

## **Stormwater Drainage Calculations**

for

# 11 McKim Road Gisborne

## VIC

## Stage 3 - additional 2 lots

**REVISION A** 

Job Ref: 500302

391 Townsend St ALBURY NSW 2640 AUSTRALIA Phone (Australia) 02 6021 7233 (Inter.) + 61 2 60 217 233 Fax (Australia) 02 6041 2579 (Inter.) +61 2 60 412 579 Ron Emptage & Associates Pty Ltd ABN 42 632 289 540 – Trading as SJE Consulting E-Mail: <u>consulting@sje.com.au</u> Website: www.sje.com.au

### 1. Introduction

The subdivision at 11 McKim Road, Gisborne will be constructed in three (3) stages. It is proposed to include an additional two (2) lots in Stage 3.

The stormwater calculations are being carried out to determine if the existing retention basin has capacity to receive an additional two (2) lots which are proposed in Stage 3.

## 2. Stormwater Drainage Calculations

Using the stormwater drainage calculations (prepared by others) for the subdivision, it can be shown that the two (2) additional lots will increase the flow in the stormwater drainage pipe by 20%.

Looking at the catchment of the upstream pit which discharges into the existing retention basin, where

- the proposed lots sizes are 632m<sup>2</sup>, 640m<sup>2</sup> and 640m<sup>2</sup>;
- an area of 403m<sup>2</sup> impervious and 229-237m<sup>2</sup> for pervious areas per lot;
- with the runoff coefficient of 0.30 for pervious areas and 0.90 for impervious areas;
- the sum of the CA is 0.1299 increase from 0.1058;
- flow Q = 34.2m<sup>3</sup>/s increase from Q = 27.8m<sup>3</sup>/s.

Based on these calculations the flow discharging into the existing basin at pit 11 is 102.2 l/s. The flow was 85l/s. This is an increase of about 20%.

Calculating the volume of the existing retention basin using the formula;

Volume (m3) = [A + B + (SQRT(A X B))] X D /3

where

A = top surface area (m<sup>2</sup>)

B = base area (m<sup>2</sup>)

D = depth(m)

with A = 29.047 x 18.16 = 163m<sup>2</sup>, B = 14 x 6.51 = 91.14m<sup>2</sup>, D = 0.60m

Volume = 75.205 m<sup>3</sup>

Using Boyd's formula to determine the increase in volume in the basin due to the increased inflow indicates the volume of the basin will increase by  $9 \text{ m}^3$ .

This equates to an increase in the depth of storage of D = 0.055m, 55mm.

The retention basin water RL was RL455.8 and will increase to RL455.855.

The lowest top of batter level is RL456.303, this will leave a freeboard of 0.453m.

### 3. Conclusion

The proposed additional two (2) lots will increase the water level in the existing retention basin. The increase will not require any additional works to the existing retention basin. A freeboard of 0.453m is available from the lowest top of batter level to the increased water level.

### APPENDIX A

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#### 11 McKIM ROAD GISBORNE DRAINAGE RETENTION

#### PRE-DEVELOPED FLOW (see catchment plan)

The method of estimation of the stormwater runoff is the rational formula i.e. Q = C.I.A/360

#### A) COEFFICIENT OF RUNOFF

Pre developed flow runoff coefficient 0.55

B) CATCHMENT AREA

| CATCHMENT | AREA (ha) |
|-----------|-----------|
| В         | 0.3824    |
| TOTAL     | 0.3824    |

## C) TIME OF CONCENTRATION

| TIME OF CONCENTRATION | t (min) |
|-----------------------|---------|
| tc =                  | 7       |

D) INTENSITY

| Intensity for tc = 8 min |       |
|--------------------------|-------|
| ARI 1 in                 | mm/hr |
| Q <sub>40</sub>          | 92.1  |
| Q20                      | 108   |
| Qao                      | 131   |
| Q <sub>100</sub>         | 149   |

E) PREDEVELOPED FLOWS

| ARI              | m3/s |
|------------------|------|
| Quo              | 0.05 |
| Q <sub>20</sub>  | 0.06 |
| Q <sub>80</sub>  | 0.08 |
| Q <sub>100</sub> | 0.09 |

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#### 11 McKIM ROAD GISBORNE DRAINAGE RETENTION

#### POST DEVELOPED FLOW (see catchment plan)

The method of estimation of the stormwater runoff is the rational formula i.e. Q = C.I.A/360

0.68

#### A) COEFFICIENT OF RUNOFF

Pre developed flow runoff coefficient

#### CATCHMENT AREA

| <u>.</u> | CATCHMENT | AREA (ha) |
|----------|-----------|-----------|
| 8        | Α         | 0.3824    |
| 1        | TOTAL     | 0.3824    |

C) TIME OF CONCENTRATION

For urban areas

| TIME OF CONCENTRATION | t (min) |
|-----------------------|---------|
| to =                  | 0       |
| tch =                 | 0       |
| tp =                  | 7       |
| ts =                  | 0       |
| tc =                  | 7       |

D)

B)

| mm/hr |
|-------|
| 92.1  |
| 108   |
| 131   |
| 149   |
|       |

E) POSTDEVELOPED FLOWS

22

| ARI              | m3/s |
|------------------|------|
| Qap              | 0.07 |
| Qao              | 0.08 |
| Q <sub>so</sub>  | 0.09 |
| Q <sub>100</sub> | 0.11 |

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#### 11 McKIM ROAD GISBORNE DRAINAGE RETENTION

RETENTION VOLUME REQUIRED USING BOYD'S FORMULA

 $S_{MAX} = V_I (1 - Q_p / l_p)$ 

|          | PRE-DEVELOPED       | POST                 |
|----------|---------------------|----------------------|
|          | FLOW Q <sub>p</sub> | DEVELOPED<br>FLOW Ip |
| Q (m3/s) | 0.09                | 0.11                 |
| tc (min) | 7                   | 7                    |



RETENTION VOLUME REQUIRED IS

9 m3

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