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**Hydrology Model:**

An ILSAX hydrological model was set up in DRAINS to estimate peak runoff flows and volume for the lowered capping layer. A summary of the hydrological model parameters adopted is provided in Table 1.

The supplementary area, also assigned a 10 mm depression storage, was used to represent the hydraulic behaviour of ballast and rail formation materials. Ballast has been classified as a supplementary area as it is not directly connected to the drainage network, with runoff required to pass over adjacent pervious surfaces, allowing for some infiltration or delay before entering the drainage system, refer Figure 3.

A diagram of a tennis court

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Figure 1 ILSAX Supplementary Areas

Table 1 ILSAX Hydrological Model Parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Hydrological Model | Impervious Area Depression Storage (mm) | Supplementary Area Depression Storage (mm) | Pervious Area Depression Storage (mm) | Antecedent Moisture Condition Setting | Soil Type |
| RAIL ILSAX | 1.5 | 10 | 10 | 1 | 1 |

A screenshot of a computer

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# Catchment Area

A total catchment area of 0.104 hectares was calculated using 12d. The Catchment area encompasses the adjusted capping surface area. Un-altered surfaces continue to be treated as per the existing condition which is infiltration at surface.

# Rainfall Data

Rainfall data was downloaded from BOM:

Table 1 Rainfall Metatdata

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | |  |  |
| Issued: | 21-Jul-25 |  |  |  |
| Location Label: | |  |  |  |
| Requested coordinate: | Latitude | -32.03 | Longitude | 115.752 |

10% and 1% AEP rainfall depths were extracted from the dataset and shown in Table 3

Table 3 Rainfall Data

|  |  |  |
| --- | --- | --- |
| Duration | 10% | 1% |
| 1 min | 2.96 | 4.45 |
| 2 min | 5.02 | 7.52 |
| 3 min | 6.78 | 10.2 |
| 4 min | 8.27 | 12.5 |
| 5 min | 9.55 | 14.4 |
| 10 min | 14.1 | 21.1 |
| 15 min | 17 | 25.5 |
| 20 min | 19.2 | 28.7 |
| 25 min | 21 | 31.3 |
| 30 min | 22.5 | 33.6 |
| 45 min | 26.1 | 39.2 |
| 1 hour | 28.9 | 43.7 |
| 1.5 hour | 33.3 | 51.3 |
| 2 hour | 36.9 | 57.6 |
| 3 hour | 42.7 | 68 |
| 4.5 hour | 49.5 | 80.3 |
| 6 hour | 54.8 | 90 |
| 9 hour | 63.2 | 105 |
| 12 hour | 69.6 | 115 |
| 18 hour | 78.9 | 129 |
| 24 hour | 85.7 | 137 |
| 30 hour | 90.9 | 143 |
| 36 hour | 95.2 | 147 |
| 48 hour | 102 | 153 |
| 72 hour | 113 | 161 |
| 96 hour | 122 | 169 |
| 120 hour | 131 | 180 |
| 144 hour | 140 | 193 |
| 168 hour | 150 | 208 |

# Hydrological Results Output

Simulated and adopted temporal patterns are shown in Figure 2.

A graph of blue and black lines

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Figure 2 Maximum Flow for Each Simulated Storm

Median temporal patterns were adopted and hydrographs were exported.

# Soakwell Sizing

Argue (2004) provides the following formula for sizing of a soakwell:

A black and white text

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Where:

𝑑 = 𝑤𝑒𝑙𝑙 𝑑𝑖𝑎𝑚𝑒𝑡𝑒𝑟 (𝑚)

∀ = 𝐼𝑛𝑓𝑙𝑜𝑤 𝑣𝑜𝑙𝑢𝑚𝑒 (𝑚3 )

𝐻 = 𝑤𝑒𝑙𝑙 ℎ𝑒𝑖𝑔ℎ𝑡 (𝑚)

𝑘ℎ = 𝑠𝑜𝑖𝑙 𝑠𝑎𝑡𝑢𝑟𝑎𝑡𝑒𝑑 ℎ𝑦𝑑𝑟𝑎𝑢𝑙𝑖𝑐 𝑐𝑜𝑛𝑑𝑢𝑐𝑡𝑖𝑣𝑖𝑡𝑦 (𝑚𝑠 −1 )

𝜏 = 𝑡𝑖𝑚𝑒 𝑏𝑎𝑠𝑒 𝑜𝑓 𝑡ℎ𝑒 𝑑𝑒𝑠𝑖𝑔𝑛 𝑠𝑡𝑜𝑟𝑚 𝑟𝑢𝑛𝑜𝑓𝑓 ℎ𝑦𝑑𝑟𝑜𝑔𝑟𝑎𝑝ℎ (𝑚𝑖𝑛)

𝑈 = 𝑠𝑜𝑖𝑙 𝑚𝑜𝑑𝑒𝑟𝑎𝑡𝑖𝑜𝑛 𝑓𝑎𝑐𝑡𝑜𝑟 (𝑇𝑎𝑏𝑙𝑒 3 𝑖𝑛 𝑡ℎ𝑒 𝐼𝑛𝑓𝑖𝑙𝑡𝑟𝑎𝑡𝑖𝑜𝑛 𝐵𝑎𝑠𝑖𝑛𝑠 𝑎𝑛𝑑 𝑇𝑟𝑒𝑛𝑐ℎ𝑒𝑠 𝐵𝑀𝑃)

Soil permeability = 4.63m/day