5. Hydrology

5.1 Sub-catchment Delineation

The proposed industrial area was divided into sub-catchments for hydrologic purposes firstly based on the existing drainage network. As detailed in Section 2.6, the section of the development area to the east of Victoria Road primarily drains into the Bickley Brook catchment, whilst the section to the west of Victoria Road ultimately drains to Yule or Binley Brook.

Within these larger divisions, further sub-catchments were delineated based on:

» the existing drainage network where already available; and

» a suggested layout for additional access roads and drainage to accommodate likely subdivision of existing larger rural properties.

This resulted in seven sub-catchments in the Yule/Binley Brook area (Yule-1 through to Yule-7), and three sub-catchments in the Bickley Brook area (Bickley-1 through to Bickley-3).

The sub-catchment delineation used for the hydrologic and hydraulic assessment is shown in Figure 5.

5.2 Design Peak Flows

To meet the design objective of maintaining existing flows to Yule and Bickley Brooks, an assessment of peak flows under pre-development conditions was undertaken. These flows become the design peak flows for the developed catchments.

Yule Brook Catchment

For the Yule Brook catchment within the study area (downstream of Welshpool Road to the outlet at the culvert under the railway line adjacent to Roe Highway), design flows for the 10 year and 100 year events were calculated for each sub-catchment using the Rational Method for the existing (pre-development) rural and future industrial land uses.

A previous hydrologic study of the entire Yule Brook catchment, extending up until the foothills, had been undertaken by the Water Corporation (formerly the Water Authority of Western Australia) in 1989, as part of a waterways analysis reported in Evangelisti & Associates (1996). This included determining the 10 year and 100 year ARI design flows at the Yule Brook culvert under the railway line adjacent to Roe Highway, and was based on the existing (pre-development) land use. This study reported a 10 year ARI design flow of 16m^3/s, and a 100 year ARI design flow of 22 m^3/s for the entire Yule Brook catchment.

A Rational Method analysis of the same entire Yule Brook catchment with pre-development land use calculated 10 year and 100 year ARI design flows of 18m^3/s and 33m^3/s respectively. Since the RORB modelling was considered to be more detailed and expected to be more accurate, the design flows calculated by the Rational Method

were factored down to more closely match those obtained from RORB modelling. The design flows that were calculated for each sub-catchment using the Rational Method for predevelopment land use could then be similarly adjusted by the same factor. The resultant 10 year and 100 year ARI design flows for each sub-catchment are summarised in Table 3.

Bickley Brook Catchment

The Bickley Brook catchment within the study area includes the rural land to the north of Bickley Road, as well as the existing industrial area south of Bickley Road. As the land use in the existing industrial area (Bickley1) will not change significantly under the proposed development, the existing drainage network is considered to be adequate and a hydrologic assessment of this sub-catchment was not undertaken.

For the two remaining Bickley Brook sub-catchments (Bickley2 and Bickley3), design flows for the 10 year and 100 year events were calculated for each sub-catchment using the Rational Method under pre-development and post-development conditions.

The RORB to Rational Method factors previously obtained for the Yule Brook sub-catchments were applied to the two Bickley Brook sub-catchments. This methodology assumes that the RORB to Rational Method factors obtained for the Yule Brook catchment would be similar to those that would be obtained for the Bickley Brook catchment. This is a reasonable assumption considering the existing land use in both sections is similar, with a comparable topography.

The 10 and 100 year design flows for each subcatchment are summarised in Table 3.

Table 3 Peak flows

Proposed Sub-catchment	Peak Flow 10 Year (m^3/s)	Peak Flow 100 Year (m^3/s)
Yule Brook Catchment - WCWA (1989)	16	22
Yule Brook Catchment - Rational Method	17.7	32.6
Reduction Factor	0.90	0.68
Yule1	0.51	0.75
Yule2	0.96	1.40
Yule3	0.47	0.68
Yule4	0.74	1.06
Yule5	1.05	1.52
Yule6	0.39	0.59
Yule7	0.42	0.61
Bickley2	1.06	1.54
Bickley3	1.08	1.57