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1. CATCHMENT AREA

The catchment consists of both residential and commercial areas. It is approximately bordered by Horatio Street to the South, Perry Street to the west and Lewis Street to the east. The catchment flows in a northerly direction and discharges into open drains which are connected to the Cudgegong River.

The catchment includes much of Mudgee's Central Business District and thus has a high percentage of impervious area. This high level of imperviousness leads to short times of concentration of stormwater flows.

In the upstream reaches of the catchment stormwater flows are conveyed mainly within the open gutters beside the road network. Stormwater flows overland and follows the road network to the low lying area in Mortimer Street. The construction of the commercial properties over the piped drainage system to the north of Mortimer Street reduced opportunities for stormwater drainage improvements. During events which exceeded the capacity of the drainage system, ponding occurred along the frontage to the properties, which subsequently experienced flooding. A laneway is located to the west of the ponding area (Byron Lane), but its use as an effective overland flow path was limited due the excessive depths of ponding required in Mortimer Street before floodwaters could escape.

In the late 1980s Council undertook works to reduce the severity of flooding within the area. The works consisted of a new piped drainage system which continued along Perry Street and on to the Cudgegong River. More recently Council constructed a trunk drain comprising sections of 1050 – 1200 mm diameter along Church Street to reduce overland flows in that street and overland flows leading to ponding in Mortimer Street.

Some smaller sub-catchments are situated on the western fringes of Catchment D which drain directly to the Cudgegong River and do not converge on the low spot in Mortimer Street. These areas include the sub-catchment to the west of Perry Street, which discharges into the road side gutter on the west side of the road before following the natural grade to the river.

Main river flooding from the Cudgegong River extends upstream of the outlet of the pipe system at Short Street. However, the slope of the drainage system is such that the river has little effect on the pipe flow. Flooding within the catchment is due to short duration local catchment storm events.
2. HYDROLOGIC MODELLING

2.1 Model Setup

Figure 2.1 shows the arrangement of sub-catchments and drainage links used to define the hydrologic computer model of Catchment D. The pipe arrangement adopted for the DRAINS model was developed both from Council plans and site inspection. Pit entry capacities for input to the DRAINS model were estimated by counting the number of pits situated within each sub-catchment. Overflows from pits were directed to the next downstream reach with overland travel times calculated assuming a velocity of overland flow equal to 2 m/s.

The depression located in Mortimer Street was incorporated into the model as a detention basin with storage parameters being computed using the survey of Mortimer Street. A three dimensional contour plan of Mortimer Street was used to calculate the storage volumes at different ponding depths within the roadway and is shown in Figure 2.2. Storage volumes were assessed as commencing at the top of the low spot along the northern kerb, an elevation of 454.9 m. By inspection of gutter and road centre line profiles along Mortimer Street, it was concluded that depths of ponding must exceed 600 mm above the lowest kerb height along the northern gutter, and reach an elevation of 455.5 m, before flows will make their way down Byron Lane.

Figure 2.2: Three dimensional plot of Mortimer Street (coordinate (0,0) is the south west corner).
2.2 Model Results

Storms of 10 to 180 minutes duration and 5, 20 and 100 year ARI were applied to the model. Results of the hydrologic modelling indicate that, storm durations of 20 to 25 minutes are critical. Figure 2.2 shows the peak overland flows in the street system. These flows would be conveyed at depths less than 100 mm and at velocities less than 1 m/s. Consequently it would be expected that the streets would function as floodways and there would be no inundation of properties fronting the streets.

Stormwater ponding within the low lying area in Mortimer Street would be considerably reduced in depth as a result of upgrading the stormwater system in Church Street. From Table 2.1 it can be seen that for the 100 year ARI event, the depth of ponding reaches around 420 mm. This is less than the depth corresponding to the elevation of the overland flow path along Byron Lane.

The peak inflows shown in Table 2.1 are the peak flows into the detention basin from Mortimer Street plus overflows flows from sub-catchment A4 which exceed the capacity of the piped drainage system. The 500 RCP which conveys water under Woolworths to Byron Place has a capacity of 0.45 m$^3$/s. The DRAINS model is set up so that when the 500 RCP is flowing at full capacity and the detention basin is surcharged, any overflows of the storage are directed down Byron Place. However the analysis showed that flows would be contained within the storage and overflows would not be significant.

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<tr>
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<th>BEHAVIOUR IN THE STORAGE AREA</th>
<th>IN MORTIMER STREET</th>
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<tr>
<td></td>
<td>5 yr ARI</td>
<td>20 yr ARI</td>
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<tr>
<td>Peak overland flow from Church Street and sub-catchment A4 (m$^3$/s)</td>
<td>0.1</td>
<td>0.38</td>
</tr>
<tr>
<td>Depth of Ponding (mm)</td>
<td>neg</td>
<td>50</td>
</tr>
<tr>
<td>Peak overland flow from storage via Byron Place (m$^3$/s)</td>
<td>Neg.</td>
<td>Neg.</td>
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MUDGEE LOCAL CREEKS
FLOOD BEHAVIOUR STUDIES - CATCHMENT D

Figure 2.1
DRAINS MODEL LAYOUT

LEGEND
- Sub-Catchment Boundary
- Sub-Catchment Number
- Drainage Reach

Scale
0  100  200m

ST HOBS

HORATIO

ST DOURO

ST LEWIS

ST PERRY

ST CHURCH

ST LAWSON

ST INGLIS

ST MARKE

ST LOVEJOY

ST MORTIM

ST GLADSTONE

FIG. 2.1 DRAINS MODEL LAYOUT
3. SUMMARY AND CONCLUSIONS

A hydrologic model of the catchment was prepared using the DRAINS rainfall runoff program. The results of the model were used to determine the behaviour of the system for rainfall events ranging between 5 and 100 year ARI.

As confirmed by the DRAINS model results, the construction of the trunk drain in Church Street has reduced overland flows ponding in front of Woolworths in the depression on Mortimer Street.

Residual flows which surcharge the trunk line may be conveyed northwards along Church Street as overland flow within the extent of the roadway which would function as a floodway during major flood events. For the 100 year ARI flood, depths of flow are expected to be no more than 150 mm.