

PROJECT INFORMATION			
Project Name: Edgeware Village – Street Drainage Assessment DRAFT			
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Edgeware Village Street Drainage Assessment

1 Background

The objective of this memo is to investigate the surface drainage issues around Edgeware Village at 74-76 Edgeware Road. These include the existing drainage capacity of the 825mm diameter stormwater main (Blakiston Drain) and its associated drainage components along Edgeware Road from Dover Street to St Albans Creek. The Request for Professional Service (RPS) number for this project is RPS 4407.

2 Objectives

The objectives of this investigation is as below:

- a) Investigate the capacity of the existing stormwater network in Edgeware Road under free discharge conditions
- b) Investigate the adequacy of sumps in the Edgeware Road corridor
- c) Investigate the existing kerb and channel capacity around Edgeware Village
- d) Compare existing capacity against current design standards
- e) Compare the water level in St. Albans Creek that will trigger issues upstream during the local storm event and compare this to model results of the creek for different storms

3 Background

An 825mm diameter stormwater main drains from west to east along Edgeware Road from Dover Street to St Albans Creek. The catchments draining to the pipe are a mixture of medium density residential area and a commercial shopping area within St Albans.

Previous investigations by LDRP (Land Drainage Recovery Project) had identified St Albans Creek as being severely constrained downstream of Edgeware Road down to Hills Road. The Council project to improve the Dudley Creek drainage capacity in the mid-2010s had carried out several upgrades to St Albans Creek up to Hills Road, however, the benefits of these works do not extend up to Edgeware Road.

4 Drainage Assessment

4.1 Adequacy of Sumps in the Road Corridor

There are a total of 38 inlets (double sumps, single sumps and silt trap) within the Edgeware Road corridor between Dover Street and St Albans Creek and up to 116 inlets for the entire catchment. A site walk over was carried out to assess the conditions of the inlet sumps. The sumps all appeared to be functioning normally and clear of debris.

A standard single flat sump has 20L/s inlet capacity as per CCC Waterways, Wetlands and Drainage Guide Part B, Section 22.10.2. Using this as a guidance, there are 38 sumps x 20L/s = 760L/s of inlet capacity along Edgeware Road.

4.2 Existing Kerb and Channel Capacity

The road drainage network east of Sherbourne Street was upgraded by SCIRT in 2014–15 and is comparatively new. The kerb and channel west of Sherbourne Street is of varying standards and conditions. Sections of kerb on the south side between Caledonian Street and Sherbourne Street does not have the standard CCC kerb height as shown in Figure 1 and is in relatively poor physical condition (Figure 2 shows the area of interest).

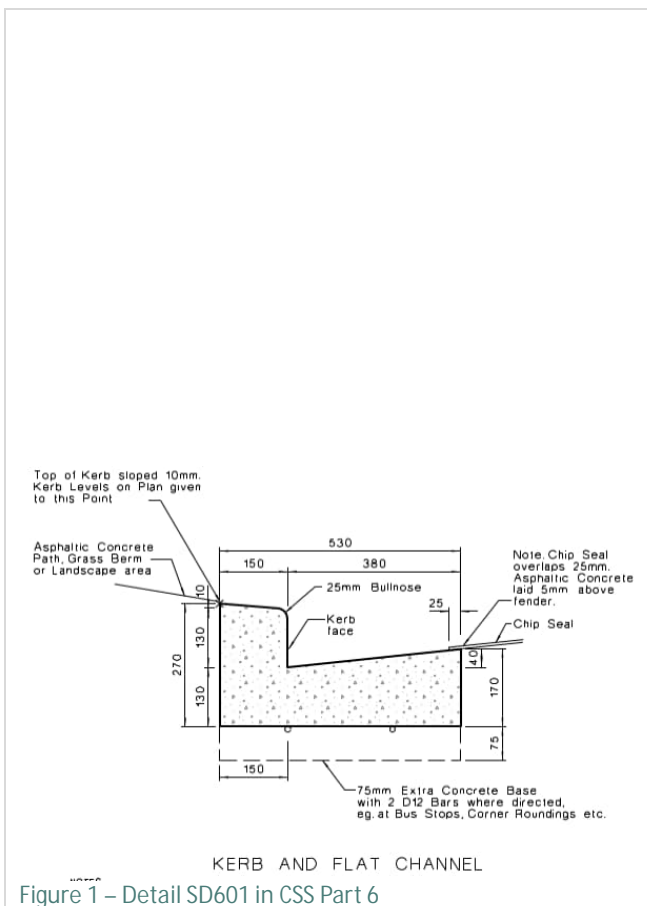


Figure 2 – Kerb and channel outside of Edgeware Village (looking east towards Sherbourne Street)

A 2016 survey shows that the lowest sump level surveyed is RL15.01 at the vehicle entry to the parking lot at 1064 Colombo Street (around 180m from its outfall at St Albans Creek). The longitudinal slope of the kerb falling to this location from both directions is very flat. The channel at the vehicle entry is shallow and has limited capacity,

however, this is compensated by a 225mm diameter under channel piping beneath the vehicle crossing. A 225mm diameter pipe at a very flat hydraulic gradient of 1 in 500 could carry 18L/s.

The survey also shows that the back of footpath in front of Edgeware Village at 70 – 76 Edgeware Road is around RL15.10 (only 90 mm above the lowest gutter level), while the crest of the road between Colombo Street and Sherbourne Street varies between RL 15.33 – 15.39. This kerb has only approximately 2/3 of a standard kerb height and less conveying capacity than a standard kerb due to the flatness of the channel slope. A comparison of the conveying capacity between a standard kerb and channel is listed in Table 1.

Table 1 – Side channel flow capacity comparison

Description	Longitudinal Grade	Capacity (L/s)
Standard kerb and flat channel SD601	1 : 200	54
Standard kerb and flat channel SD601	1 : 500	35
Kerb at 70 – 76 Edgeware Road	1 : 637	30

* - Assuming 3% cross fall and using a water depth of 80mm

There are two double sumps in this segment of street – referred to as Sump 1 and Sump 2 respectively in Figure 3. Sump 1 drains a catchment of approximately 1.15ha, while Sump 2 around 0.26ha. In a 5yr event, Sump 1 will receive a peak runoff 58L/s, while Sump 2 around 15L/s. There is a single sump to the west of Sump 1, which would aid in removing the surface runoff. The position of the sumps allow them to intercept and capture runoff from the 5yr ARI storms. The close spacing of sumps in this location exceeds the requirements of CCC Waterway, Wetlands and Drainage Guide (WWDG) Ch 14, which recommends double sumps to be spaced no greater than 90m apart, or single sumps no greater than 45m apart. This indicates past efforts to resolve flooding issue and counterbalance the inadequacy of the kerb and channel system.

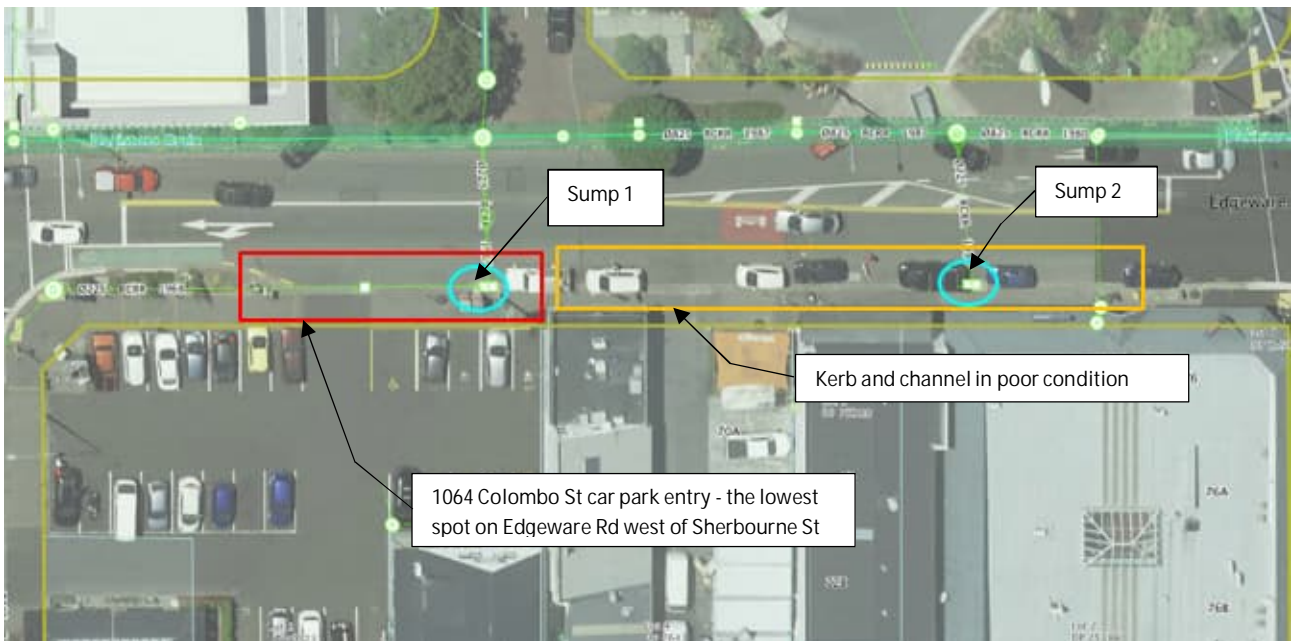


Figure 3 – Surface drainage network between Colombo St and Sherbourne St

4.3 Capacity of the Existing Network under Free Discharge Conditions

The main outfall for the area is a 415m length of 825mm diameter pipe running from Dover Street along Edgeware Road to St Albans Creek (SwAccessID5566 to SWAccess6169) known as Blakiston Drain. The pipe has an average gradient of 1 in 704. Assuming a free discharge condition at St Albans Creek (and ignoring head losses), the pipe has a discharge capacity of 592 L/s. Table 2 below lists the discharge capacity of the pipe for other theoretical hydraulic gradient with the change in St Albans Creek water level.

Table 2 – The Edgeware Road 825mm diameter actual slope vs theoretical hydraulic gradient

Grade	Capacity (L/s)
Pipe slope 1: 704	592.2
Hydraulic grade 1:500	704.1
Hydraulic grade 1:1000	495.7
Hydraulic grade 1:2000	348.5

4.4 Existing Capacity against Design Standard

Chapter 5.6 in the CCC Infrastructure Design standard stated that the primary drainage network must cater for the more frequent rainfall events including the 5 year ARI (Average Recurrence Interval) event.

Blakiston Drain receives runoff from an estimated 30.6ha of mostly impervious catchment area, which flows to the 825mm pipe in Edgeware Road 825mm pipe. Using a C of 0.80, the calculated 5yr ARI surface runoff using the Rational formula are listed in the Table 3 below.

Table 3 – Calculated 5yr ARI runoff using Rational Formula

Time of concentration	Intensity (mm/hr) *	Discharge (L/s)
45 minutes	14.52	988
1 hour	13.11	891
3 hours	8.35	568
9 hours	1.50	329

* - The rainfall intensity is obtained using the HIRdV4 for existing scenario.

The pipe is under capacity for both the 45 minutes and 1 hours high intensity storms, however, it is unlikely that a 30ha catchment has such a short time of concentration. A more realistic time of concentration for the catchment is around the 3 hours mark.

The Citywide Avon Model interim results provided by GHD on 14th March 2022 has a peak runoff of 526L/s for 10yr 1hr duration storm. This is under the discharge capacity calculated in Section 4.3, and means the pipe size is adequate under a free discharge scenario.

4.5 Critical Water Levels in St. Albans Creek and Comparison to the Model Results for Different Storms

St Albans Creek is a narrow waterway with relatively steep planted banks and flows through a 1200mm diameter circular culvert under Edgeware Road. The creek always experiences high water level during wet events due to large runoff volume from the mostly impervious catchment and constraints downstream of Edgeware Road. Table 4 and Table 5 list the flood levels in St Albans Creek for the 10yr and 50yr events.

Table 4 – Modelled 10yr flood levels in St Albans Creek (no sea level rise)

Model Chainage	1hr	3hr	9hr	18hr	36hr
Avon.StAlban Ch4374 *	15.102	15.179	15.134	14.993	15.045
Avon.StAlban Ch4394 **	14.985	15.029	15.003	14.914	14.95

* Upstream of Edgeware Road culvert

** Downstream of Edgeware Road culvert

Table 5 – Modelled 50yr flood levels in St Albans Creek (no sea level rise)

Model Chainage	1hr	3hr	9hr	18hr	36hr
Avon.StAlban Ch4374 *	15.199	15.231	15.219	15.167	15.102
Avon.StAlban Ch4394 **	15.043	15.062	15.051	15.022	14.985

The sump grating in the driveway to 1064 Colombo Street – approximately 220m away from the St Albans Creek outfall – has a surveyed level RL 15.08. The modelled flood levels in the creek in the 10 year event are higher than this level for some durations. This will prevent drainage via gravity for periods of the storm and could lead to backflow up the pipe network towards the village.

Ignoring all hydraulic losses in the pipe and using a theoretical hydraulic gradient of 1:1000, this equals to a 0.22m fall in water levels between the sump and the creek. It means that a creek water level of 14.86 will inhibit discharge of stormwater to such a degree that the network will surcharge at the street sumps. This assumption is validated when compared to the 10yr and 50yr ARI modelled flood levels along Edgeware Road (refer Table 6 and Table 7).

Table 6 - CWM Avon Model Mike Urban 10yr water levels

Node ID	IL	GL	1hr	3hr	9hr	18hr	36hr	Comments
AVON.Manhole.CRM.5560	14.092	15.7689	15.449	15.489	15.485	15.389	15.198	Dover St
AVON.Manhole.CRM.5566	14.085	15.7026	15.391	15.435	15.433	15.346	15.181	
AVON.Manhole.CRM.5644	14.083	15.1813	15.345	15.386	15.387	15.321	15.171	
AVON.Manhole.CRM.5665	14.037	15.2552	15.324	15.364	15.368	15.308	15.167	Caledonian St
AVON.Manhole.CRM.5760	14.033	15.2351	15.254	15.304	15.312	15.262	15.14	Colombo St
AVON.Manhole.CRM.5892	14.03	15.2191	15.181	15.256	15.273	15.22	15.115	Cornwall St
AVON.Manhole.CRM.5930	13.931	15.1213	15.131	15.224	15.254	15.202	15.09	
AVON.Manhole.CRM.5969	13.901	15.3939	15.076	15.191	15.24	15.184	15.066	Sherbourne St
AVON.Manhole.CRM.6002	13.826	15.1654	15.032	15.163	15.226	15.169	15.044	
AVON.Outlet.CCCGIS.6169	13.5	15.4820	14.941	15.103	15.178	15.134	14.993	Outfall to St Albans Creek

* The blue cells represent surface ponding

** The red figures are the maximum water levels

Table 7 – CWM Avon Model Mike Urban 50yr water levels

Node ID	IL	GL	1hr	3hr	9hr	18hr	36hr	Comments
AVON.Manhole.CRM.5560	14.092	15.7689	15.532	15.546	15.514	15.474	15.409	Dover St
AVON.Manhole.CRM.5566	14.085	15.7026	15.472	15.487	15.46	15.423	15.363	
AVON.Manhole.CRM.5644	14.083	15.1813	15.414	15.43	15.407	15.38	15.336	
AVON.Manhole.CRM.5665	14.037	15.2552	15.391	15.408	15.387	15.362	15.322	Caledonian St
AVON.Manhole.CRM.5760	14.033	15.2351	15.324	15.349	15.333	15.31	15.275	Colombo St
AVON.Manhole.CRM.5892	14.03	15.2191	15.27	15.307	15.296	15.273	15.235	Cornwall St
AVON.Manhole.CRM.5930	13.931	15.1213	15.228	15.28	15.279	15.258	15.219	
AVON.Manhole.CRM.5969	13.901	15.3939	15.18	15.252	15.263	15.244	15.205	Sherbourne St
AVON.Manhole.CRM.6002	13.826	15.1654	15.139	15.228	15.247	15.232	15.193	
AVON.Outlet.CCCGIS.6169	13.5	15.4820	15.045	15.199	15.231	15.22	15.167	Outfall to St Albans Creek

The predicted water levels in the 10yr event means that the lowest lying sumps between Caledonian Street and Sherbourne Street (most notably sumps connected to Nodes 5760 and 5892, which are manholes situated at the Colombo Street junction and Cornwall Street junction respectively) will surcharge and overflow the kerb. With the

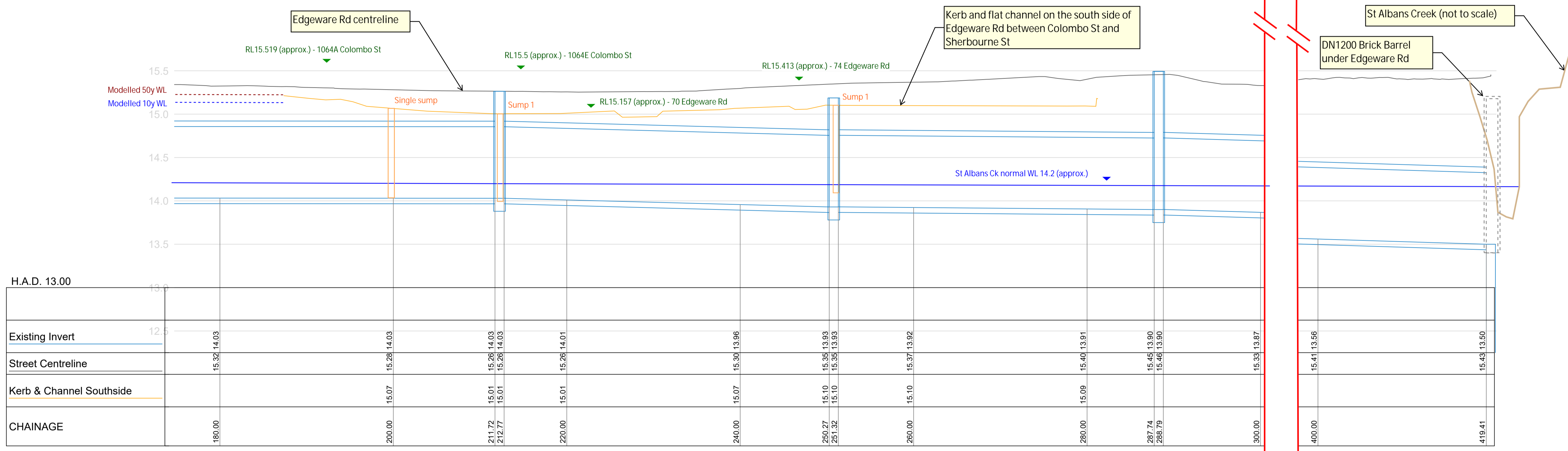
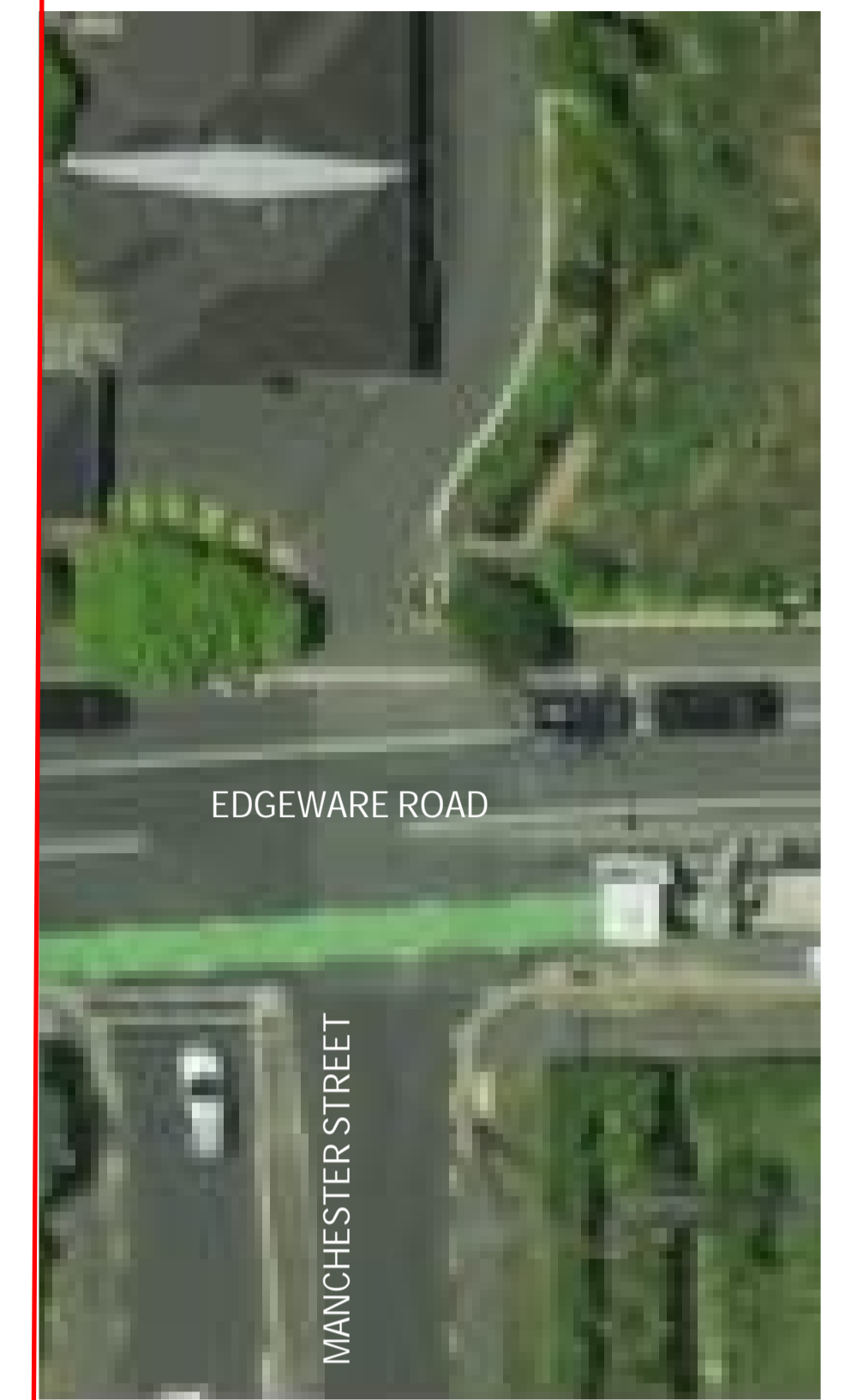
road having a significant cross fall to the south, this overflow could possibly impact some of the properties on the south side of Edgeware Road.

For the more extreme 50yr event, surface runoff is likely to surcharge and overland flow in the southeast direction to the low spot at the Manchester St-Canon St junction.

5 Summary

From the investigation, it could be concluded that:

- a) The inlet sumps along Edgeware Road has up to 760L/s of intake capacity, which should be sufficient for a 5yr ARI storm runoff for the catchment
- b) Although the kerb is not of standard height, there are sufficient sumps providing inletting to the pipe network that the kerb meets current design standard.
- c) The 825mm diameter stormwater main along Edgeware Road has plenty of discharge capacity in free discharge scenario.
- d) Overall, the local stormwater network has sufficient capacity to meet the 5y design storm requirements for the local catchment with a clear outfall to St Albans Creek.
- e) St Albans Creek has a normal WL of approximately 14.3. This gets as high as RL15.18 in a 10yr ARI event, and RL15.23 in a 50y ARI event. This causes water to surcharge out of the sumps in low lying positions and impact the surrounding street drainage.
- f) The main cause of surface flooding issues around Edgeware Village is the combination of high tailwater levels in St Albans Creek and the comparatively low lying area between Colombo Street and Sherbourne Street, which renders gravity drainage ineffective in a significant storm event. Upgrades to the local kerb and channel, sumps and pipe network will not address this issue.
- g) A wider flood alleviation scheme or changes to floor levels would be required to materially reduce flood risk in the area.



LONGITUDINAL SECTION - EdgwareDN825
 HORIZ 1:250 VERT 1:25