MELROSE PARK HIGH SCHOOL

CIVIL ENGINEERING REF DESIGN REPORT

Prepared for: SINSW
By: **en**struct group pty ltd
January 2025

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MELROSE PARK HIGH SCHOOL

CIVIL ENGINEERING REF DESIGN REPORT

ISSUE AUTHORISATION

PROJECT: Melrose Park High School

Project No: 140232

Rev	Date	Purpose of Issue / Nature of Revision	Prepared by	Reviewed by	Issue Authorised by
1	20/09/2024	Issue as DRAFT	ASE	JAF	PAL
2	04/10/2024	Issue as DRAFT	JAF	JAF	PAL
3	15/11/2024	Issue For Schematic Design	ASE	JAF	PAL
4	29/11/2024	Issue for REF	JAF	JAF	PAL
5	11/12/2024	Reissue for REF	JAF	PAL	PAL
6	22/01/2025	Issue for REF	ASE	JAF	PAL
7	29/01/2025	Issue for REF	ASE	JAF	PAL

Executive Summary

enstruct have been engaged by Schools Infrastructure NSW (SINSW) to provide civil engineering consultancy services and design development of Melrose Park High School (hereafter MPHS).

This report relates to the civil engineering elements of the schematic design, and will discuss items such as site composition, stormwater and erosion and sediment control. This report should be read in conjunction with the Flood Impact Assessment Report and the Flood Emergency Management Plan.

This report supports the submitted development application documentation.

The key items include:

- Stormwater Design
- Onsite Stormwater Detention (OSD)
- Water Sensitive Urban Design (WSUD)
- Overland Flow
- Erosion and Sediment Control
- Design Integration

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REF Checklist

Stormwater drainage	Y	N	N/A	Comments
Has a stormwater management plan been prepared that: • considers and complies with council's applicable engineering specifications, including requirement for on-site detention and water quality treatment?	☒	☐	☐	Refer to Drawing PS140232-CV-0401.
• demonstrates that the proposed stormwater management system would not increase runoff from the site (i.e. that post-development flows do not exceed pre-development flows)?	☒	☐	☐	Refer to Sections 2.1 and 2.2.
• demonstrates that the stormwater management system would discharge to a legal point of discharge?	☒	☐	☐	Refer to Drawing PS140232-CV-0401.
• conclude that stormwater would be managed so that the proposal would not be likely to have significant environmental affects?	☒	☐	☐	Refer to Sections 1.3 and 5.
Does the REF summarise the proposed stormwater management strategy and conclude that the activity would not be likely to have significant environmental impacts as a result of stormwater management with or without mitigation measures?	☒	☐	☐	Refer to Section 1.3.
Soil and water				
If the site is mapped as, or has otherwise been identified, as having salinity potential, does the geotechnical report consider impacts from salinity and set out measures to mitigate impacts (i.e. Salinity Management Plan) so that they would not be significant?	☐	☐	☒	N/A for Civil Engineering Report, refer to Geotechnical.
If the site is mapped as, or has otherwise been identified as having acid sulfate soils (ASS) potential, does the geotechnical report consider impacts from ASS and set out measures to mitigate impacts (i.e. ASS Management Plan) so that they would not be significant?	☐	☐	☒	N/A for Civil Engineering Report, refer to Geotechnical.
If the site is mapped as being in an area of groundwater vulnerability, does the REF include an Integrated Water Management Plan that assess the potential of the activity to impact groundwater and does it conclude that the activity would not be likely to have significant environmental impacts with or without mitigation measures?	☐	☐	☒	N/A for Civil Engineering Report, refer to Geotechnical.
If the site is mapped as being in an area of landslide risk, does the REF assess the potential of the activity and does it conclude that the activity would not be likely to have significant environmental impacts with or without mitigation measures?	☐	☐	☒	N/A for Civil Engineering Report, refer to Geotechnical.
Has an Erosion and Sediment Control plan been prepared to inform the REF that includes: • a plan(s) detailing: ○ property boundaries, existing levels of the land in relation to the building, roads and where stormwater surface flows enter and leave the site?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
○ the location of stabilised construction access points?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
○ the location of perimeter sediment/erosion controls?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
○ any 'no-go' areas that are not to be disturbed?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
○ location of stockpile areas?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
○ location of proposed temporary and permanent site drainage?	☒	☐	☐	Refer to Drawing PS140232-CV-0101.
• specific measures to be implemented to prevent pollution of stormwater off the site?	☒	☐	☐	Refer to Section 1.4.
Does the REF summarise the proposed controls and incorporate any mitigation measures identified in the above documents?	☒	☐	☐	Refer to Section 1.4.

Contents

1 Introduction

This Civil Engineering REF Report has been prepared by enstruct on behalf of the Department of Education (DoE) to assess the potential environmental impacts that could arise from the construction and use of the new Melrose Park High School project (the Activity) at 37 Hope Street, Melrose Park. This report supports the assessment of the proposed Activity under Part 5 of the Environmental Planning and Assessment Act 1979. The Activity is proposed by the DoE to meet the growth in educational demand in the Melrose Park precinct.

This report has been prepared as a part of the REF Design for the proposed development of Melrose Park High School, which will accommodate current and future growth in population in the City of Parramatta.

1.1 Summary of the Activity

The proposed activity involves the construction and use of a new high school in two stages for approximately 1,000 students.

Stage 1 of the proposed activity includes the following:

- Site preparation works.
- Construction of Block A – a six-storey (with additional roof/plant level) school building in the south-western portion of the site containing staff rooms and General Learning Spaces (GLS).
- Construction of Block B – a one storey (double height) hall, gymnasium, canteen and covered outdoor learning area (COLA) building in the south-eastern portion of the site.
- Construction of Block C – a single storey plant and storage building at the north-eastern portion of the site.
- Associated landscaping.
- Construction of on-site car parking.
- Provision and augmentation of services infrastructure.
- Associated public domain infrastructure works to support the school, including (but not limited to):
    - Provision of kiss and drop facilities along Wharf Road and widening of the Wharf Road footpath.
    - Raised pedestrian crossings on Wharf Road and Hope Street.

Stage 2 of the proposed activity includes the following:

- Construction of Block D – a five-storey (with additional roof/plant level) school building in the north-western portion of the site containing staff rooms and GLS:
- Additional open play spaces within the terrace areas of Building D.
- Minor layout amendments to Block A.

The Review of Environmental Factors prepared by Ethos Urban provides a full description of the proposed works.

1.2 Site Description

The site is located at 37 Hope Street, Melrose Park within the Parramatta LGA. The school covers an approximate area of 9,500m^2 and is generally rectangular in shape. The site is currently cleared and vacant. The site is located approximately 8km east of the Parramatta CBD.

The subject site falls within the Local Government Area of the City of Parramatta Council (COPC). The site is bounded by a combination of low-height residential developments and future high rise residential developments.

On the western side, along Hope Street, high-rise developments are planned for the future. To the east, the site borders Wharf Road Reserve, with existing low-rise residential buildings located on the eastern side of Wharf Road. To the south, across Hope Street, there are existing industrial buildings, while to the north, the site adjoins a future communal sports field.

The site's topography generally slopes down to the north of the site at a relative constant slope of 0.5-1%. The maximum level is approximately RL 16.55 (m AHD) in the north-east corner and the minimum level is approximately RL15.25 (m AHD) in the north-west corner.

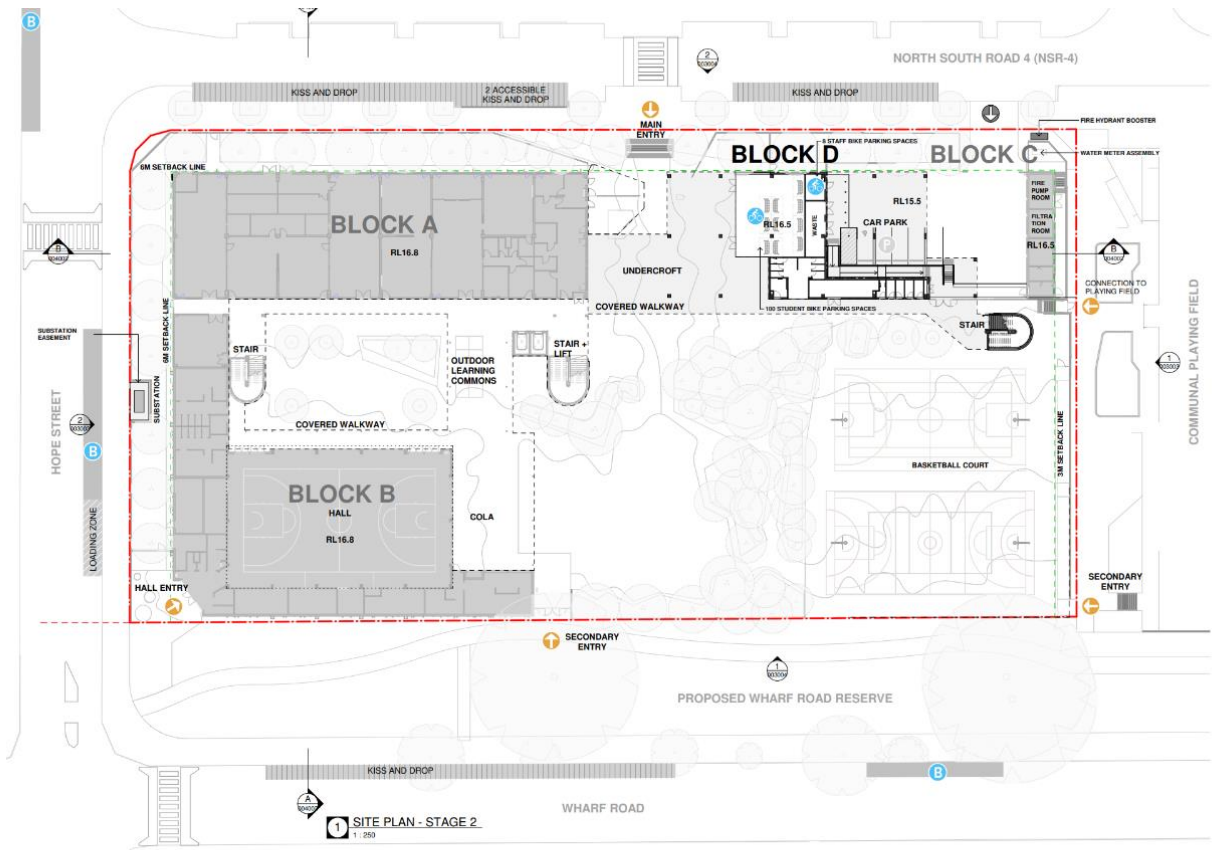

Figure 1: Site Plan (Source: NBRS)

1.3 Significance of Environmental Impacts

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are low and will not have significant impact on the locality, community and/or the environment.
- Potential impacts can be appropriately mitigated or managed to ensure that there is no significant impact on the environment.

1.4 Mitigation measures

As all the mitigation measures are described in future chapters, the following table provides a summary:

Table 1: Mitigation measures related to civil engineering

Project Stage D – Design C – Constrction O - Operation	Mitigation Measures	Relevant section of the report
D, C	Erosion and Sediment control measures	Section 3
D, C, O	Stormwater Quantity Control measures (OSD)	Section 2.1 and 2.2
D, C, O	Stormwater Quality Control measures (WSUD)	Section 2.5
D, C, O	Flood analysis and planning measures	Refer to "Flood Impact Assessment Report" prepared by Enstruct

1.5 Existing Stormwater

An investigation into the existing stormwater assets surrounding the site was undertaken through DBYD, the available survey and Masterplan drawings. Based on this study, it is understood that there are existing COPC stormwater assets at the site's eastern boundaries, along Wharf Road, as reflected in Figure 2a below. It is understood that stormwater runoff collected from the site, as well as the masterplan, connects into this existing network of stormwater assets.

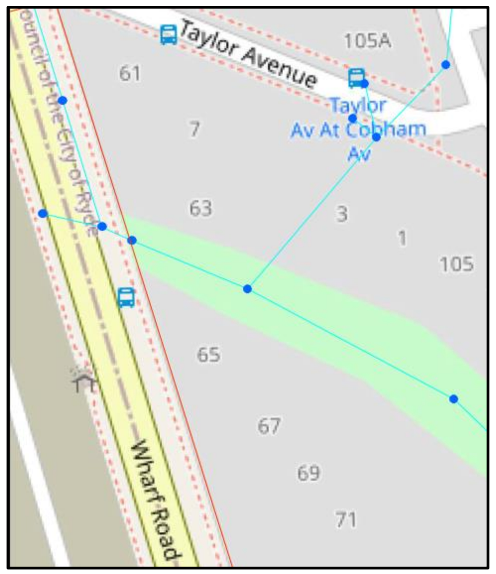

Figure 2: Existing Stormwater Assets at Wharf Rd.

(Source: Before You Dig Enquiry – City of Ryde)

As per the masterplan drawings provided (Figure 2b), the school site will have two connection points, with the primary connection point on the furthermost northwest corner, and a secondary connection point along the western road.

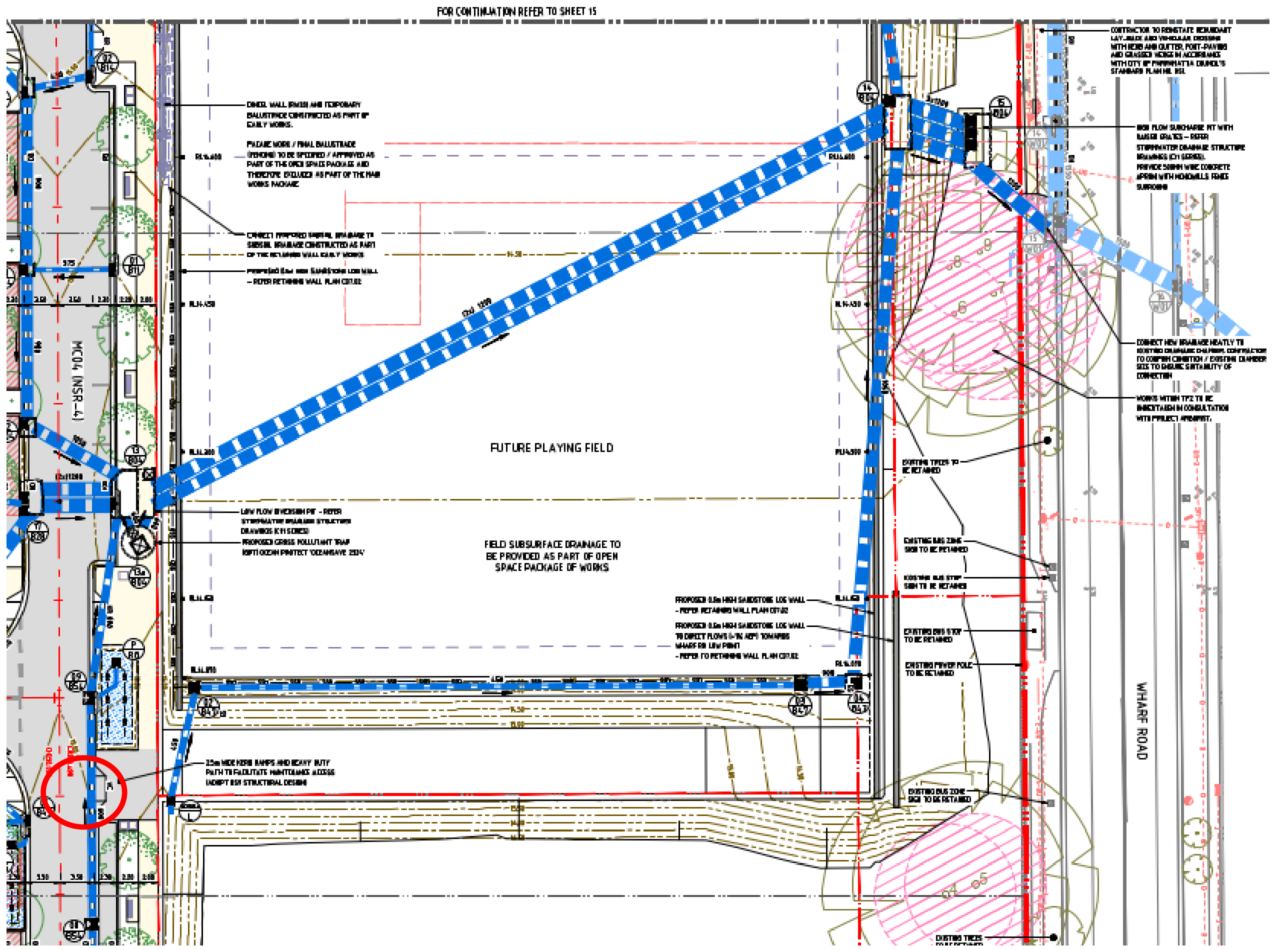

Figure 3: Stormwater Assets downstream of site, as per Masterplan drawings (Source: Northrop)

1.6 *Existing Public Infrastructure*

The public domain surrounding the site currently consists of pedestrian footpaths, kerb and gutters along Hope Street and Wharf Road, to the south and east of the existing site respectively. Additionally, the existing site includes one vehicle entry driveway along MC05 (Waratah Street). It is understood additional public domain infrastructure has been proposed as a part of this design development.

This infrastructure includes:

- A proposed Wharf Road Gardens circulation corridor to connect to the existing active transport network,
- Primary and secondary school entry and forecourts along the western boundary.
- Pedestrian entrance points at the eastern and northern boundary of the site.
- Secondary school entry to outdoor play and playing fields,
- Maintenance of tree planting to the site perimeter to enhance the public domain outside the school's secure perimeter.

1.7 *Standards list*

The following list indicates the relevant design guidelines and standards to be considered:

Engineering Specific:

- Australian Rainfall & Runoff
- Austroads: Guide to Road Design
- Austroads: Guide to Pavement Technology
- AS1428.1 Design for Access & Mobility
- AS2890.1 Parking Facilities: Off–street car parking
- AS2890.2 Parking Facilities: Off-street commercial parking
- AS2890.5 Parking Facilities: On-street parking
- AS2890.6 Parking Facilities: Off-street for people with disabilities
- AS3500.3 Plumbing and Drainage: Stormwater Drainage
- Managing Urban Stormwater: Soils and Construction, "The Blue Book" – 4th edition 2004.
- Concrete Pipe Selection and Installation - Concrete Pipe Association 1990.
- NSW MUSIC Modelling Guidelines 2015

Government Specific:

- City of Parramatta Development Control Plan (DCP)
- City of Parramatta Development Engineering Design Guidelines 2018
- City of Parramatta Technical Design Guide – Stormwater Cartridge Filters
- City of Parramatta Public Domain Guidelines
- Upper Parramatta River Catchment Trust On Site Detention Handbook 4th Edition

- Parramatta Local Environment Plan (LEP) 2023
- Educational Facilities Standards and Guidelines (ESFG)

2 Stormwater Design

The stormwater design must be in accordance with Australian Standards, City of Parramatta Development Control Plan (2023), City of Parramatta Development Engineering Design Guidelines (2018), and Australian Rainfall and Runoff (2019).

In general, drainage is to be designed to ensure that site facilities are available for students' use in all weather conditions up to a 1% AEP storm event. All new roof stormwater will be collected in roof gutters and downpipes and conveyed to the in-ground pipe system. Surface stormwater will be collected in pits. The in-ground stormwater will be connected to water quality controls.

Pipes and pits will need to be designed to satisfy the minimum provisions of AS 3500.3. They must be designed to convey, at least, the 5% Annual Exceedance Probability (AEP) flows as per ESFG guidelines. Where pipe capacity is exceeded i.e., greater than 5% AEP, stormwater will be conveyed as overland flow. Overland flow paths are to be designed to convey at the minimum 1% AEP stormwater flows with a Velocity x Depth to be less than $0.4m^2/s$.

Class B, C and D pits are to be used in accordance with AS 3996.

2.1 Onsite Stormwater Detention (OSD)

Mitigation Measures

Generally, COPC requires OSD for all multi-unit residential development, including dual occupancies, all commercial development and all community-focused facilities.

City of Parramatta Development Engineering Design Guidelines (2018) stipulate that all OSD systems must be designed in accordance with the Upper Parramatta River Catchment Trust (UPRCT) OSD Handbook. Based on this handbook, the minimum OSD storage required is $455\ m^3/ha$. Based on the proposed site area, it is expected that an OSD tank of around $452m^3$ will be required.

The OSD must be designed and constructed to control stormwater runoff from development sites such that, for all peak stormwater events up to and including 1%AEP discharges from the site do not exceed pre-development stormwater discharges.

The ESFG notes the preference for open and absorption storage systems, this is equivalent to a fenced pond. While this might sound effective for a big site, this system requires further investigation. Therefore, currently, an underground OSD is proposed.

OSD storage volume shall be provided such that the total OSD discharge and bypass flow from the site does not exceed the maximum permissible site discharge. OSD will be located in a way, to ensure that future stage 2 of the development is not impacted.

2.2 OSD Modelling

A preliminary OSD modelling has been developed using the UPRCT spreadsheet to assess the ability of the single (1) proposed OSD tank to manage stormwater flows from the site to below predevelopment site flow rates for both stages of the project. Preliminary calculations indicate that a 452m3 OSD tank will be required.

2.3 Flooding

For flooding analysis refer to the Flood Emergency Management Plan (FEMP) and Flood Impact Assessment Report prepared by Enstruct, which includes the analysis for the 1% AEP event, up to the PMF event.

Also refer to the Flood Emergency Management Plan for flooding response.

2.4 Overland Flow Paths

If the piped in-ground stormwater system fails due to blockage or other obstruction, stormwater flows will be required to be conveyed as overland flow. The overland flow is to be directed away from buildings and towards the site's boundary.

Overland flow paths will be sized to accommodate the 1% AEP storm flows and not exceed safe Depth x Velocity products of $0.4m^2/s$ for pedestrians and vehicles.

The designated overland flow route for the site corresponds to the northeast corner, where water will be conveyed to the downstream park.

2.5 Water Sensitive Urban Design (WSUD)

Mitigation Measures

Water Sensitive Urban Design typically includes water reuse, pollutant removal via natural systems, and the minimisation of hard structures to control stormwater and improve aesthetic and recreational appeal.

Where open space exists, an attempt to incorporate WSUD principles into the stormwater design should be made. Although, as standing water poses waterborne health risk, careful attention to the WSUD type and how it is incorporated is required.

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2.5.1 Stormwater Quality

Part 8.2.6.7.5 of COPC's DCP sets out the requirements for treatment of the stormwater prior to discharge into the Council system. The guidelines require all developments to achieve a minimum percentage reduction of the post development average annual load of pollutants. The targets for stormwater treatment are available in **Table 2**.

Table 2: Pollutant Reduction Targets Requirements as per COPC DCP

Pollutant	Performance Requirements
Gross Pollutants (greater than 5mm)	90% reduction in the post development mean annual load
Total Suspended Solids (TSS)	85% reduction in the post development mean annual load
Total Phosphorus (TP)	60% reduction in the post development mean annual load
Total Nitrogen (TN)	45% reduction in the post development mean annual load
Total Hydrocarbons	90% reduction in the post development mean annual load

The safety of the school population is to be considered when designing the stormwater treatment train. Consequently, mechanical (in lieu of natural removal) pollutant removal devices may need to be incorporated to remove gross pollutants, suspended solids, reduce nutrient runoff including nitrogen and phosphorous.

The pollution control devices will require on-going maintenance. Pollutant removal devices will require at least a yearly inspection and maintenance.

It is proposed that a series of pollution control devices will need to be provided to remove contamination from stormwater runoff to the required level prior to discharge. It is expected that the devices will include, litter screens in all pits and an end of line treatment device to remove nitrogen & phosphorus contaminants etc., prior to discharge to the Authority's stormwater system. This system is preferred as it will be able to achieve pollutant reductions required, is easily maintained, and does not require large open areas or pose safety risk to the school population.

2.5.2 MUSIC Model

A MUSIC Model has been developed in accordance with the NSW WSUD Developer Handbook 2015 to indicate the suitability of the proposed WSUD measures on the site. The proposed water quality control devices for the site are:

- 2 OceanProtect OceanGuard pit inserts,
- 15 x 690mm high PSORB stormfilter cartridges within a 12m^2 stormfilter chamber as the end-of-line treatment measure before discharge into Council's system.

The results of the MUSIC model confirmed the ability of the above devices to reduce the pollutants discharged from the site to below the requirements described by council. The results comparison is available in **Table 3**.

Table 3: Pollutant Reduction MUSIC Results Comparison

Pollutant	Performance Requirement	Performance Result
Gross Pollutants	90%	100%
Total Suspended Solids	85%	85.99%
Total Phosphorus	60%	71.17%
Total Nitrogen	45%	51.20%

Further detail of the MUSIC models is available in **Appendix A**.

2.6 EFSG Departures

This development proposes departure from EFSG requirements:

0224.0.04: "Where an above ground OSD or adsorption system is preferred, where practical". Due to the topography of the site, an above ground detention system is not favourable. An above ground system will require a greater ponding structure and perimeter fencing, disrupting visual aesthetics and introducing drowning risks. Alternatively, an underground OSD tank can be safely placed underground in lieu of an above ground OSD or adsorption system.

2.7 Integrated Water Management Plan

The integrated water management plan is a holistic and collaborative approach of the water cycle and consider elements such as: Potable water, Rainwater reuse, Recycled water, Surface stormwater, Groundwater, Stormwater detention, Water quality, among others.

In this report, civil has covered the elements related to surface stormwater, stormwater quality and stormwater detention. For potable water, rainwater storage and reuse, refer to the Hydraulics engineering report and drawings.

3 Erosion and Sediment Control

Mitigation Measures

During construction and while the site is disturbed, erosion prevention and sediment control measures will be required. Erosion prevention generally involves managing stormwater by diverting overland flow around construction areas as well as collecting stormwater within the construction zone and directing to sediment control devices. Devices likely to be incorporated are silt removal fences, hay bales, catch drains, and water flow dissipation and discharge control devices such as sandbags, pollution mattresses, and sedimentation basins.

Erosion prevention and sediment removal strategies need to be inspected regularly during construction works, cleaned, and maintained after storm events, and modified to suit construction work progress, decanting and demolition.

Erosion and sediment controls are to be designed, constructed, and installed in accordance with Managing Urban Stormwater: Soils and construction - Volume 1 and maintained until the site is fully stabilised to prevent pollution of the receiving environment. An erosion and sediment control plan has been provided in the civil drawing set.

4 Pavements

As per the Geotechnical Report prepared by 'JK Geotechnicks' ref 31073ZNrpt, dated 02/02/2018, Section 4.5, a CBR of 6% can be adopted for the site, assuming the compaction and moisture as specified. Furthermore, refer to section 4.5.1 of the same report for Subgrade preparation. Subgrade testing must be carried out prior commencement of works.

It is important to note, however, that the boreholes of the above report were taken before the masterplan site regrading, therefore, conditions could have changed since then, depending among others, on the cut/fill of the works undertaken.

Pavement design is to meet the requirements of future geotechnical studies, alongside, ESFG and Austroads guidelines for vehicular pavements. The following items are applicable:

- All pavements to be designed for a 25-year life
- All pavements trafficked by buses and trucks to be designed for a minimum 5E5 repetitions of a standard axle load, as defined by AUSTROADS and ESFG, for other pavements, the repetitions are 1E5
- Allow for movements in the foundations caused by moisture variations and mine subsidence.
- Design rigid pavements so there is no vertical differential movement between panels at joints.
- For truck turning areas pavements shall be rigid in construction and finished with a reinforced concrete surface.
- For other areas pavements may be either flexible or rigid in construction. For flexible construction finish with a surface coat of asphaltic concrete.
- Breccia or dolerite is not to be used in road base or concrete mix.
- Non-skid finish for vehicular trafficked pavements
- Non-slip finish for pedestrian trafficked pavements, including carpark
- AC for roads and parking to be AC10 and have a minimum thickness of 40mm or greater as the design requires.
- AC for games courts to be AC5 and have a minimum thickness of 25mm levelling course plus 25mm surface course or greater as the design requires.
- Limit fly ash content to 20% of cementitious content of the mix by weight.
- For roads and parking areas concrete shall have a minimum 32 MPa characteristic compressive strength.
- For rigid method of construction finish with a reinforced concrete surface.
- Concrete pavements for vehicles shall be a minimum of 150mm thick and reinforced with not less than SL92 mesh at top and 100 mm thick road base.
- Other concrete pavements shall be a minimum 100mm thick and reinforced with no less than SL72 mesh at top.
- Provide a thicker pavement and heavier mesh as the design requires and to meet durability requirements for minimum cover to reinforcement.
- For flexible construction finish with a surface coat of asphaltic concrete.
- Paving is to fall away from the buildings and covered areas.
- Finished vertical grades to be limited to < 1 in 10. Provide vertical curves where change of grade exceeds 3%. Provide cross-falls, as required.

Integration with all engineering and building systems, including services and traffic components, will continue to be coordinated through the upcoming phases. All stormwater drainage will be outside of the building's extent and will require no structural penetrations.

5 Conclusion

The civil works associated with the design and construction of the new Melrose Park High School will be carried out in accordance with typical engineering practices and will meet the requirements of relevant standards.

Erosion and sediment control measures are to be in place during construction to prevent contamination of the downstream stormwater system and tracking of grit and sediment onto the roadway.

An on-site-detention (OSD) system will be provided to meet acceptable stormwater runoff discharge rates from the site, taking into consideration the flood levels for the downstream neighbouring site.

WSUD systems will ensure the stormwater drainage network to meet council standards.

Subject to implementing the recommendations/mitigation measures such as erosion control, water quantity management and water quality management of this report, the conclusion of this assessment is that the proposed Activity is not likely to significantly affect the environment in relation to stormwater and soil matters.

Supporting Information and External References

Northrop's IFC Civil masterplan drawings for 'Sekisui House'
150077-60_CC_COMBINED PACKAGE REVIEW.pdf

Lyall & Associates Masterplan Flood studies for 'Sekisui House'
MPNP_PP_USQ&QA_001 [Final].pdf

Before You Dig Australia
https://www.byda.com.au/

ESFG
https://efsg.det.nsw.edu.au/design
https://efsg.det.nsw.edu.au/spec
https://education.nsw.gov.au/about-us/efsg/design-framework

NSW LGA boundaries map
https://portal.spatial.nsw.gov.au/portal/home/webmap/viewer.html

Parramatta LGA flood maps
https://www.cityofparramatta.nsw.gov.au/flooding/2024-parramatta-river-flood-study/full-report
https://www.cityofparramatta.nsw.gov.au/sites/council/files/2024-06/prfs-file_4b.pdf
https://www.cityofparramatta.nsw.gov.au/sites/council/files/2024-06/prfs-file_9.pdf
https://www.cityofparramatta.nsw.gov.au/sites/council/files/2024-06/prfs-file_10.pdf
https://www.cityofparramatta.nsw.gov.au/sites/council/files/2024-06/prfs-file_11.pdf

Ryde LGA flood maps
https://www.ryde.nsw.gov.au/HaveyourSay/Past-Have-Your-Say/City-of-Ryde-Draft-Flood-Study-2023
https://www.ryde.nsw.gov.au/files/assets/public/v/1/have-your-say/planning/draft-flood-study-2023/230601_appendixf_merged.pdf

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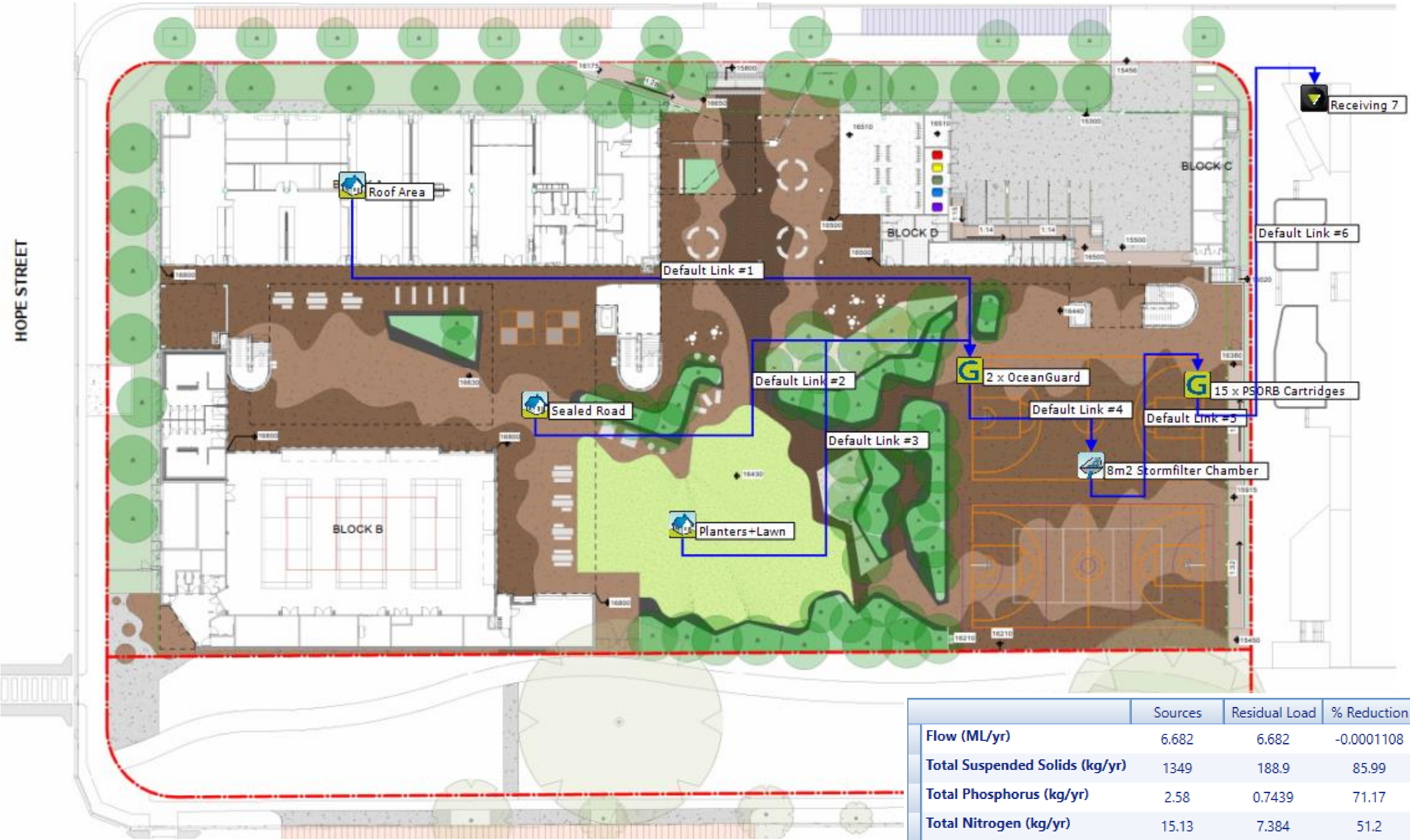
APPENDIX A: MUSIC MODELS

WATER QUALITY MUSIC MODEL AND RESULTS



	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.682	6.682	-0.0001108
Total Suspended Solids (kg/yr)	1349	188.9	85.99
Total Phosphorus (kg/yr)	2.58	0.7439	71.17
Total Nitrogen (kg/yr)	15.13	7.384	51.2
Gross Pollutants (kg/yr)	152.9	0	100

APPENDIX B: ARR AND BOM DATA

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	151.072
Latitude	-33.813
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Climate Change Factors	show
Probability Neutral Burst Initial Loss (./nsw_specific)	show
Baseflow Factors	show

Data

River Region

Division	South East Coast (NSW)
River Number	13
River Name	Sydney Coast-Georges River

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2016_v1

ARF Parameters

$$ARF = Min\left\{1, \left[1 - a\left(Area^{b} - c\log_{10}Duration\right)Duration^{-d} + eArea^{f}Duration^{g}\left(0.3 + \log_{10}AEP\right) + h10^{iArea\frac{Duration}{1440}}\left(0.3 + \log_{10}AEP\right)\right]\right\}$$

Zone	a	b	c	d	e	f	g	h	i
SE Coast	0.06	0.361	0.0	0.317	8.11e-05	0.651	0.0	0.0	0.0

Short Duration ARF

$$ARF = Min\left[1, 1 - 0.287\left(Area^{0.265} - 0.439\log_{10}(Duration)\right).Duration^{-0.36} + 2.26 \text{ x } 10^{-3} \text{ x } Area^{0.226}.Duration^{0.125}\left(0.3 + \log_{10}(AEP)\right) + 0.0141 \text{ x } Area^{0.213} \text{ x } 10^{-0.021\frac{(Duration-180)^2}{1440}}\left(0.3 + \log_{10}(AEP)\right)\right]$$

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Note: As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. The continuing storm loss information from the ARR Datahub provided below should only be used where relevant under the loss hierarchy (level 5) and where used is to be multiplied by the factor of 0.4.

ID	7239.0
Storm Initial Losses (mm)	33.0
Storm Continuing Losses (mm/h)	1.8

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECsouth.zip)

code	ECsouth
Label	East Coast South

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2016_v2

Areal Temporal Patterns | Download (.zip) (./static/temporal_patterns/Areal/Areal_ECsouth.zip)

code	ECsouth
arealabel	East Coast South

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2016_v2

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-33.813&longitude=151.072&sdmin=true&sdhr=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

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Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	9.3 (0.319)	6.4 (0.172)	4.5 (0.105)	2.7 (0.056)	2.6 (0.046)	2.5 (0.040)
90 (1.5)	14.5 (0.436)	9.6 (0.225)	6.3 (0.129)	3.1 (0.057)	2.3 (0.036)	1.7 (0.024)
120 (2.0)	10.3 (0.282)	7.4 (0.160)	5.5 (0.103)	3.7 (0.061)	3.1 (0.043)	2.6 (0.033)
180 (3.0)	9.2 (0.217)	7.4 (0.137)	6.2 (0.099)	5.0 (0.071)	4.1 (0.049)	3.4 (0.037)
360 (6.0)	7.3 (0.131)	11.1 (0.154)	13.6 (0.161)	16.0 (0.165)	12.1 (0.105)	9.1 (0.071)
720 (12.0)	5.2 (0.070)	11.2 (0.111)	15.2 (0.126)	18.9 (0.136)	23.5 (0.141)	27.0 (0.143)
1080 (18.0)	4.5 (0.050)	10.1 (0.082)	13.9 (0.093)	17.5 (0.100)	23.5 (0.112)	27.9 (0.118)
1440 (24.0)	1.1 (0.011)	6.5 (0.045)	10.0 (0.058)	13.3 (0.066)	21.1 (0.086)	26.9 (0.097)
2160 (36.0)	0.0 (0.000)	2.6 (0.015)	4.4 (0.021)	6.0 (0.024)	8.9 (0.030)	11.0 (0.033)
2880 (48.0)	0.0 (0.000)	0.1 (0.000)	0.1 (0.001)	0.2 (0.001)	2.2 (0.007)	3.8 (0.010)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.9 (0.002)	1.5 (0.004)

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	19 September 2024 09:26PM

Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.2 (0.002)	0.3 (0.003)	0.4 (0.004)	0.2 (0.001)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.1 (0.005)	1.9 (0.008)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.4 (0.002)	0.7 (0.003)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	46.2 (1.587)	34.2 (0.915)	26.2 (0.609)	18.6 (0.382)	19.6 (0.347)	20.3 (0.325)
90 (1.5)	43.4 (1.304)	42.0 (0.989)	41.0 (0.840)	40.1 (0.725)	32.9 (0.512)	27.5 (0.385)
120 (2.0)	43.2 (1.176)	40.1 (0.860)	38.1 (0.709)	36.2 (0.594)	35.7 (0.503)	35.3 (0.447)
180 (3.0)	46.4 (1.095)	43.2 (0.801)	41.1 (0.660)	39.2 (0.552)	43.5 (0.524)	46.7 (0.505)
360 (6.0)	43.5 (0.783)	54.3 (0.753)	61.5 (0.730)	68.4 (0.706)	71.6 (0.626)	73.9 (0.575)
720 (12.0)	29.1 (0.388)	41.2 (0.408)	49.2 (0.410)	56.8 (0.407)	67.1 (0.403)	74.8 (0.397)
1080 (18.0)	30.7 (0.341)	41.8 (0.337)	49.1 (0.330)	56.1 (0.322)	70.5 (0.337)	81.3 (0.343)
1440 (24.0)	13.6 (0.134)	32.4 (0.227)	44.8 (0.260)	56.7 (0.279)	64.6 (0.265)	70.5 (0.255)
2160 (36.0)	8.5 (0.071)	22.5 (0.131)	31.8 (0.152)	40.7 (0.164)	52.0 (0.175)	60.6 (0.180)
2880 (48.0)	4.9 (0.037)	9.2 (0.048)	12.0 (0.051)	14.7 (0.053)	25.8 (0.077)	34.1 (0.090)
4320 (72.0)	0.0 (0.000)	1.6 (0.007)	2.7 (0.010)	3.7 (0.012)	24.1 (0.063)	39.3 (0.092)

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	87.6 (3.011)	73.1 (1.957)	63.5 (1.474)	54.2 (1.113)	81.3 (1.440)	101.6 (1.626)
90 (1.5)	110.6 (3.321)	109.1 (2.572)	108.2 (2.214)	107.3 (1.940)	99.3 (1.546)	93.3 (1.310)
120 (2.0)	87.0 (2.372)	108.9 (2.334)	123.5 (2.296)	137.4 (2.254)	129.6 (1.827)	123.7 (1.569)
180 (3.0)	77.8 (1.838)	100.7 (1.864)	115.8 (1.856)	130.3 (1.837)	121.4 (1.464)	114.8 (1.240)
360 (6.0)	76.7 (1.381)	94.9 (1.314)	106.9 (1.268)	118.4 (1.222)	131.1 (1.146)	140.6 (1.093)
720 (12.0)	60.3 (0.803)	82.0 (0.812)	96.5 (0.804)	110.3 (0.790)	123.5 (0.741)	133.4 (0.708)
1080 (18.0)	68.5 (0.762)	89.2 (0.721)	102.9 (0.693)	116.1 (0.665)	136.6 (0.653)	152.1 (0.642)
1440 (24.0)	48.2 (0.473)	73.0 (0.512)	89.5 (0.519)	105.2 (0.518)	116.7 (0.478)	125.4 (0.453)
2160 (36.0)	30.9 (0.256)	60.7 (0.354)	80.5 (0.386)	99.5 (0.402)	107.5 (0.361)	113.6 (0.337)
2880 (48.0)	20.0 (0.149)	44.5 (0.231)	60.8 (0.259)	76.3 (0.273)	93.3 (0.278)	106.1 (0.280)
4320 (72.0)	6.7 (0.044)	16.3 (0.074)	22.7 (0.085)	28.8 (0.090)	60.7 (0.159)	84.7 (0.197)

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Climate Change Factors

Rainfall Factors

SSP1-2.6

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	**1.18**	**1.17**	**1.16**	**1.14**	**1.13**	**1.12**	**1.12**	**1.11**	**1.1**	**1.1**
2040	1.21	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.11
2050	**1.22**	**1.2**	**1.18**	**1.17**	**1.15**	**1.15**	**1.14**	**1.13**	**1.12**	**1.11**
2060	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2070	1.24	1.22	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2080	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2090	**1.23**	**1.21**	**1.2**	**1.18**	**1.17**	**1.16**	**1.15**	**1.14**	**1.13**	**1.12**
2100	1.22	1.2	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.12

SSP2-4.5

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	**1.18**	**1.17**	**1.16**	**1.14**	**1.13**	**1.12**	**1.12**	**1.11**	**1.1**	**1.1**
2040	1.22	1.2	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.12
2050	**1.27**	**1.24**	**1.23**	**1.21**	**1.19**	**1.18**	**1.17**	**1.16**	**1.15**	**1.14**
2060	1.3	1.27	1.25	1.23	1.21	1.2	1.19	1.18	1.16	1.16
2070	1.33	1.3	1.28	1.26	1.24	1.22	1.21	1.19	1.18	1.17
2080	1.37	1.33	1.31	1.28	1.26	1.24	1.22	1.21	1.2	1.19
2090	**1.4**	**1.36**	**1.34**	**1.31**	**1.28**	**1.26**	**1.24**	**1.23**	**1.21**	**1.2**
2100	1.41	1.37	1.35	1.32	1.29	1.27	1.25	1.24	1.22	1.21

SSP3-7.0

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	**1.18**	**1.17**	**1.16**	**1.14**	**1.13**	**1.12**	**1.12**	**1.11**	**1.1**	**1.1**
2040	1.23	1.21	1.2	1.18	1.17	1.16	1.15	1.14	1.13	1.12
2050	**1.29**	**1.26**	**1.24**	**1.22**	**1.2**	**1.19**	**1.18**	**1.17**	**1.16**	**1.15**
2060	1.35	1.32	1.3	1.27	1.25	1.23	1.22	1.2	1.19	1.18
2070	1.42	1.38	1.35	1.32	1.29	1.28	1.26	1.24	1.22	1.21
2080	1.5	1.45	1.42	1.38	1.35	1.33	1.3	1.28	1.26	1.25
2090	**1.59**	**1.53**	**1.49**	**1.44**	**1.4**	**1.38**	**1.35**	**1.33**	**1.3**	**1.29**
2100	1.66	1.59	1.55	1.5	1.45	1.42	1.39	1.37	1.34	1.32

SSP5-8.5

Year	<1 hour	1.5 Hours	2 Hours	3 Hours	4.5 Hours	6 Hours	9 Hours	12 Hours	18 Hours	>24 Hours
2030	**1.2**	**1.18**	**1.17**	**1.16**	**1.14**	**1.13**	**1.13**	**1.12**	**1.11**	**1.11**
2040	1.26	1.24	1.22	1.2	1.18	1.17	1.16	1.15	1.14	1.14
2050	**1.34**	**1.31**	**1.29**	**1.26**	**1.24**	**1.23**	**1.21**	**1.2**	**1.18**	**1.18**
2060	1.42	1.38	1.35	1.32	1.29	1.28	1.26	1.24	1.22	1.21
2070	1.52	1.47	1.43	1.4	1.36	1.34	1.31	1.29	1.27	1.26
2080	1.63	1.57	1.52	1.48	1.43	1.4	1.37	1.35	1.33	1.31
2090	**1.77**	**1.69**	**1.64**	**1.58**	**1.52**	**1.49**	**1.45**	**1.42**	**1.39**	**1.37**
2100	1.86	1.77	1.71	1.64	1.58	1.54	1.5	1.47	1.43	1.41

Loss Factors

Initial Loss (Adjustment Factors)

	Losses SSP1-2.6	Losses SSP2-4.5	Losses SSP3-7.0	Losses SSP5-8.5
2030	**1.02**	**1.02**	**1.02**	**1.03**
2040	1.03	1.03	1.03	1.03

	Losses SSP1-2.6	Losses SSP2-4.5	Losses SSP3-7.0	Losses SSP5-8.5
2050	**1.03**	**1.03**	**1.04**	**1.04**
2060	1.03	1.04	1.04	1.05
2070	1.03	1.04	1.05	1.06
2080	1.03	1.05	1.06	1.07
2090	**1.03**	**1.05**	**1.07**	**1.08**
2100	1.03	1.05	1.07	1.09

Continuing Loss (Adjustment Factors)

	Losses SSP1-2.6	Losses SSP2-4.5	Losses SSP3-7.0	Losses SSP5-8.5
2030	**1.04**	**1.05**	**1.05**	**1.05**
2040	1.05	1.05	1.06	1.06
2050	**1.06**	**1.06**	**1.07**	**1.08**
2060	1.06	1.07	1.08	1.1
2070	1.06	1.08	1.1	1.12
2080	1.06	1.09	1.11	1.14
2090	**1.06**	**1.09**	**1.13**	**1.16**
2100	1.06	1.1	1.14	1.18

Temperature Changes (Degrees, Relative to 1961-1990 Baseline)

Year	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
2030	**1.2**	**1.2**	**1.2**	**1.3**
2040	1.3	1.4	1.5	1.6
2050	**1.4**	**1.7**	**1.8**	**2.1**
2060	1.5	1.9	2.2	2.5
2070	1.5	2.1	2.5	3
2080	1.5	2.2	2.9	3.5
2090	**1.5**	**2.4**	**3.3**	**4.1**
2100	1.4	2.5	3.6	4.5

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2024_v1
Note	Updated climate change factors for IFD Initial loss and continuing loss based on IPCC AR6 temperature increases from the updated Climate Change Considerations (Book 1: Chapter 6) in ARR (Version 4.2). ARR recomends the use of Current and near-term (2030 midpoint). Medium-term (2050 midpoint) and Long-term (2090 midpoint)

Probability Neutral Burst Initial Loss

min (h)\AEP(%)	50.0	20.0	10.0	5.0	2.0	1.0
60 (1.0)	15.8	9.3	9.9	11.1	10.5	8.3
90 (1.5)	14.2	8.8	9.5	9.7	9.5	7.7
120 (2.0)	15.7	9.7	10.2	10.1	9.9	7.0
180 (3.0)	16.1	10.4	11.2	11.0	11.0	7.3
360 (6.0)	17.0	10.9	11.8	10.7	10.9	6.6
720 (12.0)	20.5	14.4	13.7	12.3	12.2	4.1
1080 (18.0)	20.6	15.9	15.6	13.5	14.6	3.9
1440 (24.0)	25.4	18.5	18.0	15.0	16.8	6.4
2160 (36.0)	28.9	22.4	21.4	18.1	18.6	8.8
2880 (48.0)	31.3	25.8	24.4	27.8	21.8	9.7
4320 (72.0)	35.6	31.3	30.4	32.6	24.4	10.8

Layer Info

Time Accessed	19 September 2024 09:26PM
Version	2018_v1
Note	As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. Probability neutral burst initial loss values for NSW are to be used in place of the standard initial loss and pre-burst as per the losses hierarchy.

Baseflow Factors

Downstream	0
Area (km2)	771.79552
Catchment Number	10177
Volume Factor	0.209079
Peak Factor	0.016982

Layer Info

Time Accessed	19 September 2024 09:26PM
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Download TXT (downloads/a724aac1-a02c-46ab-b0cd-d562b2a881f4.txt) Download JSON (downloads/3f32e6cd-934b-41e5-bbd8-83c1fdd487ce.json)

Generating PDF... (downloads/78d44e02-7813-43b4-a0f3-75beb39b8f95.pdf)

Australian Government
Bureau of Meteorology

Location

Label: Not provided
Latitude: -33.813 [Nearest grid cell: 33.8125 (S)]
Longitude:151.072 [Nearest grid cell: 151.0625 (E)]

IFD Design Rainfall Depth (mm)

Issued: 19 September 2024

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	2.24	2.48	3.24	3.76	4.27	4.95	5.47
2 min	3.71	4.03	5.06	5.79	6.53	7.55	8.34
3 min	5.15	5.62	7.12	8.18	9.23	10.7	11.8
4 min	6.46	7.08	9.08	10.5	11.8	13.7	15.2
5 min	7.64	8.41	10.9	12.6	14.3	16.5	18.3
10 min	12.1	13.4	17.7	20.6	23.4	27.1	30.0
15 min	15.1	16.8	22.1	25.7	29.3	33.9	37.4
20 min	17.3	19.2	25.3	29.4	33.4	38.7	42.7
25 min	19.1	21.2	27.7	32.2	36.5	42.3	46.7
30 min	20.6	22.8	29.7	34.4	39.0	45.2	49.9
45 min	24.0	26.4	34.1	39.4	44.6	51.6	57.0
1 hour	26.5	29.1	37.3	43.1	48.7	56.5	62.5
1.5 hour	30.5	33.3	42.4	48.9	55.3	64.2	71.2
2 hour	33.6	36.7	46.7	53.8	60.9	70.9	78.9
3 hour	38.8	42.3	54.0	62.4	71.0	82.9	92.6
4.5 hour	45.1	49.4	63.6	73.9	84.5	99.3	111
6 hour	50.5	55.5	72.2	84.3	96.9	114	129
9 hour	59.6	66.1	87.5	103	119	142	160
12 hour	67.3	75.1	101	120	140	167	188
18 hour	79.8	90.0	124	149	174	209	237
24 hour	89.9	102	143	172	203	244	277
30 hour	98.2	112	158	192	227	273	310
36 hour	105	121	171	209	247	298	337
48 hour	117	134	192	235	279	335	379
72 hour	132	152	220	269	319	382	429
96 hour	142	163	235	287	340	405	454
120 hour	148	171	245	298	352	417	466
144 hour	153	176	250	304	358	421	471
168 hour	156	179	254	307	360	423	472

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

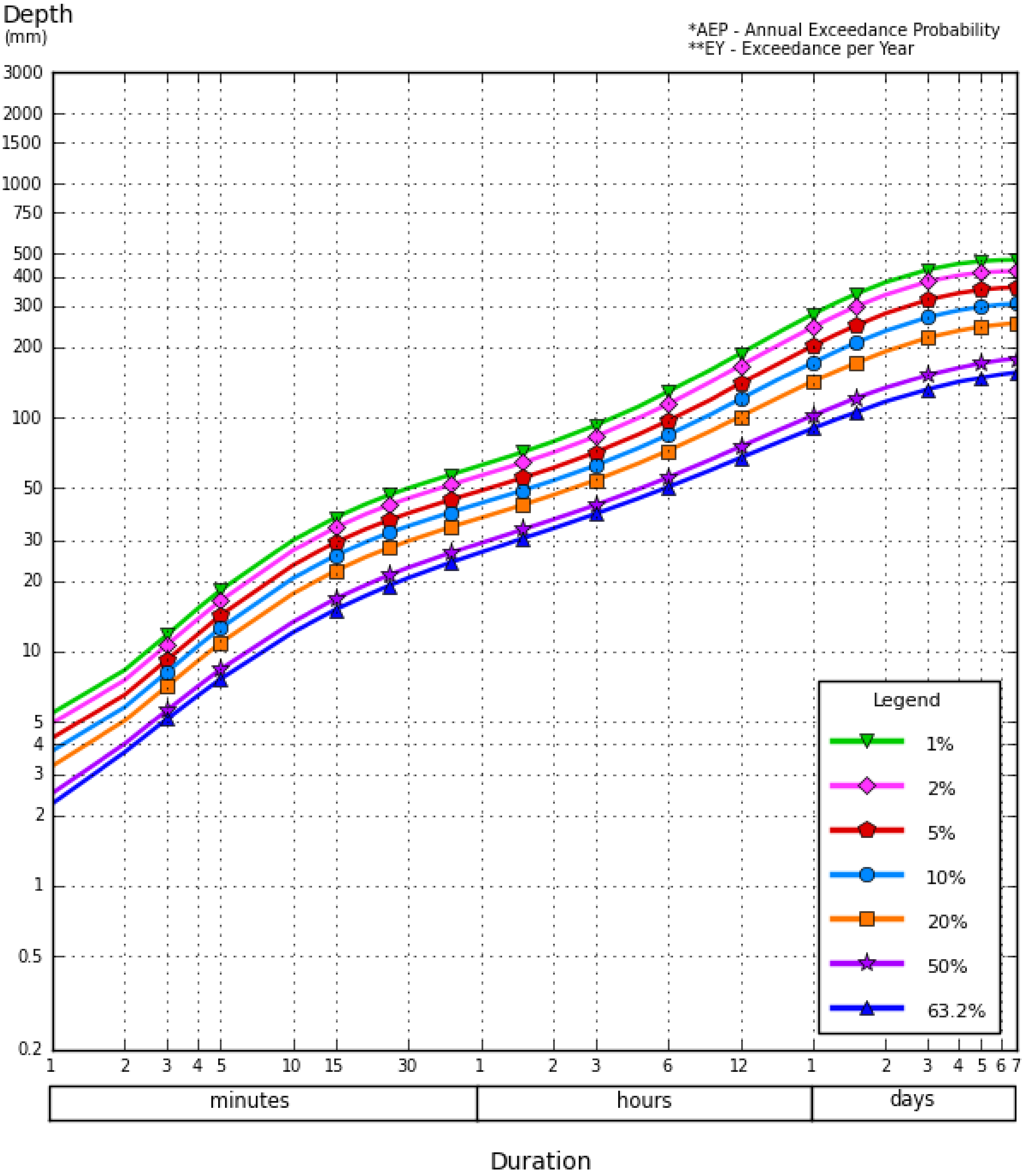
This page was created at **21:29 on Thursday 19 September 2024 (AEST)**

Requested coordinate Latitude: -33.8130 Longitude: 151.0720
Nearest grid cell Latitude: 33.8125 (S) Longitude: 151.0625 (E)

IFD Design Rainfall Depth (mm)

Issued: 19 September 2024

Rainfall depth in millimetres for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).



APPENDIX C: PRODUCT LITERATURE

The Stormwater Management StormFilter®

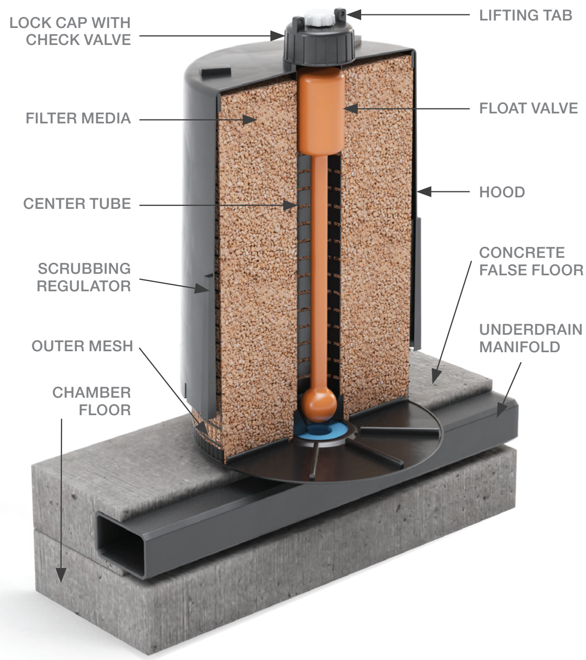
The Stormwater Management StormFilter® is a proprietary stormwater treatment asset (typically installed underground) and composed of one or more structures that house rechargeable, media-filled cartridges.

StormFilter® is typically applied to trap the most challenging pollutants within stormwater, such as total suspended solids, hydrocarbons, nutrients, metals, and other common pollutants. A range of media types are available, however, to target specific pollutants within stormwater, including PFAS (per-and poly-fluoroalkyl substances).

Since 2001, StormFilter® has been installed in a variety of applications to meet regulatory requirements set by authorities throughout Australia. At the start of 2022, there had already been over 30,000 StormFilter® cartridges installed within Australia and 250,000 globally.

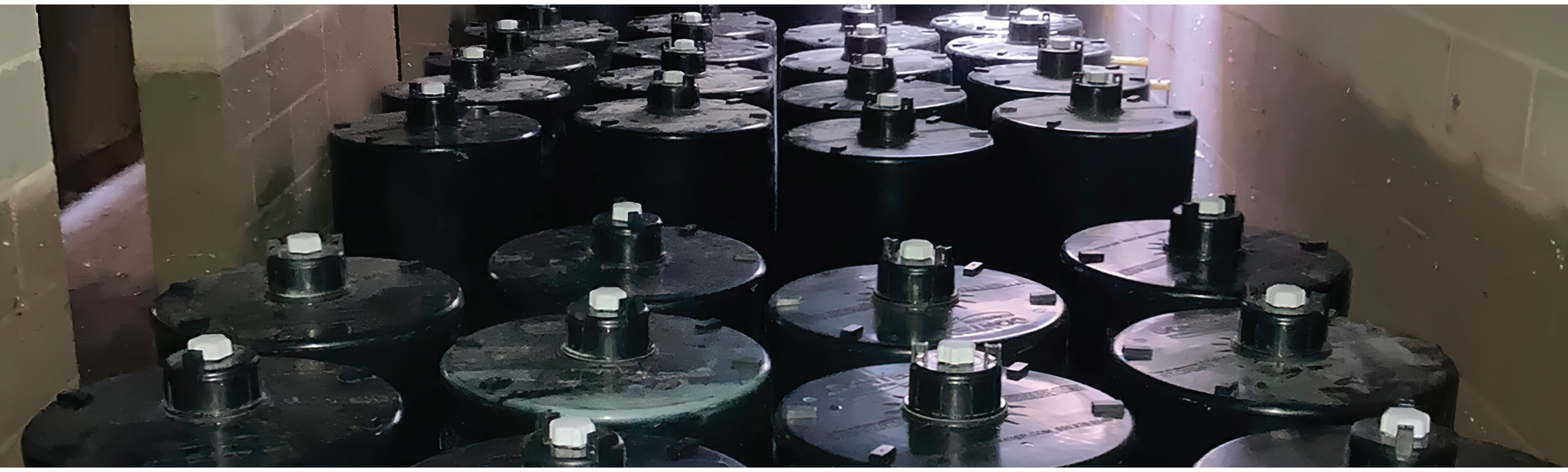
How does it work?

- During a storm, runoff passes through the filtration media and starts filling the cartridge centre tube. The air inside the hood is purged through a one-way check valve as the water rises
- When water reaches the top of the float, buoyant forces pull the float free and allow filtered water to exit the cartridge. A siphon is established within each cartridge that draws water uniformly across the full height of the media bed ensuring even distribution of pollutants and prolonged media longevity
- After a storm, the water level in the structure starts falling. A hanging water column remains under the cartridge hood until the water level reaches the scrubbing regulators at the bottom of the hood
- Air then rushes through the regulators, breaking the siphon and creating air bubbles that agitate the surface of the filter media, causing accumulated sediment to settle on the treatment bay floor. This unique surface-cleaning mechanism prevents surface blinding and further extends cartridge life



OCEAN PROTECT

StormFilter®

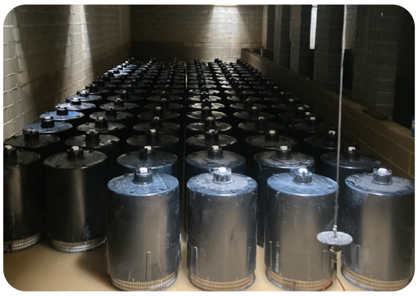


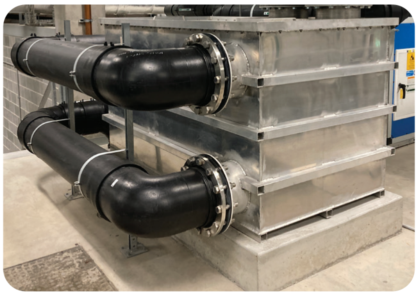
Features

- Siphon actuated, high surface area media cartridges
- Multiple cartridge heights
- Multiple media options
- Multiple configurations
- Maintenance intervals of one to five years, resulting in fewer maintenance events and reduced long-term ownership costs

Benefits

- Stormwater is drawn evenly through the filter media providing efficient, effective stormwater treatment
- Flexibility in arrangement and hydraulics to meet your sites needs
- Target specific pollutants including TSS, nutrients, heavy metals and hydrocarbons
- Lightweight, reusable cartridges





Configurations and Applications

The StormFilter® is available in a wide variety of configurations, such as precast concrete pits and tanks, custom above ground HDPE/aluminium tanks, and incorporated into on-site detention structures. When combined with the multiple cartridge heights and media options, the StormFilter® design flexibility makes it suitable for a wide range of applications such as:

- Commercial, industrial and residential development, infill and redevelopment and stormwater quality retrofit applications
- Special projects, such as highways, airports, seaports and military installations
- Treatment for subsequent infiltration and stormwater harvesting and reuse

Maintenance

To ensure optimal performance, it is advisable that regular maintenance is performed for StormFilter®. Typically, the StormFilter® requires an inspection and removal of accumulated pollution.

Speak to the team at Ocean Protect who can help inspect and maintain your StormFilter®.

1300 354 722 enquiries@oceanprotect.com.au www.oceanprotect.com.au