN - TYPICAL SECTION
C013455.04-C421	MPE STAGE 2B - STORMWATER DETENTION DETAILS - SHEET 1
C013455.04-C422	MPE STAGE 2B - STORMWATER DETENTION DETAILS - SHEET 2
C013455.04-C423	MPE STAGE 2B - STORMWATER DETENTION DETAILS - SHEET 3
C013455.04-C424	MPE STAGE 2B - STORMWATER DETENTION DETAILS - SHEET 4
C013455.04-C451	MPE STAGE 2B - STORMWATER DRAINAGE DETAILS - SHEET 1
C013455.04-C452	MPE STAGE 2B - STORMWATER DRAINAGE DETAILS - SHEET 2



LOCALITY PLAN
1:5000

50m 0 100 200 300 400 500m
1:5000 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
REVISED FOR UPDATED MPE SITE & STAGE 2 BOUNDARIES	29.10.18	C
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS DATE ISSUE

CLIENT: DUBE MOOREBANK LOGISTICS PARK

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PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
X.C		AUG '18		A0	AS SHOWN	C013455.04-C100

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DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE DRAWING LIST & LOCALITY PLAN

DRAWING No: C013455.04-C100 ISSUE: C

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 '115804500 REV.22' BY 'CARDNO' DATED 12/10/2017.

LIVERPOOL CITY COUNCIL NOTE:

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL STANDARDS AND CIVIL WORKS SPECIFICATIONS.

EXISTING SERVICES NOTES:

1. DURING THE EXECUTION OF WORKS, THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF EXISTING SERVICES. THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED TO THE EXISTING SERVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE RELEVANT SERVICE AUTHORITY, AT NO COST TO THE PRINCIPAL.
2. WHERE IT IS NECESSARY TO REMOVE, DIVERT OR CUT INTO ANY EXISTING SERVICE, THE CONTRACTOR SHALL GIVE AT LEAST THREE (3) DAYS NOTICE OF ITS REQUIREMENTS TO THE SUPERINTENDENT, WHO WILL ADVISE WHAT ARRANGEMENTS SHOULD BE MADE FOR THE ALTERATION OF SUCH EXISTING WORKS.
3. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA. THE ACCURACY IS NOT GUARANTEED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO COMMENCING WORK. ALL CLEARANCES AND APPROVALS SHALL ALSO BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF WORK.
4. ALL NEW AND EXHUMED SERVICES THAT CROSS EXISTING AND FUTURE ROADS/PAVEMENTS WITHIN THE SITE SHALL BE BACKFILLED WITH DGB20 MATERIAL TO SUBGRADE LEVEL AND COMPACTED TO 98% STANDARD DENSITY RATIO. SUBJECT TO PRIOR APPROVAL FROM RELEVANT AUTHORITY.
5. ON COMPLETION OF SERVICES INSTALLATION. ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.
6. CARE TO BE TAKEN WHEN EXCAVATING NEAR UTILITY SERVICES. NO MECHANICAL EXCAVATION TO BE UNDERTAKEN OVER SERVICES. LIAISE WITH RELEVANT AUTHORITY.
7. THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL IF REQUIRED OF ALL EXISTING SERVICES IN AREAS AFFECTED BY THE WORKS WITHIN THE CONTRACT AREA AS SHOWN ON THE DRAWINGS UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT. ALL TO REGULATORY AUTHORITY STANDARDS AND APPROVAL.
8. THE CONTRACTOR IS TO MAINTAIN EXISTING STORMWATER DRAINAGE FLOWS THROUGH THE ROADS AT ALL TIMES. MAKE DUE ALLOWANCE FOR ALL SUCH FLOWS AT ALL TIMES.
9. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL OBTAIN THE SUPERINTENDENT'S APPROVAL OF THE PROGRAM FOR THE RELOCATION/CONSTRUCTION OF TEMPORARY SERVICES.
10. CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES AS REQUIRED TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
11. INTERRUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE OR DAMAGE TO THE ADJACENT RESIDENCES. CONTRACTOR TO GAIN APPROVAL OF THE SUPERINTENDENT FOR TIME OF INTERRUPTION.
12. THE CONTRACTOR SHALL UNDERTAKE A DIAL BEFORE YOU DIG (DBYD 1100) SERVICES SEARCH BEFORE THE COMMENCEMENT OF ANY WORKS.

STORMWATER DRAINAGE NOTES:

1. ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
3. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS.
4. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
5. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
6. ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 3 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
7. ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE SN8 UNO.
8. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
9. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c 25 MPA. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
10. IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
11. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
12. CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
13. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
14. ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
15. ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
16. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
17. MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
18. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
19. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
20. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
21. PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS	DATE	ISSUE

CLIENT: DUBE; MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
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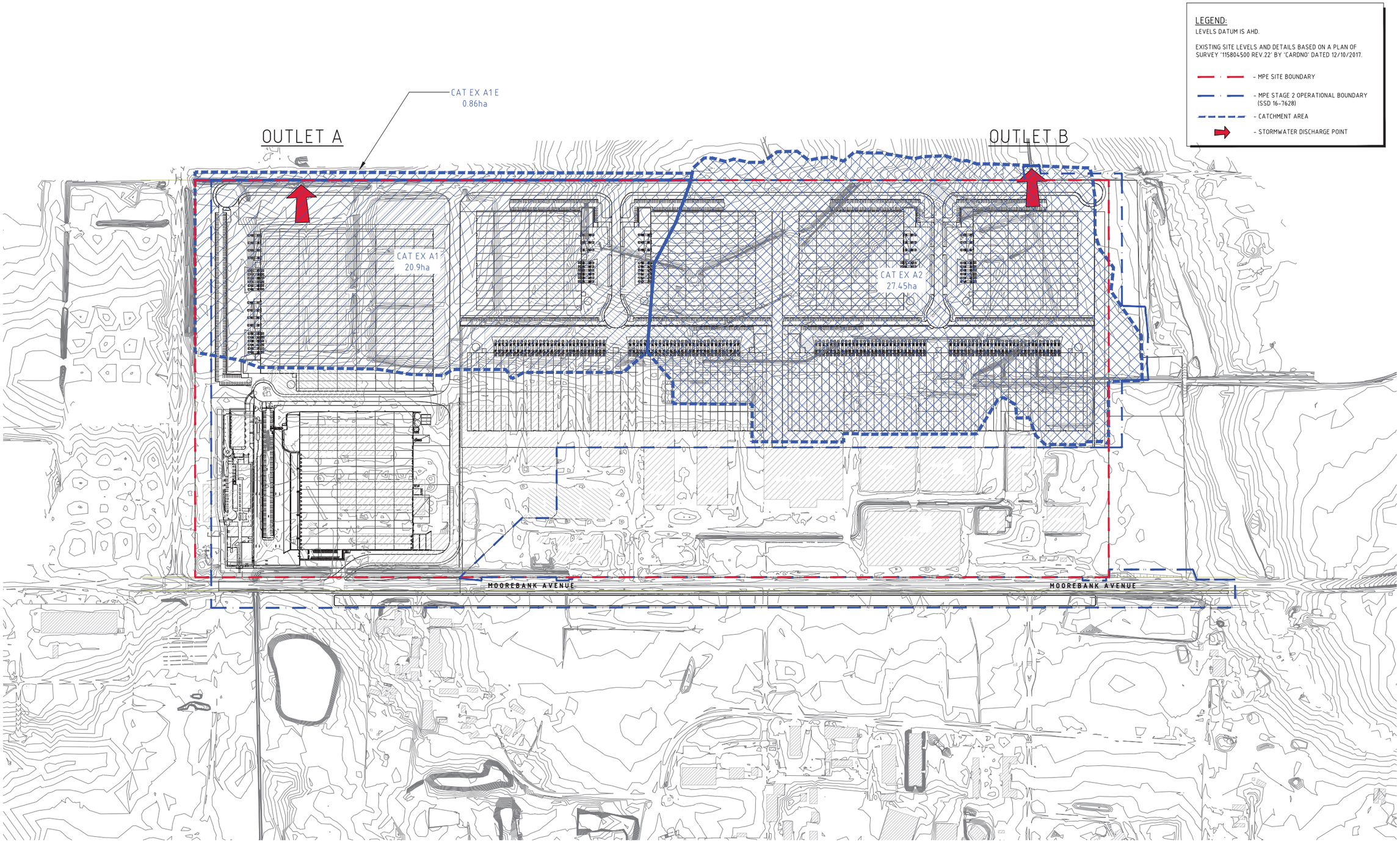
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE GENERAL NOTES

DRAWING No: C013455.04-C110 ISSUE: B



STORMWATER CATCHMENT PLAN - PRE-DEVELOPMENT
1:2000 SCALE

NOTE:
EXISTING CATCHMENTS BASED ON SSD7628
SWMP FIGURE 4-1 PREPARED BY ARCADIS (2016)

20m 0 50 100 150 200m
1:2000 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
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CLIENT: QUBE; MOOREBANK LOGISTICS PARK

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PROJECT MANAGER: TACTICAL GROUP

PROJECT
MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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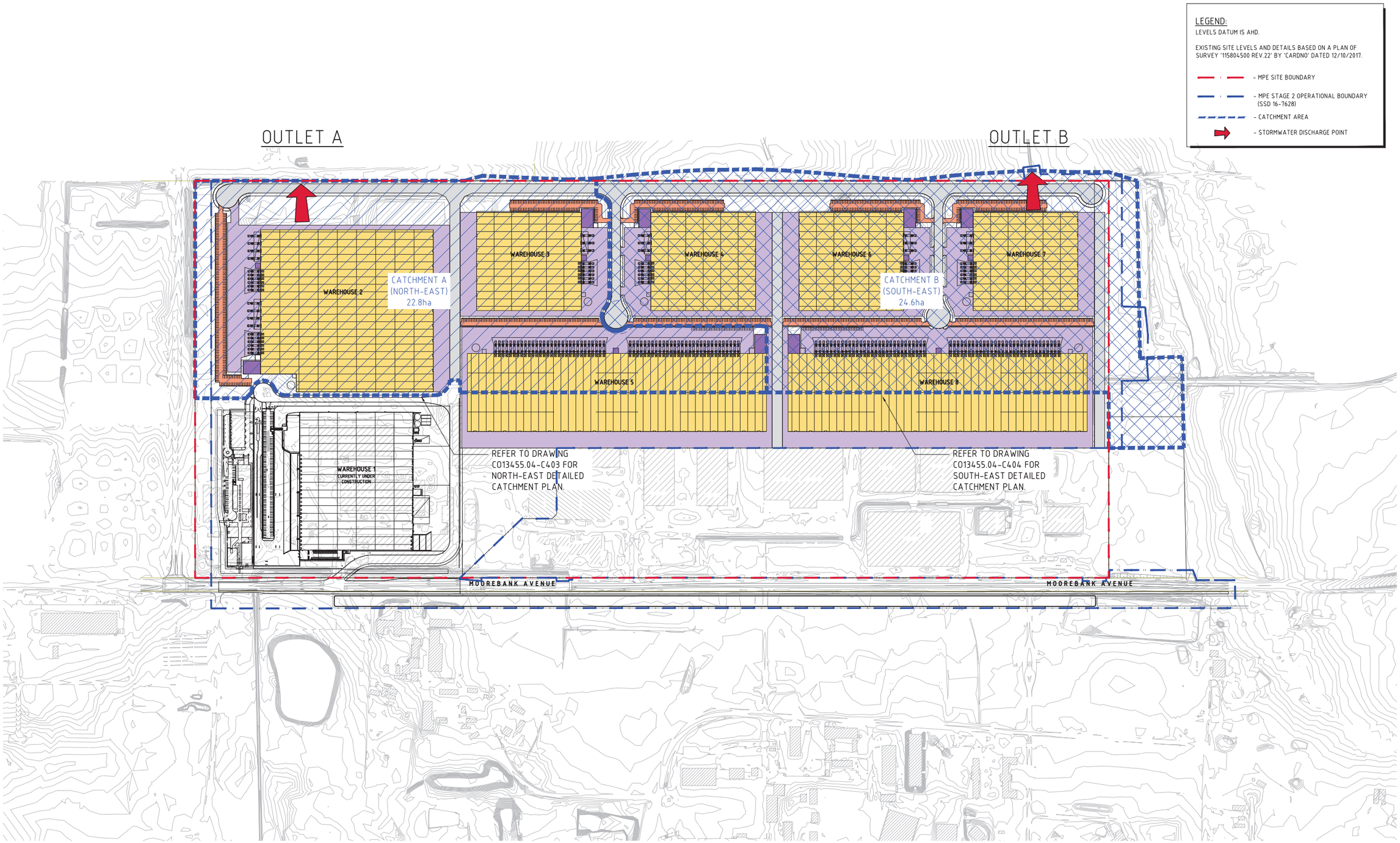
DRAWING TITLE
MPE STAGE 2 - BALANCE OF SITE
STORMWATER CATCHMENT PLAN
PRE-DEVELOPMENT

DRAWING No C013455.04-C401 ISSUE C



STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT
1:2000 SCALE

20m 0 50 100 150 200m
1:2000 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
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AMENDMENTS DATE ISSUE

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PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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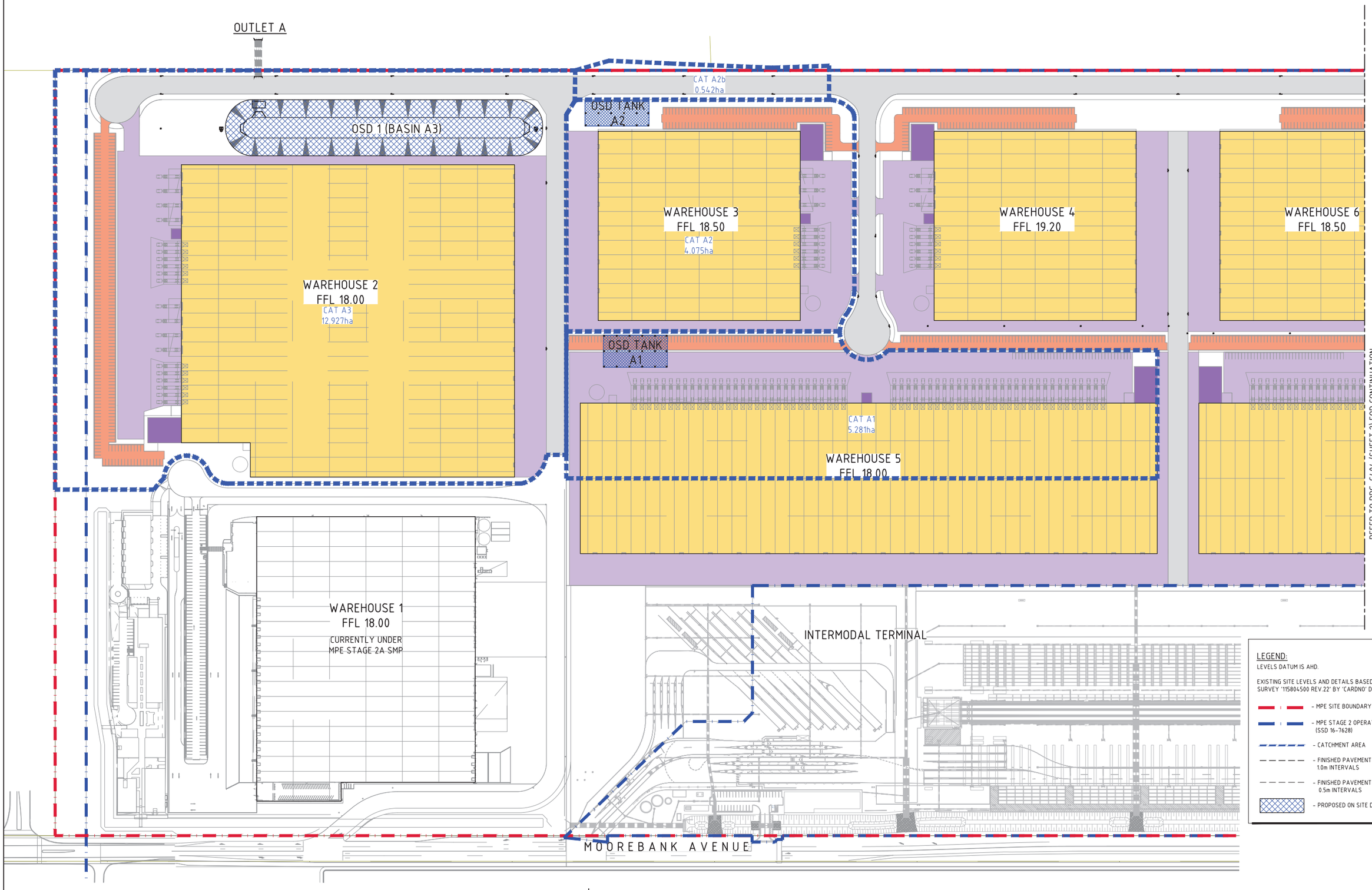
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER CATCHMENT PLAN POST-DEVELOPMENT

DRAWING No: C013455.04-C402 ISSUE: D



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY '1158045 00 REV.22' BY 'CARDNO' DATED 12/10/2017.

- MPE SITE BOUNDARY
- MPE STAGE 2 OPERATIONAL BOUNDARY (SSD 16-7628)
- CATCHMENT AREA
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.5m INTERVALS
- PROPOSED ON SITE DETENTION SYTEM

STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT (NORTH-EAST)
1:1000 SCALE

10m 0 10 20 30 40 50 60 70 80 90 100m
1:1000 SCALE AT A0 SHEET SIZE

FOR INFORMATION

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AMENDMENTS DATE ISSUE

CLIENT: QUBE / MOOREBANK LOGISTICS PARK

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PROJECT
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STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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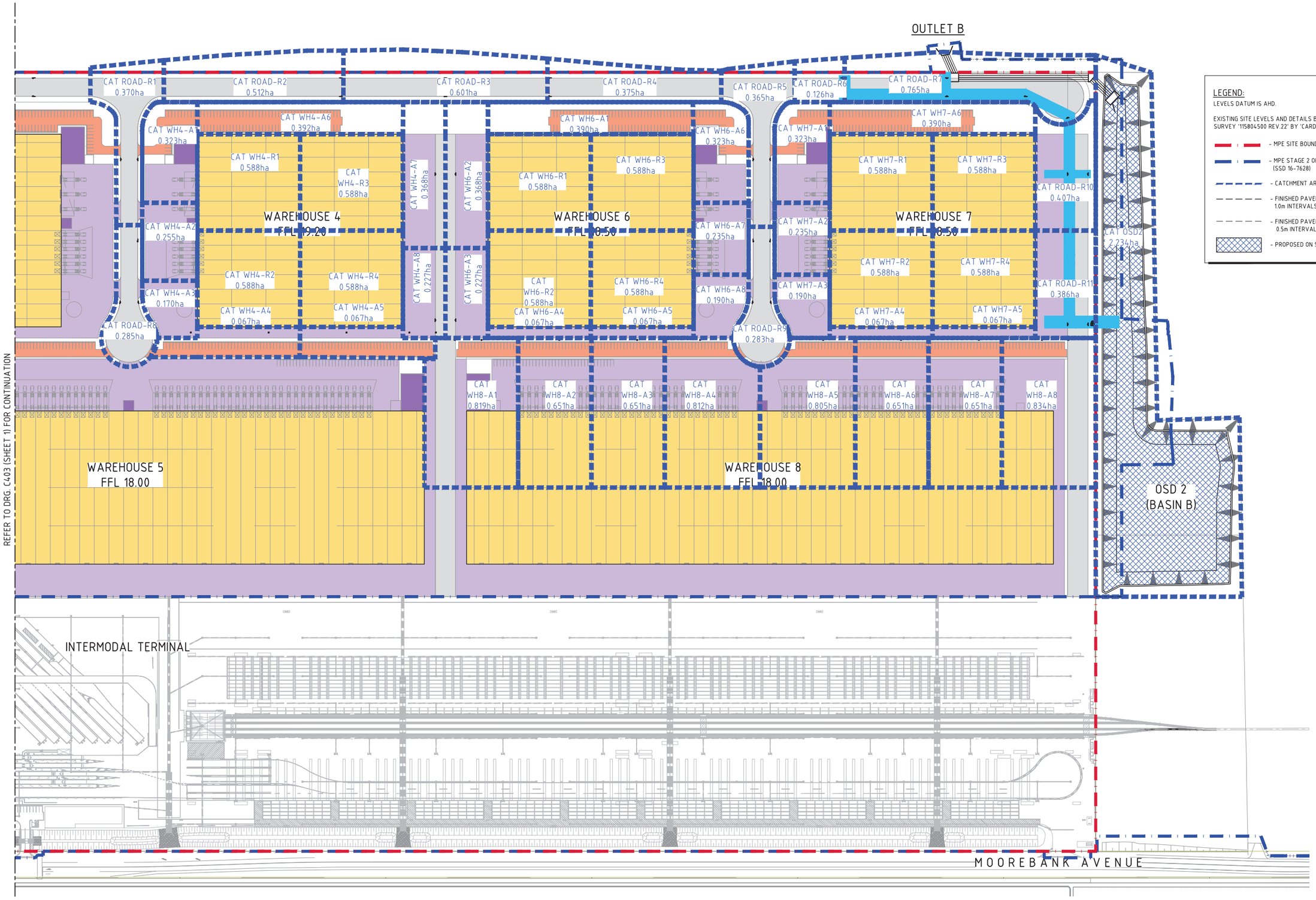
DRAWING TITLE
MPE STAGE 2 - BALANCE OF SITE
STORMWATER CATCHMENT PLAN
POST-DEVELOPMENT (NORTH-EAST)

DRAWING No C013455.04-C403 ISSUE D



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY '115804500 REV.22' BY 'CARDNO' DATED 12/10/2017.

- MPE SITE BOUNDARY
- MPE STAGE 2 OPERATIONAL BOUNDARY (SSD 16-7628)
- CATCHMENT AREA
- FINISHED PAVEMENT CONTOUR (MAJOR) 1.0m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.5m INTERVALS
- PROPOSED ON SITE DETENTION SYTEM

STORMWATER CATCHMENT PLAN - POST-DEVELOPMENT (SOUTH-EAST)
1:1000 SCALE

10m 0 10 20 30 40 50 60 70 80 90 100m
1:1000 SCALE AT A0 SHEET SIZE

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PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER CATCHMENT PLAN POST-DEVELOPMENT (SOUTH-EAST)

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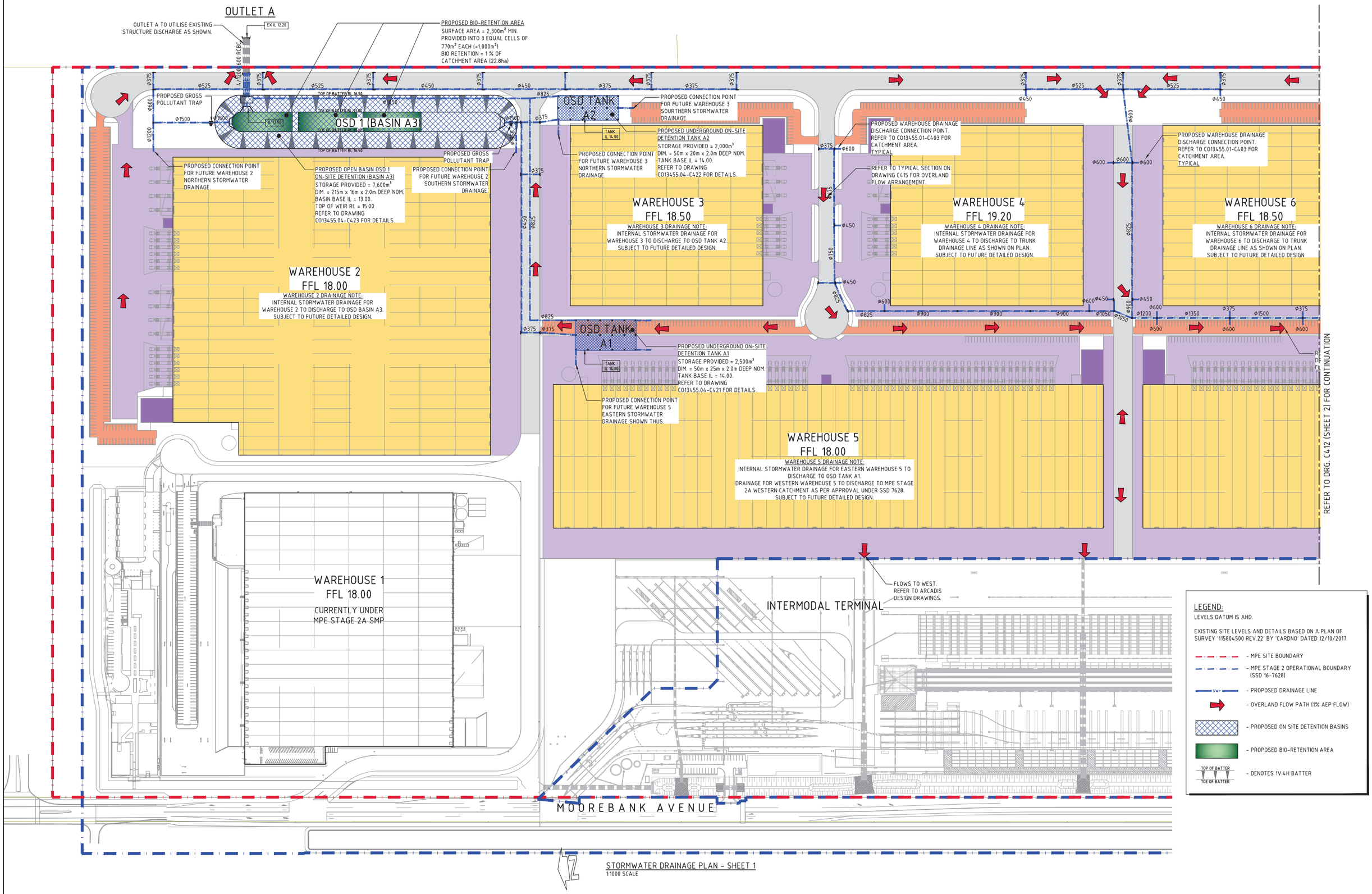

STORMWATER DRAINAGE PLAN - SHEET 1
1:1000 SCALE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
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CLIENT: QUBE / MOOREBANK LOGISTICS PARK

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PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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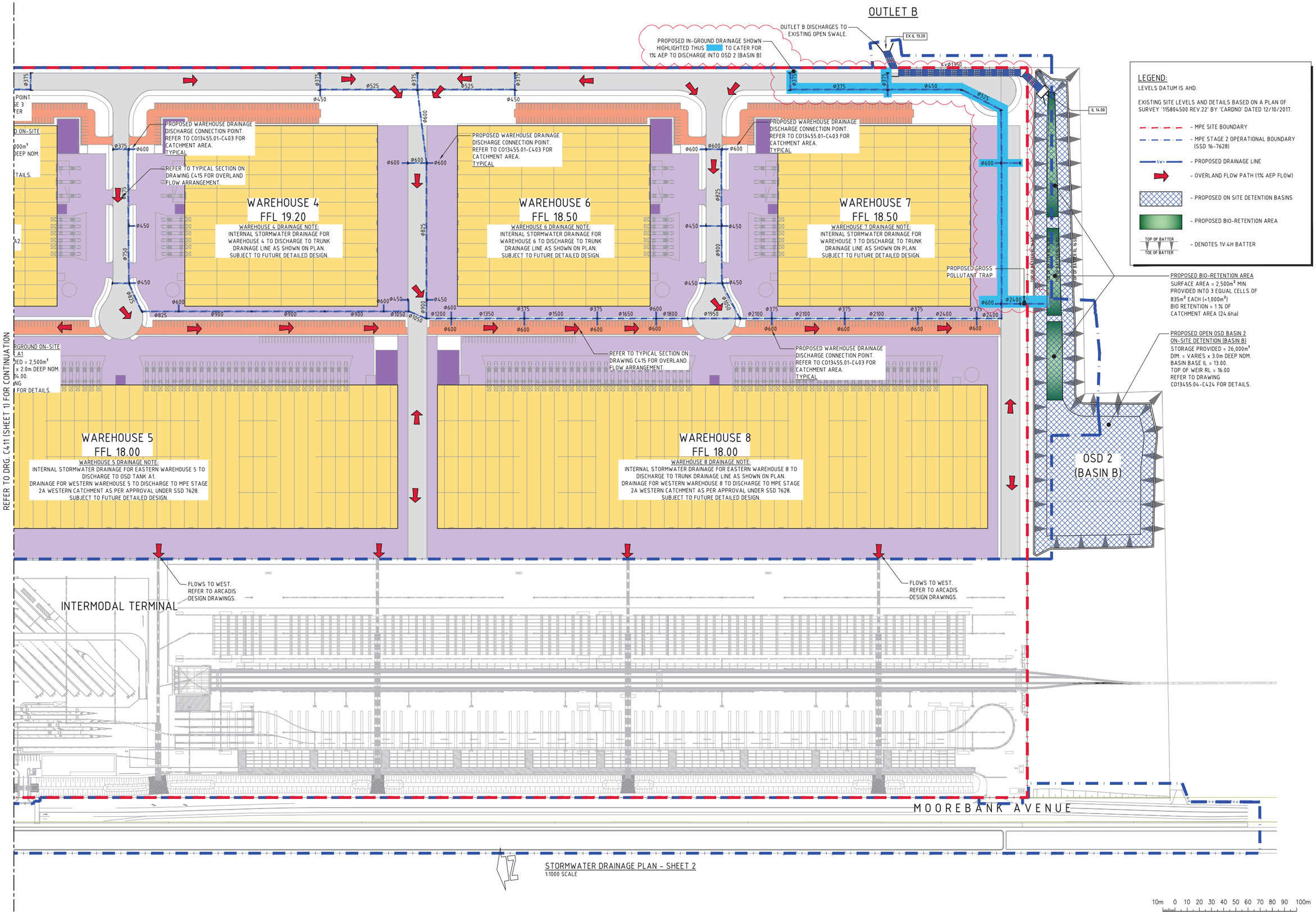
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER MANGEMENT PLAN SHEET 1

DRAWING No: C013455.04-C411 ISSUE: E



STORMWATER DRAINAGE PLAN - SHEET 2
1:1000 SCALE

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ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS DATE ISSUE

CLIENT: QUBE / MOOREBANK LOGISTICS PARK

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PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

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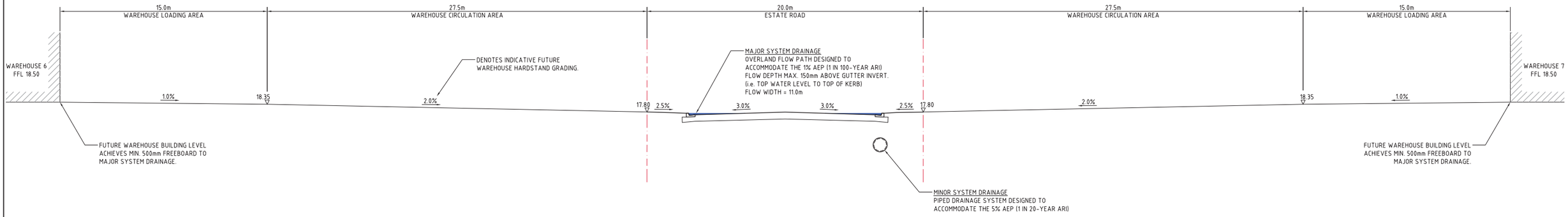
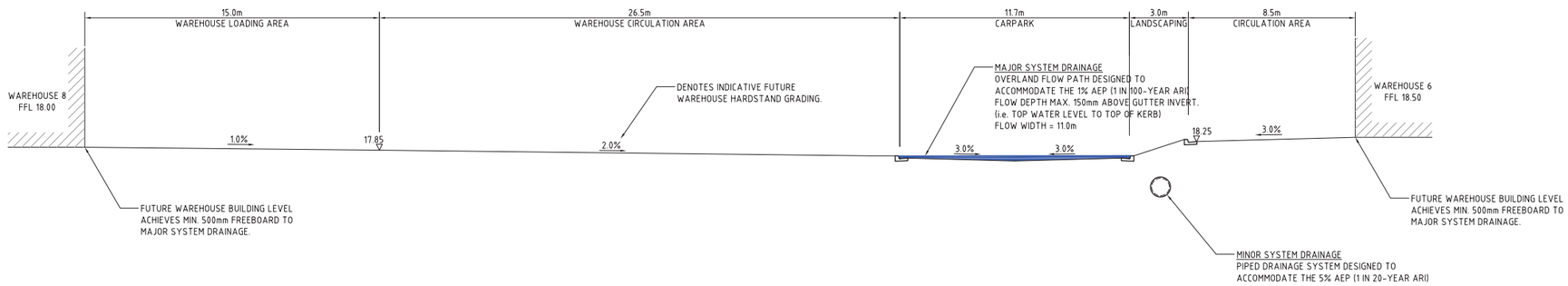
DRAWING TITLE: MPE STAGE 2B
STORMWATER DRAINAGE PLAN
SHEET 2

DRAWING No: C013455.04-C412
ISSUE: F



TYPICAL DRAINAGE ARRANGEMENT - ESTATE ROADS

SCALE 1:100



TYPICAL DRAINAGE ARRANGEMENT - CARPARK

SCALE 1:100

1m 0 1 2 3 4 5 6 7 8 9 10m

SCALE 1:100 AT A0 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	12.10.18	B
ISSUED FOR INFORMATION	03.10.18	A

AMENDMENTS	DATE	ISSUE

CLIENT: QUBE / MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL
Architecture, Interiors, Project Management

PROJECT MANAGER: TACTICAL GROUP

PROJECT
MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
X.C.		AUG '18		A0	AS SHOWN	C013455.04-C415

Costin Roe Consulting Pty Ltd.
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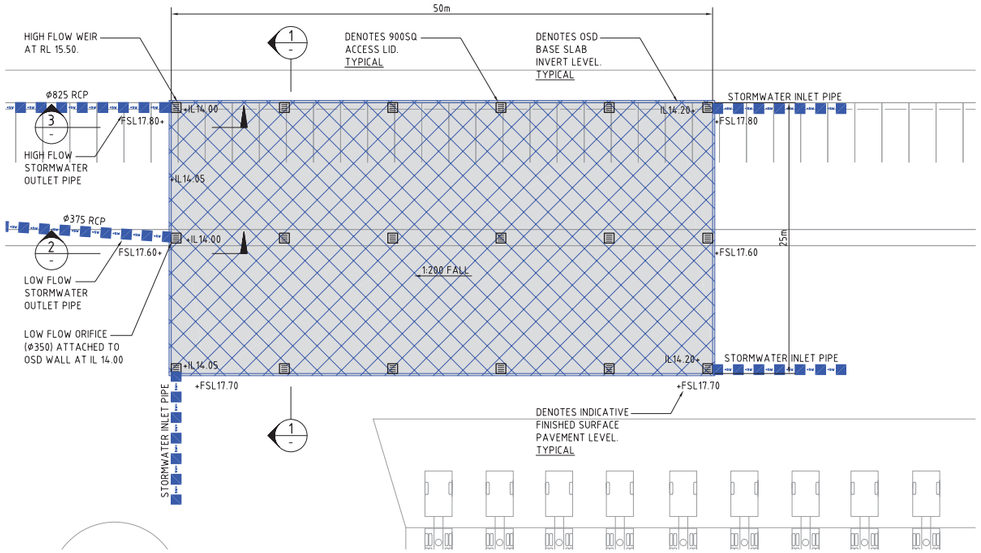
Costin Roe Consulting

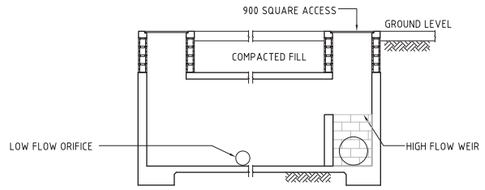
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
MPE STAGE 2 - BALANCE OF SITE
STORMWATER DRAINAGE PLAN
TYPICAL SECTION

DRAWING No C013455.04-C415 ISSUE B

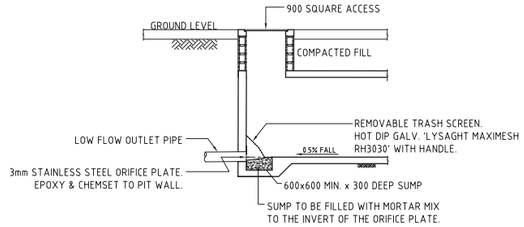


OSD 1 (TANK A1)
1:200 SCALE

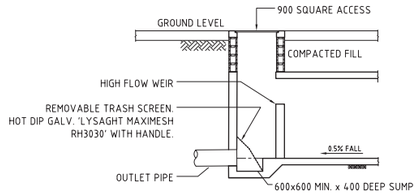


SECTION 1:50 (1) : TYPICAL THRU' OSD TANK

PROVIDE GALVANISED STEP IRONS AT 300mm CENTRES PLACED IN A STAGGERED PATTERN IN ACCORDANCE WITH AS4198-1994.



SECTION 1:50 (2) : TYPICAL THRU' OSD TANK LOW FLOW OUTLET



SECTION 1:50 (3) : TYPICAL THRU' OSD TANK HIGH FLOW OUTLET

OSD TANK STORAGE DETAILS

VOLUME PROVIDED 2,500m³

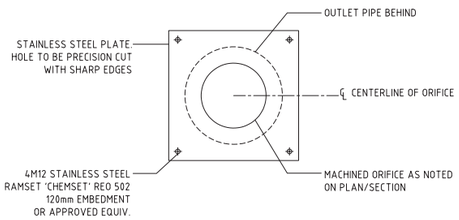
INTERNAL TANK DIMENSIONS
(INC. HIGH FLOW CHAMBERS)

OSD WARNING SIGN
N.T.S
SUGGESTED SIZE 600mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS /OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

CONFINED SPACE SIGN
N.T.S
SUGGESTED SIZE 300mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / DCP OUTLET PITS IN SUITABLE
AREA T.B.C ON SITE

OSD SIGN
N.T.S
SUGGESTED SIZE 110mm x 80mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

NOTE:
REFER TO APPENDIX 'N' IN VERSION 4 OF THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) FOR SIGN REQUIREMENTS.



ORIFICE PLATE DETAIL
SCALE 1:10

100mm 0 200 400 600 800 1000mm
1:10 SCALE AT A0 SHEET SIZE

500mm 0 1 2 3 4 5m
1:50 SCALE AT A0 SHEET SIZE

1m 0 1 2 3 4 5 6 7 8 9 10m
1:100 SCALE AT A0 SHEET SIZE

2m 0 5 10 15 20m
1:200 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

CLIENT: DUBE; MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
X.C.		AUG '18		A0	AS SHOWN	C013455.04-C421

Costin Roe Consulting Pty Ltd.
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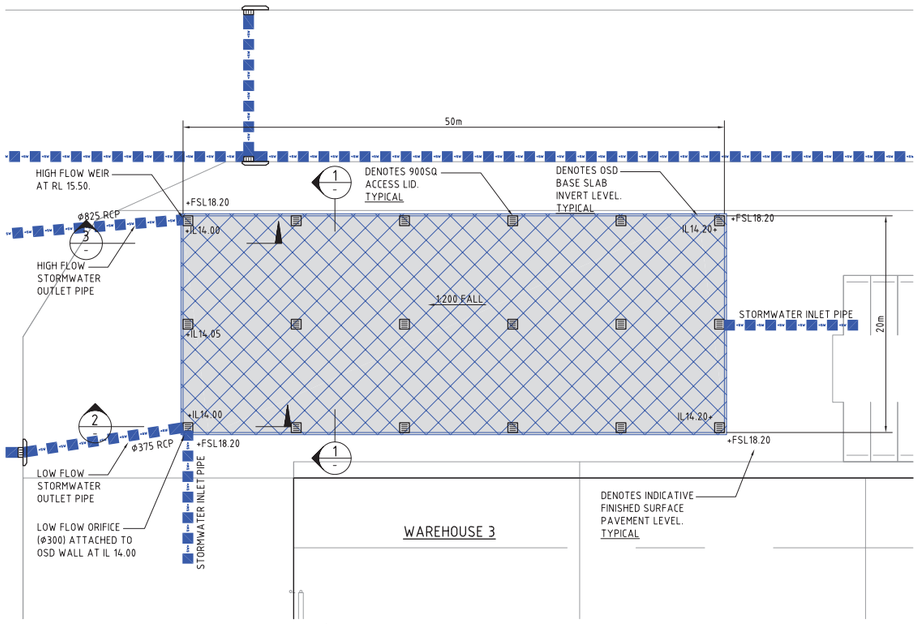
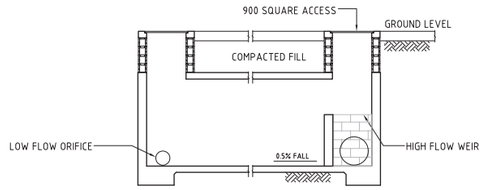
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DETENTION DETAILS SHEET 1

DRAWING No: C013455.04-C421 ISSUE: B

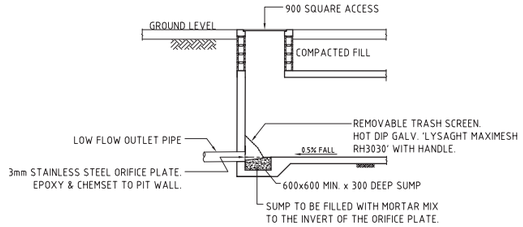


OSD 1 (TANK A2)
1:200 SCALE

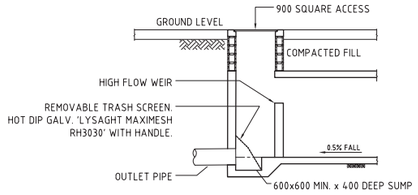


SECTION 1:50 1 : TYPICAL THRU' OSD TANK

PROVIDE GALVANISED STEP IRONS AT 300mm CENTRES PLACED IN A STAGGERED PATTERN IN ACCORDANCE WITH AS4198-1994.



SECTION 1:50 2 : TYPICAL THRU' OSD TANK LOW FLOW OUTLET



SECTION 1:50 3 : TYPICAL THRU' OSD TANK HIGH FLOW OUTLET

OSD TANK STORAGE DETAILS

VOLUME PROVIDED $2{,}000m^3$

INTERNAL TANK DIMENSIONS
(INC. HIGH FLOW CHAMBERS)

OSD WARNING SIGN

N.T.S
SUGGESTED SIZE 600mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS /OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

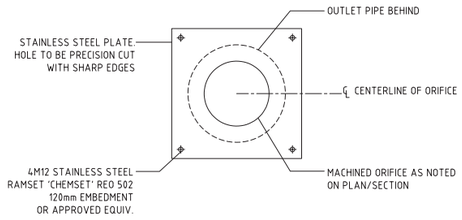
CONFINED SPACE SIGN

N.T.S
SUGGESTED SIZE 300mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / DCP OUTLET PITS IN SUITABLE
AREA T.B.C ON SITE

OSD SIGN

N.T.S
SUGGESTED SIZE 110mm x 80mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

NOTE:
REFER TO APPENDIX 'N' IN VERSION 4 OF THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) FOR SIGN REQUIREMENTS.



ORIFICE PLATE DETAIL

SCALE 1:10

100mm 0 200 400 600 800 1000mm
1:10 SCALE AT A0 SHEET SIZE

500mm 0 1 2 3 4 5m
1:50 SCALE AT A0 SHEET SIZE

1m 0 1 2 3 4 5 6 7 8 9 10m
1:100 SCALE AT A0 SHEET SIZE

2m 0 5 10 15 20m
1:200 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS DATE ISSUE

CLIENT: QUBE; MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
X.C.		AUG '18		A0	AS SHOWN	C013455.04-C422

Costin Roe Consulting Pty Ltd.
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email: mail@costinroe.com.au ©

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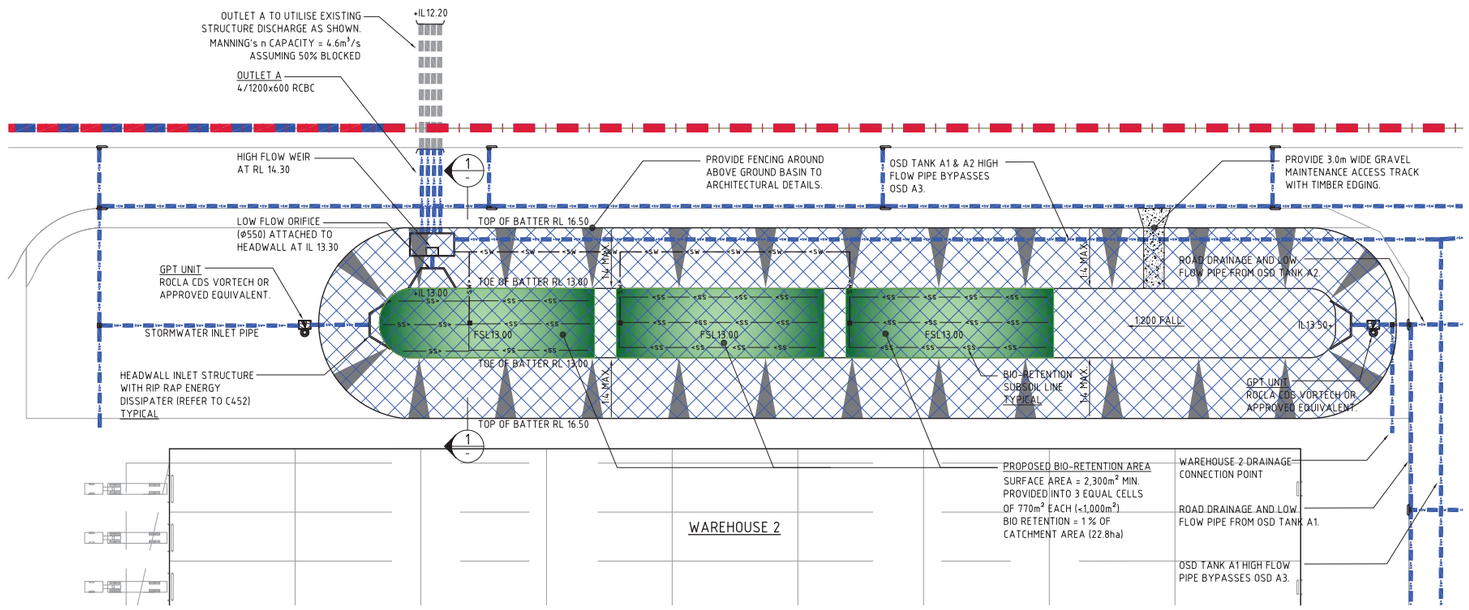
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DETENTION DETAILS SHEET 2

DRAWING No: C013455.04-C422 ISSUE: B



OSD 1 (BASIN A3)
1:500 SCALE

OSD WARNING SIGN
N.T.S
SUGGESTED SIZE 600mm x 450mm
TO BE PROVIDED ADJACENT TO OSD TANKS /OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

CONFINED SPACE SIGN
N.T.S
SUGGESTED SIZE 300mm x 450mm
TO BE PROVIDED ADJACENT TO OSD TANKS / DCP OUTLET PITS IN SUITABLE AREA T.B.C ON SITE

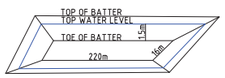
OSD SIGN
N.T.S
SUGGESTED SIZE 110mm x 80mm
TO BE PROVIDED ADJACENT TO OSD TANKS / OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

NOTE:
REFER TO APPENDIX 'N' IN VERSION 4 OF THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) FOR SIGN REQUIREMENTS.

OSD BASIN STORAGE DETAILS

VOLUME PROVIDED 7,000m³

NOMINAL BASIN DIMENSIONS

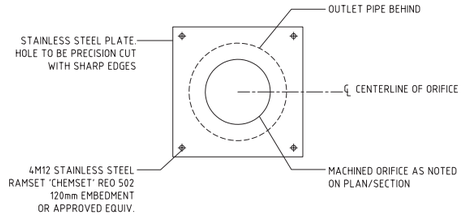


LEGEND:

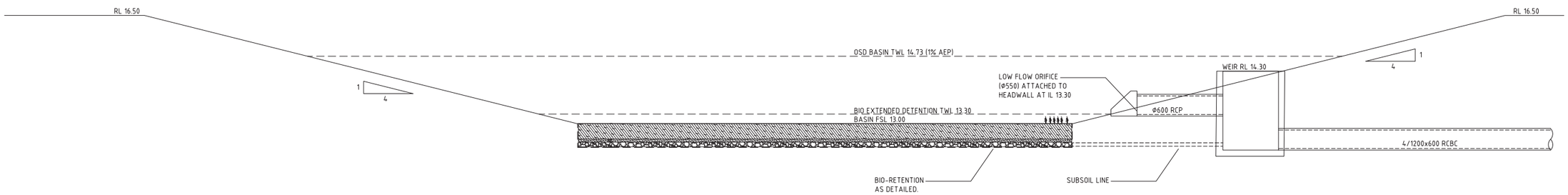
LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY '115804500 REV.22' BY 'CARDNO' DATED 12/10/2017.

- MPE SITE BOUNDARY
- MPE STAGE 2 OPERATIONAL BOUNDARY (SSD 16-7628)
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW PATH (1% AEP FLOW)
- PROPOSED ON SITE DETENTION BASINS
- PROPOSED BIO-RETENTION AREA
- DENOTES 1V:4H BATTER



ORIFICE PLATE DETAIL
SCALE 1:10



SECTION 1:50 (1)

100mm 0 200 400 600 800 1000mm
1:10 SCALE AT A0 SHEET SIZE

500mm 0 1 2 3 4 5m
1:50 SCALE AT A0 SHEET SIZE

1m 0 1 2 3 4 5 6 7 8 9 10m
1:100 SCALE AT A0 SHEET SIZE

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
REVISED FOR UPDATED MPE SITE & STAGE 2 BOUNDARIES	29.10.18	D
ISSUED FOR INFORMATION	12.10.18	C
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

CLIENT: QUBE / MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL
Architecture, Interiors, Project Management
ACN 002 055 861 ABN 28 317 849 870
Level 15, 124 Walker Street
North Sydney NSW 2060 Australia
Tel: 61 02 9954 8011 Email: sydney@reidcampbell.com
Fax: 61 02 9954 4948 Web: www.reidcampbell.com

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
X.C.		AUG '18		A0	AS SHOWN	C013455.04-C423

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
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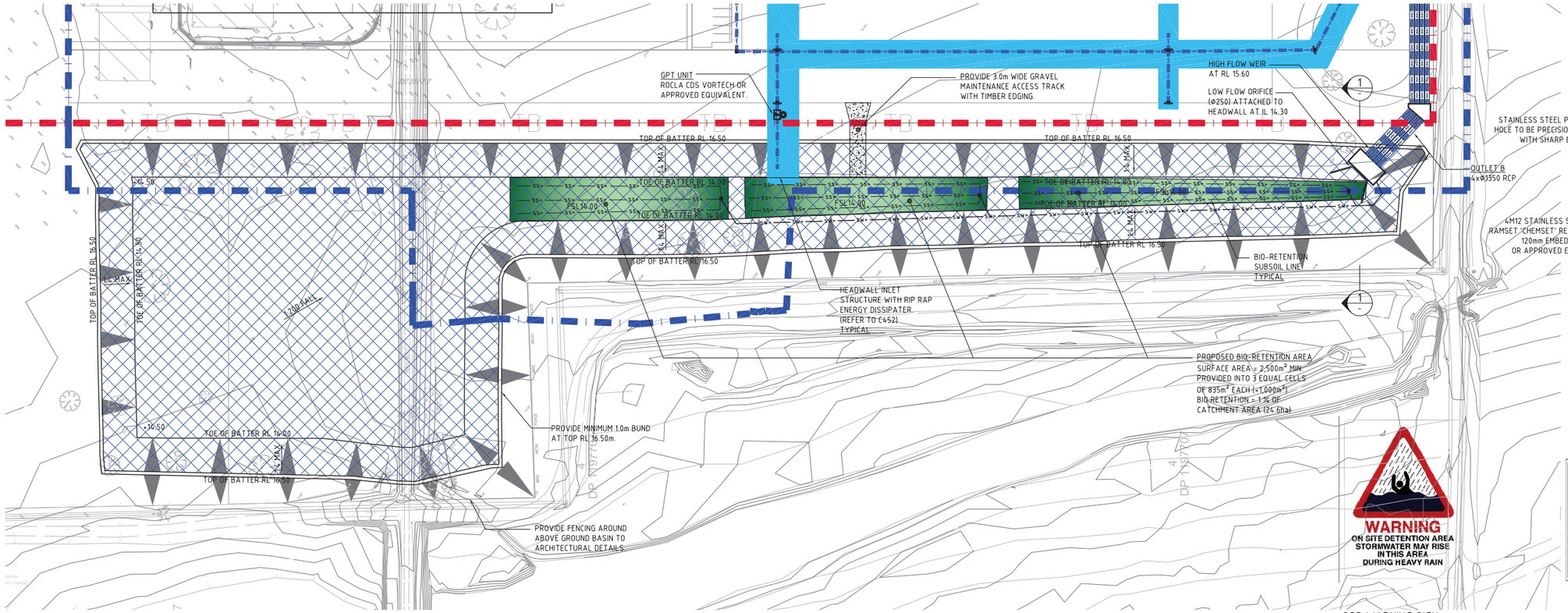
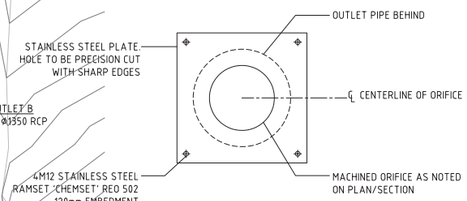
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DETENTION DETAILS SHEET 3

DRAWING No: C013455.04-C423 ISSUE: D





ORIFICE PLATE DETAIL

SCALE 1:10

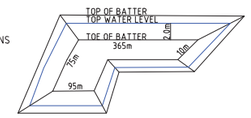
OSD 2 (BASIN B)

1:500 SCALE

OSD BASIN STORAGE DETAILS

VOLUME PROVIDED 24,000m³

NOMINAL BASIN DIMENSIONS



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY '115804500 REV.22' BY 'CARDNO' DATED 12/10/2017.

- MPE SITE BOUNDARY
- MPE STAGE 2 OPERATIONAL BOUNDARY (SSD 16-7628)
- PROPOSED DRAINAGE LINE
- OVERLAND FLOW PATH (1% AEP FLOW)
- PROPOSED ON SITE DETENTION BASINS
- PROPOSED BIO-RETENTION AREA
- DENOTES 1V:4H BATTER

OSD WARNING SIGN

N.T.S
SUGGESTED SIZE 600mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS /OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

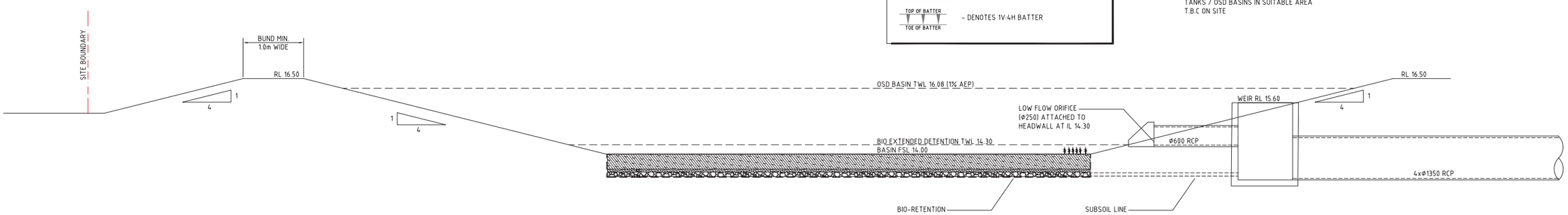
CONFINED SPACE SIGN

N.T.S
SUGGESTED SIZE 300mm x 450mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / DCP OUTLET PITS IN SUITABLE
AREA T.B.C ON SITE

OSD SIGN

N.T.S
SUGGESTED SIZE 110mm x 80mm
TO BE PROVIDED ADJACENT TO OSD
TANKS / OSD BASINS IN SUITABLE AREA
T.B.C ON SITE

NOTE:
REFER TO APPENDIX 'N' IN VERSION 4 OF THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) FOR SIGN REQUIREMENTS.



SECTION 1:50 1

100mm 0 200 400 600 800 1000mm
1:10 SCALE AT A0 SHEET SIZE

500mm 0 1 2 3 4 5m
1:50 SCALE AT A0 SHEET SIZE

1m 0 1 2 3 4 5 6 7 8 9 10m
1:100 SCALE AT A0 SHEET SIZE

5m 0 10 20 30 40 50m
1:500 SCALE AT A0 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
REVISED FOR UPDATED MPE SITE & STAGE 2 BOUNDARIES	29.10.18	C
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

CLIENT: QUBE / MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL
Architecture, Interiors, Project Management
ACN 050 608 803 ABN 28 817 836 874
Level 10, 126 Walker Street
North Sydney NSW 2060 Australia
Tel. 61 02 9961 5011 Email sydney@reidcampbell.com
Fax 61 02 9961 4948 Web www.reidcampbell.com

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST
STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
X.C.		AUG '18		A0	AS SHOWN	C013455.04-G424

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
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Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au

Costin Roe Consulting
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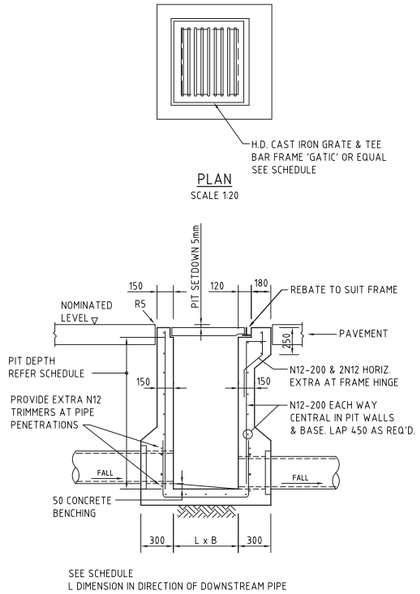
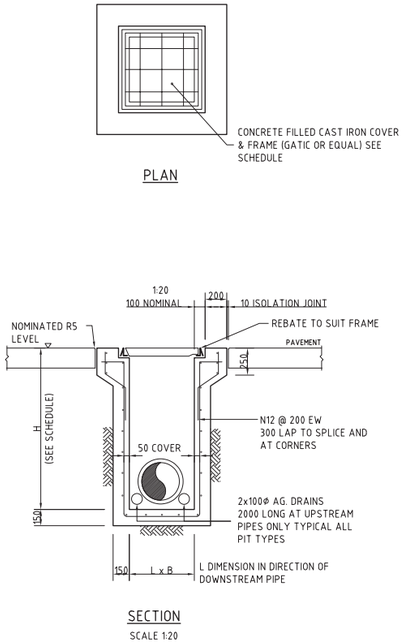
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DETENTION DETAILS SHEET 4

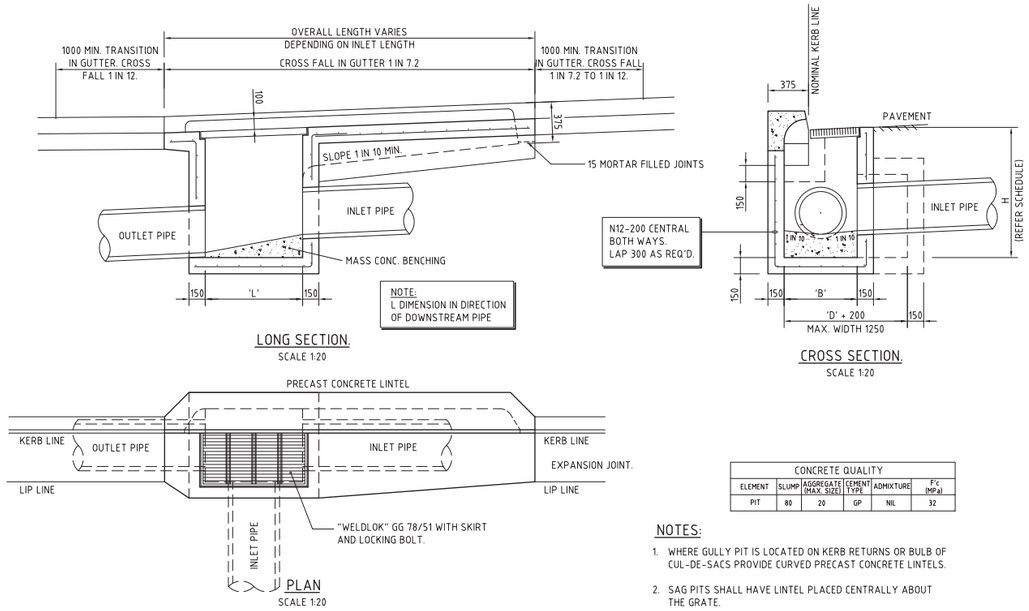
DRAWING No: C013455.04-C424 ISSUE: C



SINGLE GRATED GULLY PIT - SGGP



SEALED JUNCTIONPIT - SJP

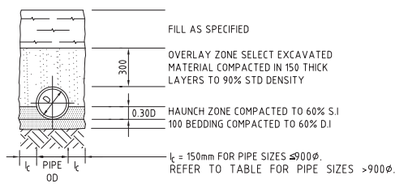


KERB INLET PIT - KIP

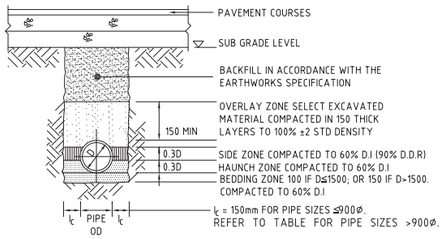
CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	32

NOTES:

1. WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
2. SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
3. ALL REINFORCING TO HAVE 30 MIN. CLAER CONCRETE COVER.
4. FOR PITS DEEPER THAN 1200mm CLIMB RAILS SHALL BE PROVIDED.

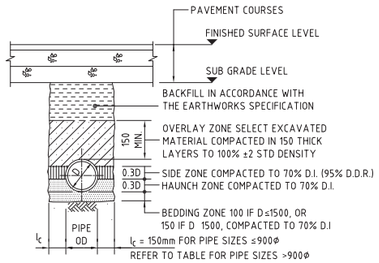


TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS



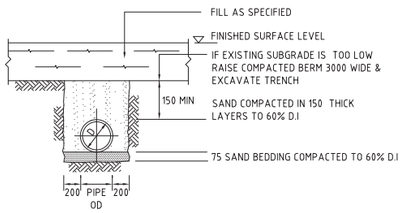
TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

D≤ 1350, MAX FILL = 4.0m
D> 1350, MAX FILL = 3.0m

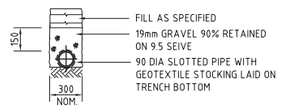


TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20
D ≤1050, MAX FILL = 6.0m
D >1050, MAX FILL = 4.8m



SUPPORT TO uPVC PIPES



SUPPORT TO AG. DRAIN

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 50
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE WIDTH	
PIPE SIZE (mm)	l_t (mm)
≤900Φ	150
1050Φ	175
1200Φ	200
1350Φ	225
1500Φ	250
1650Φ	275
1800Φ	300

ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Φ

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
75.0	100
9.5	100 TO 50
2.36	100 TO 50
0.60	50 TO 15
0.075	25 TO 0

SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725

200mm 0 500 1000 1500 2000mm

SCALE 1:20 AT A0 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS DATE ISSUE

CLIENT: DUBE; MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL Architecture, Interiors, Project Management

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF.
X.C.		AUG '18		A0	AS SHOWN	C013455.04-C451

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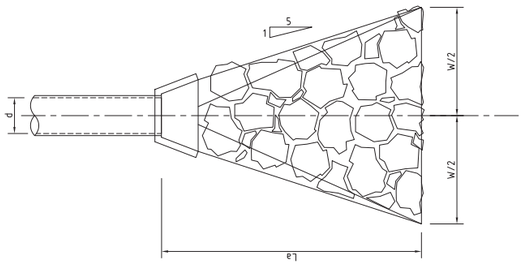
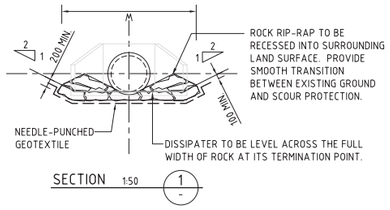
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DRAINAGE DETAILS SHEET 1

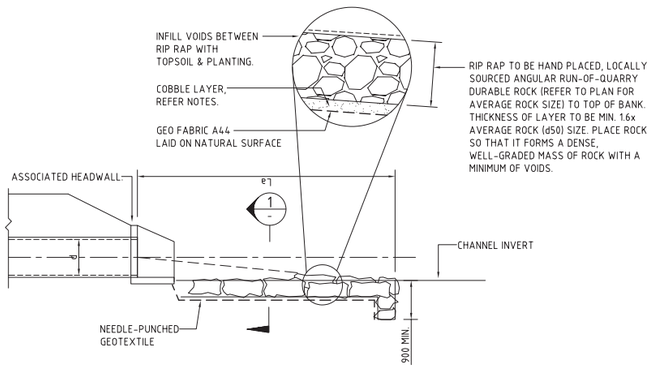
DRAWING No: C013455.04-C451

ISSUE: B





SECTION 1:50 (1)

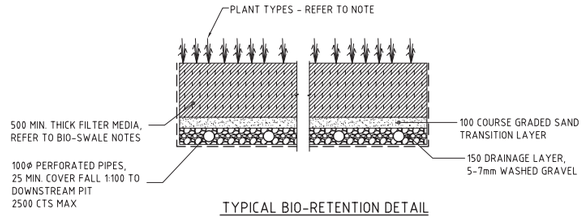


STORMWATER OUTLET DISSIPATER WITH HEADWALL

SCALE 1:50

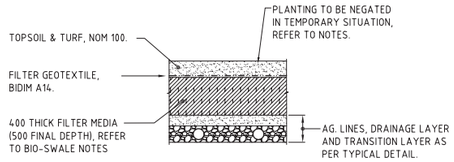
DISSIPATER NOTES:

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= 150mm MINIMUM) AS NOTED ON THE PLAN. 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 A44.
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.



TYPICAL BIO-RETENTION DETAIL

SCALE 1:20



TEMPORARY BIO-RETENTION PROTECTION DETAIL

SCALE 1:20
TEMPORARY CONSTRUCTION REQUIREMENT DETAIL - REFER TO NOTES FOR IMPLEMENTATION PERIODS.

BIO-RETENTION NOTES:

FILTER MEDIA TO BE LOAMY SAND WITH A PERMEABILITY NOT LESS THAN 200mm/hr. FILTER MEDIA TO BE FREE OF RUBBISH, DELETERIOUS MATERIAL, TOXICANTS, DECLARED PLANTS AND LOCAL WEEDS, AND IS TO NOT BE HYDROPHOBIC.

FILTER MEDIA TO HAVE THE FOLLOWING COMPOSITION RANGE:

CLAY & SILT (<0.05mm)	<3%
VERY FINE SAND (0.05-0.15mm)	5-30%
FINE SAND (0.15-0.25mm)	10-30%
MEDIUM TO COARSE SAND (0.25-1.00mm)	40-60%
COARSE SAND (1.0-2.0mm)	7-10%
FINE GRAVEL (2.0-3.4mm)	<3%

FILTER MEDIA THAT DOES NOT MEET THE FOLLOWING CRITERIA SHALL BE REJECTED:

a. ORGANIC MATTER CONTENT TO BE IDEALLY WITHIN 1% TO 3% (W/W) AND TO BE NO GREATER THAN 5%(W/W).
b. PH TO BE BETWEEN 5.5 AND 7.5
c. PHOSPHOROUS CONTENT TO BE NO GREATER THAN 35mg/kg

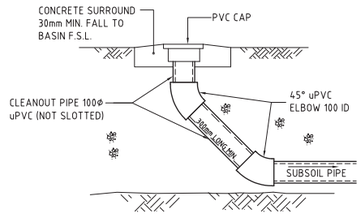
FILTER MEDIA TO BE ASSESSED BY QUALIFIED HORTICULTURALIST TO ENSURE CAPABILITY OF SUPPORTING PLANT LIFE.

DRAINAGE LAYER TO BE CLEAN GRAVEL 5-7mm.

PLANTS TO BE IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL WSUD HANDBOOK PART 5 - VEGETATION SELECTION GUIDE, WITH A MINIMUM OF SIX DIFFERENT SPECIES.

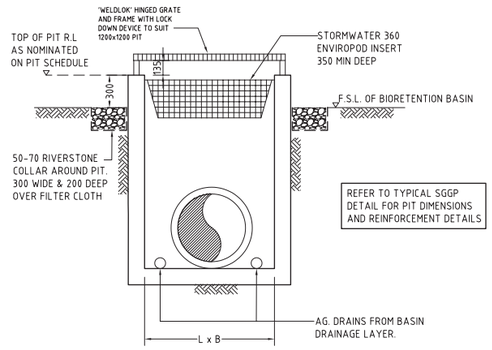
PROVIDE 100mm TOPSOIL AND TEMPORARY EROSION PROTECTION (JUTEMASTER OR EQUIV) TO SWALE BATTER SLOPES AND ADJACENT LANDSCAPED AREAS. NOTE THAT NO TOPSOIL IS TO BE PLACED OVER FILTRATION MEDIA. PROVIDE SILT FENCE TO TOP OF BANK UNTIL SUCH TIME AS THIS STABILISING AND VEGETATION HAS BEEN COMPLETED.

BIO-RETENTION TO BE PARTIALLY INSTALLED, FOLLOWING COMPLETION OF THE ROAD, WITH THE TOP 75-100mm OF FILTER MEDIA REPLACED WITH A FINE TO COARSE SAND UNDERLAIN WITH A GEOTEXTILE LAYER (REFER TO DETAIL). FOLLOWING COMPLETION OF THE UPSTREAM DEVELOPMENT AND SITE STABILISATION, THE SAND IS TO BE REMOVED, REPLACED WITH FILTER MATERIAL AND PLANTED OUT. REFER TO TEMPORARY BIO-BASIN DETAIL



BIORETENTION CLEANOUT EYE ELEVATION

SCALE 1:20
DENOTED C.E. ON PLAN



SECTION
SCALE 1:20

BASIN INLET PIT - BIP

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A0 SIZE SHEET
500mm 0 1 2 3 4 5m
SCALE 1:50 AT A0 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	03.10.18	B
ISSUED FOR INFORMATION	13.09.18	A

AMENDMENTS DATE ISSUE

CLIENT: DUBE, MOOREBANK LOGISTICS PARK

ARCHITECT: REIDCAMPBELL

PROJECT MANAGER: TACTICAL GROUP

PROJECT: MOOREBANK PRECINCT EAST STAGE 2 - BALANCE OF SITE
MOOREBANK AVENUE, MOOREBANK

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
X.C.		AUG '18		A0	AS SHOWN	C013455.04-G52

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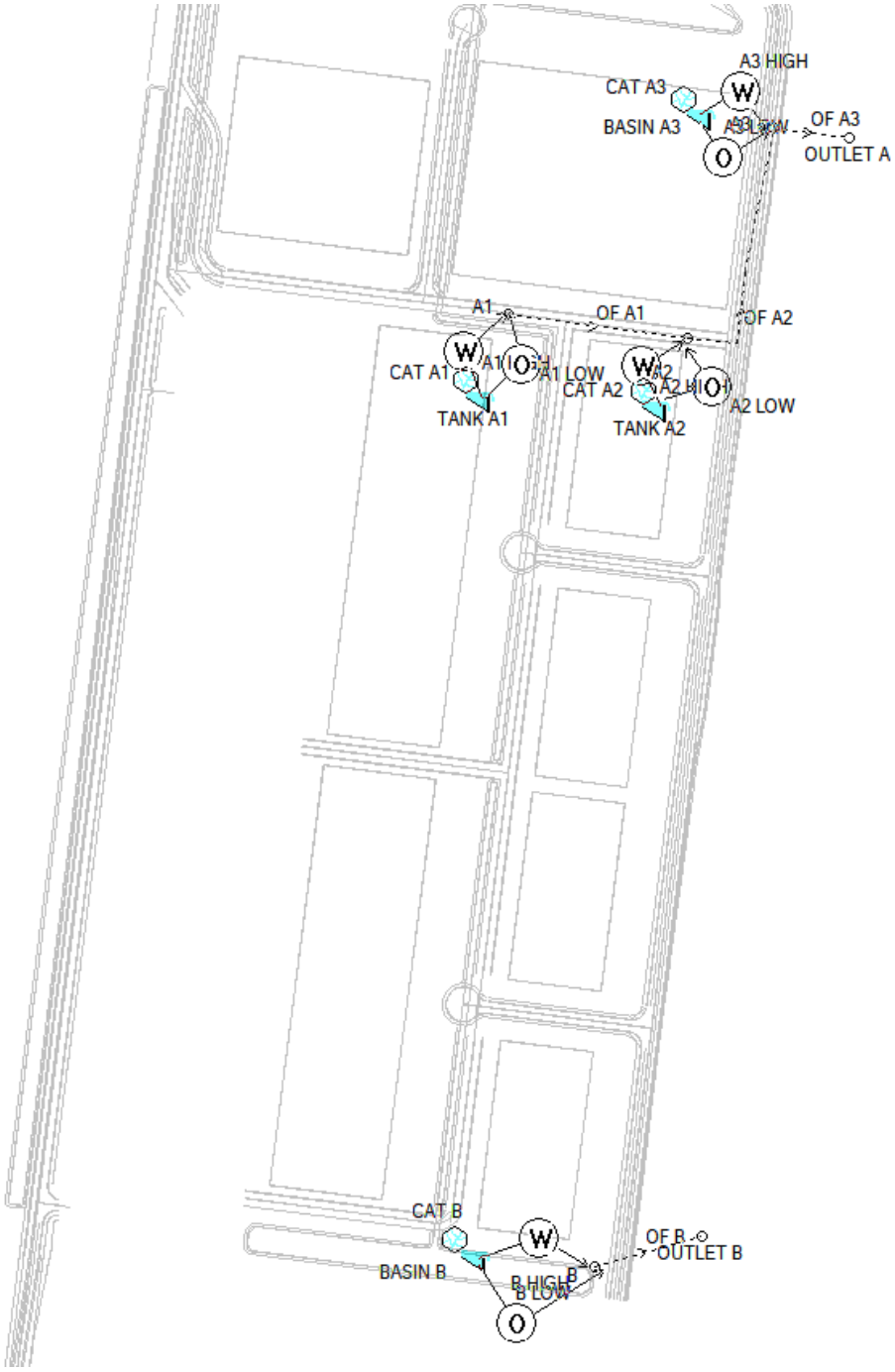
DRAWING TITLE: MPE STAGE 2 - BALANCE OF SITE STORMWATER DRAINAGE DETAILS SHEET 2

DRAWING No: C013455.04-C452 ISSUE: B

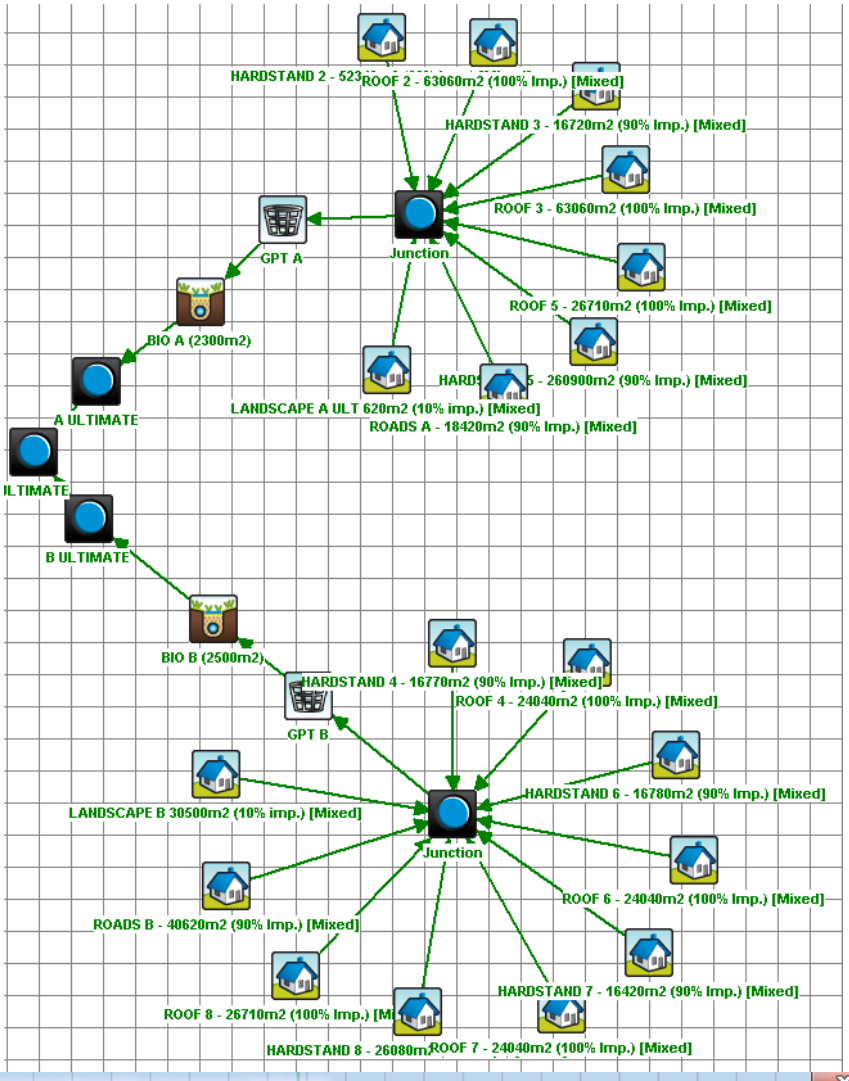
Appendix B

DRAINS MODEL CONFIGURATION



Appendix C

MUSIC MODEL CONFIGURATION



Treatment Train Effectiveness - ULTIMATE

	Sources	Residual Load	% Reduction
Flow (ML/yr)	348	337	3.2
Total Suspended Solids (kg/yr)	59600	6390	89.3
Total Phosphorus (kg/yr)	121	36.6	69.8
Total Nitrogen (kg/yr)	793	403	49.1
Gross Pollutants (kg/yr)	9080	0	100

Appendix D

ROCLA CDS – OPERATION & MAINTENANCE MANUAL

CDS® UNIT TECHNICAL SUMMARY

CAPABILITIES

The CDS® Unit is the most awarded stormwater treatment device. CDS® pioneered the first gross pollutant trap in Australia in 1995 and since then the vast amount of validation and testing performed in Australia and overseas has led to both local and international leadership. Rocla Water Quality has a highly skilled design team devoted to improving stormwater quality. This dedication has made the CDS® Gross Pollutant Trap (GPT) the most efficient, cost effective and easy to clean GPT on the market.

Some the key parameters of the CDS® Units are summarised below;

Features	Benefits
Continuously Deflective Screen	- This insures the screen does not block. - Screens don't require cleaning or maintenance.
Vortex force	- The vortex aids the screen cleaning and draws the waste into the centre and down to the storage sump away from the treatment area.
Screening Chamber	- The sheer plane created by the screen between the vortex flow action keeps the screen clear of trapped pollution to ensure continuous and max treatment performance. - The flow regime in the screening chamber avoids re-suspension and wash-outs of stored pollutants.
Optional Maintenance Procedures	- Can be fully isolated from flow. - Doesn't require confined space entry. - Choice of the most effective cleaning process for the application.
Fixed weir	- Guarantees maximum treatment flow is diverted into screening chamber including all neutrally buoyant material.
Design Service	- Life cycle cost analysis. - Installation supervision. - Stormwater quality assessment. - Complete hydraulic assessment.
Continuous field validation.	- Provide design information for industry on the ability of CDS® Units to meet the latest developments and future demands in stormwater quality.
Design Flexibility	- Can customise designs to suit most applications.
Off-line storage	- Does not allow stored waste to be re-suspended. - Keeps the storage area isolated from the screening area, allowing for continuous and maximum treatment.

TECHNOLOGY

The CDS® Unit utilises the energy of the inflow to create a vortex flow regime within the CDS® screening chamber.

The stormwater inflow is introduced tangentially to the screening chamber via a customised inlet chute. The vortex motion within the screen chamber provides a continuous circular flow that directs the pollutants away from the screen towards the centre. This low energy zone is where most of the pollutants lose buoyancy and sink into the storage sump below.

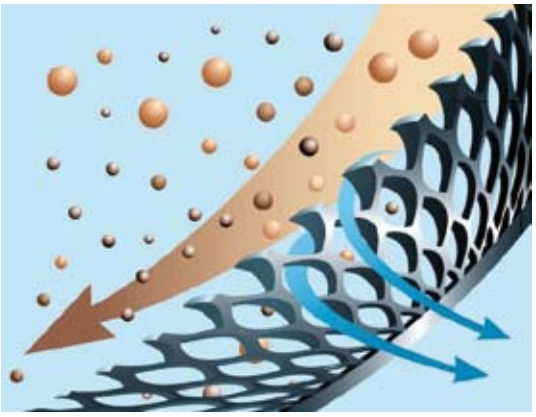


Figure 1: CDS® Unit deflective screen operation

The specially designed deflective screen shields the apertures from the pollution in rotational flow, which improves treatment operation and performance efficiency (as shown in Figure 1). The screen design along with the tangential flow and vortex forces provides all the benefits of a vortex separator and a physical filter without their limitations.

The CDS® Unit simply creates a whirlpool that draws all the deflected and settling pollutants to the centre of the screening chamber where they fall out into the storage sump below.

The pollutant storage sump located below the screening chamber allows pollutants to be removed from the flow path and away from the screens, thus maintaining a reliable treatment efficiency.

The unique CDS® technology is the most reliable way to effectively and efficiently treat gross pollutants in stormwater drainage systems.

FEATURES

The standard CDS® Unit design incorporates the key features shown in Figure 2.

Flexible Diversion chamber:

CDS® Units can be installed on pipe, culvert and open channel drainage systems.

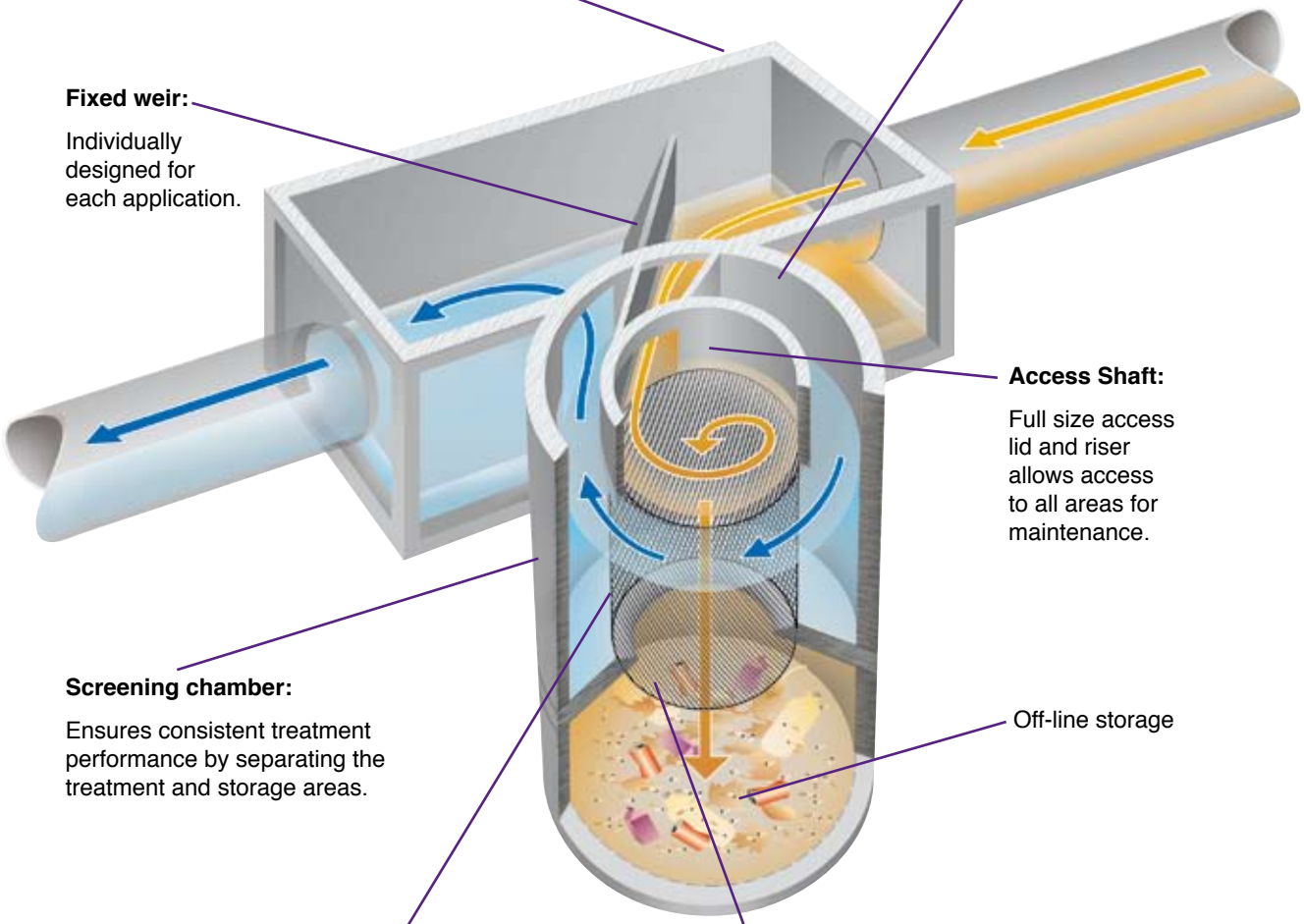
Every diversion chamber is designed to safely by-pass maximum flows.

Diversion chamber can be supplied as precast chambers, slab chambers or box culverts.

Off-line treatment

Fixed weir:

Individually designed for each application.



Access Shaft:

Full size access lid and riser allows access to all areas for maintenance.

Screening chamber:

Ensures consistent treatment performance by separating the treatment and storage areas.

Off-line storage

Deflective screens

Optional Removable Basket:

Flexible storage options allow the most economic and effective maintenance solutions to be utilised.

Figure 2: Key features of CDS® Units

CDS® UNIT PERFORMANCE

Since the inception of CDS® Units, performance has been the highest design imperative. The performance of CDS® Units has been an integral part of shaping stormwater quality standards worldwide. CDS® Units confidently achieve stormwater quality benchmarks even when markets can be focused on less important aspects of stormwater treatment. CDS® Units provide asset owners a high level of trust in stormwater treatment effectiveness and reliability. They can consistently achieve the following stormwater quality parameters:

CAPTURE EFFICIENCY

The screens in a standard CDS® Unit have a 4.7mm aperture, however, due to the deflective nature plus the vortex motion, 95% of material down to 1mm is captured. Although CDS® Units are designed as GPTs it is common to capture high volumes of particles less than 1mm as well. The specific pollutant groups targeted by a CDS® Unit are described following:

Gross pollutants (>5mm)

As per Allison 1996, "Field monitoring suggests that CDS® Units are efficient gross pollutant traps. During the 12 months of monitoring, practically all gross pollutants transported by the stormwater were trapped by the CDS® device".

As per CRCCH 1999 "The CDS® Unit can remove nearly all gross pollutants and a significant proportion of finer pollutants, particularly during storms".

As per CSIRO 1999: Circular Screens (CDS®) were the only category (device) to rate a Very High performance of over 90%. All other devices failed to meet this standard.

Fine particles

As per Portland State University 2002: "the experimental results show that the CDS® Unit generally removed over 95% of particles greater than 215 microns with screen apertures of both 2400microns and 4700 microns."

As per Sansalone Summary 2004: "the CDS® Unit was trapping over 90% of particles down to 75 microns." Also, capture of this particle size range was noted to contain approximately 80% of the heavy metals.

Suspended solids (excluding everything >1mm)

The common definition of Total Suspended Solids (TSS) excludes particles greater than 1mm. In accordance with this, TSS removal rates of CDS® Units exclude gross pollutants, organics, coarse sediment and any particles greater than 1mm. But most importantly the TSS removal rates of CDS® Units have been consistently field validated.

As per Sansalone Summary 2004: there was a notable net removal of particles less than 75 microns by the CDS® Unit. NJCAT removal of 49% TSS (better than any other GPT).

As per CRCCH 1999: "The CDS® trap removes a considerable amount of TSS above background concentrations during storm events, with a mean removal efficiency of approximately 70%".

As per Brevard County 1997: "Monitoring has shown the CDS® Unit has provided an average 52% removal efficiency for total suspended solids".

It is worth noting that devices which store Total Suspended Solids (TSS) in the treatment chamber are highly susceptible to re-suspension and loss.

Nutrients (Phosphorus)

Nutrient removal rates of CDS® Units show a correlation with sediment removal. Independent validation shows insoluble nutrient forms such as Phosphorous (P) are also reliably captured.

As per Brevard County 1997: "Monitoring has shown the CDS® Unit has provided…. 31% removal efficiency for phosphorus".

CRCCH 1999: "The CDS®… consistently retains TP, thought to be because P is in particulate form, with a mean removal efficiency of approximately 30%".

Sansalone Summary 2004: "There was a nett positive removal for TP for all events, with an averaged removal of over 30%".

Oil grease retention

As with nutrient capture there is also a high correlation of oils and grease removal with sediment capture in CDS® Units.

UCLA have reported 50-80% of oil and grease may be attached to sediments.

Hoffman 1982: "Our data confirm the observations of the workers in that hydrocarbons are primarily associated with particulate material (83 – 93%)".

CRCCH 1999: "Colwill found 70% of oil and approximately 85% PAH to be associated with solids in stormwater. That study subsequently demonstrated that over a period of dry weather conditions, increasing concentrations of oil become associated with particulates with the highest oil content found in the sediment range of 200μm to 400μm.

CSIRO 1999: In the category of "attached pollutants" CDS® Units were the only GPT device to even be considered capable of capturing anything.

CDS® Units can also capture free floating oil spills. However, when most of the oil is associated with fine particulates and sediments, CDS® Units remove very high levels of oils and greases due to their very high capture rate of those fine particles. Further information on oil removal can be provided upon request.

CAPTURE PERFORMANCE SUMMARY

A summary of the CDS® Unit performance parameters is outlined in Table 1 below;

Pollutant / Items	Removal Efficiency	Independent Reference Source
Suspended Solids (TSS)	70 %	CRCCH Report 99/2 Feb 1999
Total Phosphorous (TP)	30 %	CRCCH Report 99/2 Feb 1999
Total Nitrogen (TN)	0 %	Scattered results
Gross Pollutants (>5mm)	98 %	CRCCH Report 98/3 Apr 1998
Sediments>0.215mm	95 %	Portland State Uni, Oregon Oct 02
Fine sediment> 75 microns	90 %	Louisiana State University 2004
Heavy Metals	80 %	Louisiana State University 2004
Hydrocarbons, Oils & Grease	82-94 %	UCLA Report 1998

Table 1: CDS® Unit performance summary

ENVIRONMENTAL IMPACT

Anaerobic breakdown is a natural process involving the decay of organic material in drainage pipe systems. However, conventional treatment design practice prefers this process to occur in the CDS® Unit rather than the downstream drainage system. This way the decaying pollution can be more cost effectively controlled and removed from the stormwater system.

Dry sump treatment options do not remove the silts and finer sediments that contain higher stormwater contaminant loads. Therefore these treatment options do not contain the decaying process of these more volatile stormwater contaminants resulting in a less cost effective pollution removal and less environmental benefits.

The ability of the CDS® Unit to remove both coarse and fine organic material results in much better environmental and more cost-effective pollution removal gains.

The volume of a wet sump GPT is very minor in comparison to the volume of water in any one storm event. This means that together with the dilution and aeration of water in the GPT during a storm event the impact of water on a receiving stream would typically not even be measurable. Furthermore the odour generating potential of stormwater is minimal and no odour can be detected outside the CDS® Unit under normal conditions. More information on this subject can be provided upon request.

HYDRAULIC IMPEDANCE (HEAD LOSS)

Rocla Water Quality can provide hydraulic assessment for each project in order to ensure the hydraulic grade line (HGL) remains below ground level for the design storm event. If the HGL is determined to be approaching surface level, multiple options to avoid or minimise this situation are available. The worst case headloss condition is always used in hydraulic assessments of CDS® Units. The worst case K factor of a CDS® Unit is 1.3, which is equally the lowest validated K factor for a stormwater treatment device.

INDEPENDENT (MOSTLY UNSOLICITED) TESTING AND VALIDATION STUDIES OF CDS® UNITS HAVE BEEN PERFORMED BY:

- Allison, 1996
- Wong, 1997
- Brevard County, 1997
- Water Resources Management, 2003
- Cooperative Research Centre for Catchment Hydrology, 1999
- Monash University,
- Portland University, 2002
- Louisiana State University, 2004
- University of California LA
- University of NSW
- NSW Environment Protection Authority, 1997
- Willoughby Council
- Brisbane City Council
- Thiess Environmental Services

Full copies of any of the reports mentioned above are available upon request.

CDS® DESIGN

DESIGN PRINCIPLE

The design of a CDS® Unit for a specific catchment involves numerous parameters and is generally divided into two main steps. The first step in determining the suitability of a specific CDS® model is to consider the catchment and pollution load and the second is a hydraulic assessment.

STEP 1: Catchment Parameters and pollution load

The first step includes considering the following parameters:

- Catchment area;
- Site location and depth to invert;
- Tidal influence or other backwater influence;
- Treatable flow and its relation to the volumetric treatment efficiency;
- Target pollutants and land use;
- Treatment performance;
- Expected pollution loads; and
- Storage volume to minimise lifecycle costs.

Sometimes these parameters have competing project priorities and compromises are required. The CDS® Unit design can account for these and still provide high quality quantifiable treatment outcomes.

However, the CDS® Unit is generally sized on a flow volume basis, therefore the design aim is to treat a sufficient volume of the annual flow and remove a sufficient amount of pollution to meet a project's requirements.

The flow volume is based on the CDS® Unit having a reliable treatment flowrate which in turn means that the CDS® Unit will treat this flowrate in all events. The flowrate can be relied upon because of the Non-blocking functionality of the CDS® screen and the separate treatment/storage zones which provides the ability to treat runoff continuously. Thereby ensuring the stated pollution load is removed from the drainage system.

The patented CDS® Unit offers the most reliable treatable flowrate of any GPT because of these two unique design features. Very high volumetric treatment efficiencies are maintained consistently by lowering the likelihood of blockages as well as treating and storing stormwater pollutants in separate zones.

When using MUSIC modeling the treatment efficiencies of the CDS® Unit provides the highest integrity and most reliable design for stormwater quality treatment. Therefore no safety factors need to be applied to CDS® Unit treatment performance data shown in Table 1.

STEP 2: Hydraulic Analysis

Once a suitable CDS® model has been chosen for the catchment, step two is undertaken, the hydraulic analysis. This step determines whether the CDS® model chosen based on catchment and pollution characteristics will suit the hydraulic capacity of the drainage system. This step will also determine the most suitable position of the CDS® Unit.

Due to the headlosses involved with treating stormwater through any GPT, a weir needs to be installed in the drainage system to divert flow and maintain an energy level difference between the upstream and downstream side of the treatment device. Hydraulic weirs and floating weirs do not provide reliable flow diversion, therefore Rocla Water Quality prefer fixed weirs as best practice.

The hydraulic analysis takes the following important hydraulic parameters into consideration:

- The existing capacity of the drainage system (either closed or open system);
- Physical parameters of existing drainage system such as pipe or channel size and grade etc;
- Tidal influence or other backwater influence;
- Design flow of the system (Q20 or similar);
- Flow velocity;
- Flooding at the site; and
- Other site constraints or opportunities such as multiple pipes, drops, bends or multiple outlets for stormwater harvesting.

Rocla Water Quality uses a variety of design tools to determine the impact on the chosen site of any proposed CDS® Unit. The tool chosen will depend on the drainage system characteristics such as whether or not the system is open or closed and the geometry of the system.

Generally, Manning's equation is used to determine the capacity of the system if sufficient information on drainage geometry and grade is available. In open channel systems, HEC-RAS can be used to determine hydraulic capacity if sufficient information is available to create a reliable model.

The CDS® Unit diversion weir chamber and weir can function in three general ways, these are:

1. Free weir
2. Submerged weir
3. Orifice

It should be noted that Rocla Water Quality utilises the most conservative approach when calculating the depth of water flow over a weir. Sound hydraulic theory and analysis is used to assess proposed CDS® Unit installations on drainage systems. This ensures that it has been designed with sufficient bypass for the capacity or other nominated design events at the location of the weir.

Rocla Water Quality also has the option of using a lower weir with a twin unit arrangement, drop weirs, collapsible weirs, super collapsible weirs, and flume weirs. Where possible the use of moving parts such as a collapsible weir is avoided. Rocla Water Quality do not use hydraulic weirs or weirs incorporating assumptions on kinetic energy since these have proved false and unreliable in the field.

The diversion chamber design assumes that the CDS® Unit has not been maintained and that all flow must divert over the weir. This is the worst case design condition and this K factor of 1.3 for the CDS® Unit is one of the lowest available.

CONSTRAINTS

For any given site, the opportunity to treat the stormwater could be limited by a number of factors, these include:

- Site hydraulics
- Velocity impact
- Tidal or backwater levels
- Access for construction, and/or ongoing maintenance
- Geotechnical considerations such as rock, water or acid sulphate soils
- Physical obstacles such as property boundaries, roads, services, etc
- Budgetary limitations

When any of these factors are prevalent, Rocla Water Quality has more options and solutions than any other proprietor, and always consults with the Designer to find a solution. This can commonly require some compromises, but ultimately it will offer the most cost effective solution for any given site. It is often recommended to visit proposed GPT sites to canvas all available options in consultation with clients.

Following is a list of the more common CDS® Unit design options available;

- Multiple pipe configurations
- Bends and drops
- Various weir options (as per above)
- Extended inlets
- Tidal units with dual inlets
- Stormwater harvesting units with dual outlets
- Pump-down units (dry trap)
- Ex-filtration units (dry trap)
- Sump options (width and depth)
- Baskets
- Screen sizes
- Oil baffle volumes
- Multiple lid options
- Low flow polishing device (upflow media filter at CDS® Unit outlet)
- Multiple cleaning options
- Incorporation of penstocks and drop boards
- Exclusion bars
- Multiple CDS® Unit arrangements

DESIGN CERTIFICATION

CDS® Units have no moving parts, and are manufactured from tough corrosion resistant materials.

A operational life of 50 years for the 316 grade stainless steel and 80 years for the concrete could be expected under standard operating conditions.

The pre-cast concrete components of CDS® Units comply generally with the following Australian Standards, where relevant:

- **AS3600-2001** Concrete structures
- **AS3725-1989** Loads on buried pipes
- **AS3996-1992** Metal access covers, road grates and frames
- **AS4058-1992** Precast concrete pipes (pressure and non-pressure)
- **AS5100.2-2004** Bridge design, Part 2: Design Loads
- **AS5056-2005** Polyethylene and polypropylene pipes and fittings for drainage and sewer applications.

By following these Australian Standards requirements structural integrity is ensured. Additionally, CDS® Units are not affected by ground water buoyancy effects.

Rocla Water Quality have extensive technical resources supporting the CDS® Unit product range. Each model is supplied with a technical drawing including weights and dimensions, or a site specific design usually encompassing a set of drawings, and we provide a comprehensive installation instruction and maintenance manual for each unit. Standard CDS® Unit drawings are available upon request.

CDS® Units can be modified to suit applications. Sump storage sizes are listed on technical drawings. Penstocks, dewatering options, baskets and a variety of diversion options are available on request to suit virtually any application. These modifications are designed by the Rocla Water Quality design staff to ensure peak hydraulic performance, maximum maintenance and cleaning periods and flood risk elimination.

CDS® UNITS INSTALLATION

This information is provided as general guidance to assist with the installation of CDS® Unit Gross Pollutant Traps.

It is the purchaser's responsibility to ensure that installation work is carried out by competent tradespeople in accordance with all relevant drawings, codes of practise, legislation and regulations.

MODEL IDENTIFICATION

2018 L

The Screen Dia is 2.0 metres	The Screen Height is 1.8 metres	The Circular Treatment Chamber is to the LEFT of the pipe or channel

Check that the CDS® Unit model supplied is that which is specified on the project drawing and that the relevant Rocla Water Quality Operation and Maintenance manual has been provided.

INSTALLATION SUMMARY

CDS® Unit models generally consist of two main sections, the Diversion Chamber which is on line (in relation to the drainage system), and the treatment device which is off line and situated to one side of the diversion chamber.

However, for the P0506, P0708 and P0708 MAXI CDS® Unit models the diversion chamber is an integral part of the CDS® device. Hence there is only one section for these models.

When provided, the diversion chamber may be configured in several different ways for which there are separate guides. The customer should refer to the specific project drawings provided for detailed advice on these options.

The following is a general outline of the construction procedures and relevant reference literature;

ORDER	WORK PROCEDURE	REFERENCE
1	Site works and set out	CDS® Unit Model Operation & Maintenance manual
2	Excavate for CDS® Unit	
3	Construct CDS® Unit	
4	Fitting out	
5	Excavate for diversion chamber	Diversion Chamber Guide
6	Construct diversion chamber	
7	Backfilling and lids	Both Guides
8	Waste Removal Basket (if fitted)	Basket Guide

Ensure that all of the required reference manuals and guides are provided and understood before installation is commenced.

TYPICAL COMPONENTS

Diversion Chamber

The type of diversion chamber used will vary with the type of drainage system.

Typically a pre-cast diversion chamber is supplied. However slab chambers may be supplied or an in-situ option specified for the diversion chamber. Therefore refer to the specific project drawing to ensure that all the relevant manuals have been supplied.

Typical precast components for CDS® Unit models (not including diversion chamber) are as follows:

- Sump
- Shear Cone
- Lower Separation Chamber
- Upper Separation Chamber
- Top Hat
- "L" shaped Outlet Wall

Additional pre-cast concrete items that may be required include:

- Access shaft risers (One or more of varying length may be supplied depending on depth required)
- Prefabricated Screen cage

Assembly aids which also may be required and are delivered on a pallet include:

- Fibreglass Inlet Chute
- "H" brackets for assembling major components
- Right Angle Brackets for fixing the access riser
- Angle brackets for fixing screen cage to shear cone
- Bolts and Dynabolts for all the above
- Assorted sealants as required
- Fish plate brackets

CDS® UNITS MAINTENANCE

Whilst the frequency of cleaning will be dependant upon the pollutant loads of each catchment, there are three alternative methods of removing the collected waste from CDS® Units.

The following methods of cleaning can be used individually on any CDS® Unit, even well after installation.

This is a very significant feature that allows asset owners to choose the cheapest option available for ongoing maintenance given the required cleaning frequency and the respective cleaning services and resources available.

The three maintenance options available are described following:

1. MECHANICAL GRAB CLEANING

Cleaning by grab can be carried out without dewatering the unit and is a single person operation in most locations.

This results in a cleaning technique which is generally faster, cheaper and safer. It also allows a visible inspection of the pollution that was captured, as opposed to suction that doesn't. No physical entry is required.

2. BASKET REMOVAL CLEANING

If a waste removal basket is fitted, it can be lifted at any time, without the need for dewatering. Also it provides a safe and cost effective method of cleaning. The cost benefit of this option depends on the CDS® Unit design and on waste disposal requirements. No physical entry is required.

3. SUCTION CLEANING

Due to the dewatering time, costs and disposal of the water, suction cleaning is generally the most expensive cleaning option. However by taking advantage of the large sump volumes available in CDS® Units, it may still be a very cost effective maintenance option.

Suction cleaning is used for most proprietary GPT's. Even if a more cost effective method is used at shorter intervals, suction cleaning is recommended for CDS® Units at one to two year intervals so that a thorough inspection of the screen and lower chambers can be carried out. Physical entry may or may not be required.

Normally a CDS® Unit would be sized with an appropriate sump volume to allow cleaning 3 or 4 times per year. These maintenance cleans would be carried out either by using a basket or a grab, with a single comprehensive clean per year completed by suction.

The best option for any particular unit will depend on tidal or backwater impact, pollution load and cleaning frequency as well as access and disposal costs for pump-down water.

CDS® Units may sometimes be required to use penstocks to isolate the unit during maintenance operations. This would be essential where a unit is affected by backwater and/or high levels of tidal inundation.

The main benefit of removable baskets is their speed and ease of cleaning, particularly in tidal zones. But the storage basket must be smaller than the screen to allow its removal. As such, the volume in a basket will be less than that of a large sump CDS® Unit volume.

Consequently, whilst it may be cheaper, cleaning removable baskets might also be required 4 or 5 times more often.

For larger CDS® Units, the grab truck cleaning option offers the removal of 80 – 90% of the pollution stored in a sump and is subjected to similar constraints as the removable basket option.

When considering GPT maintenance costs and procedures, the three maintenance options of CDS® Units offer greater operational flexibility and low life-cycle cost considerations.

More general GPT maintenance decision methodology information is available in the CDS® Unit Operation and Maintenance manuals or upon request.

Appendix E

SSD 7628 Consent Conditions

Development Consent

Section 89E of the Environmental Planning and Assessment Act 1979

As delegate for the Minister for Planning under delegation executed on 14 September 2011, the Planning Assessment Commission (the Commission) of New South Wales, grants consent to the Development Application referred to in Schedule 1 except for the subdivision component of the Application under section 80(4)(b), subject to the conditions in Schedule 2.

These conditions are required to:

- prevent, minimise, or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the development.

Annabelle Pegrum AM **Member of the Commission**	Steve O'Connor **Member of the Commission**	Peter Duncan AM **Member of the Commission**

Sydney 31 January 2018

SCHEDULE 1

Application Number:	SSD 7628
Applicant:	SIMTA
Consent Authority:	Minister for Planning
Site:	Lot 1 DP1048263 Part Lots 1, 2 and 4 DP 1197707 Moorebank Avenue
Development:	Construction and operation of Stage 2 of the SIMTA Concept Plan comprising: • Earthworks including the importation of 600,000m3 of fill and vegetation clearing. • Approximately 300,000m^2 GFA of warehousing and ancillary offices. • Warehouse fit-out. • Freight village, with 8,000m^2 GFA of ancillary retail, commercial and light industrial land uses. • Internal road network and hardstand across site. • Ancillary supporting infrastructure within the site, including: – stormwater, drainage and flooding infrastructure – utilities relocation/installation – fencing, signage, lighting, remediation and landscaping. • Moorebank Avenue upgrade including: – raising by about two metres and some widening – embankments and tie-ins to existing Moorebank Avenue road levels – signalling and intersection works.

- Intersection upgrades along Moorebank Avenue including:
  - Moorebank Avenue/MPE Stage 2 access
  - Moorebank Avenue/MPE Stage 1 northern access
  - Moorebank Avenue/MPE Stage 2 central access
  - MPW Southern Access/MPE Stage 2 southern emergency access.
- Operation 24 hours a day, seven days per week.

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DEFINITIONS

Aboriginal object	Has the same meaning as the definition of the term in section 5 of the NP&W Act
Aboriginal place	Has the same meaning as the definition of the term in section 5 of the NP&W Act
ANZECC water quality guidelines	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 Guidelines)
Applicant	SIMTA, or any other person carrying out any development to which this consent applies
Approved disturbance area	The area within the site boundaries indicated in APPENDIX A, and not including any clearing the southern and eastern swales located outside of the MPE site
Ancillary facility	A temporary facility for construction of the project including, but not limited to an office and amenities compound, construction compound, material crushing and screening plant, materials storage compound, maintenance workshop, testing laboratory and material stockpile area
Austroads guidelines/ requirements	The relevant Guides issued from time to time by Austroads
ARI	Average Recurrence Interval
BCA	Building Code of Australia
Best Practice	Best practice is commensurate with reasonable and feasible practices that are accepted or prescribed by the relevant regulatory agency and implemented within the industry
Building height (or height of building)	(a) in relation to the height of a building in metres—the vertical distance from ground level (existing) to the highest point of the building, or (b) in relation to the RL of a building—the vertical distance from the Australian Height Datum to the highest point of the building, including plant and lift overruns, but excluding communication devices, antennae, satellite dishes, masts, flagpoles, chimneys, flues and the like.
CEMP	Construction Environmental Management Plan
CIV	Capital Investment Value (for the purpose of calculating the Section 94 contribution this excludes the Moorebank Avenue upgrade)
Conditions of this consent	The conditions contained in Schedule 2 of this document
Consolidated assessment clarification responses	*MPE Stage 2 (SSD-7628) – Consolidated assessment clarification responses*, prepared by Arcadis, dated 10 November 2017
Construction	The carrying out of construction works for the purpose of the development, including earthworks, and erection of buildings and other infrastructure permitted by this consent, other than the low impact work defined as Early Works. However, where heritage items, or threatened species, populations or ecological communities (within the meaning of the EP&A Act) are affected or potentially affected by any low impact work, that work is construction, unless otherwise determined by the Secretary in consultation with OEH or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation)
Council	Liverpool City Council
Day	The period from 7 am to 6 pm on Monday to Saturday, and 8 am to 6 pm on Sundays and public holidays
Department	NSW Department of Planning and Environment
Development	The development described in the EIS and Submissions Report, as modified by and subject to the conditions of this consent, excluding subdivision.
Development layout	The updated plans required as a condition of this approval
DCP	Development Control Plan
DDA	Disability Discrimination Act 1992
DPI	NSW Department of Primary Industries
Early Works	Site preparation works including:

	(a) establishment of site access points; (b) installation of temporary site fencing; (c) remediation, where required, including unexploded ordnance (UXO), exploded ordnance (EO) and exploded ordnance waste (EOW) management; (d) survey; acquisitions; or building/ road dilapidation surveys; (e) establishment of site compounds; (f) installation of environmental mitigation measures; (g) heritage archival monitoring and recording (h) heritage salvage; (i) clearing of non-native vegetation; (j) importation, stockpiling and placement of 60,000 m3 of spoil; (k) utilities adjustment and relocation that do not present a significant risk to the environment, as determined by the Environmental Representative; and (l) other activities determined by the Environmental Representative to have minimal environmental impact
Earthworks	Bulk earthworks, site levelling, import and compaction of fill material, excavation for installation of drainage and services
EIS	The Environmental Impact Statement submitted with the development application, titled *Moorebank Precinct East - Stage 2 Proposal: Environmental Impact Statement*, prepared by Arcadis, dated December 2016
ENM	Excavated Natural Material as defined under the Excavated Natural Material Order 2014 or subsequent orders issued by the EPA under the Protection of the Environment Operations (Waste) Regulation 2014
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
EPL	An Environment Protection Licence as defined in the POEO Act
Evening	The period from 6 pm to 10 pm
FR NSW	Fire and Rescue NSW
Floor space ratio	Ratio of the gross floor area of all buildings within the site to the site area
Gross floor area	The sum of the floor area of each floor of a building measured from the internal face of external walls, or from the internal face of walls separating the building from any other building, measured at a height of 1.4 metres above the floor, and includes the area of a mezzanine, but excludes: (a) any area for common vertical circulation, such as lifts and stairs, and (b) any basement: (i) storage, and (ii) vehicular access, loading areas, garbage and services, and (c) plant rooms, lift towers and other areas used exclusively for mechanical services or ducting, and (d) car parking to meet any requirements of the consent authority (including access to that car parking), and (e) any space used for the loading or unloading of goods (including access to it), and (f) terraces and balconies with outer walls less than 1.4 metres high, and (g) voids above a floor at the level of a storey or storey above.
Harm	to the environment includes any direct or indirect alteration of the environment that has the effect of degrading the environment and, without limiting the generality of the above, includes any act or omission that results in pollution, and such harm will be material if: (a) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or (b) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)
Heavy vehicle	A vehicle that has a combined Gross Vehicle Mass or Aggregate Trailer Mass of more than 4.5 tonnes

Heritage item	An Aboriginal object, an Aboriginal place, or a place, building, work, relic, moveable object, tree or precinct of heritage significance that is listed under any of the following: the State Heritage Register under the *Heritage Act 1977*, a state agency heritage and conservation register under section 170 of the *Heritage Act 1977*, a Local Environmental Plan under the EP&A Act, the World Heritage List, or the National Heritage List or Commonwealth Heritage List under the *Environment Protection and Biodiversity Conservation Act 1999*, or anything identified as a heritage item under the conditions of this consent
ICNG	Interim Construction Noise Guideline (EPA 2009)
IECA	International Erosion Control Association
Independent	Independent reviewer must not: (a) be related to the Applicant (other than being engaged to undertake the review), owner, operator or other entity involved in the project. Such a relationship includes that of employer/employee, a business partner/ship, sharing a common employer, a contractual arrangement outside the review, or family (b) have any pecuniary interest in the project, proponent or related entities (other than being reimbursed for undertaking the review). Such an interest includes the likelihood or expectation of financial gain or loss to the reviewer, or to a person to whom the reviewer is closely related (i.e. immediate family) (c) have provided services to the project within the last five years (not including expert reviews).
INP	Industrial Noise Policy (NSW EPA 2000)
IMT	Intermodal terminal
Incident	An occurrence or set of circumstances that causes, or threatens to cause material harm. *Note: "material harm" is defined in this consent*
Land	Has the same meaning as the definition of the term in section 4 of the EP&A Act
Management & Mitigation Measures	The management and mitigation measures set out in APPENDIX B
Material harm	is harm that: • involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)
Minister	NSW Minister for Planning (or delegate)
NP&W Act	*National Parks and Wildlife Act 1974*
Night	The period from 10 pm to 7 am on Monday to Saturday, and 10 pm to 8 am on Sundays and public holidays
Non-compliance	An occurrence, set of circumstances or development that results in non-compliance or is non-compliant with this consent but is not an incident
NML	Noise Management Level
OEH	Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
Operation	Operation of the development (whether in full or in part) for its intended purpose, excluding the following activities carried out during construction: • commissioning trials of equipment; • temporary use of any part of the development; and • maintenance works
OSD basin	Onsite Detention basin
Out of hours stockpile area	A stockpile area approved by the Secretary for placement of spoil during out of hours importation
p.a.	Per annum
POEO Act	*Protection of the Environment Operations Act 1997*

Reasonable	Means applying judgement in arriving at a decision, taking into account mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Registered Aboriginal Parties	Means the Aboriginal persons identified in accordance with the document entitled "*Aboriginal cultural heritage consultation requirements for proponents 2010*" (DECCW)
Relevant Council	Liverpool City Council or Liverpool and Campbelltown Councils where works and activities have the potential to impact both LGAs.
RBL	Rating Background Level
RFS	NSW Rural Fire Service
RMS	Roads and Maritime Services
RNP	NSW Road Noise Policy (DECCW 2011)
Secretary	Secretary of the Department, or nominee
Sensitive receiver	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises), and others as identified by the Secretary
Site	The land listed in Schedule 1
Site Auditor	Has the same meaning as the definition of the term in section 4 of the *Contaminated Land Management Act 1997*
Site Audit Report	Has the same meaning as the definition of the term in section 4 of the *Contaminated Land Management Act 1997*
Site Audit Statement	Has the same meaning as the definition of the term in section 4 of the *Contaminated Land Management Act 1997*
Site Fill	Includes importation, stockpiling and placement of fill to establish development finished surface levels within the MPE site and for the upgraded Moorebank Avenue
Spoil	Includes site fill, VENM and ENM
Submissions report	The Response to Submissions (RtS) report submitted to the Secretary under the EP&A Act comprising a response to written submissions made during the public exhibition period of the EIS, dated July 2017
TfNSW	Transport for New South Wales
TEU	Twenty-foot Equivalent Unit
Threatened Species	Species, populations and ecological communities listed under the *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
TSC Act	Threatened Species Conservation Act 1995 (note that transitional provisions relate to this application)
UDLP	Urban Design and Landscape Plan
Unexpected Find	Any unexpected find that has consequences for the project and/ or requires further assessment including unexpected services, contaminated soil or sediments, unexploded ordnance (UXO), heritage items and threatened or thought to be extinct flora and fauna species
Updated BAR	Updated Biodiversity Assessment Report (*Moorebank Precinct East - Stage 2 Proposal: Biodiversity Assessment Report*, prepared by Arcadis, dated November 2017)
VEMN	Virgin Excavated Natural Material as defined under the *Protection of the Environment Operations Act 1997*
VPA	Voluntary Planning Agreement
Waste	Has the same meaning as the definition of the term in the Dictionary to the POEO Act
WAD	Works Approval Deed
WSUD	Water Sensitive Urban Design

w/w	Weight per weight

SCHEDULE 2

PART A

ADMINISTRATIVE CONDITIONS

OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

A1. In addition to meeting the specific performance measures and criteria established under this consent all reasonable measures must be implemented to prevent, and if prevention is not reasonable, minimise, any harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under this consent.

TERMS OF CONSENT

A2. The development may only be carried out:
(a) in compliance with the conditions of this consent;
(b) in accordance with all written directions of the Secretary in relation to this consent;
(c) in accordance with the EIS, Submissions Report, Consolidated assessment clarification responses, and updated Biodiversity Assessment Report;
(d) in accordance with the amended Development Layout Plans and Design Plans, amended WSUD plans and amended architectural plans to be submitted for the Secretary's approval as part of this consent; and
(e) in accordance with the management and mitigation measures at APPENDIX B of this consent.

A3. The Secretary may make written directions to the Applicant:
(a) as a result of the Department's assessment of any strategy, plan, program, review, audit, notification, report or correspondence submitted under or in relation to this consent;
(b) as a result of the Department's assessment of any review, report or audit undertaken or commissioned by the Department regarding compliance with this consent or in relation to an incident (whether notified to the Department or not); and
(c) in relation to the implementation of any actions or measures contained in any of the documents listed in condition A2.

A4. The conditions of this consent and directions of the Secretary prevail to the extent of any inconsistency, ambiguity or conflict between them and a document listed in condition A2(c) or A2(e). In the event of an inconsistency, ambiguity or conflict between any of the documents listed in condition A2(c) and A2(e), the most recent document prevails to the extent of the inconsistency, ambiguity or conflict. For the purpose of this condition, there will be an inconsistency between documents if it is not possible to comply with both documents, or in the case of a condition of consent or direction of the Secretary and a document, if it is not possible to comply with both the condition or direction and the document.

LIMITS OF CONSENT

A5. This consent lapses five years after the date from which it operates, unless the development has physically commenced on the land to which the consent applies before the date on which the consent would otherwise lapse under section 95 of the EP&A Act.

A6. The total volume of spoil to be imported, including fill required to raise Moorebank Avenue and spoil imported during early works must not exceed 600,000m^3.

A7. No works are permitted within the Defence Joint Logistics Unit site under this approval.

A8. The container freight road volume must not exceed 250,000 TEUs p.a., subject to the exception identified in condition A9, which may only be considered under condition A9 after the facility has been in operation.

A9. The movement of container freight by road may exceed the 250,000 TEU limit p.a. by up to a further 250,000 TEU p.a., if the Secretary is satisfied that traffic monitoring and modelling of the operation of the facility demonstrate that traffic movements resulting from the proposed increase in TEU will achieve the objective of not exceeding the capacity of the transport network.

A10. In determining the TEU limit, the Secretary may take account any roadworks or mitigation measures proposed under a Voluntary Planning Agreement to minimise traffic impacts.

A11. The maximum GFAs for the following uses apply:
(a) 300,000m^2 for the warehousing and distribution facilities; and
(b) 8,000m^2 for the freight village.

A12. The warehousing and distribution facilities must only be used for activities associated with freight using the MPE Stage 1 rail intermodal terminal.

A13. Freight village tenants and occupations are restricted to those activities that provide:
(a) ancillary support for the development, its tenants, worker population and visitors;
(b) a nexus with activities undertaken in relation to the warehouse, logistics functions of the IMT development and/or;
(c) provide aligned services to the intermodal functions.

Prior to occupancy of any freight village tenancy, and every subsequent occupation of these tenancies, details of the tenant and occupation activity is to be submitted to the Secretary demonstrating that the proposed activity complies with this condition.

STAGED SUBMISSION OF STRATEGIES, PLANS OR PROGRAMS

A14. With the approval of the Secretary, the Applicant may submit any strategy, plan or program required by this consent on a staged basis.

A15. If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program.

COMBINED SUBMISSION OF STRATEGIES, PLANS OR PROGRAMS

A16. With the approval of the Secretary, any strategy, plan or program required by this consent may be combined.

A17. In seeking the Secretary's approval, a clear relationship must be demonstrated between the strategies, plans or programs that are proposed to be combined.

NOTIFICATION OF COMMENCEMENT

A18. The date of commencement of each of the following phases of the development must be notified to the Department, at least one month before that date:
(a) early works;
(b) fill importation;
(c) construction;
(d) operation; and
(e) occupation.

If the construction, operation or occupation of the development is to be staged, then the Applicant must notify the Department in writing at least one month before the commencement of each stage, and clearly identify the development to be carried out in that stage.

EVIDENCE OF CONSULTATION

A19. Where conditions of this consent require a document to be prepared in consultation with an identified party, the Applicant must:
(a) consult with the relevant party prior to submitting the subject document to the Secretary for approval;
(b) provide evidence that at least two weeks was provided for the relevant party to comment on the document; and
(c) include in the document:
  (i) details of the consultation undertaken;
  (ii) a description of how matters raised by those consulted have been resolved to the satisfaction of both the Applicant and the party consulted; and
  (iii) details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.

STATUTORY REQUIREMENTS

A20. All licences, permits, approvals and consents as required by law must be obtained and maintained as required for the development. No condition of this consent removes the obligation for the Applicant to obtain, renew or comply with such licences, permits, approvals and consents.

DEMOLITION

A21. All demolition work must be carried out in accordance with the latest version of *Australian Standard AS 2601-2001: The Demolition of Structures* (Standards Australia, 2001) and the requirements of the *Work Health and Safety Regulation 2011*.

DESIGN MASTER PLANS

A22. Prior to construction, the Applicant must prepare amended **Development Layout Plans and Design Plans** to the satisfaction of the Secretary which achieve the improvements and revisions referred to in conditions B140 and B141, including integration of Water Sensitive Urban Design (WSUD) and landscape design.

Water Sensitive Urban Design

A23. Prior to commencement of early works and fill importation, the Applicant must prepare amended **WSUD plans** that incorporate water sensitive urban design principles, be generally in accordance with relevant Council policies, plans and specifications, and address condition B40, to ensure that:

(a) the stormwater and drainage systems for the development will operate independently of any works proposed as part of the MPW Stage 2 development application (SSD 7709) that have not been incorporated in this development, unless development consent has been granted to those works under SSD 7709 prior to commencement of early works and fill importation;

(b) adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% ARI rainfall event;

(c) on site detention basins are visually unobtrusive,

(d) that the design of the basins, and ,associated setbacks and fencing, ensures public safety;

(e) adequate site area has been provided for stormwater treatment;

(f) design of stormwater treatment systems minimises the risk of failure; and

(g) setback of drainage work and fencing has been finalised in consultation with RMS.

Architectural Plans

A24. Prior to commencement of permanent built surface works and/or landscaping, the Applicant must prepare amended **architectural plans** that reflect updated plans required under the conditions.

ACCESS FOR PEOPLE WITH A DISABILITY

A25. The siting, design and construction of premises available to the public are to ensure an appropriate level of accessibility so that all people can enter and use these premises. Access is to meet the requirements of the Disability Discrimination Act 1992, relevant Australian Standards and Building Code of Australia (BCA)

STRUCTURAL ADEQUACY

A26. All new buildings and structures, and any alterations or additions to existing buildings and structures, that are part of the development must be constructed in accordance with the relevant requirements of the BCA.

Note:

- *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
- *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development.*

UTILITIES AND SERVICES

A27. Before the construction of any utility works associated with the development, approvals required from service providers must be obtained.

A28. Prior to operation of the development, a compliance certificate for water and sewerage infrastructure servicing of the site under section 73 of the *Sydney Water Act 1994* must be obtained.

PROTECTION OF PUBLIC INFRASTRUCTURE

A29. Before the commencement of construction, the Applicant must:

(a) consult with the relevant owner and provider of utility services that are likely to be affected by the development to make suitable arrangements for access to, diversion, protection, and support of the affected infrastructure;

(b) prepare a dilapidation report identifying the condition of all public infrastructure between the M5 and the site and any local roads identified in the Heavy Vehicle Route Plan required under condition B2 (including roads, gutters and footpaths); and

(c) submit a copy of the dilapidation report to the Secretary and Council.

A30. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:

(a) repair, or pay the full costs associated with repairing any public infrastructure that is damaged by carrying out the development; and

(b) relocate, or pay the full costs associated with relocating any infrastructure that needs to be relocated as a result of the development.

LOCAL DEVELOPMENT CONTRIBUTIONS

A31. Prior to the issue of a Construction Certificate, the Applicant must pay a monetary levy of 1% of the development Capital Investment Value ($3,577,900) or other amount agreed to by Liverpool City Council for transport, drainage, community facilities, administration and professional and legal fees pursuant to section 94B(2) of the EP&A Act 1979.

OPERATION OF PLANT AND EQUIPMENT

A32. All plant and equipment used at the site or to monitor the performance of the development must be:

(a) maintained in a proper and efficient condition; and
(b) operated in a proper and efficient manner.

PART B

ENVIRONMENTAL PERFORMANCE AND MANAGEMENT

B1. The Applicant must:
(a) prepare each plan, program and other documents in consultation with the specified stakeholders;
(b) not commence each phase of the project until the plans, programs and other documents required under this consent are approved by or, where not required to be approved, submitted to the Secretary specified within the timeframes; and
(c) implement the most recent version of the required plans and programs approved by the Secretary for the duration of the development.

TRAFFIC AND TRANSPORT

Traffic and Access

B2. Prior to commencement of early works and construction, the Applicant must prepare a **Construction Traffic and Access Management Plan** (CTMP) to the satisfaction of the Secretary. The Plan must form part of the CEMP required by condition C1 and must:
(a) be prepared by a suitably qualified and experienced person whose appointment has been endorsed by the Secretary;
(b) be prepared in consultation with Council, TfNSW and RMS;
(c) include details of all transport routes and traffic types to be used for development-related traffic, access and parking arrangements;
  (i) include a protocol for undertaking dilapidation surveys to assess the existing condition of the transport routes prior to construction works; and
  (ii) condition of the transport routes following construction works;
(d) include a protocol for the repair of any roads identified in the dilapidation surveys to have been damaged during construction and demolition works;
(e) include details of:
  (i) staging of construction works;
  (ii) construction vehicle routes;
  (iii) heavy vehicle movements associated with spoil and demolition material transport off-site;
  (iv) construction traffic generation;
  (v) hours of construction;
  (vi) parking for workers; and
  (vii) access arrangements.
(f) include a Heavy Vehicle Route Plan detailing:
  (i) the origin and destination of spoil / fill and demolition material; and
  (ii) details of the heavy vehicle routes to and from the site within the Campbelltown and Liverpool Local Government Areas (LGAs).
(g) include details of the measures to be implemented to minimise traffic safety issues and disruption to local road users including pedestrians / cyclists during construction works, including:
  (i) temporary traffic controls, including detours and signage;
  (ii) how two lanes of traffic on Moorebank Avenue will be available at all times during construction (unless otherwise approved by RMS);
  (iii) temporary traffic controls, including detours and signage;
  (iv) notifying the local community about development-related traffic impacts;
  (v) responding to any emergency repair requirements or maintenance during construction; and
  (vi) a traffic management system for managing over sized vehicles.
(h) include a driver's code of conduct that requires:
  (i) compliance with specified travelling speeds;
  (ii) drivers to adhere to specified transport routes, including no access from Cambridge Avenue; and
  (iii) drivers to implement safe driving practices.
(i) include a program to monitor the effectiveness of these measures; and
(j) detail procedures for notifying residents and the community (including local schools), of any potential disruptions to transport routes.

B3. The Applicant must:
(a) not commence early works or construction until the Construction Traffic Management Plan required by condition B2 is approved by the Secretary; and
(b) carry out the development in accordance with the most recent version of the Construction Traffic Management Plan approved by the Secretary,

B4. A Road Occupancy Licence is to be obtained from the Transport Management Centre for any works that may impact on traffic flows on Moorebank Avenue or the adjoining State road network during construction activities.

B5. A construction zone will not be permitted on Moorebank Avenue without the express approval of RMS.

B6. All demolition and construction vehicles must be contained wholly within the site and vehicles must enter the site before stopping.

B7. All vehicles are to enter and leave the site in a forward direction.

B8. All trucks entering or leaving the site with loads must have their loads covered and must not track dirt onto any public road.

Road Safety Audit

B9. Prior to commencement of any importation of site fill, the Applicant must undertake a Road Safety Audit for heavy vehicle movements associated with the importation of fill, for construction vehicle swept paths in and out of the development site via the proposed temporary construction access points along Moorebank Avenue, and for motorists and construction vehicle movements along Moorebank Avenue during the staged road upgrade works identified in condition B13.

The Road Safety Audit is to be prepared by an independent TfNSW accredited road safety auditor in accordance with the relevant Austroads guidelines to identify any safety issues. The Road Safety Audit must consider road safety issues for the proposed construction access arrangements and affected vehicle movements during upgrade works on Moorebank Avenue.

The Applicant must recommend corrective actions for the identified safety issues and propose appropriate traffic management measures (i.e. temporary traffic signals and other traffic management measures) in consultation and with the approval of the relevant Council, TfNSW and RMS.

Site Access and Layout Design Plans

B10. The swept path of the longest vehicle entering and exiting the subject site, as well as manoeuvrability through the site, must be in accordance with Austroads requirements.

Prior to commencement of construction on permanent infrastructure a plan must be submitted to the Secretary and RMS for approval, which shows that the proposed development complies with this requirement.

B11. The layout of the proposed car parking areas associated with the subject development (including driveways, grades, turn paths, sight distance requirements in relation to landscaping and/or fencing, aisle widths, aisle lengths, and parking bay dimensions) must be in accordance with *AS2890.1-2004 Parking facilities Off-street car parking*, *AS2890.6-2009 Parking facilities Off-street parking for people with disabilities* and *AS2890.2-2002 Parking facilities Off-street commercial vehicle facilities* for heavy vehicle usage.

B12. The development is to be designed so that:
(a) all vehicles are wholly contained on site before being required to stop;
(b) adequate parking for heavy vehicles is provided on-site to accommodate any potential delays in schedule time;
(c) all loading and unloading of materials is carried out on-site; and
(d) site roads accommodate buses, bus infrastructure and cyclist use for employees.

Road Infrastructure Upgrades

B13. The Applicant is to undertake the following upgrades, in accordance with the specified timing requirements, as set out in **Table 1**.

Table 1: Required Upgrades and Specified Timing Requirements

Upgrade	Specified Timing Requirements		
	Upgrade requirements	Required timing for 100% design approval by RMS	Required timing for completion of upgrade
Moorebank Avenue / M5 Motorway intersection	• Indicative layout to be provided by Applicant, subject to design development and approval by RMS	To be obtained prior to the issue of the first Occupation Certificate for warehousing	Prior to issue of the first Occupation Certificate for warehousing in excess of 100,000m^2, or no later than December 2020, or a later date as agreed with the Secretary of Transport for NSW

Newbridge Road / Moorebank Avenue intersection	• Indicative layout to be provided by Applicant, subject to design development and approval by RMS	To be obtained prior to the issue of the first Occupation Certificate for warehousing	By December 2022
Moorebank Avenue / Heathcote Road intersection	• As strategically described for intersection I-5 Moorebank/Heathcote Road (page 76, MPE Stage 2 EIS Operational Traffic and Transport Impact Assessment) • Heathcote Road bus jump lane must be retained or a bus jump lane of equivalent length replaced by the Applicant. • Indicative layout provided by Applicant, subject to design development and approval by RMS	To be obtained prior to the issue of the first Occupation Certificate for warehousing	By December 2022
Moorebank Avenue Upgrade, being the upgrade of Moorebank Avenue to four lanes between Anzac Avenue and the IMEX Terminal Main access point	• Indicative layout provided by Applicant, subject to design development and approval by RMS, and incorporating a bicycle/pedestrian share lane	To be obtained within 12 months of the date of this consent, or prior to the issue of the first Occupation Certificate for warehousing, whichever is the sooner	Prior to issue of an Occupation Certificate for warehousing in excess of 100,000m2 of gross floor area

B14. A Works Authorisation Deed(s) (WAD) with RMS is to be executed by the Applicant for the infrastructure listed in condition B13 prior to the issue of the first Occupation Certificate for warehousing.

B15. Traffic Control Signal (TCS) plans must be drawn by a suitably qualified person and endorsed by a suitably qualified practitioner. The designs submitted to RMS must be in accordance with *Austroads Guide to Road Design* in association with relevant RMS supplements (available on www.rms.nsw.gov.au).

B16. RMS fees for administration, plan checking, civil works inspections and project management must be paid by the Applicant prior to the commencement of works. The Applicant may be required to dedicate land for the maintenance of the traffic control lights. Further details will be included in the WAD process.

B17. The proposed road upgrade, road raising and widening works by the Applicant along Moorebank Avenue must be designed to meet RMS requirements, and endorsed by a suitably qualified person(s). The design requirements must be in accordance with Austroads guidelines and other Australian Codes of Practice.

B18. The works associated with traffic lights and road upgrade works detailed in condition B13 are to be designed and delivered at no cost to TfNSW or RMS unless otherwise agreed by TfNSW and RMS.

B19. The Applicant is responsible for all works required by public utility adjustment/relocation works necessitated by the road infrastructure upgrade works and as required by the various public utility authorities and/or their agents.

B20. All works/ regulatory signposting associated with the road infrastructure upgrades must be approved by RMS.

Moorebank Avenue Public Road Dedication

B21. The Applicant is to procure the dedication as public road under the *Roads Act 1993* of part of the existing Moorebank Avenue (i.e. part of Lot 2 DP 1197707) and any associated land required for the road widening or upgrades between the southern boundary of the Defence Joint Logistics Unit site (Lot 3 DP 1197707) and Anzac Avenue.

B22. The Applicant is to procure the dedication as "temporary public road" under the *Roads Act 1993* of the balance of the existing Moorebank Avenue (and any associated land required for the road widening or upgrades) that is owned by the Commonwealth and is not required to be dedicated under condition B21.

B23. The Moorebank Avenue road dedications required by conditions B21 and B22 must occur prior to the first Construction Certificate for any road works on Moorebank Avenue, unless otherwise agreed by the Secretary of Transport for NSW.

B24. The Applicant must pay all costs incurred by Council and/or RMS in relation to conditions B21 and B22.

Operating Traffic

B25. The Applicant must ensure:

(a) internal roads, driveways and parking (including grades, turn paths, sight distance requirements, aisle widths, aisle lengths and parking bay dimensions) associated with the development are constructed and maintained in accordance with the latest version of AS 2890.1:2004 Parking facilities Off-street car parking (Standards Australia, 2004) and AS 2890.2:2002 Parking facilities Off-street commercial vehicle facilities (Standards Australia, 2002);
(b) the final configuration of the internal road network is established and available for use prior to occupation of the freight village or any warehousing;
(c) the swept path of the longest vehicle entering and exiting the site, as well as manoeuvrability through the site, is in accordance with the relevant Austroads guidelines;
(d) the development does not result in any vehicles queuing on the public road network;
(e) heavy vehicles and bins associated with the development are not parked on local roads or footpaths in the vicinity of the site;
(f) all vehicles are wholly contained on site before being required to stop;
(g) all loading and unloading of materials is carried out on-site;
(h) all trucks entering or leaving the site with loads have their loads covered and do not track dirt onto any public road; and
(i) the proposed turning areas in the car park are kept clear of any obstacles, including parked cars, at all times.

Operational Traffic and Access Management Plan

B26. The Applicant must prepare an **Operational Traffic and Access Management Plan** to the satisfaction of the Secretary. The Plan is to be developed in consultation with the relevant Council, TfNSW and RMS. The plan must be approved by the Secretary prior to the commencement of operation.

The Plan must be prepared by a suitably qualified and experienced person(s), and must:
(a) demonstrate how the development will be managed during operation to meet the requirements of this development consent;
(b) detail numbers and frequency of truck movements, sizes of trucks, vehicle routes and hours of operation;
(c) detail access arrangements for the site to ensure road and site safety, and demonstrate there will be no queuing on the road network;
(d) detail measures to ensure turning areas and internal access roads are kept clear of any obstacles, including parked cars, at all times;
(e) set out procedures for collecting the information required to prepare the **Biannual Trip Origin and Destination Report** required under condition B28;
(f) incorporate the Workplace Travel Plan as required under condition B29;
(g) include a driver's code of conduct that requires:
  (i) compliance with specified travelling speeds;
  (ii) drivers to adhere to specified transport routes including no access from Cambridge Avenue; and
  (iii) drivers to implement safe driving practices.
(h) include a program to monitor the effectiveness of these measures.

B27. The Operational Traffic and Access Management Plan required by condition B26 must be implemented by the Applicant for the duration of operations.

B28. The Applicant is to prepare a Biannual Trip Origin and Destination Report each six months following commencement of any operation (in a format agreed with TfNSW and RMS) that advises:
(a) the number of actual and standard twenty foot equivalent shipping containers despatched and received during the period;
(b) the number of days in the period that the truck gate was open for despatching trucks 24 hours a day, 7 days a week and detail any exceptions to this and advise actual hours of operation;
(c) records of vehicle numbers accessing the site; and
(d) representative vehicle origins and destinations, based on a cordon in the surrounding network.

A framework for recording and reporting on the data required for the report, prepared to the satisfaction of TfNSW and RMS, is to be submitted to the Secretary three months prior to the commencement of operation.

The report is to be submitted within one month of its preparation throughout operation of the project, starting six months from the commencement of operation, unless otherwise agreed by the Secretary, TfNSW and RMS.

The cordon count at (d) above will:
- apply to all classes of vehicles; and
- cover the intermodal terminal, the warehousing facility and any other uses such as the freight village.

Workplace Travel Plan

B29. Prior to the issue of any Occupation Certificate, the Applicant must prepare a **Workplace Travel Plan** to the satisfaction of the Secretary.

The Workplace Travel Plan must form part of the Operational Traffic and Access Management Plan required by condition C3, and must:

(a) be prepared in consultation with TfNSW;
(b) outline facilities and measures to promote public transport usage, such as car share schemes and employee incentives;
(c) describe pedestrian and bicycle connections and linkages to and from the site from Moorebank Avenue and within the site including between warehouses and the freight village;
(d) describe end of trip facilities available on-site which must include under cover bike storage, showers and change facilities - the layout, design and security of bicycle facilities must comply with the minimum requirements of *Australian Standard AS 2890.3 – 1993 Parking Facilities Part 3: Bicycle Parking Facilities*; and
(e) include the results of negotiations with the relevant agencies/ authorities as required to facilitate the staged delivery of the public transport infrastructure including:
  (i) construction of a covered bus drop off/ pick up facility within the site to encourage the use of buses for employees;
  (ii) review and rationalisation of the locations of Route 901 bus stops in the vicinity of the site to match the proposed northern terminal entry location and enhance accessibility;
  (iii) peak period and SIMTA shift work responsive express buses to /from the site and Liverpool Station via Moorebank Avenue and Newbridge Roads with frequency dependent on the development of the site;
  (iv) peak period express buses to/ from the site and Holsworthy rail station via Anzac Road, Wattle Grove Drive and Heathcote Road with frequency dependent on the development of the site;
  (v) potential to extend the Route 901 bus through the site via the light vehicle road and increasing peak period bus service frequencies to better match the needs of existing and future employees of the locality with frequency dependent on the extent of development of the site; and
  (vi) changes to existing bus stop locations and the identification of new bus stop locations if required; and
(f) include provision of annual reporting of employee numbers to DP&E, Transport for NSW and RMS for a period commencing one year from commencement of operation up to and including 5 years from occupation of final building.

B30. The Applicant must ensure that the **Workplace Travel Plan** is implemented for the life of the development.

CONCRETE BATCHING PLANT

B31. The applicant must prepare must prepare a **Concrete Batching Plant Management Plan** to the satisfaction of the Secretary. The plan must be approved by the Secretary prior to the establishment of Concrete Batching Plant and form part of the CEMP required by condition C1.

The Plan must be prepared by a suitably qualified and experienced person(s) and detail the establishment and operation of the Plant including:
(a) demonstrate how the development will be managed during construction to meet the requirements of this development consent;
(b) a description of the works proposed to be undertaken;
(c) a description of the plant, equipment and materials to be used and/or stored on each site, including dangerous and hazardous goods;
(d) a summary of the potential environmental impacts associated with the establishment and operation of the facility;
(e) details of the mitigation, monitoring and management procedures specific to the plant that would be implemented to minimise environmental and amenity impacts during both site establishment and operation;
(f) include a program to monitor the effectiveness of these measures;
(g) details of how waste is to be managed in association with the operation of the Plant;
(h) detail any licenses required to discharge waste from the plant; and
(i) mechanisms for the monitoring, review and amendment of the Ancillary Facilities Management Plan.

SOILS, WATER QUALITY AND HYDROLOGY

Geotechnical

B32. A **Site Specific Earthworks Specification** must be prepared by a suitably qualified and experienced person(s) in accordance with the Geotechnical Interpretive Report prepared by Golder Associates, dated 11 November 2016.

B33. Prior to construction of permanent built works, a geotechnical engineer must prepare a works-as-executed report detailing encountered geotechnical conditions and how residual geotechnical constraints can be accommodated within the structural designs for the development. The structural design must be confirmed or amended by the structural engineer based on the works-as-executed geotechnical report.

B34. Prior to early works, fill importation or any other surface disturbance, the Applicant must prepare a **Soil and Water Management Plan** (SWMP) to the satisfaction of the Secretary. The plan must form part of the CEMP required by condition C1 and must include:
(a) measures to verify the properties of fill imported to the site (see condition (b));
(b) plans showing limits of clearing, filling and other earthworks and vegetation to be retained and protected;
(c) plans showing temporary access points and haul roads within the site for fill stockpiling and placement;
(d) plans showing the location of stockpiled fill and other materials and storage areas (see condition (c));

(e) an **Erosion and Sediment Control Plan** (see condition B40);
(f) measures to minimise dust, erosion and prevent migration of soil off site and migration into constructed and natural drainage lines (see condition B39);
(g) details on design and maintenance of temporary stormwater drainage infrastructure including sediment basins and temporary diversion channels around temporary work obstructions to allow low and normal flows to safely bypass the work areas and to separate clean and dirty water flows (see condition B39);
(h) details of existing stormwater infrastructure to be retained, including upgrades to meet design criteria, and design and maintenance of proposed new infrastructure (see condition B40);
(i) evidence that legal agreement has been obtained:
  (i) to discharge stormwater through adjacent sites;
  (ii) for any necessary upgrade works to be constructed;
  (iii) for undertaking maintenance activities;
  (iv) use of OSD basins on other sites, such as the MPW site, for this development; and
  (v) evidence that an easement has been obtained or is currently in place to discharge and detain water through adjacent sites;
(j) evidence that a drainage easement is in place to discharge stormwater through the MPW site, and to provide OSD basins within the MPW site, for this development, and that drainage infrastructure within the MPW site to the Georges River has been repaired or upgraded to the satisfaction of the Secretary prior to completion of construction of the temporary MPE Stage 2 sediment basins.
(k) confirmation that the stormwater drainage systems in adjacent sites are designed, or can be upgraded to accept flows from the MPE site, including provision of scour protection at discharge points;
(l) demonstrate no impact on Anzac Creek flood levels or flood extents due to filling of the MPE site;
(m) demonstrate no change to stormwater flows directly entering proposed biodiversity offset areas;
(n) demonstrate no deterioration in the quality of stormwater discharged from the site into proposed biodiversity offset areas; and
(o) demonstrate that stormwater leaving the site meets the design water flow and water quality criteria (see condition B44 water quality monitoring).

Spoil Management

B35. The Applicant must ensure that only VENM or ENM, or other material approved in writing by EPA is brought onto the site.

B36. Prior to the commencement of importation of spoil, the Applicant must prepare a **Spoil Management Plan** to the satisfaction of the Secretary. The Spoil Management Plan must incorporate detailed information on the handling and transport of spoil, including stock pile management. The Spoil Management Plan must be approved by a NSW EPA Accredited Site Auditor prior to submission to the Secretary, to ensure that imported material will be assessed including with regard to the waste classification and site suitability. The Spoil Management Plan is to be prepared separate to, but consistent with the CEMP required by conditions C1 and must:
(a) be prepared by a suitably qualified and experienced person(s);
(b) include:
  (i) a protocol for recording the volume, type and source of fill imported to site and vehicle registrations on a daily basis;
  (ii) quality assurance and quality control measures to ensure compliance with condition B35;
  (iii) a protocol for dealing with unexpected finds including material contamination; and
  (iv) independent auditing by a suitably qualified and experienced specialist; and
(c) be consistent with Volume 1 of Managing Urban Stormwater: Soils and Construction ('the Blue Book') (Landcom 2004) and include:
  (i) Details on and the location of fill sorting, crushing and stockpiling;
  (ii) Plans and details on the progressive formation of stockpiles, placement and stabilisation of placed fill;
  (iii) Stockpiles not to exceed 10m in height with stockpiles over 4m in height to be benched, with maximum of 1V:3H slopes;
  (iv) Monitoring of stockpile moisture content and stockpile watering;
  (v) Stabilisation of stockpiles if not worked on for more than 10 days; and
  (vi) Stabilisation of placed fill if construction does not commence within 10 days.

B37. The handling of spoil during construction of the development is to be conducted in accordance with the Spoil Management Plan.

B38. Permanent fill batters to adjacent lands to be a maximum of 1V:4H and details to be provided on methods of slope stabilisation.

Erosion and Sediment Control Plan

B39. Prior to commencement of early works and fill importation the **Erosion and Sediment Control Plan** required as part of the Soil and Water Management Plan must:
(a) be prepared by a suitably qualified person;

(b) be prepared in accordance with Volume 1 of *Managing Urban Stormwater: Soils and Construction* ('the Blue Book') (Landcom 2004), *Managing Urban Stormwater: Soils and Construction – Installation of Services*, Volume 2A (OEH 2008) and *Managing Urban Stormwater: Soils and Construction – Main Road Construction*, Volume 2D (OEH 2008). The plan must consider likely stages of the works and provide for appropriate control of sediment and erosion for each stage. The plan must show:
   (i) location and extent of all necessary sediment and erosion control measures for the site;
   (ii) catchment plan;
   (iii) sediment basin(s) locations including details showing how runoff from the entire site will be directed to the sediment basin(s);
   (iv) all relevant details and calculations of the sediment basins including sizes, depths, flocculation, outlet design, all relevant sections, pump out systems, and depths;
   (v) all details of basement and other excavation pump out and dewatering treatment systems including flocculation and any proposed discharge from the site from dewatering and pump out systems;
   (vi) identification and management of any stormwater run-on to the site from adjacent sites;
   (vii) location of any temporary stockpiles (soil, spoil, top soil or otherwise) and accompanying sediment and erosion control measures;
   (viii) location and details of all vehicle wash down bays and associated erosion and sediment control measures such as earthen bunds; and
   (ix) a daily and weekly site inspection checklist consistent with International Erosion Control Association Best Practice Erosion and Sediment Control documents.

(c) be implemented prior to commencement of early works, fill importation and construction (and any substages of these phases) and be updated as relevant to changing early works; fill importation, stockpiling and placement, and construction activities.

Stormwater Management Plan

B40. Prior to commencement of early works and fill importation, an amended **Stormwater Management Plan** must be submitted and approved by the Secretary. The plans must be prepared by a suitably qualified person, and independently reviewed, to ensure it meets the following criteria for:

(a) Drainage:
   (i) convey flows from low order events (up to and including the 10% AEP event from the main part of the site within the formal drainage system, with flows from rarer events (up to the 1% AEP event) conveyed in controlled overland flow paths;
   (ii) show the location and width of controlled overland flow paths; and
   (iii) provide levels to AHD confirming building floor levels are a minimum of 150 mm above the maximum design flow path levels.

(b) Water Sensitive Urban Design:
   (i) incorporate water sensitive urban design principles, be generally in accordance with relevant Council policies, plans and specifications
   (ii) ensure that adequate overland flow paths have been provided in the event of stormwater system blockages and flows in excess of the 1% ARI rainfall event;
   (iii) ensure on site detention basins are visually unobtrusive and ensure public safety;
   (iv) ensure rainwater harvesting is provided for each warehouse;
   (v) ensure adequate site area has been provided for stormwater treatment;
   (vi) ensure design of stormwater treatment systems minimises the risk of failure; and
   (vii) develop concept options for how 20% of the average annual volume of stormwater from the site can be reused via rainwater capture and reuse for activities including but not limited to:
      - irrigation,
      - all internal non-potable uses,
      - washdown,
      - cooling towers,
      - heating, ventilation, and air conditioning, and
      - ground source heat exchange.

   The Applicant is to brief the Department on how these initiatives will be implemented prior to the completion of the Stormwater Management Plan.

(c) Water quantity:
   (i) on site detention is to be provided to attenuate peak flows from the development such that both the:
      - 1 in 1 year ARI event post development peak discharge rate is equivalent to the pre-development (un-developed catchment) 1 in 1 year ARI event
      - 1 in 100 year ARI event post development peak discharge rate is equivalent to the pre-development (un-developed catchment) 1 in 100 year ARI event;
   (ii) no new drainage infrastructure work within the Defence Joint Logistics Unit (DJLU) site;
   (iii) all on site detention basins to have maximum batter slopes of 1V:4H or, for works immediately adjacent to the Moorebank Avenue upgrade, an alternate slope gradient agreed to by RMS;
   (iv) siting and design of on site detention basins to eliminate/ minimise excavation within the southern ordinance burial pits; and
   (v) maintenance access to be provided to each on site detention basin.

(d) Connection to natural creeklines:
  (i) on site detention basin outlets to natural drainage lines must be constructed of natural materials to facilitate natural geomorphic processes and to include vegetation as necessary (gabion baskets and gabion mattresses are not acceptable).

(e) Stormwater Quality
  (i) have a stormwater quality treatment train comprised of gross pollutant traps and biofiltration/ bioretention systems designed to meet the following criteria compared to a base case if there were no treatment systems in place:
    - reduce the average annual load of total nitrogen by 45%;
    - reduce the average annual load of total phosphorus by 65%; and
    - reduce the average annual load of total suspended solids by 85%.
  (ii) all stormwater quality elements are to be modelled in MUSIC as per the NSW MUSIC Modelling Guide.
  (iii) all stormwater quality elements are to be installed upstream of stormwater detention basins, unless it can be demonstrated that biofiltration/ bioretention systems within the OSD basins will not suffer damage from design flows and can be maintained to achieve the water quality criteria.
  (iv) the area of biofiltration / bioretention systems is to be at least 1% of the catchment draining to the system, to ensure there is no short-circuiting of the system.
  (v) bioretention systems which are greater than 1,000m^2 in area, are to be divided into cells with no individual cell greater than1,000m^2.
  (vi) all filter media used in stormwater treatment measures must:
    - be loamy sand with an appropriately high permeability under compaction and must be free of rubbish, deleterious material, toxicants, declared plants and local weeds, and must not be hydrophobic;
    - have an hydraulic conductivity = 100-300 mm/hr, as measured using the ASTM F1815-06 method
    - have an organic matter content less than 5% (w/w)
    - be provided adequate solar access, considering the design and orientation of OSD basins.

A copy of the independent review must be submitted with the Plan. A statement from the reviewer confirming their independence and declaring any actual, potential or perceived conflicts of interest must be provided as part of the reporting of the findings and recommendations of the review.

B41. Notwithstanding condition B40, the Stormwater Management Plan does not require the Secretary to approve drainage works that would be designed, approved by RMS, and delivered, in accordance with condition B13. However, the Stormwater Management Plan must:
  (a) include confirmation that any such works are proposed to be designed and delivered in accordance with condition B13; and
  (b) incorporate, and be designed in consideration of, preliminary principles for that road drainage.

B42. The amended numerical models are to be submitted to the Secretary with the Stormwater Management Plan.

Water Quality Monitoring Plan

B43. A **Stormwater Monitoring Program** must be prepared in consultation with Council and OEH prior to operation and must be implemented for 5 years following completion of construction to monitor performance of the stormwater treatment system. The Stormwater Monitoring Program must form part of the Biodiversity Monitoring Strategy required by condition B106, prepared with reference to *Using the ANZECC Guidelines and Water Quality Objectives* in NSW (DEC, 2006).

B44. The Stormwater Monitoring Program must:
  (a) assess water quality and quantity performance for construction discharges and ongoing stormwater discharges from the development to ensure protection of the desired ecological values of Anzac Creek; and
  (b) include sampling locations and the frequency of sampling including wet weather sampling.

Stormwater Infrastructure Operation and Maintenance Plan

B45. Conversion of any construction stage sediment and erosion control measures into permanent stormwater quality treatment elements must only occur once the civil works (roads and drainage) have been completed for the site to ensure the treatment measure is not compromised by sediment runoff.

B46. All permanent stormwater infrastructure must be constructed in accordance with the Stormwater Management Plan approved by the Secretary and properly maintained on an ongoing basis.

B47. Written signoff from the design engineer(s) responsible for the construction drawings is to be provided to the Secretary certifying that the system has been constructed in accordance with the construction drawings or, where modified, this has not adversely affected the performance of the system.

B48. Left blank

B49. Prior to operation, the Applicant must prepare a **Stormwater Infrastructure Operation and Maintenance Plan** to manage the operation and maintenance of stormwater infrastructure on-site and off-site, to the satisfaction of the Secretary. The plan must form part of the OEMP required under condition C3 and must be implemented for the life of the assets and include:

(a) the entity responsible for management and maintenance of the assets, including evidence that a maintenance contract is in place with a reputable and experienced maintenance contractor;
(b) quarterly inspections, and inspections after major rainfall events;
(c) schedule for routine checking, cleaning and servicing of all devices/ systems in accordance with the manufacturer's and/or designer's recommendations;
(d) records of all maintenance activities undertaken;
(e) quarterly maintenance reports, detailing the results of quarterly inspections, inspections after major rainfall events, and maintenance activities;
(f) results of water quality monitoring;
(g) investigation, management and mitigation of water quality target exceedances;
(h) annual independent auditing; and
(i) provision for submission of the quarterly maintenance reports and annual independent audit reports to the Secretary, including the results of inspections, management and maintenance actions and water quality monitoring.

B50. Assets to be managed under the **Stormwater Infrastructure Operation and Maintenance Plan** must include the channel through the MPW site to the Georges River unless the maintenance of this infrastructure is included in an operational environmental management plan approved by the Secretary for the MPW site.

B51. The annual independent audit must be undertaken by a suitably qualified professional with demonstrable experience in WSUD. The audit is to verify the condition of the treatment system(s), verify and document that the system(s) is working as intended, verify the system(s) has been cleaned adequately, verify there is no excessive build-up of material in the system(s) and identify any issues with the treatment system(s) which require rectification for the system(s) to adequately perform its intended function.

Flood Management

B52. Before the commencement of construction, the Applicant must prepare a **Flood Emergency Response Plan** to the satisfaction of the Secretary. The Plan must form part of the CEMP and OEMP required by conditions C1 and C3 and must:

(a) be prepared by a suitably qualified and experienced person(s) whose appointment has been endorsed by the Secretary;
(c) address the provisions of the *Floodplain Risk Management Guideline* (OEH, 2007) (as may be updated or replaced from time to time);
(d) include details of:
- the flood emergency responses for both construction and operation phases of the development;
- predicted flood levels;
- flood warning time and flood notification;
- assembly points and evacuation routes;
- evacuation and refuge protocols; and
- awareness training for employees and contractors.

B53. The Applicant must:

(a) not commence construction until the Flood Emergency Response Plan required by condition B52 is approved by the Secretary; and
(e) implement the most recent version of the Flood Emergency Response Plan approved by the Secretary for the duration of the development.

AIR QUALITY

Dust Minimisation

B54. Best practice reactive and proactive management measures must be implemented to minimise dust generated during all works authorised by this consent.

B55. Deposited dust must not exceed an increase of $2g/m^2$/month or maximum of $4g/m^2$/month at the closest off site sensitive receiver.

B56. During construction:

(a) fill importation must not exceed $22,000m^3$ per day;
(b) exposed areas and stockpiles must be watered regularly to minimise dust emissions;
(c) water carts must be used to control dust emissions from vehicles travelling on unpaved surfaces, and graders and dozers pushing fill material;
(d) grader and bulldozer travel routes and the fill material being handled must be suitably moist;

(e) water must be used as appropriate to maintain moisture in the fill material being bulldozed, such that dust emissions would be halved relative to not applying the water;
(f) water may be applied prior to fill being delivered to site, provided that the same effect is achieved as in (e) above;
(g) all trucks entering or leaving the site with loads must have their loads covered;
(h) trucks associated with the development must not track dirt onto public roads;
(i) public roads used by trucks associated with the development must be kept clean; and
(j) land stabilisation works must be carried out progressively on site to minimise exposed surfaces.

Construction Air Quality Management Plan

B57. The Applicant must prepare a **Construction Air Quality Management Plan** (AQMP) to the satisfaction of the Secretary. The AQMP must be prepared by a suitably qualified and experienced person(s). The Construction AQMP must form part of the CEMP required by condition C1. The AQMP must include:
(a) a **Construction Air Quality Monitoring Program**;
(b) identification of sources (including stockpiles and open work areas) and quantify airborne pollutants;
(c) best practice reactive and proactive control measures that will be implemented for each emission source including measures to prevent the emission of visible dust from the site as listed in condition B56;
(d) provisions for the implementation of additional mitigation measures in response to issues identified during monitoring and reporting;
(e) for all emission sources at the site:
(i) key performance indicator(s);
(ii) monitoring method(s);
(iii) location, frequency and duration of monitoring;
(iv) record keeping;
(v) complaints register;
(vi) response procedures; and
(vii) compliance monitoring.

B58. Air quality monitoring must be undertaken during early works, fill importation and construction.

Operational Air Quality Management Plan

B59. The Applicant must prepare an **Operational AQMP** to the satisfaction of the Secretary for the entire precinct (MPE + MPW), unless this has been prepared and approved under an approval for the MPW site. The AQMP must be prepared by a suitably qualified and experienced person(s) and must form part of the OEMP required by condition C3. The AQMP must include:
(a) identification of sources and quantify airborne pollutants;
(b) best practice reactive and proactive control measures that will be implemented for each emission source;
(c) provisions for the implementation of additional mitigation measures in response to issues identified during monitoring and reporting;
(d) for all emission sources associated with site operations:
(i) key performance indicator(s);
(ii) monitoring method(s);
(iii) location, frequency and duration of monitoring;
(iv) record keeping;
(v) complaints register;
(vi) response procedures; and
(vii) compliance monitoring.

B60. The Applicant must ensure the development does not cause or permit the emission of any offensive odour (as defined in the POEO Act).

B61. Equipment must be installed and operated in accordance with best practice to ensure that the development complies with all load limits, air quality criteria, air emission limits and air quality monitoring requirements as specified under this consent.

CONSTRUCTION NOISE AND VIBRATION

Noise monitoring

B62. Prior to early works, the Applicant must undertake noise monitoring in accordance with INP to verify RBLs for the closest sensitive receivers.

B63. Prior to early works and fill importation, the Applicant must submit a **Noise Monitoring Report** detailing the results of background noise monitoring, any resulting adjustment of NMLs for the development and any additional noise mitigation measures to be include in the CEMP required under condition C1.

B64. Continuous noise monitoring at sensitive receivers must be undertaken during early works, fill importation, construction and for at least 12 months following occupation of the entire site.

Construction Hours

B65. The construction hours detailed in **Table 2** must be complied with, except where they may be undertaken under condition B66.

Table 2: Hours of Work

Activity	Day	Time
Early works and Construction	Monday – Friday Saturday	7 am to 6 pm 7 am to 1 pm
Moorebank Avenue upgrade	Monday – Friday Saturday	7 am to 6 pm 7 am to 1 pm

B66. Except as permitted by an EPL, activities resulting in high noise impact (including impulsive or tonal noise emissions) must only be undertaken:
(a) between the hours of 8:00 am to 5:00 pm Monday to Friday;
(b) between the hours of 8:00 am to 1:00 pm Saturday; and
(c) in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.
Note:
For the purposes of this condition, 'continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing any of the work that is the subject of this condition.

B67. Works may be undertaken outside the hours detailed in **Table 2** in the following circumstances:
(a) for the delivery or dispatch of materials as requested by the NSW Police Force or other public authorities for safety reasons;
(b) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm;
(c) where different construction hours are permitted or required under an EPL in force in respect of construction, in which case these construction hours must be complied with;
(d) where they are undertaken in accordance with an **Out-Of-Hours Work Protocol** detailing the assessment, management and monitoring of noise as part of the Construction Noise and Vibration Management Plan.

B68. The Applicant must prepare an Out-Of-Hours Work Protocol for any work undertaken outside the hours specified in condition B65 or outside the circumstances specified under condition B67. An **Out-Of-Hours Work Protocol** must provide for the assessment, management and monitoring of out of hours work noise including:
(a) where works are shown to be inaudible at the nearest sensitive receivers and vibration levels do not exceed those stipulated by Table 2.2 and Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006);
(b) where a negotiated agreement has been arranged with affected receivers;
(c) where noise can be shown to satisfy the noise management levels specified in the *Interim Construction Noise Guideline* (ICNG, DECC, 2009) at non-residential land uses; or
(d) where works are undertaken as part of an **Extended Hours Work Plan** approved as part of the **Out-Of-Hours Work Protocol.**

B69. An **Extended Hours Work Plan** will be prepared for any construction undertaken during the extended hours detailed in **Table 3** as required by condition B68(d). The **Extended Hours Work Plan** must provide for:
(a) a three month assessment period, commencing at the start of extended hours construction works;
(b) implementation of the Construction Noise and Vibration Management Plan;
(c) noise monitoring at a representative number of sensitive receivers (including closest and furthest) to confirm the predicted noise levels;
(d) targeted consultation with the noise affected sensitive receivers;
(e) notification of the relevant Council, local residents and other affected stakeholders and sensitive receivers of the timing and duration at least 48 hours prior to the commencement of the works;
(f) construction work timeframes and methods for investigation of noise complaints;
(g) submission of monthly complaints reports to the Department for the life of extended hours activities;
(h) continual refinement of mitigation measures based on consultation with the noise affected sensitive receivers;
(i) implementation of work practices set out in section 5.2 of the ICNG;
(j) a final summary report submitted to the Secretary at the end of the assessment period in subcondition (a), detailing the outcomes of the assessment period, the resolution of complaints during the assessment period, and demonstrate the acceptability of works outside standard hours.

Table 3: Extended Hours of Work

Activity	Day	Time

Early works and Construction (not including high noise impact, piling, spoil placement, rock breaking, concrete batching)	Monday – Friday Saturday	6 am to 7 am 6 pm to 10 pm 1 pm to 5 pm

B70. The Applicant must comply with all written directions of the Secretary arising from the review of the final summary report required under condition B69.

B71. Construction must be carried out in accordance with the construction noise management levels and requirements detailed in the *INCG* (DECC, 2009).

B72. All reasonable and feasible noise mitigation measures must be implemented in addition to the management and mitigation measures in **APPENDIX B** with the aim of achieving the following construction Noise Management Levels (NMLs) and vibration criteria:
(a) construction noise management levels established using the *INCG* (DECC 2009);
(b) vibration criteria established using the *Assessing Vibration: a Technical Guide* (DECC 2006) (for human exposure); and
(c) the vibration limits set out in the *German Standard DIN 4150-3: Structural Vibration effects of vibration on structures* (for structural damage).

B73. Any construction activities identified as exceeding the construction noise management levels and/or vibration criteria must be managed in accordance with the **Construction Noise and Vibration Management Plan (CNVMP)** required by condition B77. All feasible and reasonable noise mitigation and management measures must be implemented and any activities that could exceed the construction NMLs must be identified and managed in accordance with the CNVMP.

Note: The INCG identifies 'particularly annoying' activities that require the addition of 5dB(A) to the predicted level before comparing to the construction NML.

Construction Traffic Noise

B74. Where feasible and reasonable, construction traffic movements on public roads should aim to limit any increase in existing road traffic noise levels to no more than 2 dB $L_{Aeq,period}$, where 'period' is defined in the EPA's Road Noise Policy (RNP) for both day and night.

B75. The Applicant is to ensure that construction contractor's vehicles operate so as to minimise impacts. Measures that could be used include:
(a) toolbox talks;
(b) contracts that include provisions to deal with unsatisfactory noise performance for the vehicle and/or the operator; and
(c) specifying non-tonal movement alarms in place of reversing beepers or alternatives such as reversing cameras and proximity alarms, or a combination of these, where tonal alarms are not mandated by legislation.

B76. Use of compression brakes for construction vehicles associated with the project that are on site or on nearby roads is not permitted (e.g. Anzac Avenue).

Construction Noise and Vibration Management Plan

B77. A **Construction Noise and Vibration Management Plan (CNVMP)** must be prepared for the development to the satisfaction of the Secretary. The plan must form part of the CEMP required by C1 and detail how construction noise and vibration impacts will be minimised and managed. The Plan must be consistent with the guidelines contained in the ICNG (DECC, 2009). The plan must be developed in consultation with the EPA and include:
(a) identification of the work areas, site compounds and access points;
(b) identification of the type and number of plant and equipment expected on site at the same time;
(c) identification of sensitive receivers (including heritage structures if relevant) and relevant construction noise and vibration goals applicable to the project as stipulated in condition B71;
(d) details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise and/or vibration impacts on surrounding sensitive receivers, particularly residential areas;
(e) an **Out-of-hours Work Protocol** as referenced in condition B68 for the assessment, management and approval of works outside standard construction hours, for the Secretary's approval. The **Out-of-hours Work Protocol** must:
(i) detail assessment of out-of-hours works against the relevant noise and vibration criteria;
(ii) provide detailed mitigation measures for any residual impacts (that is, additional to general mitigation measures), including extent of at-receiver treatments;
(iii) include proposed notification arrangements; and
(iv) include an **Extended Hours Work Plan** as required by condition B69.

(f) identification of feasible and reasonable measures to be implemented to minimise and manage construction noise impacts, including, but not limited to, acoustic enclosures, erection of noise walls (hoardings), respite periods;
(g) management of the number of trucks accessing the site;
(h) a truck driver protocol addressing designated routes, acceptable delivery hours, speed limits on site, no engine braking in the vicinity or on site, no extended periods of engine idling, avoiding queuing in or around the site and limiting the need for reversing on site;
(i) identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibration criteria are achieved, including applicable buffer distances for vibration intensive works, use of low vibration generating equipment/ vibration dampeners or alternative construction methodology, and pre- and post- construction dilapidation surveys of sensitive structures where vibration is likely to result in damage to buildings and structures (including surveys being undertaken immediately following a monitored exceedance of the criteria);
(j) a description of how the effectiveness of mitigation and management measures would be monitored during the proposed works, clearly indicating how often this monitoring would be conducted, the locations where monitoring would take place, how the results of this monitoring would be recorded and reported, and, if any exceedance is detected, how any non-compliance would be rectified;
(k) noise and vibration monitoring procedures (routine and complaints triggered monitoring);
(l) a community consultation and complaints handling procedure; and
(m) mechanisms for the monitoring, review and amendment of this plan.

B78. Blasting is not permitted on the site.

OPERATIONAL NOISE AND VIBRATION

Hours of Operation

B79. The permitted hours of warehouse and distribution operation are detailed in **Table 4**.

Table 4: Hours of Operation

Activity	Day	Time
Operation	Monday to Sunday	24 hours

Operational Noise Limits

B80. Noise generated by operation of the development inclusive of MPE Stage 1 operations must not exceed the noise limits in **Table 5**.

Table 5: Noise Limits dB(A)

Location (residential receivers)	Day $L_{Aeq,15\ minute}$	Evening $L_{Aeq,15\ minute}$	Night $L_{Aeq,15\ minute}$	Night $L_{A1,\ 1\ minute)}$
Casula	35 dB	35 dB	35 dB	52 dB
Glenfield	35 dB	35 dB	35 dB	52 dB
Wattle Grove	35 dB	35 dB	35 dB	52 dB

Notes:

To determine compliance with the $L_{Aeq,15\ minute}$ noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.

To determine compliance with the $L_{A1,1\ minute}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).

The noise emission limits identified above apply under meteorological conditions of:
(i) wind speeds of up to 3 m/s at 10 metres above ground level; or

(ii) 'F' atmospheric stability class.

Review of Sleep Disturbance Impacts

B81. The Applicant must prepare **a Review of Sleep Disturbance Impacts** based on detailed design, including:
(a) an assessment of how often noise events occur, the time of day they occur and whether there are any times of day when there is a clear change in the noise environment;
(b) confirm the operational LAmax predictions of the final design; and
(c) consider appropriate noise mitigation measures where required.

B82. The Review of Sleep Disturbance Impacts must be prepared in consultation with the EPA and to the satisfaction of the Secretary and must be submitted to the Secretary within six months of commencement of construction, unless otherwise agreed by the Secretary.

Operational Noise Management Plan

B83. An **Operational Noise Management Plan** must be submitted to the Secretary for approval and form part of the OEMP required under condition C3. The report must be prepared by a suitably qualified and experienced person(s) and include:
(a) an outline of management actions to be taken to address any potential non-compliances with the limits specified in **Table 5**;
(b) a description of contingency measures to be implemented in the event management actions do not reduce noise levels to a compliant level; and
(c) identification of additional feasible and reasonable measures to those proposed in the documents specified under condition A2, that would be implemented with the objective of meeting the criteria outlined in the *NSW RNP* (EPA, 2011), when these measures would be implemented and how their effectiveness would be measured and reported to the Secretary and the EPA.

Mechanical Plant and Other Equipment

B84. Prior to construction of the freight village and each warehouse, the Applicant must submit to the Secretary a Noise Assessment for Mechanical Plant and other noisy equipment to demonstrate that plant has been selected to meet the overall operational noise limits specified in **Table 5**.

B85. The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.

Operational Noise Report

B86. Within 12 months of occupation of the first warehouse, 50% occupation of the site and 100% occupation of the site, or as otherwise agreed by the Secretary, the Applicant must undertake operational noise monitoring to compare actual noise performance of the project against predicted noise performance, and prepare an Operational Noise Report to document this monitoring. The Report must include, but not necessarily be limited to:
a) noise monitoring to assess compliance with the predicted operational noise levels and the noise limits specified in **Table 5**;
b) a validation by predictive modelling of the operational noise levels in terms of criteria and noise goals established in the *NSW RNP* (EPA, 2011);
c) sleep disturbance impacts compared to those determined in documents specified under condition A2;
d) impacts associated with annoying characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity and dominant low-frequency content;
e) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which project noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers;
f) details of any complaints and enquiries received in relation to operational noise generated by the project between the date of commencement of operation and the date the report was prepared;
g) any required recalibrations of the noise model taking into consideration factors such as actual traffic numbers and heavy vehicle proportions; and
h) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures.

B87. The Applicant must provide the Secretary and the EPA with a copy of the Operational Noise Report within 60 days of completing the operational noise monitoring referred to in (a) above or as otherwise agreed by the Secretary.

B88. To ensure the operational noise impacts are appropriately managed, the following measures apply:
a) use of best practice plant; and

b) preparation of a risk assessment to determine if non-tonal reversing alarms can be fitted as a condition of site entry. Alternatively, site design may include traffic flow that does not require or precludes reversing of vehicles.

Heavy Vehicles

B89. For the duration of operation heavy road freight vehicles are not permitted to use Moorebank Avenue south of the East Hills Railway corridor. A main gate monitoring system (e.g. CCTV) must be installed to identify heavy vehicles turning left from the terminal site onto Moorebank Avenue, or turning right from Moorebank Avenue to the terminal site. The Secretary may at any time request the Applicant to provide a heavy vehicle monitoring report for the prior 12 month period.

Continuous improvement

B90. For the duration of operation, the Applicant must:
a) continue to implement all reasonable and feasible best practice noise mitigation measures;
b) continue to investigate ways to reduce the noise generated by the development, including maximum noise levels which may result in sleep disturbance; and
c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.

HERITAGE

Archival Recording

B91. Prior to Early Works and Fill Importation, archival recording of the entire former DNSDC site must be undertaken in accordance with the Non-Indigenous Heritage Assessment (artefact, 2016) by a suitably qualified and experienced person(s).

Heritage Management Plan

B92. Prior to commencement of Early Works and Fill Importation, the Applicant must prepare a **Heritage Management Plan**, to the satisfaction of the Secretary. The plan must form part of the CEMP required by C3 and must:
(a) be prepared by suitably qualified and experienced person(s);
(b) be prepared in consultation with NSW Heritage Division, Council, relevant landowners and stakeholders including the Moorebank Heritage Group (MHG) and Department of Defence.

B93. The **Heritage Management Plan** must include:
(a) plans/strategies to monitor, mitigate and manage the effects of the development on identified PADs;
(b) measure to ensure site workers receive suitable heritage inductions prior to carrying out any activities which may cause impacts to heritage, and that suitable records are kept of these inductions;
(c) a program and description of the measures/procedures to be implemented for:
(i) undertaking surface surveys and archaeological investigations (where subsurface disturbance is proposed) of any items of heritage significance;
(ii) protecting heritage items located outside the disturbance area from the impacts of the development;
(iii) managing any new heritage items discovered during the development; and
(iv) additional archaeological excavation and recording of any significant heritage deposits uncovered during demolition.

Archaeological Monitoring and Recording

B94. Prior to commencement of Early Works and Fill Importation, archaeological monitoring and recording must be undertaken at potential archaeological deposits (PADs) V and W in accordance with the Non-Indigenous Heritage Assessment (artefact 2016) by a suitably qualified and experienced archaeologist with Excavation Director Criteria qualifications.

B95. The results must be reported to the Secretary within one month of completion of monitoring and recording at PADs V and W, along with recommendations for further monitoring at additional sites, if significant archaeological deposits are encountered.

B96. Fill importation must not commence within 10 metres of PADs V and W until the results of any further monitoring and recording, along with any additional Non-Indigenous Heritage management measures, are submitted to the Secretary and included in an updated **Heritage Management Plan** to the satisfaction of the Secretary.

Unexpected Finds Protocol

B97. Before commencement of construction, the Applicant must prepare an **Unexpected Finds Protocol** for the development in consultation with the Registered Aboriginal Parties, OEH and the NSW Heritage Division and must implement the Protocol in accordance with its terms.

Discovery of Human Remains or Aboriginal Objects or Places

B98. If human remains are discovered on site, then all work surrounding the area must cease, and the area must be secured. The Applicant must immediately notify NSW Police and OEH, and work must not recommence in the area until authorised by NSW Police and OEH.

B99. If any Aboriginal object or Aboriginal place is identified on site, or suspected to be on site:
(b) all work in the immediate vicinity of the object or place must cease immediately;
(j) a 10m buffer area around the object or place must be cordoned off; and
(k) OEH must be contacted immediately.

B100. Work in the immediate vicinity may only recommence if:
(a) the object or place is confirmed by OEH upon consultation with the Registered Aboriginal Parties, not to be an Aboriginal object or Aboriginal Place; or
(b) an **Aboriginal Cultural Heritage Management Plan** is prepared in consultation with the Registered Aboriginal Parties and OEH to include the object or place and appropriate measures in respect of it, and the Plan is approved by the Secretary; or
(c) OEH is satisfied as to the measures to be implemented in respect of the object or place and makes a written direction in that regard.

Heritage Interpretation Plan

B101. Prior to commencement of operation, the Applicant must prepare a **Heritage Interpretation Plan** based on the recommendations contained in the Heritage Interpretation Strategy (artefact, 2017) approved under MPE Stage 1. The plan must be prepared for the entire Moorebank Intermodal Precinct (MPE and MPW sites).

B102. The plan must form part of the OEMP required by condition C3 and must:
(a) be prepared by a suitably qualified and experienced person(s);
(b) be prepared in consultation with NSW Heritage Division, Council, relevant landowners and stakeholders including the Moorebank Heritage Group (MHG), Department of Defence, as well as the Relevant Aboriginal Parties (RAPs) should themes relating to Aboriginal heritage be included for interpretation; and
(c) be approved by the Secretary prior to the commencement of operation.

BIODIVERSITY

B103. The Applicant must:
(a) ensure that no more than 4.69 hectares of native vegetation is cleared for the development; and
(b) minimise:

i. the impacts of the development on hollow-bearing trees; and
ii. the clearing of native vegetation and key habitat within the approved disturbance footprint.

B104. Prior to the commencement of construction, unless the Secretary agrees otherwise, the Applicant must retire biodiversity credits of a number and class specified in **Tables 6** and **7** and provide evidence to the satisfaction of the Secretary. The retirement of credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects, and can be achieved by
(a) acquiring or retiring credits under the BioBanking scheme established under the-then *Threatened Species Conservation Act 1995*
(b) making payments unto an offset fund that has been established by the NSW Government; or
(c) providing suitable supplementary measures.

Table 6: Ecosystem credit requirements

Site	Plant community type	Area to be impacted	Credits required
MPE Stage 2 (excluding Moorebank Avenue site)	**Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin (ME003**	0.1 ha	4
MPE Stage 2 (excluding Moorebank Avenue site)	**Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion (ME002)**	0.05 ha	3

Moorebank Avenue site	**Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin (ME003)**	3.73 ha	167
Moorebank Avenue site	**Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin (ME005)**	0.22 ha	6
Moorebank Avenue site	**Forest Red Gum - Roughbarked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney (ME018)**	0.59	17

Table 7: Species credit requirements

Species	Impacted individuals	Credits required
Nodding Geebung (*Persoonia nutans*)	12	924
Hibbertia puberula* subsp. *puberula	110	4400
Small-flower Grevillia (*Grevillea parviflora* subsp. *parviflora*)	79	1106

B105. Notwithstanding condition B103, the Applicant:
(a) may elect to retire biodiversity credits in conjunction with the retirement of biodiversity credits for other developments on the MPE or MPW developments, prior to the commencement of construction of this development, or at another time agreed by the Secretary; and
(b) is not required to retire credits for biodiversity impacts that it has already offset under another development consent, pending the provision of evidence of what credits were retired to offset which development.

Baseline Monitoring Program

B106. Prior to early works, a baseline monitoring program must be prepared in consultation with OEH and DPI to define pre-development conditions for water quality, invertebrates and fish assemblages. The results of this monitoring program are to be used to:
(a) develop a **Biodiversity Monitoring Strategy** to identify any changes between upstream and downstream sites as a result of the construction and operation of the development; and
(b) set the stormwater water quality and quantity performance criteria referred to in condition B40.

B107. Any unavoidable indirect impacts as identified through the Biodiversity Monitoring Strategy required under condition B106, e.g. impacts of change hydrology on vegetation in boot land/ biobank site must be identified and measures to address this must be developed in consultation with OEH and implemented to the satisfaction of the Secretary. Measures may include additional offsetting.

Construction Flora and Fauna Management Plan

B108. Prior to clearing of native vegetation, the Applicant must prepare a **Construction Flora and Fauna Management Plan** (CFFMP) in consultation with OEH. The CFFMP must form part of the CEMP required by condition C1 and must include the following:
(a) measures to minimise the loss of key fauna habitat, including tree hollows;
(b) measures to minimise the impacts on fauna on site, including conducting fauna pre-clearance surveys prior to vegetation clearing and building demolition;
(c) controlling weeds and feral pests;
(d) an Unexpected Finds Procedure detailing procedures and management measures to be implemented in the event that flora and fauna is uncovered in any area not identified in the updated Biodiversity Assessment (BAR);
(e) to ensure biodiversity values not intended to be impacted are protected. These measures may include barriers and mapping of protected/ 'no-go' areas; and
(f) a program to monitor the effectiveness of the measures in the CFFMP.

B109. Prior to removing/clearing any vegetation, pre-clearing surveys and inspections for threatened species, populations and ecological communities must be undertaken to confirm the on-site location of those entities. The surveys and inspections, and any subsequent relocation of species and associated management measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist.

Methodologies must be incorporated into the **Construction Flora and Fauna Management Plan** required under condition B108. The agreement of OEH, whichever is the relevant agency, is required for any proposed amendments to the location or reclassification of threatened species, populations and ecological communities as identified in the updated BAR.

Operational Flora and Fauna Management Plan

B110. Prior to operation, the Applicant must prepare an **Operational Flora and Fauna Management Plan** (OFFMP) in consultation with OEH. The **OFFMP** must form part of the **OEMP** required by condition C3 and must include measures to ensure biodiversity values not intended to be impacted are protected, including but not limited to:
(i) weed control;
(ii) feral animal control;
(iii) pathogen management procedures;
(iv) monitoring; and
(v) rehabilitation actions.

B111. Bushfire asset protection zones are to be contained wholly within the site boundary and management of the inner protection zone and must not impact on the Boot Land.

HAZARDS AND RISKS

Dangerous Goods

B112. The Applicant (the operator/occupant of each premises) must store and handle all chemicals, fuels and oils, including Dangerous Goods as defined in the *Australian Code for the Transport of Dangerous Goods by Road & Rail*, in accordance with:
(a) the requirements of all relevant Australian Standards; and
(b) the NSW EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Handbook* if the chemicals are liquids.
In the event of an inconsistency between the requirements listed above, the most stringent requirement shall prevail to the extent of the inconsistency.

B113. The Applicant (the operator/occupant of each premises) must ensure compliance with the *Environment Protection Manual for Authorised Officers: Bunding and Spill Management* – technical bulletin (EPA, 1997 and that for liquids, a minimum bund volume of 110% of the volume of the largest single stored volume within the bund is required.

B114. The quantities of Dangerous Goods present at any time within each premises or transported from and to the development must be kept below the screening threshold quantities listed in the Department's *Hazardous and Offensive Development Guidelines Application Guidelines Applying SEPP 33* (January 2011).

B115. Prior to occupation of each premises and in each instance of occupation by a new occupant, a report must be submitted and approved by the Secretary confirming that the premises will be operated so as to comply with the requirements of conditions B112 and B114.

Notes:
The total quantity of DG within a warehouse must be considered as part of the screening, not the size of one container and separation distances must be based on the Applying SEPP 33 guideline.

Emergency Response Plan

B116. Six months prior to operation, the Applicant must prepare an **Emergency Response Plan**, in consultation with FRNSW and NSW Police Force.

The Emergency Response Plan must include, but not be limited to:
(a) protocols and procedures to be followed during emergency situations associated with the operation of the project (including fires and explosions). The protocols and procedures are to take into account the needs of people with a disability or who may experience access problems in emergency situations;
(b) details of traffic management measures to be implemented during emergencies, where appropriate, to minimise the potential for escalation of the emergency;
(c) design and management measures to address the potential environmental impacts of an emergency situation, including measures for containment of contaminated fire-fighting water, fuel spills and gaseous combustion products; and
(d) details of a training and testing program to ensure that all operational staff are familiar with the Emergency Response Plan.

WASTE MANAGEMENT

Construction and Demolition Waste Management

B117. All waste generated by the project must be assessed, classified and managed in accordance with the *Waste Classification Guidelines Part 1: Classifying Waste* EPA 2014.

B118. Prior to the commencement of early works, the Applicant must prepare a **Construction and Demolition Waste Management Plan** for the development to the satisfaction of the Secretary. The plan must form part of the CEMP required by condition C1 and must detail the quantities of each waste type generated during construction and the proposed reuse, recycling and disposal locations.

B119. The Applicant must:
(a) not commence construction until the Construction and Demolition Waste Management Plan is approved by the Secretary; and
(b) carry out the development in accordance with the most recent version of the Construction and Demolition Waste Management Plan approved by the Secretary.

Operational Waste Management

B120. Prior to the commencement of operation, the Applicant must prepare a **Waste Management Plan** for the development to the satisfaction of the Secretary. The Waste Management Plan must form part of the OEMP required by condition C3 and be prepared in accordance with condition C7. The Plan must:
(a) detail the type and quantity of waste to be generated during operation of the development;
(b) describe the handling, storage and disposal of all waste streams generated on site, consistent with the Protection of the Environment Operations Act 1997, Protection of the Environment Operations (Waste) Regulation 2014 and the Waste Classification Guidelines Part 1: Classifying Waste (EPA, 2014) (as may be updated or replaced from time to time);
(c) detail the materials to be reused or recycled, either on or off site; and
(d) include the Management and Mitigation Measures included in APPENDIX B.

B121. Waste must be secured and maintained within designated waste storage areas at all times and must not leave the site or be deposited on or otherwise enter neighbouring public or private properties.

Statutory Requirements

B122. All waste materials removed from the site must only be directed to a waste management facility or premises lawfully permitted to accept the materials.

B123. The Applicant must assess and classify all liquid and non-liquid wastes to be taken off site in accordance with the latest version of EPA's *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014).

B124. Waste generated outside the site must not be received at the site for storage, treatment, processing, reprocessing, or disposal unless it satisfies these conditions.

B125. The Applicant must retain all sampling and waste classification data for the life of the development in accordance with the requirements of EPA.

B126. The collection of waste generated during operation of the development must be undertaken between 7 am to 10 pm Monday to Friday.

PESTS, VERMIN AND NOXIOUS WEED MANAGEMENT

B127. The Applicant must:
(a) take all reasonable steps to manage pests and vermin on the site;
(b) manage declared noxious weeds on the site in accordance with the requirements of the *Noxious Weeds Act 1993*; and
(c) inspect the site on a regular basis, no less than every 3 months, to ensure that these measures are working effectively, and that pests, vermin or noxious weeds are not present on site in sufficient numbers to pose an environmental hazard, or cause the loss of amenity in the surrounding area.

Note: For the purposes of this condition, noxious weeds are those species subject to an order declared under the Noxious Weed Act 1993.

CONTAMINATION

B128. The Applicant must provide the NSW EPA with a copy of all reports to date relating to the assessment of per- and poly-fluoroalkyl substances including perfluorooctanoate (PFAS) undertaken for the Site within 3 months of this consent.

B129. Prior to the commencement of early works or construction on site, the Applicant must engage a Site Auditor accredited under the EPA *Contaminated Land Management Act 1997* NSW Site Auditor Scheme.

B130. Prior to an occupation certificate being issued, the Applicant must submit to the Secretary a Site Audit Statement, prepared in accordance with the NSW *Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd edition, 2017)*, which demonstrates that the site is suitable for its intended land use (i.e. Section 'A').

The Site Auditor must consider the most up to date PFAS guidance.

B131. If the Site Auditor determines that further assessment of PFAS is required to adequately assess the site in accordance with the current guidance "Designing Sampling Programs for Sites Potentially Contaminated by PFAS (EPA 2016), the assessment(s) are to be completed and submitted to the EPA within 6 months of granting of consent.

B132. Should the Applicant identify a potential risk to off-site receptors due to PFAS contamination, the Applicant must contact the NSW EPA as soon as practicable to discuss requirements for community consultation and long term management.

B133. Prior to any demolition on the site, and entry and any subsurface activities within the southern burial pits, an **UXO, EO and EOW Site Assessment Survey** must be undertaken by an UXO contractor listed on the Defence Panel of suitably qualified UXO consultants and contractors and submitted to the Secretary.

B134. Prior to early works and fill importation, a **Contamination Management Plan** must be prepared to the satisfaction of the Secretary and form part of the CEMP required under condition C1. The Contamination Management Plan is to be based on the Environmental Management Plan prepared by GHD (2016) and results of the UXO, EO and EOW Site Assessment Survey and must take into account additional risks posed by the proposed works and in particular:
(a) excavation within the southern burial pits;
(b) removal/remediation of underground storage tanks;
(c) disturbance of soil containing asbestos material; and
(d) demolition of buildings containing asbestos materials.

B135. The Contamination Management Plan must include:
(a) an **UXO, EO and EOW management and remediation plan**, prepared by a qualified person(s) listed on the Defence Panel;
(b) an **Asbestos Management Plan**; and
(c) **Unexpected Finds Procedure**.

The Contamination Management Plan must be approved by a NSW EPA Accredited Site Auditor prior to submission to the Secretary.

B136. Following demolition, a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken and an updated Contamination Management Plan is to be prepared to the satisfaction of the Secretary to address any additional contamination issues identified. Remediation works must only be carried out by suitably qualified and experienced contractor(s) including a contractor listed on the Defence Panel in the case of UXO, EO and EOW.

B137. Details of any containment cells located on the site following remediation shall be provided to the Secretary, including relevant GPS data on the extent of the cell and details of the long term management of the cells.

B138. All containment cells located on the site following remediation shall be registered on title including, details of relevant Contamination Management requirements.

URBAN DESIGN, VISUAL AMENITY AND LANDSCAPE

Urban Heat Island Mitigation Strategy

B139. Prior to commencement of permanent built surface works and/or landscaping, or as otherwise agreed by the Secretary, an **Urban Heat Island (UHI) Mitigation Strategy** must be prepared and submitted to the Secretary for approval, in consultation with the NSW Government Architect. The UHIMS must be prepared by a suitably qualified and experienced person(s).

The **UHI Mitigation Strategy** must
(a) review the current architectural details, building layout, landscaping provision, shading provision, landscape irrigation, stormwater water detention and WSUD, as well as building and paving material specifications;
(b) make recommendations to mitigate the UHI effects generated by the development including but not limited to:
(i) provision of WSUD elements;
(ii) street tree planting;
(iii) landscape coverage and screening;
(iv) use of building material including reflectivity;
(v) use of pavement material including reflectivity;

(vi) improved green space maintained by independent, climate resilient water supplies, to achieve increased amenity and urban cooling; and
(vii) heat generation from operations; and

(c) include a design strategy with the goal to achieve a 4°C degree decrease in temperature compared to neighbouring industrial developments;

(d) details of where and how recommendations from the **UHI Mitigation Strategy** have been incorporated into the:
(i) updated final Development Layout Plans and WSUD Plans required by conditions A22 and A23;
(ii) updated final architectural details required by condition A24;
(iii) UDLP required by condition B141;
(iv) CEMP required by condition C1; and
(v) OEMP required by condition C3.

Urban Design and Landscape Plan

B140. Prior to commencement of permanent built surface works and/or landscaping, or as otherwise agreed by the Secretary, an **Urban Design and Landscape Plan (UDLP)** must be prepared. The **UDLP** must be prepared by a suitably qualified and experienced person(s), in consultation with the relevant council(s). The **UDLP** must be approved by the Secretary, in consultation with the NSW Government Architect. The UDLP must present an integrated urban and landscape design for the development, and must include, but not be limited to:

(a) identification of design objectives, principles and standards based on -
(i) local environmental values,
(ii) urban design context,
(iii) sustainable design and maintenance,
(iv) community, visitor and worker safety, amenity and privacy, including 'safer by design' principles where relevant,
(v) relevant design standards and guidelines,
(vi) addressing the visual amenity and values of adjoining receivers,
(vii) minimising and addressing the footprint of the project (including at operational facilities), and
(viii) the urban design principles outlined in the documents referred to in condition A2;

(b) landscaping and building design opportunities to mitigate the visual impacts of buildings and infrastructure particularly when viewed from Moorebank Avenue, Wattle Grove, and Casula);

(c) details on the location of existing vegetation and proposed landscaping (including use of endemic and advanced tree species where practicable). Details of species to be replanted/revegetated must be provided, including their appropriateness to the area and habitat for threatened species. Where feasible and reasonable, top soil and vegetation to be removed must be reused;

(d) details of pedestrian movement through the site and to surrounding areas for employees;

(e) incorporate the following:
(i) a minimum landscaped width of 10m within the 18m setback from Moorebank Avenue;
(ii) the footprint of the warehouses along the eastern boundary must be reduced so that the car parking area and warehouse can be setback a minimum of 5m from the eastern internal road to provide visual screening of the building, and adequate landscape width to support canopy trees;
(iii) landscaping located around the car parking areas is to support sufficient canopy trees to provide visual screening to the warehouse buildings;
(iv) 15% of the site landscaped at ground level, 10% of which must include soft landscaping and not include land set aside for future access ways;
(v) minimum rate of 1 canopy tree per 30m^2 of landscaped area;
(vi) a 2.5 m wide landscaped bay every 6-8 car spaces incorporating canopy trees for shade;
(vii) perimeter site screening using advanced shrubs and canopy trees;
(viii) perimeter and on site detention and biofiltration/bioretention basin fences higher than 1.2m must be transparent and dark in colour but not constructed of chain wire.

(f) include a planting schedule including details of the soil specification and depth and irrigation systems as well as tree and shrub species, expected mature height, pot sizes and planting densities) and deep soil areas containing soil (not spoil);

(g) a description of the retaining walls, including the graphics such as sections, perspective views and material details;

(h) details of the landscaped areas and solid fencing required to screen waste bin or other outside storage areas;

(i) graffiti management commitments and provisions;

(j) the sub-plans identified in condition B141;

(k) details of where and how recommendation from the UDLP and sub plans have been incorporated into the:
(i) updated final Development Layout Plans and WSUD Plans required by conditions A22 and A23;
(ii) updated Architectural Plans required by condition A24, including architectural elements to articulate building facades and minimise large expanses of blank walls
(iii) updated OEMP required by condition C3;

(l) details of how the principles of Ecologically Sustainable Development listed at condition B143, in particular rainwater capture and reuse and energy efficiency have been incorporated into the UDLP and final **Stormwater Management Plan** plans required by Condition B40

(m) details how the **Heritage Interpretation Plan** required by condition B101 has been incorporated into the **UDLP**;
(n) details of how the **UHI Mitigation Strategy** required by condition B140 has been incorporated into the **UDLP** and final Development Layout, **Stormwater Management Plan** and Architectural Details;
(o) details of where and how recommendations from the **Flora and Fauna Management Plan** for adjoining offset area (condition B108) have been incorporated into the **UDLP**,
(p) details of where and how recommendations from the **Bushfire Management Plan** (condition B144) have been incorporated into the **UDLP**,
(q) details of where and how employee facilities including but not limited to secure bicycle parking, pedestrian paths, outdoor eating areas have been incorporated into the **UDLP**; and
(r) evidence of consultation with the Relevant Council(s), prior to finalisation of the **UDLP.**

The **UDLP** must be implemented prior to occupation of the warehouse and freight village, unless otherwise agreed by the Secretary.

Note:

The UDLP may be submitted in parts to address the built elements of the development and landscaping aspects of the development.

B141. The **Urban Design and Landscape Plan** must include the following sub-plans:

(a) a **Landscape Vegetation Management Sub Plan** to assist in the monitoring and maintenance of landscape elements required to be delivered as part of the approval. The Plan must be prepared and approved by the Secretary within twelve months of the date of this approval, unless otherwise agreed by the Secretary.

The Plan must provide details of the monitoring and maintenance procedures for the landscape vegetation elements, rehabilitated vegetation and landscaping (including weed and pathogen control) including performance indicators, identification of commitments, identification of the responsibilities of each entity involved in the management of the intermodal precinct including the overarching management responsibilities and obligations for common land and tenant responsibilities, timing and duration, as well as contingencies where rehabilitation of vegetation and landscaping measures fail.

The approved plan must be implemented prior to occupation of the warehouse and freight village.

(b) a **Lighting Sub Plan** to assist in the control of lighting and reduce the visual impact of the 24 hour operational facility when viewed from residents within residential areas within the locality. The Plan must provide an assessment of the location, design specification and impacts of operational lighting associated with the development and measures proposed to minimise lighting impacts and standardise lighting design within the MPE development. The Plan must be prepared and approved by the Secretary. The Applicant must ensure that the lighting associated with the development:
(i) complies with the latest version of AS 4282-1997 - Control of the obtrusive effects of outdoor lighting (Standards Australia, 1997);
(ii) is mounted, screened and directed in such a manner that it does not create a nuisance to surrounding properties or the public road network; and
(iii) is designed to reduce light spill and mitigate the visual impact of the 24-hour facility when viewed from the residential areas in the locality and the Boot Land.

(c) The **Lighting Sub Plan** must identify and provide details of the common and individual lighting throughout the development to reduce light spill and mitigate visual impact on the residential areas in the locality by:
(i) eliminating upward spill light;
(ii) directing light downwards, not upwards;
(iii) using shielded fittings;
(iv) avoiding 'over' lighting;
(v) switching lights off when not required;
(vi) using energy efficient bulbs;
(vii) using asymmetric beams, where floodlights are used;
(viii) ensuring lights are not directed towards reflective surfaces; and
(ix) using warm white colours.

The approved plan must be implemented prior to occupation of the warehouse and freight village.

(d) **Cycling and Pedestrian Access and Facilities Sub Plan** to assist in safe cycling and pedestrian connectivity through the MPE precinct by providing dedicated linkages between the warehouses, the freight village and Moorebank Avenue that will contribute to the quality and safety of the pedestrian and cyclist environment associated with the development. The Plan must be prepared by a suitably qualified and experienced person(s) and approved by the Secretary within twelve months of the date of this approval, unless otherwise agreed by the Secretary.

The Plan must be prepared by a suitably experienced and qualified person(s) in the design and provision of Cycling and Pedestrian Access and Facilities. The Plan must detail the construction, timing and responsibility for the delivery of Cycling and Pedestrian Access and Facilities and take into account the following considerations:

(i) all relevant policies, guidelines and plans;
(ii) provide details for the provision of safe and efficient pedestrian and cyclist access connectivity within the development and include integration with the existing and future pedestrian and cycling access in the locality;
(iii) provide details of end of trip facilities available on-site at each warehouse which are to include under cover bike storage, showers and change facilities sufficient to accommodate the needs of the forecast number of employee; and
(iv) the layout, design and security of bicycle facilities must comply with the minimum requirements of *Australian Standard AS 2890.3 – 1993 Parking Facilities Part 3: Bicycle Parking Facilities.*

The approved plan must be implemented prior to occupation of the warehouse and freight village.

(e) **Employee Outdoor Meal Break Area sub plan** to provide employee amenity associated with the development. The Plan must identify and facilitate the construction and establishment of employee outdoor meal break area and be prepared by a suitably experienced and qualified person(s) and submitted to the Secretary for approval.

The Plan must be prepared by a suitably experienced and qualified person(s) in the design and provision of outdoor open space. The Plan must detail the construction, timing and responsibility for the delivery and maintenance of an individual employee outdoor meal break areas for each warehouse and a communal employee/visitor eating area at the freight village and take into account the following considerations:

(i) all relevant policies, guidelines and plans;
(ii) the type of facilities to be provided having regard to forecast future employee and visitor needs;
(iii) provide detail of the siting and design of outdoor eating areas including seating, lighting, paving, landscaping, screening, shading, vermin proof waste storage and security; and
(iv) include details of the maintenance and waste collection responsibilities.

Where it can be demonstrated to the satisfaction of the Secretary, that an outdoor break area cannot be accommodated on site for each warehouse, an internal eating/sitting area is to be provided within each warehouse and details provided within this subplan.

The approved plan must be implemented prior to occupation of the warehouse and freight village.

(f) **Signage Sub Plan** to assist in the management of individual building, wayfinding and common directory signage associated with the development. The Plan must be prepared by a suitably experienced and qualified person(s). and submitted to the Secretary for approval.

The Plan must detail the design, illumination, construction, timing and responsibility for the delivery and maintenance of individual building and common directory signage and take into account the following considerations:

(i) provision of wayfinding signage for internal streets to individual buildings and loading docks;
(ii) individual building signage integration within building forms no higher than 3m above the finished ground;
(iii) no general advertising;
(iv) no form of moving or flashing signs;
(v) no east or south facing illuminated building signage;
(vi) details of the location and specifications of the common directory board;
(vii) signs are to display corporate logos and company names and must not to occupy more than 10% of any façade or wall of building; and
(viii) internally illuminated signs are not permitted.

The approved common directory board and wayfinding signs plan must be implemented prior to occupation of the warehouse and freight village.

ECOLOGICALLY SUSTAINABLE DEVELOPMENT

B142. Warehouses and the freight village must be designed and operated to meet ESD principles including:

(a) passive solar design;
(b) use of energy efficient plant and equipment;
(c) use of renewable energy sources;
(d) cross-ventilation
(e) selection of materials with lower energy manufacturing requirements;
(f) use of locally sourced materials to reduce impacts associate with transport;
(g) rainwater capture and reuse;
(h) water efficient fixtures and fittings; and
(i) waste minimisation and recycling.

BUSHFIRE MANAGEMENT

B143. Before the commencement of construction, the Applicant must ensure that a **Bushfire Emergency and Evacuation Plan** is prepared. The Plan must form part of the CEMP and OEMP required by conditions C1 and C3 and must:
(a) be prepared by a suitably qualified and experienced person(s);
(b) be consistent with the *Development Planning – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, December 2014 and *Australian Standard AS3745 2010 Planning for Emergencies in Facilities*; and
(c) a copy of the plan must be submitted to the Secretary, NSW Rural Fire Service, Council and the Certifying Authority prior to occupation.

B144. The entire site must be managed as an inner protection area (IPA) as outlined within section 4.1.3 and Appendix 5 of the *Planning for Bush Fire Protection 2006* and the NSW Rural Fire Service's document *Standards for asset protection zones*. An updated **Bushfire Management Plan** must be prepared by a suitably qualified person(s) having regard to the amended final plans and demonstrating that the bushfire asset protection zones can be contained wholly within the site boundary and that management of the inner protection zone will not impact on the Boot Land. The **Bushfire Management Plan must be approved by the RFS** and submitted to the Secretary prior to construction of permanent access or buildings, unless otherwise agreed by the Secretary.

B145. Public road access must comply with section 4.1.3(1) of *Planning for Bush Fire Protection 2006* except for the requirement for through-access.

B146. The provision of water, electricity and gas must comply with section 4.1.3 of *Planning for Bush Fire Protection 2006.*

ANCILLARY FACILITIES

B147. Ancillary facilities that are not identified by description and location in the documents listed in A2 must not be constructed unless they satisfy the following criteria:
(a) the facility is development of a type that would, if it were not for the purpose of the development, otherwise be exempt or complying development; or
(b) the facility is located as follows:
(i) at least 50 metres from any waterway unless an erosion and sediment control plan is prepared and implemented so as not to affect water quality in the waterway in accordance with Managing Urban Stormwater series;
(ii) within or adjacent to land upon which the development is being carried out;
(iii) with ready access to a road network;
(iv) so as to avoid the need for heavy vehicles to travel on local streets or through residential areas in order to access the facility;
(v) on level land;
(vi) so as to be in accordance with the INCG (DECC 2009) or as otherwise agreed in writing with affected landowners and occupiers;
(vii) so as not to require vegetation clearing beyond the extent of clearing approved under other terms of this approval except as approved by the ER as minor clearing;
(viii) so as not to have any impact on heritage items (including areas of archaeological sensitivity) beyond the impacts identified, assessed and approved under other terms of this approval;
(ix) so as not to affect lawful uses of adjacent properties that are being carried out at the date upon which construction or establishment of the facility is to commence;
(x) to enable operation of the ancillary facility during flood events and to avoid or minimise, to the greatest extent practicable, adverse flood impacts on the surrounding environment and other properties and infrastructure; and
(xi) so as to have sufficient area for the storage of raw materials to minimise, to the greatest extent practicable, the number of deliveries required outside standard construction hours.

B148. Prior to establishment of any ancillary facility that is not identified by description and location in the documents listed in A2 that satisfies the criteria in condition B148, the Applicant must prepare and implement an **Ancillary Facilities Management Plan** which outlines the environmental management practices and procedures for the establishment and operation of the ancillary facility. The **Ancillary Facilities Management Plan** must be prepared in consultation with the relevant council and submitted to the Secretary for approval one month prior to installation of ancillary facilities. The **Ancillary Facilities Management Plan** must detail the management of the ancillary facilities and include:
(a) a description of activities to be undertaken during construction (including scheduling of construction);
(b) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken prior to the commencement of construction of the development; and
(c) details of how the activities described in subsection (a) of this condition will be carried out to:
(i) meet the performance outcomes stated in the documents listed in conditions A2; and

(ii) manage the risks identified in the risk analysis undertaken in subsection (b) of this condition.

B149. Minor ancillary facilities comprising lunch sheds, office sheds, and portable toilet facilities, that are not identified in the documents listed in condition A2 and which do not satisfy the criteria set out in condition B148 of this approval must satisfy the following criteria:

(a) have no greater environmental and amenity impacts than those that can be managed through the implementation of environmental measures detailed in the CEMP required under condition C1 of this approval; and

(b) have been assessed by the ER to have:

(i) minimal amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the *INCG* (DECC 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts;

(ii) minimal environmental impact with respect to waste management and flooding; and

(iii) no impacts on biodiversity, soil and water, and heritage items beyond those already approved under other terms of this approval.

B150. Boundary screening must be erected around all ancillary facilities that are adjacent to sensitive receivers for the duration of construction unless otherwise agreed with relevant Council(s), and affected residents, business operators or landowners.

B151. Boundary screening required under condition B150 must minimise visual, noise and air quality impacts on adjacent sensitive receivers.

FOOD PREPARATION AREAS

B152. All food premises must be designed, constructed and operated to meet legislative requirements and Australian Standards including:

(a) the Australian New Zealand Food Standards Code including Food Safety Standard 3.2.2 *Food Premises and Equipment*;

(b) AS 4674-2004: Design, construction and fit out of food premises;

(c) AS 4322-1995: Quality and performance of commercial electrical appliances – Hot food storage and display equipment;

(d) AS ISO 22000-2005: Food safety management systems-Requirements for any organisation in the food chain.

B153. The Applicant must obtain a certificate from a suitable qualified tradesperson, certifying that kitchen, food storage and food preparation areas have been fitted in accordance with *Australian Standard AS4674.* The Applicant must provide evidence of receipt of the certificate to the satisfaction of the Certifying Authority prior to occupation.

COMMUNITY ENGAGEMENT

Community Consultative Committee

B154. Before early works and fill importation a Community Consultative Committee (CCC) must be established for the Moorebank Intermodal Precinct (MPE and MPW) in accordance with the Department's *Community Consultative Committee Guidelines: State Significant Projects* (2016). The CCC must function for the duration of construction and for at least 5 years following commencement of operation.

Notes:
- *The CCC is an advisory committee only.*
- *In accordance with the guidelines, the Committee should comprise an independent chair and appropriate representation from the Applicant, Council and the local community.*

Community Communication Strategy

B155. No later than one month before early works and fill importation, a **Community Communication Strategy** must be prepared and submitted to the Secretary for approval. The Community Communication Strategy is to provide mechanisms to facilitate communication between the Applicant, the Council and the community (including adjoining affected landowners and businesses, and others directly impacted by the development), during the design and construction of the development. The Community Communication Strategy must:

(a) assign a central contact person to keep the nearby sensitive receivers regularly informed throughout the development;

(a) detail the mechanisms for regularly consulting with the local community throughout the development, such as holding regular meetings to inform the community of the progress of the development and report on environmental monitoring results;

(b) detail a procedure for consulting with nearby sensitive receivers to schedule high noise generating works or manage traffic disruptions;

(c) include contact details for key community groups, relevant regulatory authorities, Registered Aboriginal Parties and other interested stakeholders; and

(d) include a complaints procedure for recording, responding to and managing complaints, including:

(i) email, toll-free telephone number and postal address for receiving complaints;
(ii) advertising the contact details for complaints prior to and during operation, via the local newspaper and through on-site signage;
(iii) a complaints register to record the date, time and nature of the complaint, details of the complainant and any actions taken to address the complaint; and
(iv) procedures for the resolution of any disputes that may arise during the course of the development.

B156. The Applicant must:
(a) not commence construction until the Community Communication Strategy is approved by the Secretary;
(b) implement the approved Community Communication Strategy for the duration of the development and for 24 months following the completion of operation.

B157. The Complaints Register must be provided to the Secretary within 7 days upon request, for the period detailed within the request.

PART C

ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

C1. Before the commencement of construction, a Construction Environmental Management Plan (CEMP) must be prepared to the satisfaction of the Secretary. The CEMP must:
(a) identify the statutory approvals required to carry out the development;
(b) outline all environmental management practices and procedures to be followed during construction works associated with the development;
(c) describe all activities to be undertaken on the site during construction of the development, including a clear indication of construction stages;
(d) detail how the environmental performance of the construction works will be monitored, and what actions will be taken to address identified adverse environmental impacts;
(e) describe the roles and responsibilities for all relevant employees involved in construction works associated with the development; and
(f) include the management plans required under this approval, including:
(i) Construction Traffic and Access Management Plan;
(ii) Concrete Batching Plant Management Plan;
(iii) Soil and Water Management Plan;
(iv) Flood Emergency Response Plan;
(v) Construction Air Quality Management Plan;
(vi) Construction Noise and Vibration Management Plan;
(vii) Heritage Management Plan;
(viii) Construction Flora and Fauna Management;
(ix) Construction and Demolition Waste Management Plan;
(x) Contamination Management Plan; and
(xi) Bushfire Emergency and Evacuation Plan.

C2. The Applicant must:
(a) not commence construction until the CEMP is approved by the Secretary; and
(b) carry out the construction of the development in accordance with the most recent version of the CEMP approved by the Secretary, unless otherwise agreed by the Secretary.

OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

C3. Before the commencement of operations, a Precinct Operational Environmental Management Plan (OEMP) must be prepared to the satisfaction of the Secretary. The OEMP must:
(a) be prepared by a suitably qualified and experienced expert;
(b) provide the strategic framework for environmental management of the development;
(c) identify the statutory approvals required to carry out the development;
(d) Identify the infrastructure to be managed under the Precinct OEMP which is to include pavements, stormwater detention and water quality treatment structures and devices; and landscaping.
(e) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development including the overall responsibility for the operational environmental management of the freight village;
(f) describe the procedures to be implemented to:
(i) keep the local community and relevant agencies informed about the operation and environmental performance of the development;
(ii) receive, handle, respond to, and record complaints;
(iii) resolve any disputes that may arise;
(iv) respond to any non-compliance;
(v) respond to emergencies; and
(g) include the management plans required under this approval, including:
(i) Operational Traffic and Access Management Plan;
(ii) Workplace Travel Plan;
(iii) Stormwater Infrastructure Operation and Maintenance Plan;
(iv) Flood Emergency Response Plan;
(v) Operational Air Quality Management Plan;
(vi) Operational Noise and Vibration Management Plan;
(vii) Heritage Interpretation Plan;
(viii) Operational Flora and Fauna Management Plan;
(ix) Waste Management Plan;

(x) Long-term Contamination Management Plan; and
(xi) Bushfire Emergency and Evacuation Plan.

C4. The Applicant must:
(a) not commence operation of the development until the OEMP is approved bv the Secretary; and
(b) operate the development in accordance with the most recent version of the OEMP approved by the Secretary, unless otherwise agreed by the Secretary.

C5. Overall responsibility of the development, including the freight village environmental management during operation, must be by the entity responsible for the Precinct environmental management.

OCCUPATION ENVIRONMENTAL MANAGEMENT PLAN

C6. Prior to occupation of individual warehouses, a **Warehouse OEMP** must be submitted to the Secretary for approval and must:
(a) be generally in accordance with the precinct OEMP required under condition C3;
(b) demonstrate compliance with condition B114 regarding maintenance of quantities of dangerous goods below the screening threshold; and
(c) include auditing requirements.

MANAGEMENT PLAN REQUIREMENTS

C7. The Applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include:
(a) detailed baseline data;
(b) a description of:
(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);
(ii) any relevant limits or performance measures/criteria; and
(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
(c) a description of the management measures to be implemented to comply with the relevant statutory requirements, limits or performance measures/criteria;
(d) a program to monitor and report on the:
(i) impacts and environmental performance of the development; and
(ii) effectiveness of any management measures (see (c) above);
(e) a contingency plan to manage any unpredicted impacts and their consequences;
(f) a program to investigate and implement ways to improve the environmental performance of the development over time;
(g) a protocol for managing and reporting any:
(i) incidents and non-compliances;
(ii) complaints;
(iii) non-compliances with statutory requirements; and
(h) a protocol for periodic review of the plan.

Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for a particular management plan.

Revision of Strategies, Plans and Programs

C8. At least one month prior to the commencement of a new phase of the development, the CEMP or OEMP and applicable subplans must be reviewed and submitted to the Secretary for approval.

C9. Within three months of:
(a) the submission of an annual review under condition C10;
(b) the submission of an incident or non-compliance notification under condition C13;
(c) the submission of an audit under condition C18;
(d) the approval of any modification of the conditions of this consent; or
(e) the issue of a direction of the Secretary under condition A2;

the strategies, plans and programs required under this consent must be reviewed, and if necessary to either improve the environmental performance of the development, cater for a modification or comply with a direction, must be revised, to the satisfaction of the Secretary. Where revisions are required, the revised document must be submitted to the Secretary for approval within six weeks of the review.

Note: The purpose of this condition is to ensure that strategies, plans and programs are regularly updated to incorporate any measures recommended to improve the environmental performance of the development.

ANNUAL REVIEW

C10. Each year, the Applicant must submit a review the environmental performance of the development (including all tenants and occupants) to the to the Department. The review must:

(a) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;

(b) include a comprehensive review of the monitoring results and complaints records from the previous year, including a comparison of these against the:

- (i) the relevant statutory requirements, limits or performance measures/criteria;
- (ii) requirements of any plan or program required under this consent;
- (iii) the monitoring results of previous years; and
- (iv) the relevant predictions in the EIS, Submissions Report, Consolidated assessment clarification responses; Modification Assessment, or conditions of this consent;

(c) identify any non-compliance over the previous year, and describe what actions were (or are being) taken to ensure compliance;

(d) identify any trends in the monitoring data over the life of the development;

(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.

The Applicant must ensure that copies of the Annual Review are submitted to Council and are available to the CCC and any interested person upon request.

REPORTING

Incident Notification, Reporting and Response

C11. The Department must be notified in writing to compliance@planning.nsw.gov.au immediately after the Applicant becomes aware of an incident. The notification must identify the development (including the development application number and the name of the development if it has one), and set out the location and nature of the incident.

C12. A written incident notification addressing all requirements for such notification set out in Appendix C of this consent, must also be emailed to the Department at the following address: compliance@planning.nsw.gov.au within 7 days after the Applicant becomes aware of an incident. Notification is required to be given under this condition even if the Applicant fails to give the notification required under condition or, having given such notification, subsequently forms the view that an incident has not occurred.

C13. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Secretary the Applicant must provide the Secretary and any relevant public authorities (as determined by the Secretary) with a detailed report on the incident addressing all requirements for such reporting set out in Appendix C of this consent, and such further reports as may be requested.

C14. Any written requirements of the Secretary or relevant public authority (as determined by the Secretary) which may be given at any point in time, to address the cause or impact of an incident must be complied with and within any timeframe specified by the Secretary or relevant public authority.

C15. If statutory notification is provided to EPA as required under the POEO Act in relation to the development, such notification must also be provided to the Secretary within 24 hours after the notification was provided to EPA.

Non-compliance Notification and Reporting

C16. The Department must be notified in writing to compliance@planning.nsw.gov.au within 7 days after the Applicant becomes aware of any non-compliance.

C17. The notification must identify the development and the application number for it, set out the condition of consent that the development is non-compliant with, the way in which it does not comply, the reasons for the non-compliance (if known), and what actions have been, or will be, undertaken to address the non-compliance.

AUDITING

Independent Environmental Audit

C18. Within one year of the commencement of any development under this consent, and every three years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit (Audit) of the development. Audits must:

(a) be led and conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;

(b) be carried out in consultation with the relevant agencies and the CCC;

(c) assess the environmental performance of the development (and tenancies) and assess whether it is complying with the relevant requirements in this consent, and any strategy, plan or program required under this consent;
(d) review the adequacy of any approved strategy, plan or program required under this consent; and
(e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under this consent.

C19. Within three months of commencing an Independent Environmental Audit, or unless otherwise agreed by the Secretary, a copy of the audit report must be submitted to the Secretary, and any other NSW agency that requests it, together with a response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Secretary.

ACCESS TO INFORMATION

C20. At least 48 hours before the commencement of construction until the completion of all works under this consent, including demolition and remediation, the Applicant must:
(a) make copies of the following publicly available on its website:
(i) the documents referred to in condition A2 of this consent;
(ii) all current statutory approvals for the development;
(iii) all approved strategies, plans and programs required under the conditions of this consent;
(iv) regular reporting on the environmental performance of the development in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent;
(v) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
(vi) a summary of the current stage and progress of the development;
(vii) contact details to enquire about the development or make a complaint;
(viii) a complaints register updated on a monthly basis;
(ix) the Annual Reviews of the development;
(x) audit reports prepared as part of any independent environmental audit of the development and the Applicant's response to the recommendations in any audit report;
(xi) any other matter required by the Secretary; and
(b) keep such information up to date, to the satisfaction of the Secretary.

COMPLIANCE MONITORING AND TRACKING

C21. The Proponent must prepare and implement a **Compliance Tracking Program** to track compliance with the requirements of this approval. The Compliance Tracking Program must be submitted to the Secretary for approval prior to the commencement of construction.

The Compliance Tracking Program must include, but not be limited to:
(a) provision for the notification of the Secretary prior to the commencement of construction and prior to the commencement of operation of the development (including prior to each stage, where works are being staged);
(b) provision for periodic review of the compliance status of the development against the requirements of this approval and the environmental management measures committed to in the documents referred to in condition A2;
(c) provision for periodic reporting of compliance status to the Secretary, including but not limited to:
(i) a Pre-Construction Compliance Report prior to the commencement of construction,
(ii) quarterly Construction Compliance Reports, for the duration of construction, and
(iii) a Pre-Operation Compliance Report prior to the commencement of operation, and six monthly operational compliance reports;
(d) a program for independent environmental auditing;
(e) mechanisms for recording environmental incidents during construction and actions taken in response to those incidents;
(f) provision for reporting environmental incidents to the Secretary during construction; and
(g) procedures for rectifying any non-compliance identified during environmental auditing, review of compliance or incident management; and (h) provision for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.

ENVIRONMENT REPRESENTATIVE

C22. A suitably qualified and experienced ER who is independent of the development must be nominated by the Applicant, approved by the Secretary and engaged for the duration of construction of the development in accordance with the *Environmental Representative Protocol* (DPE 2017). Additional ERs may be engaged for the purpose of this condition in which case the obligations to be carried out by an ER under the terms of this consent may be satisfied by any ER

that is approved by the Secretary. The details of nominated ER(s) must be submitted to the Secretary for approval no later than one month prior to the commencement of works, or within another timeframe agreed with the Secretary.

This condition does not preclude the same ER for MPW projects being considered by the Secretary.

C23. Construction must not commence until an ER nominated under C24 has been approved by the Secretary.

C24. From commencement of any works until completion of construction, the approved ER must:

(a) on behalf of the Applicant, receive and respond to communication from the Secretary in relation to the environmental performance of the development;

(b) consider and inform the Secretary on matters specified in the terms of this consent;

(c) consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community;

(d) review the following documents required to be prepared under the terms of this consent, ensure they are consistent with requirements in or under this consent and if so, endorse them prior to submission to the Secretary (if required to be submitted to the Secretary) or prior to implementation (if not required to be submitted to the Secretary):

  (i) CEMP;

  (ii) OEMP; and

  (iii) the other plans and sub-plans required by these conditions, and referenced in conditions C1 and C3;

(e) regularly monitor the implementation of all documents required to be prepared under the terms of this consent to ensure implementation is being carried out in accordance with what is stated in the document and the terms of this consent;

(f) as may be requested by the Secretary, help plan, attend or undertake Department audits of the development including scoping audits, programming audits, briefings, and site visits, but not independent audits required under condition C18 of this consent;

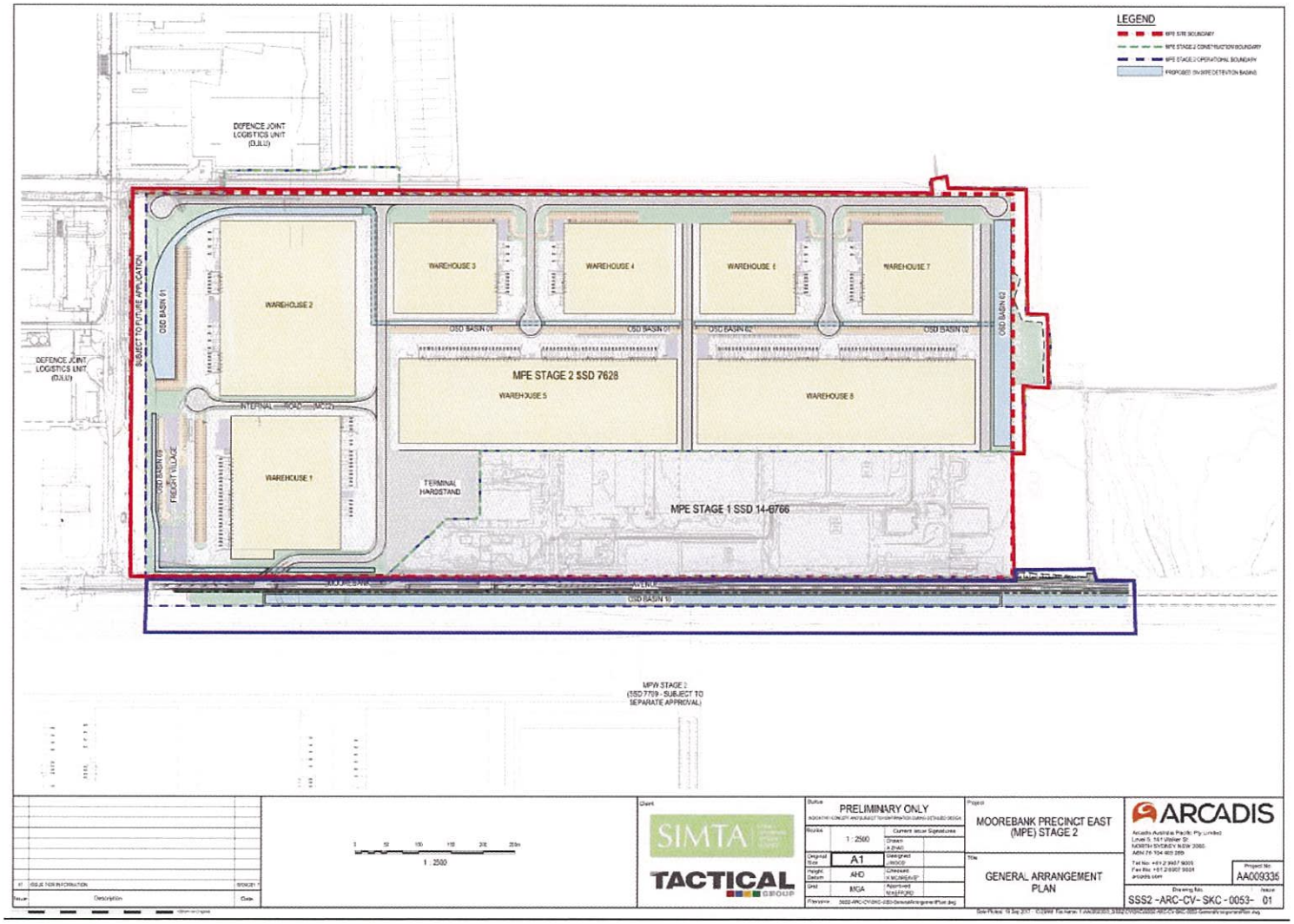
(g) if conflict arises between the Applicant and the community in relation to the environmental performance of the development, attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary;

(h) consider any minor amendments to be made to the CEMP, CEMP sub-plans and monitoring programs that comprise updating or are of an administrative nature, and are consistent with the terms of this consent and the CEMP, CEMP sub-plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this consent; and

(i) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Environmental Representative Report detailing the ER's actions and decisions on matters for which the ER was responsible in the preceding month (or other timeframe agreed with the Secretary). The Environmental Representative Report must be submitted within seven (7) days following the end of each month for the duration of construction of the development, or as otherwise agreed with the Secretary.

APPENDIX A

SITE PLAN



APPENDIX B

APPLICANT'S MANAGEMENT AND MITIGATION MEASURES

APPENDIX C

INCIDENT NOTIFICATION AND REPORTING REQUIREMENTS

WRITTEN INCIDENT NOTIFICATION REQUIREMENTS

Written notification of an incident must:

a) identify the development and application number

b) provide details of the incident (time, date, nature, duration and location of the incident)

c) the nature, the estimated quantity or volume and the concentration of any pollutants involved, if known

d) the circumstances in which the incident occurred (including the cause of the incident, if known)

e) identify how the incident was detected

f) identify when the Applicant became aware of the incident

g) identify any actual or potential non-compliance with conditions of consent

h) describe what immediate steps were taken in relation to the incident

i) identify further action(s) to be taken in relation to the incident

j) identify a contact for further communication regarding the incident and set out their contact details.

INCIDENT REPORT REQUIREMENTS

The Incident Report must include:

a) a summary of the incident

b) outcomes of an incident investigation, including identification of the cause/s of the incident

c) details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence

d) details of any communication with other stakeholders regarding the incident.