Structural
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# Stormwater Assessment

## 21-23 Victoria Avenue, Castle Hill

**Prepared for Spotlight Property Group** / 16 December 2020

191928

Taylor Thomson Whitting (NSW) Pty Ltd (ACN 113 578 377)
as trustee for the Taylor Thomson Whitting NSW Trust
(ABN 59 514 956 558) I Consulting Engineers
Level 3, 48 Chandos Street, St Leonards NSW 2065

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## Contents

# 1.0 Introduction

Taylor Thomson Whitting Pty. Ltd. (TTW) has been engaged by Spotlight Property Group to prepare a Stormwater Assessment Report for the proposed mixed use commercial development at 21 – 23 Victoria Avenue, Castle Hill in support of a planning proposal application to Hills Shire Council.

## 1.1 Site

The site is located south of the Showground Road and bordered by Victoria Avenue to the west, Salisbury Road to the north and Carrington Road to the south as shown in Figure 1. The project is within the Hills Shire Local Government Area (LGA).


**Figure 1: Site Location Plan**

## 1.2 Reference Documents

- The Hills Shire Council Design Guidelines 2011
- The Hills Development Control Plan (DCP) 2012
- Architectural Drawings prepared by Bates Smart Pty Ltd. October 2020
- Survey by Degotardi Smith & Partners, Ref 35656 December 2012
- Upper Parramatta River Catchment Trust (UPRCT) on-site detention handbook

## 2.0 Proposed Works

The proposed development includes construction of a multi-storey mixed use commercial buildings and the site area is approximately 21,048 m$^2$. The upper ground floor, lower ground floor and basement plans are included in Figure 2, 3 and 4 respectively.

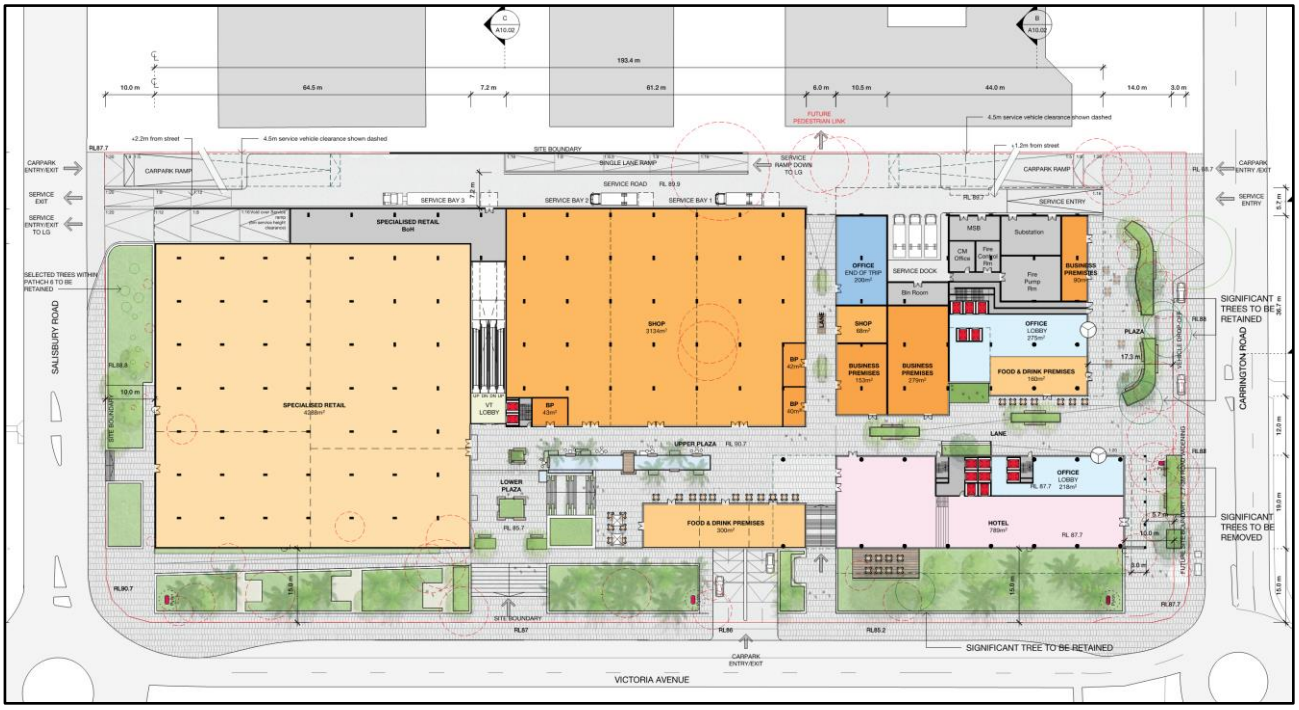


**Figure 2: Proposed Upper Ground Floor Plan**

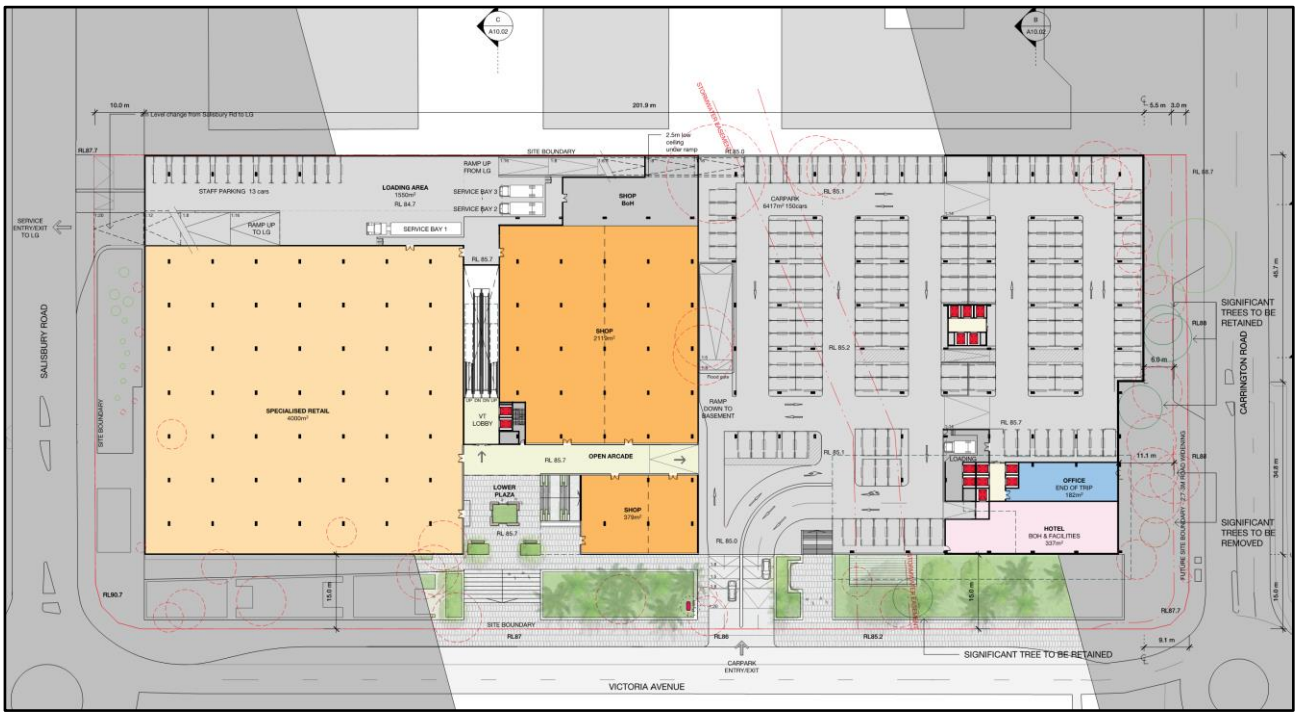


**Figure 3: Proposed Lower Ground Floor Plan**

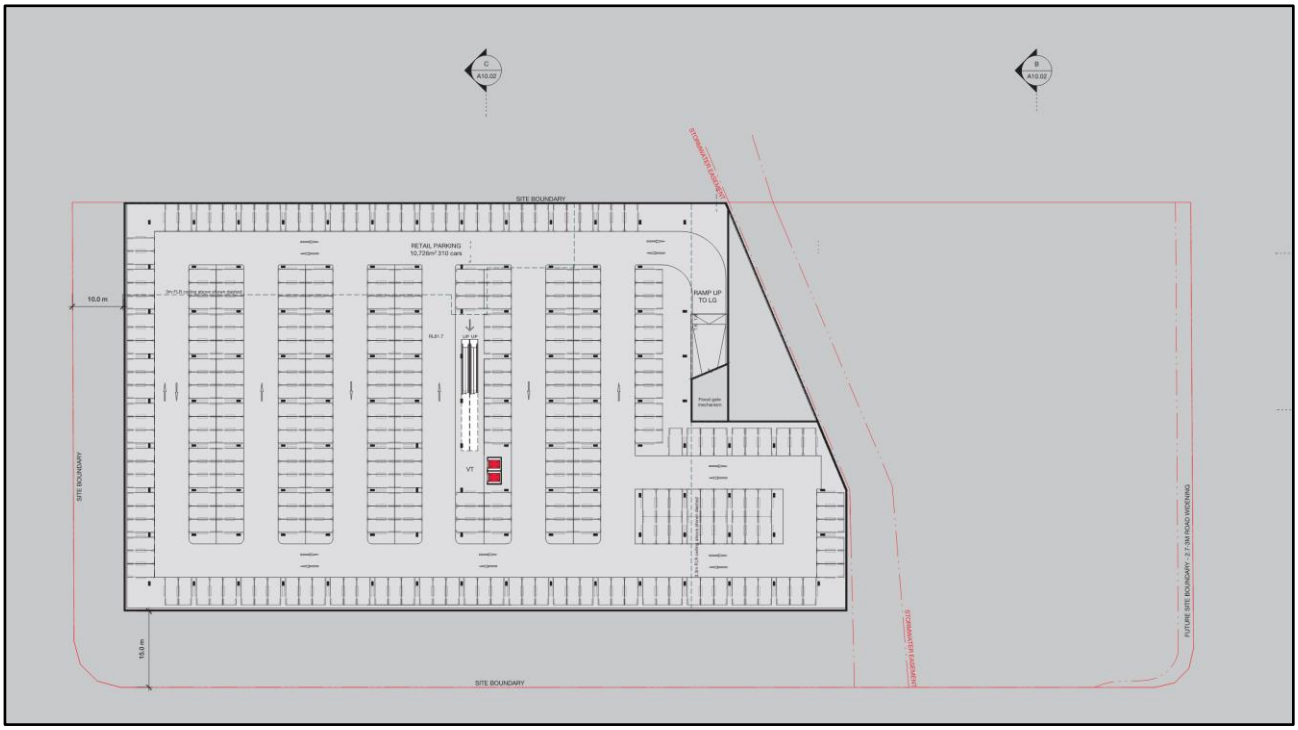


**Figure 4: Proposed Basement Floor Plan**

## 3.0 Stormwater Quantity

### 3.1. Current Stormwater

The existing site is currently occupied by commercial buildings and is considered approximately 80% impervious. Current peak stormwater discharge from the site for the 5% AEP (20 year) storm event is 888 l/s and for the 1% AEP (100 year) peak discharge is 1213 l/s.

There is an existing stormwater easement which conveys stormwater flow through twin 1.8m diameter pipes across the development site from the low point in Victoria Ave towards Cattai Creek, approximately 450m to the east of the site. An overland flow path exists along this easement which conveys overland flow from Victoria Avenue to the east of the site, refer to separate Flood impact Assessment by TTW for further details.

### 3.2. Proposed Stormwater Design

**On-site detention tank (OSD)**

The proposed development includes approximately 12,170m2 of roof catchment, 1,950 m2 of landscape area and 6,928m2 paved area. The development proposal increases the impermeable area to approximately 90% of the development area. The increase in impervious area potentially increases the peak discharge for the 5% AEP storm event (20 year) to 911 l/s and the 1% AEP (100 year) event to 1245 l/s.

The site is in the Hawkesbury River catchment and on-site tank detention is required in accordance with Council's DCP and design guidelines. It is unknown if there is existing OSD within the site.
Two on site detention tanks have been proposed to capture the site runoff and have been designed in accordance with the Upper Parramatta River Catchment Trust (UPRCT) on-site detention handbook and spreadsheet provided by Council's engineer Rashad Abboud in September 2020 as shown in Appendix A.

**OSD Tank 1 (South):**
The total OSD storage volume will be 290m$^3$ and the tank will have an orifice of 132mm and include a high early discharge chamber.
The designed peak discharge for the OSD is:

- 48 l/s during 5% AEP (20 year) event
- 55 l/s during a 1% AEP (100 year) event

The OSD has been designed to capture runoff from the catchment south of the existing easement. The OSD tank will be located under the lower ground level and connect to the existing easement as shown in Figure 5. The peak water level during the 1% AEP (100 year) event will be 84.84m which is higher that the HGL of the existing pipes in the easement at the connection point (84.20m).

**OSD Tank 2 (North):**
The OSD has been designed to capture the runoff from the catchment north of the existing easement. The total OSD storage volume will be 630m$^3$ and the OSD tank will have an orifice of 195mm and include a high early discharge chamber.
The designed peak discharge for the OSD is:

- 105 l/s during 5% AEP (20 year) event
- 116 l/s during 1% AEP (100 year) event

The OSD tank will be located under the lower ground level and connect to the existing easement as shown in Figure 5. The peak water level during the 1% AEP (100 year) event will be 84.84m which is higher that the HGL of the existing pipes in the easement at the connection point (84.20m).
The on-site detention tanks and outlet controls reduce the total peak flow from the site as followings:

- 153 l/s during 5% AEP (20 year) event, 83% less than the existing state (888 l/s).
- 171 l/s during a 1% AEP (100 year) event, 86% less than the existing state (1213 l/s).

The total peak flow during a 1% AEP (100 year) event is 171l/s which is less than the site permissible site discharge (PSD) of 184l/s.

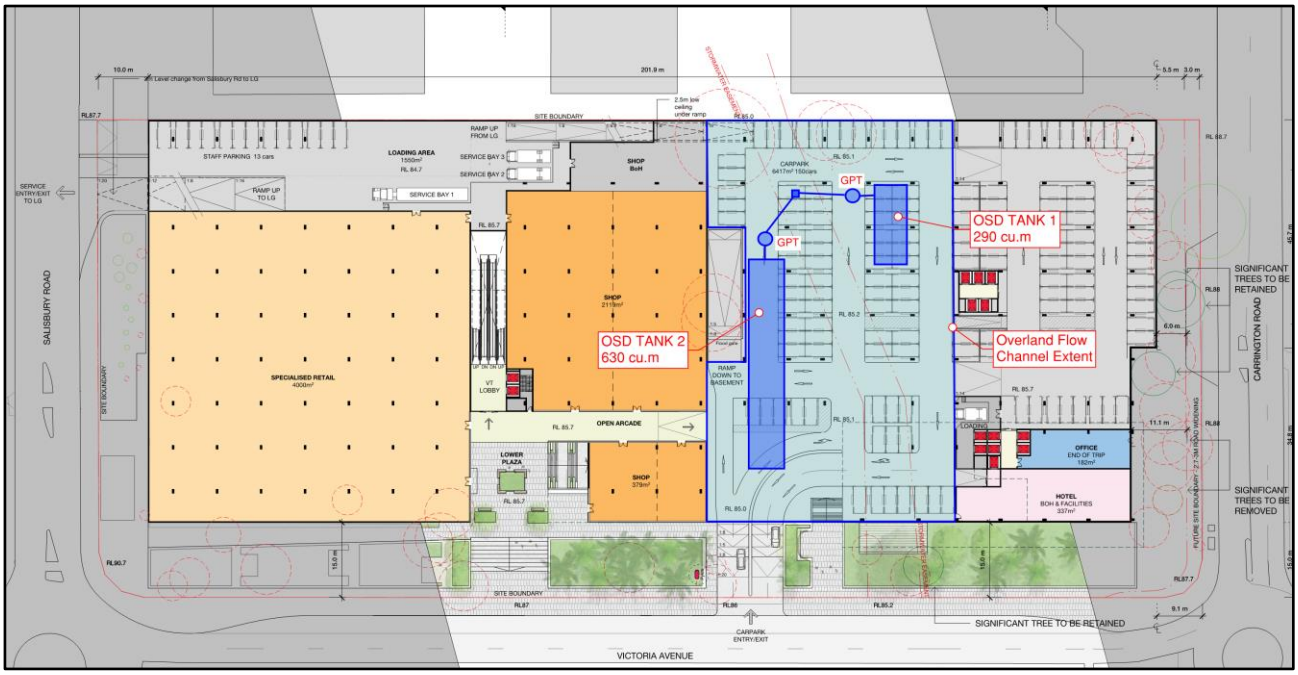

**Figure 5: Proposed on-site detention tank locations at lower ground floor level.**

**Rainwater tank**

The Hills Shire Council Design Guidelines states that “All proposals are to incorporate WSUD measures”. The document refers to Water Sensitive Urban Design Technical Guidelines for Western Sydney (NSW Government Stormwater Trust and UPRCT, May 2004) for the requirements of WSUD measures.

WSUD infrastructure recommended for implementation includes the rainwater tank along with the water quality treatment devices as discussed in section 4.0.

To allow the re-use of the collected rainwater, it is recommended the use of rainwater tank at the proposed development which will help reduce the use of potable water and help achieve Green Star requirements.

## Overland flow path

In accordance with the TTW Flood Impact Assessment, December 2020, the existing overland flow path through the site is to be maintained within the proposed lower ground floor level as shown in Figure 6.

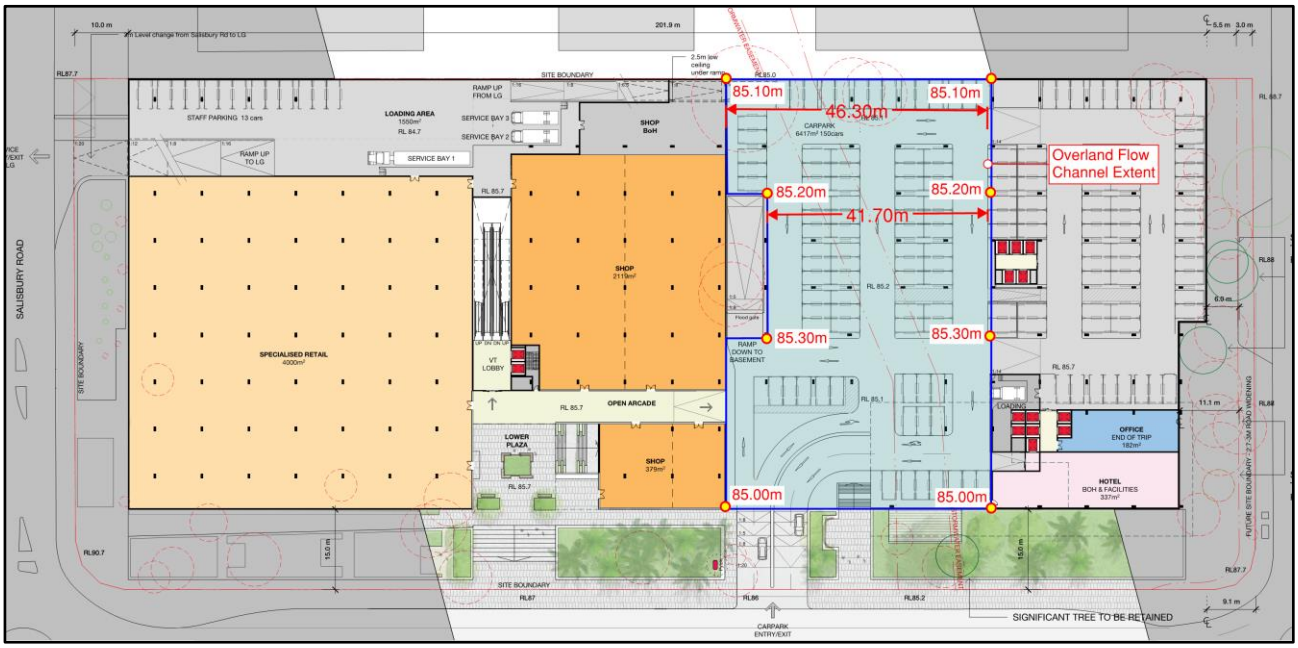


**Figure 6. Proposed Overland Flow Path (TTW Flood Impact Assessment, December 2020)**

## 4.0 Stormwater Quality Control

The Hills Shire Council Design Guidelines states that “All proposals are to incorporate WSUD measures”. The document refers to Water Sensitive Urban Design Technical Guidelines for Western Sydney (NSW Government Stormwater Trust and UPRCT, May 2004) for the requirements of WSUD measures. The treatment criteria in the guidelines are outlined in Table 1.

| POLLUTANT/ISSUE RETENTION CRITERIA | RETENTION CRITERIA |
|---|---|
| Coarse sediment | 80% of average annual load for particles 0.5 mm or less |
| Fine particles | 50% of average annual load for particles 0.1 mm or less |
| Total phosphorus | 45% retention of average annual load |
| Total nitrogen | 45% retention of average annual load |
| Litter | 70% of average annual litter load greater than 5 mm |
| Hydrocarbons, motor fuels, oils and grease. | 90% of average annual pollutant load |

**Table 1 Stormwater Quality Targets**

The proposed catchments north and south of the existing easement have been modelled in MUSIC to demonstrate that the proposed stormwater treatment devices achieve the required stormwater treatment targets.

### Water treatment devices for the northern catchment

The stormwater treatment train includes the following (schematic shown in Figure 7):

- 4x Ocean protect Enviropod (or equivalent)
- 12x 690mm Psorb Ocean protect Stormfilter (or equivalent) within a stormfilter chamber
- Ocean Save GPT (or equivalent)

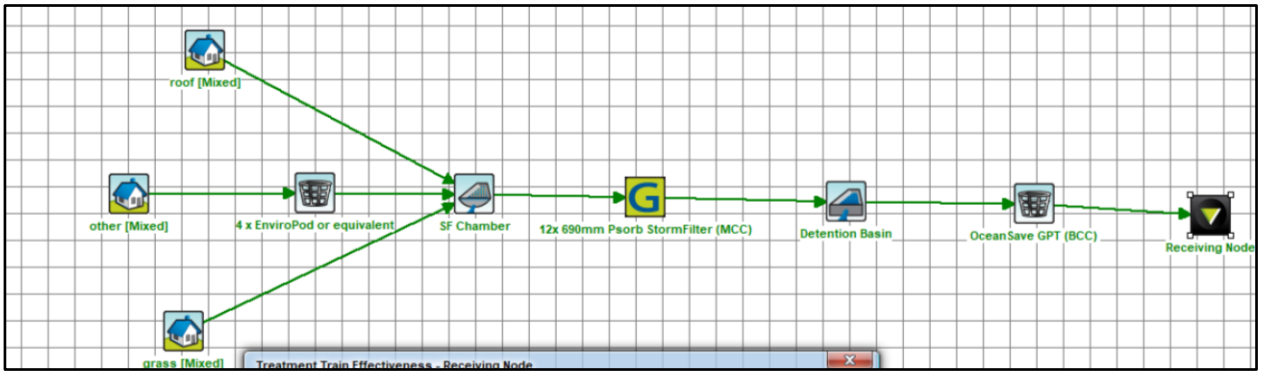


**Figure 7: Proposed water treatment devices of northern catchment**

The results of the proposed treatment train are shown in table 2.

Treatment Train Effectiveness - Receiving Node

| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| Flow (ML/yr) | 7.17 | 7.17 | 0 |
| Total Suspended Solids (kg/yr) | 1480 | 292 | 80.3 |
| Total Phosphorus (kg/yr) | 2.96 | 1.22 | 58.6 |
| Total Nitrogen (kg/yr) | 20.6 | 10.7 | 48.1 |
| Gross Pollutants (kg/yr) | 188 | 0 | 100 |

**Table 2: Water Quality Treatment Train Effectiveness of northern catchment**

## Water treatment devices for the southern catchment

The stormwater treatment train includes the following (schematic shown in Figure 8):

- 4x Ocean protect Enviropod (or equivalent)
- 22x 690mm Psorb Ocean protect Stormfilter (or equivalent) within a stormfilter chamber
- Ocean Save GPT (or equivalent)

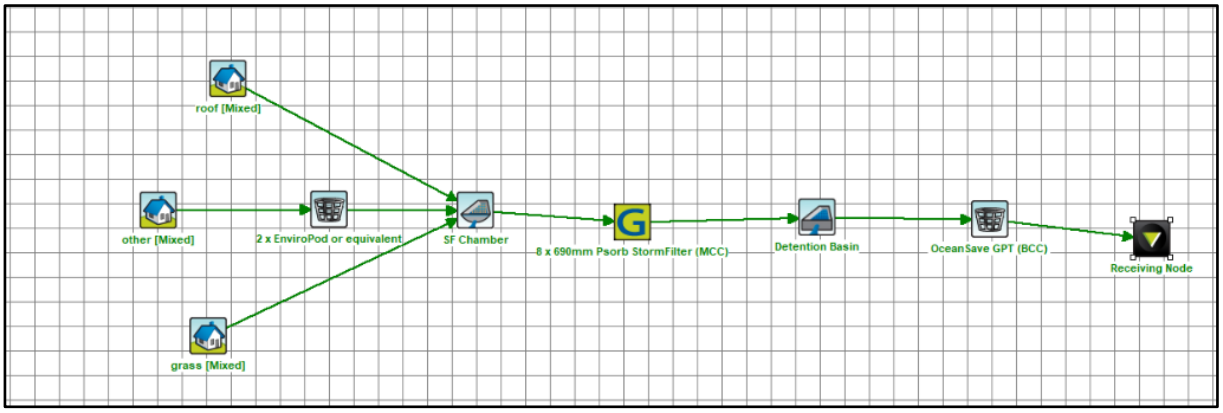


**Figure 8: Proposed water treatment devices of Southern catchment**

The results of the proposed treatment train are shown in Table 3.

Treatment Train Effectiveness - Receiving Node

| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| Flow (ML/yr) | 4.77 | 4.77 | 0 |
| Total Suspended Solids (kg/yr) | 980 | 174 | 82.3 |
| Total Phosphorus (kg/yr) | 1.99 | 0.806 | 59.6 |
| Total Nitrogen (kg/yr) | 13.8 | 7.05 | 48.8 |
| Gross Pollutants (kg/yr) | 125 | 0 | 100 |

**Table 3: Water Quality Treatment Train Effectiveness of Southern catchment**

# 5.0 Construction Phase Stormwater Management

Construction works to be carried out in accordance with the “Blue Book” erosion and sediment control requirements. The exact controls will vary depending on construction methodology and timing, but will typically consist of:

- Sediment fences;
- A sediment basin;
- Sediment trap;
- Vehicle shaker grid and wash down; and
- Sand bags surrounding existing pits.

# 6.0 Conclusion and Recommendations

The following conclusion and recommendations are made:

- Two on-site detention tanks with storage volumes of 290m$^3$ and 630m$^3$
- Stormwater quality improvement devices including:
  - Ocean protect Enviropods (or equivalent)
  - 690mm Psorb Ocean protect Stormfilters (or equivalent) within a stormfilter chamber
  - Ocean Save GPT's (or equivalent)

Prepared by
**TAYLOR THOMSON WHITTING (NSW) PTY LTD**
**in its capacity as trustee for the**
**TAYLOR THOMSON WHITTING NSW TRUST**

**ROXY HADIAN**
Civil Engineer

Authorised By
**TAYLOR THOMSON WHITTING (NSW) PTY LTD**
**in its capacity as trustee for the**
**TAYLOR THOMSON WHITTING NSW TRUST**

**Stephen Brain**
Technical Director

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## Appendix A

# OSD 1 Calculation (South)

### HAWKESBURY RIVER CATCHMENT
**COUNCIL O.S.D. CHECK SHEET**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Site Address | = 21-23 Victoria Ave | | | | | | | |
| File No. | = 191928 | | | | | | Drowned Condition | |
| Site Area | ..... | = | 0.6636 | Ha | [A] | | 0.6636 | Ha |
| Site Slope | ..... | = | 2 | % | [A1] | | 2 | % |
| Site Storage Volume | = See Chart | = | 412 | m3/Ha | [A2] | | 412 | m3/Ha |
| Permissable Discharge | = See Chart | = | 87 | l/s/Ha | [A3] | | 87 | l/s/Ha |
| Basic Storage Volume | = [A2] x [A] | = | 273.4 | m3 | [B] | | 273.4 | m3 |
| Basic Discharge | = [A3] x [A] | = | 57.7 | l/s | [C] | | 57.7 | l/s |
| Area of Site Drained to Storage | ..... | = | 0.6636 | Ha | [D] | | 0.6636 | Ha |
| % of Total Site | = [D] / [A] x 100 | = | 100 | % | [E] | | 100 | % |
| Storage Per Ha. | = [B] / [D] | = | 412.0 | m3/Ha | [F] | | 412.0 | m3/Ha |
| Permissable Discharge | = {([F] / 69.21)^ (-1.368)} x 1000 | = | 87.0 | l/s/Ha | [G] | | 87.0 | l/s/Ha |
| P.S.D. | = [G] x [D] | = | 57.7 | l/s | [H] | | 57.7 | l/s |
| Maximum Head to Orifice Centre | ..... | = | 2.350 | m | [K] | | 2.350 | m |
| Selected Orifice Dia. | = {(0.464x[H]/1000)^0.5/[K]^0.5}x1000 | = | 132 | mm | [J] | | 132 | mm |
| Maximum Discharge | = [H] | = | 57.8 | l/s | [L] | | 57.8 | l/s |
| Head for High Early Discharge | ..... | = | 1.700 | m | [M] | | 1.700 | m |
| High Early Discharge | = {[L] x ([M]/[K])^0.5} | = | 49.1 | l/s | [N] | | 49.1 | l/s |
| Approx. Ave. Discharge | = {([L] + [N]) / 2} | = | 53.5 | l/s | [P] | | 53.5 | l/s |
| Ave. Discharge per Ha. | = [P] / [D] | = | 80.6 | l/s/Ha | [Q] | | 80.6 | l/s/Ha |
| Storage Volume | = 69.21 x ([Q] / 1000)^-0.731 | = | 436.3 | m3/Ha | [R] | | 436.3 | m3/Ha |
| Site Storage Volume | = [R] x [D] | = | **289.5** | m3 | [S] | | **289.5** | m3 |

Signature .....  09/12/20

# OSD 2 Calculation (North)

## HAWKESBURY RIVER CATCHMENT

### COUNCIL O.S.D. CHECK SHEET

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Site Address | = | 21-23 Victoria Ave | | | | | | |
| File No. | = | 191928 | | | | | | |
| | | | | | | | Drowned Condition | |
| Site Area | | ..... | = | 1.4412 | Ha | [A] | 1.4412 | Ha |
| Site Slope | | ..... | = | 2 | % | [A1] | 2 | % |
| Site Storage Volume | = | See Chart | = | 412 | m3/Ha | [A2] | 412 | m3/Ha |
| Permissable Discharge | = | See Chart | = | 87 | l/s/Ha | [A3] | 87 | l/s/Ha |
| Basic Storage Volume | = | [A2] x [A] | = | 593.8 | m3 | [B] | 593.8 | m3 |
| Basic Discharge | = | [A3] x [A] | = | 125.4 | l/s | [C] | 125.4 | l/s |
| Area of Site Drained to Storage | | ..... | = | 1.4412 | Ha | [D] | 1.4412 | Ha |
| % of Total Site | = | [D] / [A] x 100 | = | 100 | % | [E] | 100 | % |
| Storage Per Ha. | = | [B] / [D] | = | 412.0 | m3/Ha | [F] | 412.0 | m3/Ha |
| Permissable Discharge | = | {([F] / 69.21)^ (-1.368)} x 1000 | = | 87.0 | l/s/Ha | [G] | 87.0 | l/s/Ha |
| P.S.D. | = | [G] x [D] | = | 125.4 | l/s | [H] | 125.4 | l/s |
| Maximum Head to Orifice Centre | | ..... | = | 2.350 | m | [K] | 2.350 | m |
| Selected Orifice Dia. | = | {(0.464x[H]/1000)^0.5/[K]^0.5}x1000 | = | 195 | mm | [J] | 195 | mm |
| Maximum Discharge | = | [H] | = | 125.5 | l/s | [L] | 125.5 | l/s |
| Head for High Early Discharge | | ..... | = | 1.700 | m | [M] | 1.700 | m |
| High Early Discharge | = | {[L] x ([M]/[K])^0.5} | = | 106.7 | l/s | [N] | 106.7 | l/s |
| Approx. Ave. Discharge | = | {([L] + [N]) / 2} | = | 116.1 | l/s | [P] | 116.1 | l/s |
| Ave. Discharge per Ha. | = | [P] / [D] | = | 80.6 | l/s/Ha | [Q] | 80.6 | l/s/Ha |
| Storage Volume | = | 69.21 x ([Q] / 1000)^-0.731 | = | 436.3 | m3/Ha | [R] | 436.3 | m3/Ha |
| Site Storage Volume | = | [R] x [D] | = | **628.8** | m3 | [S] | **628.8** | m3 |

Signature .....  26/10/20