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LOWER RICHMOND HILL CATCHMENT
12 OCTOBER 2000 FLOODING
INVESTIGATION NOTES



Report
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City Design

December 2000

Lower Richmond Hill Catchment

12 October 2000 Storm

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Technical Report Summary:

Lower Richmond Hill Catchment : 12 October 2000 Storm

What Happened:

Refer to the attached 22490/03-plan sheet 1. During the 12th October storm, some of Nayland St, Wakefield Ave and Marriner St area experienced flooding. Several houses and commercial properties had floodwaters enter above floor level. About twelve properties had water at or above floor level. Structural flooding ranged from minor seepage just above floorboards to over 100mm above floor level.

The floodwaters came from the Richmond Hill Catchment. This approximate 110ha catchment has most of its surface waters concentrated and collected by an open channel. The stormwater for the last 300m from an Intake at 12 Nayland St is discharged to a sea outlet by Cave Rock via a 1350mm pipeline.

This catchment has three main 'pinch' points/ trouble spots.

There is a grate at the uphill side of the culvert that passes under the Richmond Hill Rd hairpin, located about 300m upstream of the 12 Nayland St Intake. This grate is prone to blocking. Any overflow from here would flow down Richmond Hill Rd towards Nayland St where it would have difficulty re-entering the open waterway or 12 Nayland St Intake structure. Any blockage event at the hairpin grate has the likelihood of causing flooding in Marriner St and Nayland St similar to the 12 October Storm. Fortunately this grate performed adequately during this particular storm.

12 Nayland Sts Intake grate at the transition from the open waterway to the 1350mm pipe is small, difficult to access and prone to blockage. Substantial quantities of stormwater did bypass and overflow from this grate between about 7:30 am on the 12th October and 2:30 am on the 13th October.

Stormwater overflowed from the 12 Nayland St Intake because of a suspected combination of partial/substantial grate blockage and high intensity flows possibly greater than the pipe capacity. This and having no acceptable secondary flow path was the major cause of the flooding shown on the plan 22490/3. Other contributing factors include lost pipe capacity from the stormwater's heavy silt and debris content and perhaps higher than normal tidal events.

By Cave Rock, the 1350mm outlet has a flapvalve prone to blockage by tidal sand. Sand levels have varied by about 2m over the last decade and 3m over the last several decades. Before the flap valve was installed, turbulent seas used to wash beach sand and large rocks from the erosion protection works up the pipeline causing blockages. The flapvalve has recently been fitted with a waterjet to remove sand from the downstream side. Relatively easy removal of the flapvalve by Maintenance machinery/crews was a design feature but during turbulent storms, access would be very difficult especially over the riprap.

This flapvalve appears to have functioned adequately during the 12th October storm event but any unobserved gate resistance would have further reduced the 1350mm-pipeline capacity.

Because of the high intensity winds, this storm event blew a lot of wind blown debris into the waterways where much of it was carried into the grates. It appears as if the drainage maintenance crew was under resourced, having to deal with several critical areas during the storm in difficult dangerous conditions. The central city experienced much less rainfall; this may have contributed to what the local Sumner Police Officer considered a delayed response from Council Staff.

The two nearby rain gauges in Woolston and Sumner village recorded substantially different rainfall intensity data.

Based on the Botanic Gardens Rainfall figures,
Woolston gauge recorded approximately 50year rainfall events for a 12.5 hour period from 2:30 am on the 12th October and the:
Sumner Gauge recorded a 15yr rainfall event for a 19-hour return period from 9pm on the 11th October, although this period contained a more intense 13 hour 30year event.

Provisional adjustments to local catchment variations by Water Services Unit indicate generally a 40year event at Woolston. Given the wide range in storm intensity recorded and the likely range even within the Richmond Hill Catchments storm intensity from sea level to the top of the catchment, it is difficult to give a conclusive storm return period.

Computer 'Mouse modelling' of both rainfall events is attached. This model has only been based on a simplified catchment, e.g. the ZigZag 450mm/750mm pipeline catchment has not been separated. This model indicates that if the higher Woolston Rainfall intensity were adopted, the 1350mm pipeline would have overflowed about 1500m³ during three short periods totalling about two hours about midday the 12th. Theoretically the 1350mm could have coped with the recorded Stoke St rainfall data. Given the observed long overflow time, this modelling data thus confirms the importance of larger easier maintainable intake grates and better debris capture facilities.

It is fortunate the flooding did not cause further damage e.g. a 50-car basement car park at corner of Marriner St and Esplanade could have easily flooded also with minor additional Marriner St sump blockage.

Suggested Remedial Action:

Survey works have been undertaken to assess the extent of the flooding and this data transferred to the plan. Further investigations on ways to improve the three identified trouble areas are likely to be needed. The community desires and other Council Units desires will also influence what drainage works are undertaken in the near future. There are already plans to involve the Community in a combined City Streets and Water Services initiative for lower Richmond Hill Rd, Nayland St and Wakefield Ave streetworks. The 30th November meeting had a mixed response with removal of existing trees both strongly supported and contested by factions of the community.

The outcome of Parks Unit initiatives to have better surfing in the area will substantially impact on the effectiveness of several of the Sumner stormwater Outfalls as sand levels near the outfalls may impede stormwater flows.

Likely desirable additional drainage Capital Works may involve:

- a) Improving and enlarging the 12 Nayland St Intake grate.
- b) Purchasing 12 Nayland St for both improved debris capture near the intake and public recreational purposes. Best undertaken in conjunction with pending proposed roading works
- c) Large diameter pipes down Nayland St towards Wakefield Ave with several large sumps for secondary flow capture. The regular ponding area at Wakefield and Nayland could be also intercepted.
- d) Improving and/or extending the 1350mm pipe Outlet in conjunction with an improved gate and gate/beach access at Cave Rock.
- e) Better Secondary flow provision at the Richmond Hill hairpin grate possibly combined with a dual purpose public access under the road and/or road reshaping.
- f) Investigate an alternative additional linked lower capacity? outlet/overflow down Nayland to the Surf Club area utilising the potential stormwater pressure head down the ZigZag.
- g) Extensive planting works in any public land the upper rural valley.
- h) Additional sumps/flap valves outside 22 Marriner St on both sides of the road.
- i) Relocating the Intake in combination with extending the 1350mm pipe upstream and installing flap valves on all sidelines to the 1350mm.

Until desired works are finalised and prioritised, estimates can not be made but desired long-term works are likely to cost in the order of over a million dollars and involve substantial consultation time.

In the meantime other actions needed include:

- Improving flood data transfer via either scada or digital cameras at trouble spots. Having easily interpreted data accessible from the Internet by a variety of interested parties (e.g. police, CCC, locals) would help give a more accurate assessment of flood risks.
- Ensuring minimum dwelling floor levels of 12.0m are enforced in the block bounded by Nayland St, Marriner St and Wakefield Ave,
- Sharing flood contingency plan information with local police/fire brigade,
- Remove recently deposited silt from the 1350mm-pipe etc before it hardens,
- Communicating with manager of large Marriner/Esplanade apartment block on the risk of floodwaters entering the large basement garage and on the need to have a bunding system available.
- Ensuring City Care/WSU flood response systems are practised and
- Ensure sufficient specialist flood control City Care resources are allocated during floods.
- Ensure drainage advisers are in the field during heavy storm events and have the authority to direct City Care priorities and maintenance operations.
- Having a local person to observe & report on grate blockages may be useful.

End of Summary

Storm Event:

Catchment Overview:

Refer to Plan 22490/03.

The approximate 110ha catchment is mostly Rural Hills, about 1.9km long and falls about 330m to sea level. The hill areas are mostly grazed tussocks and some of the land is steep and unstable. Richmond Hill Waterway is open for most of its length until it reaches the main intake at 12 Nayland St. From there it is piped via a 1350mm pipe for the last 320m to an outlet by Cave Rock. The current intake at 12 Nayland St is relatively small and is difficult to access or maintain as it is in private property behind a tall picket fence. The Cave Rock outlet is prone to blocking as sand levels in the vicinity have varied by 2m over the last decade and 3 metres over the last few decades. A water jet sand-flushing device has been sited at the Cave Rock Outfall recently to assist in freeing up the gate during storm events.

Before the flap valve was installed, turbulent seas used to wash beach sand and large rocks from the erosion protection works up the pipeline causing blockages. The flapvalve has recently been fitted with a waterjet to remove sand from the downstream side. Relatively easy removal of the flapvalve by Maintenance machinery/crews was a design feature but during turbulent storms access would be very difficult especially over the riprap.

This flapvalve appears to have functioned adequately during the 12th October storm event but any unobserved gate resistance would have further reduced the 1350mm-pipeline capacity.

There is no recognised satisfactory overflow path for secondary storm flow path from 12 Nayland St for any blockage event at the 12 Nayland St intake grate or blockage event in the 1350mm pipe or a blockage at the Cave Rock Outfall gate. Stormwater overflows towards the low area in Marriner St, where it will pond to about RL 11.85m in the block bounded by Nayland St and Marriner St unless drained adequately by other sumps on the 1350mm pipeline and able to drain adequately after spilling over the Marriner St crown. Substantial flows are also directed east across Wakefield Ave to flow down Nayland St to the Stoke St and Hardwicke St stormwater systems causing a flooding nuisance.

A purely surface secondary overland flow path below floor levels to the sea does not exist from 12 Nayland St, nor is it likely to be viable from this lowish area. Rising sea level predictions make lowering any sea barrier/wall impractical.

A more detailed catchment overview is contained in a June 2000 Water Services Unit/City Design Report.

12th October 2000 Rainfall Event:

The rain fell with a wide variation in quantity and intensity over the city. Over the 36 hour period between 9pm on the 11th October and 9am on the 13th October, 36mm fell on the western side of town by Templeton /Airport. Up to about six times as much (190mm) fell at upper Bowenvale Valley. The south-eastern areas of town experienced the highest rainfall.

The three recorders nearest the Richmond Hill catchment recorded:

Sumner (Stoke St)-XSU 131.5mm.

Woolston (Tunnel Rd)-HTU 151.2mm

Bowenvale Valley Upper-HSK 190.2mm

Considering the two nearest rainfall recorders.

A) Woolston-Tunnel Rd:

Examining the Woolston-Tunnel Rd data, and assuming it is typical of the rainfall event affecting Richmond Hill catchment, it can be seen that 110.6mm (or approximately 73% of total) of high intensity rain fell in a 12.5hr period from about 2:30am to 3pm 12th October.

This is an average intensity of 8.8mm/hr for 12.5 hours or approximately a 50year event. Water Services Unit has provisionally adjusted this figure to a 40-year event to accommodate local historic intensities.

Six hours of low intensity rain between 10pm and 2:30am before this event would have saturated much of the surface, especially as it closely followed the 26mm of rain that fell during the previous week.

The remainder of the rain during this event was spread with a relatively low average 2.2mm/hr intensity over about 24 hours. This is about a 2-year event for the low intensity portion of the storm.

B) Sumner-Stoke St:

Examining the Sumner Stoke St data, and alternatively assuming it is typical of the rainfall event affecting Richmond Hill catchment, it can be seen that 98mm (or approximately 74% of total) of high intensity rain fell in the first 19hr period from about 9pm 11th October to 4pm 12th October.

This is an average intensity of 5.1mm/hr for 19 hours or about a 15-year event. This period contained a more intense 30-year event for a 13-hour period. Historic adjustment factors are not available for this rainfall gauge.

The other 33.5mm of rain during this second event was spread with a relatively low intensity over the next 17 hours. This is an average intensity of 2mm/hr for 17 hours or less than a 2-year event for the low intensity portion of the storm.

The storm was accompanied by very strong winds, blowing over many trees and creating a tremendous amount of small wind blown debris. A sufficient quantity of this debris would have been washed into the Richmond Hill waterway and contributed to the observed partial blockage of the grate at the upper hairpin and assumed partial blockage of the 12 Nayland St intake.

Computer 'Mouse modelling' of both rainfall events is attached. This model has only been based on a simplified catchment, eg. the ZigZag 450mm/750mm pipeline catchment has not been separated. This model indicates that if the higher Woolston Rainfall intensity were adopted, the 1350mm pipeline would have overflowed about 1500m³ during three short periods totalling about two hours about midday the 12th. Theoretically the 1350mm could have coped with the recorded Stoke St rainfall data. Given the observed long overflow time, this modelling data thus confirms the importance of larger easier maintainable intake grates and better debris capture

facilities. Maximum 1350mm capacity was assessed as is at $2.3\text{m}^3/\text{s}$. Extending the 1350mm pipeline uphill with a sealed line up to about 13m RL, by the Bowling Club, was modelled. This increased the 1350mm capacity from $2.3\text{m}^3/\text{s}$ to about $2.8\text{m}^3/\text{s}$. To achieve this 20% increase in maximum capacity depends on the further installation of maintenance intensive prone to leakage flapvalves.

The tidal cycle and the level of the sand at the Cave Rock outlet influence the efficiency of the 1350mm-pipe Outfall.

On the 12th October, high tides were predicted at 4:37am and 4:56 p.m. (predicted at 10.0m but actual high tide of 10.40m at 4pm) and a low tide at 11.06 am (predicted 8.3m). The sand levels were low and the outfall unimpeded. The 1350mm outfall would have been at its lowest efficiency at about 5 p.m.

Much of the wind blown debris, silt and rocks etc dislodged by the high velocity water will have reduced the capacity of the 1350mm pipeline and the 12 Nayland St intake structure.

The stormwater had a very high silt content. After the storm, a layer of silt up to approximately 30mm thick covered much of nearby Nayland St. Some of this silt deposited during this storm event is likely to have been sluiced into the stormwater system. It may settle/harden in the pipes reducing the capacity of the pipeline if it is not inspected and cleared out if necessary. Many trees blew over, the exposed loess and silt appears to be one source of the substantial silt washed down the waterway.

The pipeline should have been able to cope with most of this long duration storm event. The most likely reason of failure was blockage and/or partial blockage at the intake by storm debris.

Observations (P= supported by photograph) (S=staff) (R=Resident/Passer by)

At approximately 7:30am 12 October, at 12 Nayland St, adjacent to the 1350mm pipe entry, A Fulton Hogan worker recalls observing stormwater bubbling through fence similar to 1pm photo, but with less street flooding. (R)

At approximately 9am, 12 October, at 12 Nayland St, Mrs Whelan (12 Marriner St) observed stormwater bubbling through fence similar to 1pm photo, but with less street flooding. (R)

At approximately 10am, 12 October, at a 1350mm Manhole on the Esplanade, Paul Dickson, lifted the lid and observed the pipe was flowing about three quarter full. This indicates the 1350mm gate at Cave Rock outlet was at least partially open. (S)

At approximately 11am, 12 October, At 12 Nayland St, City Care did best to clear grate. (Lyndsey Saunders report.)(S)

At approximately 11am, 12 October, at 38 Nayland St, Local Butcher observes that water rose quickly after 11am, peaked about 2pm to about 40mm above his floor level

then receded about 6pm. He also noted that minor regular flooding is common at Wakefield Ave & Nayland St especially outside the southern Nayland St shops.(R)

At about midday, 12 October, at 20 Marriner St, Mrs Marshall observed her yard went from no ponded water to about 100mm of ponded water in about 5 minutes. Flood waters came to about 120mm below her floor level, (Flood Level approximate 11.88; 12.00-0.12) (Mark above garage floor indicates approximate 11.79 Flood Level 11.57+0.22). She also advises that 22 & 24 Marriner St had water above floor level. (R)

At approximately 1pm, 12 October, at 12 Nayland St, Peter Wehrmann observed large volumes of silt laden water flowing past the intake, completely flooding Nayland St (Richmond Hill Rd to Wakefield Ave) and flowing across the centreline of the road down the walkway towards Marriner St.

At Wakefield Ave, some flow was crossing the road and continuing east down Nayland St.

Most of the flow appeared flowing north down Marriner St. Several properties were flooded but little flow had crossed the road centreline of approximate 11.85m level in Marriner St. Water was ponding but draining away at Marriner St indicating the pipe still had some capacity and the outfall gate was at least partially open. (P)(S)

At approximately 3:00-4:00pm, 12 October, at 12 Nayland St, John Walter observed silt laden stormwater still flowing past the intake with no attempt being made to clear the grate, but Nayland St was no longer completely under water. The southern third of Nayland St (between Wakefield and Richmond Hill Rd) was flooded and stormwater was flowing north down Wakefield Ave with about 50mm depth crossing the Wakefield Ave centreline and flowing east down Nayland St.

About 25mm depth of water was crossing Nayland St to go north up Wakefield Ave. Water was draining via the sumps connecting to the 1350mm on the north side of Marriner St although ponded water was near the centreline on the south side of the road. No water was observed ponded at either Hardwicke St or Esplanade, although some ponding was at Stoke St and in Nayland St near the Police Station. The tide gate at Cave Rock was working fine. The Richmond Hill Rd hairpin grate had debris on but was about 60% clear to pass flows. (S)(P)

At 3:30pm – 4:30pm, 12 October, Mrs Whelan, 12 Marriner St advises that this was the worst/ highest period of ponding, after which time the water relatively quickly receded. Water peaked at about 150mm below her floor level. (Flood level approximately RL11.94; 12.09-0.15) (R)

At approximately 10:20 p.m., 12 October, The Nayland St/Marriner St Community Hall Custodian, Mr Baden Melhuish noted that although stormwater ponding had reached 60mm above floor level (Flood level approximately 11.85 approximately 11.79+0.06) during the day and had later receded. At 10:20pm it was starting to rise again and bubble up through the floorboards. When he walked across to his car parked in the Hotel car park, the water level on the south side of Nayland St was about 300mm above kerb level (Flood Level approximately 11.83; 11.55+0.30) (R)

At approximately 2:30am 13 October, at 12 Nayland St, Digger Machine operator/Maintenance worker lifted a manhole in Nayland St to lower ponded water & then removed the intake grate with some difficulty, damaging fence and upsetting the resident with the noise.

At approximately 9am 13 October, at 12 Nayland St, P.Wehrmann, observed damaged fence, substantial silt on road and a couple of 0.5m rocks in the concrete waterway channel. Fire engine crews were sluicing away silt from the service station into the channels. At the Cave Rock outlet, some 0.3-0.5m diameter rocks were observed downstream of the outlet. (S)(P)

At approximately 9am 13 October, P.Wehrmann observed at the Richmond Hill Rd hairpin, the grate was observed to be about 60% blocked. (S)(P)

Miscellaneous Observations.

58 Marriner St, Professional Car Valet, [REDACTED] comments that he has cleaned about 15 local cars that had internal flooding. Water reached about RL11.55 at his property to just above garage floor level. They had surprisingly little flooding for the first time, although he saw water surging upwards about 600mm out off a stormwater? sewer? manhole in the street. He understands Council had recently cleared the Marriner Ave 375mm outlet to the sea.

The Fire Brigade has been contacted and some data obtained from them. They have privacy issues, and they are concerned with confidential data being spread. They made numerous visits to properties in the lower Richmond Hill catchment area during the storm but their records do not indicate which properties had water above the floor level.

Consequences:

The intake at 12 Nayland St blocked sometime in the morning on the 12th October. Stormwater overflow flooded much of Nayland St and Marriner St, entering above the floor levels on some properties. Some of the floodwaters crossed Wakefield Ave by Nayland St and caused flooding at least one property on the east Side of Wakefield Ave also.

Marriner St ponded water appeared to be slowly draining indicating the 1350mm pipeline still had surplus capacity and the Cave Rock Outfall gate was open.

Some houses/commercial properties which it is understood had stormwater enter above floor level include:

Marriner St:

22 ? (not certain, no response from occupants received)
24 (Historic House approximately 130mm), #24 Flat3, #24 Flat4
Community Hall corner Marriner & Nayland (approximately 60mm),
#28 (approximately 20mm, Coffee Culture),
#28 (approximately 40mm, Hollywood Theatre)

Nayland St:

Marrine Hotel,
#38 Butcher, (approximately 40mm)

Wakefield Ave:

#10 ('Jellyfish Kids', minor seepage approximately at floor level saved from worse damage by sandbagging)

Miscellaneous Comments:

Apparently sewer lateral blockages problems are frequent in local neighbourhood. Service plans examined recently by Mrs Marshall did not show 1350mm pipeline in walkway.
(Mrs Marshall 20 Marriner St comments.)

Several Locals had the common complaint that the on going but reducing problem is damp smells under the floorboards and a dust nuisance from all the silt deposited. They would appreciate a council effort to clean dust up.

24 Marriner St, Mrs Mary Davie, was angry and she felt fobbed of when she contacted emergency services 'No one seemed to know who to deal with' They had flowing water come at them from both Marriner St and Nayland St. 4pm was about the time of the peak flood level. Eventually their listed historic dwelling floor received over 100mm of flooding.

Conclusions:

As some overflow from the 12 Nayland St grate occurred over about a 20 hour period and that apparently only one drainage maintenance crew was trying to deal with several critical areas it appears likely that grate blockage was the cause of most of the flooding. A more intensive better-resourced maintenance effort may have reduced the duration of the flooding problem.

Although the storm/flood damage was substantial, it is fortunate that there was not more serious flooding in Sumner. The Richmond Hill hairpin grate did not block and the Cave Rock outlet also remained open. Only minor additional sump blockage could have made the flooding more widespread and damage could have included floodwaters filling up the large Marriner St /Esplanade 50 unit basement car park

Most of the problem in this catchment can be attributed to no protected or sufficiently high overland secondary overland flow path all the way to the sea, compounded by low properties, the sea wall and rising sea levels. Thus greater than normal effort needs to be made to keep the Hairpin Grate clear, the 12 Nayland St Intake clear, 1350mm pipeline and Cave Rock outlet open.

It is important we do not miss opportunities in Taylors Mistake and other similar undeveloped catchments to cheaply protect an overland flow path now before increased development.

It should be remembered during the peak of the storm, that the Sumner area was like a small war zone. City Care staff and emergency services were working very hard in trying and dangerous high wind/rain conditions attempting to protect property from dozens of fallen trees, slips and wind blown debris and to direct traffic down safer less flooded /blocked routes. City Care have realised in hind sight (L.Saunders Report) that they needed more technical advisers on the ground to set priorities and direct operations and better deal with the source of many of the drainage problems experienced

The short time I was on site at 1pm, I had difficulty telling which way surface floodwater was flowing because of the strong wind and heavy rain. I must confess I experienced sensory overload with all the wind damage and flooding in the area. City Care was doing a great job directing traffic away from areas closed by fallen trees etc.

The marked difference in rainfall intensities between the Central City and Sumner may have created some short term communication credibility issues between Central City Flood Response Team and Sumner Locals/Staff over the magnitude of the flooding problems facing Sumner.

Recommendations:

Further investigations on ways to improve the three identified trouble areas are likely to be needed. The community desires and other Council Units desires will also influence what drainage works are undertaken in the near future. There are already plans to involve the Community in a combined City Streets and Water Services initiative for Lower Richmond Hill Rd, Nayland St and Wakefield Ave streetworks. The 30th November meeting had a mixed response with removal of existing trees both strongly supported and contested by factions of the community.

Likely desirable additional drainage Capital Works may involve:

- a) Improving and enlarging the 12 Nayland St Intake grate.
- b) Purchasing 12 Nayland St for both improved debris capture near the intake and public recreational purposes. These works are best undertaken in conjunction with the new roading works. 12 Nayland St valuation when researched in June 00 was about \$240,000. Best decided before final road design concept issued to public.
- c) Large diameter pipes down Nayland St towards Wakefield Ave with several large sumps for secondary flow capture into the 1350mm pipeline in conjunction with Nayland St roading works. The regular ponding area at the east side of Wakefield Ave and Nayland St could be also connected later in conjunction with Wakefield roading works. Further computer modelling could be undertaken to determine if there is any advantage in linking the 750mm Hardwicke main with the 1350mm via Nayland St.
- d) Investigate further an alternative additional linked lower capacity? outlet/overflow down Nayland to the Surf Club area, utilising the available potential stormwater pressure head from the ZigZag to reduce maintenance needs. Although no detailed investigation has been undertaken, it is anticipated that an additional outlet close to the edge of the Surf Club sea access track will be practical. This lower area is likely to be kept free of sand dunes and a stormwater outlet can be at a higher level to reduce the need for a conventional flap valve. The pipe could have a slope towards Nayland St to ensure only higher flows discharged near the surf club. The higher potential head of stormwater should assist in slicing out many sand blockages. This alternative outfall could be connected to the 450mm/750mm system via a partial flapvalve outside # 9 Nayland, that directed most of the large flows from the ZigZag higher-pressure flows down Nayland St towards the Surf Club and also allows 12 Nayland St surplus flows to discharge to the surf club. Low flows could still flow towards 12 Nayland St via a gap under the flap valve. The size of the additional piped outlet is dependent on the benefit desired; with 450mm being the practical minimum, 750mm being more useful, and 1350mm being desirable but most costly. Parks Unit and Community Support are necessary for this option to be practical. More frequent flooding of the Surf Club is likely but this is a cheaper community cost. Regional Council consent may be necessary also for any works on the beach.

- e) Relocating the Intake in combination with extending the 1350mm pipe upstream and installing flap valves on all sidelines to the 1350mm. An extra 20% capacity is theoretically possible by extending the pipeline up to near the south side of the Bowling Club. This extra capacity increase depends on the installation, successful flapvalve functioning when exposed to downstream water velocity/suction forces and maintenance of flapvalves on appropriate side lines or an independent outfall for the lower catchment.
- f) Improving and/or extending the 1350mm pipe Cave Rock Outlet in conjunction with an improved gate and gate/beach access at Cave Rock. This decision should be made soon preferably in conjunction with Parks Units proposals to create artificial reefs in the area or Parks Unit development works nearby. Special consideration needs to be given to the consequences on the efficiency of the 1350mm outlet (and others) from the side effects of any artificial surfing reef proposed in the area.
- g) Extensive planting works in any public land in the upper rural valley and channel/unstable slope stabilisation.
- h) Additional sumps/flap valves outside 22 Marriner St on both sides of the road. The manager of the 50 Unit complex on the corner of Marriner St and Esplanade need to be made aware of the need for them to have a means of bunding the basement carpark entrance. Floodwaters could have easily filled the 50-park basement during this storm.
- i) Any new dwellings/attached garages in the block of land bounded by Marriner St and Nayland St should have a minimum floor level of 12.00m.
- j) A Web Cam or digital camera could be set up near the Cave Rock Outfall, 12 Nayland St intake and Hairpin Grate to monitor blockage events better and /or a more proactive maintenance programme on grate clearance at Upper Hairpin, 12 Nayland St and the Cave Rock Outfall. A high water level alarm connected to the Scada system is also an alternative. Better and quicker more accurate easily transferable flood data is necessary. If the Flood Response team had been more aware of the duration and extent of spillage from 12 Nayland St, a more intensive maintenance effort there would have been likely.
- k) Better Secondary flow provision at the Richmond Hill hairpin grate possibly combined with a dual purpose public access under the road along the waterway and/or road reshaping at the hairpin to create a secondary flow path back into the waterway. 2001 Richmond Hill Roading works needs to take account of this risk of spillage.

A better sharing of flood contingency plan information with local police/fire brigade and ensuring more City Care resources are allocated to clear intakes to better control floods is also advisable.

Until community desires are known and works are finalised and prioritised, estimates can not be made but desirable long-term capital works are likely to cost in the order of over a million dollars and involve substantial consultation time.

End

Attachments:

- Plan 22490/3 with Flood Extent. (14/12/00)**
- Photos: 12 October 00.**
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A circle with a shaded sector and a shaded segment. The sector is shaded with diagonal lines, and the segment is shaded with horizontal lines.

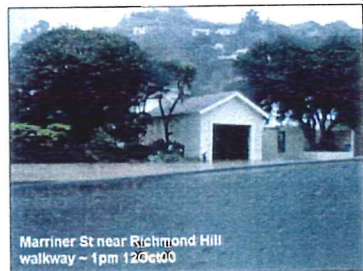
12 Oct. 2000 Predicted High Tide 10.0m, Actual High Tide 10.4m
Predicted Low Tide 8.3m



South Pacific Ocean



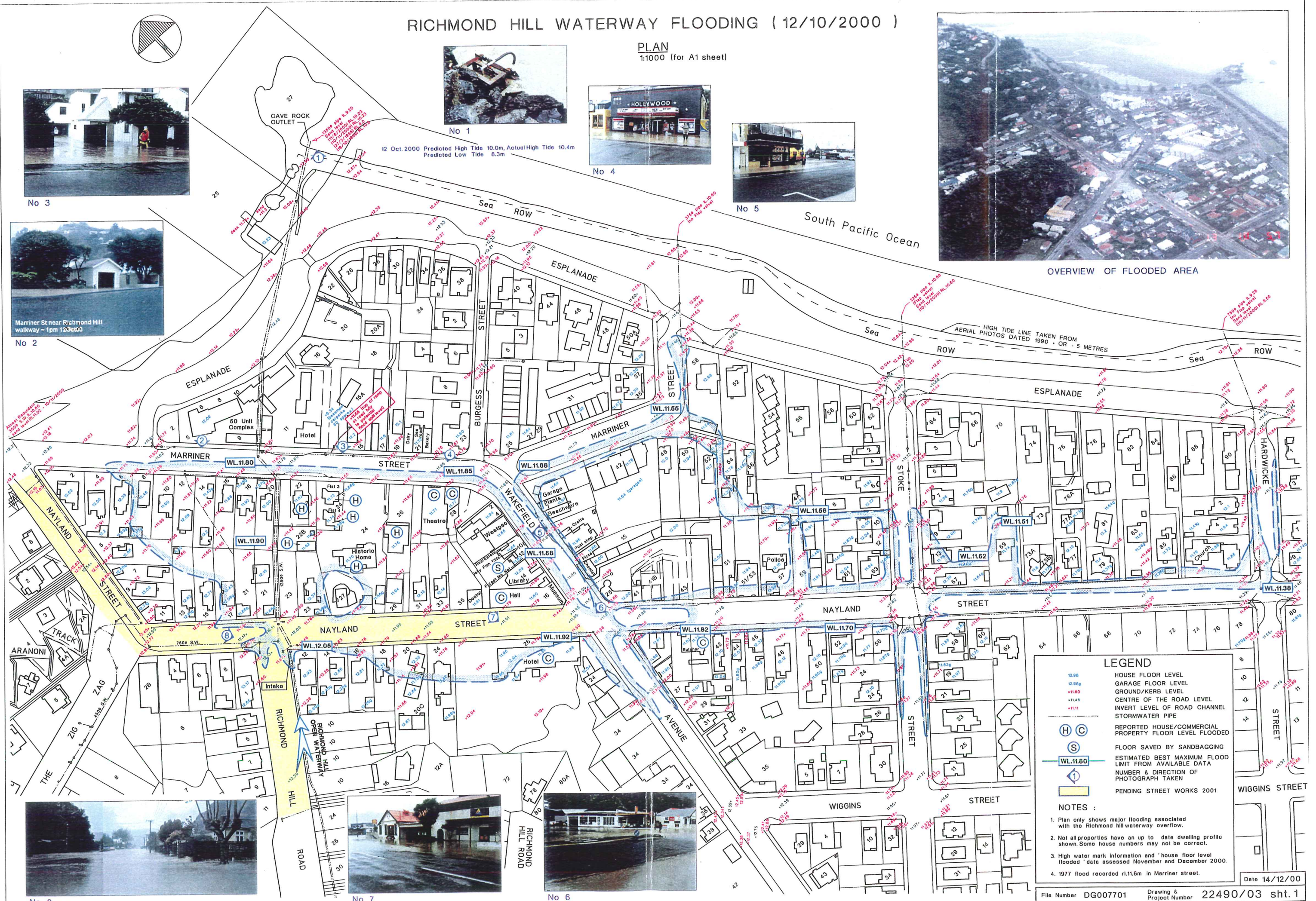
No 3



No 2



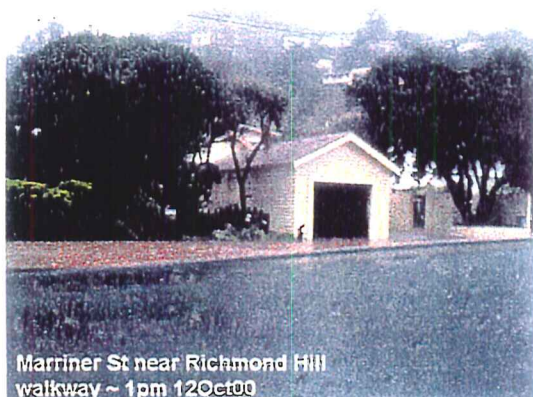
OVERVIEW OF FLOODED AREA



File Number DG007701

Drawing & Project Number 22490/03 sht. 1

12 Oct ~ 1pm



Marriner St near Richmond Hill
walkway ~ 1pm 12 Oct 00



Marriner St Library
~ 1pm 12 Oct 00



Nayland & Hardwick
~ 1pm 12 Oct 00



12 Nayland by Richmond Hill Rd
~ 1pm 12 Oct 00



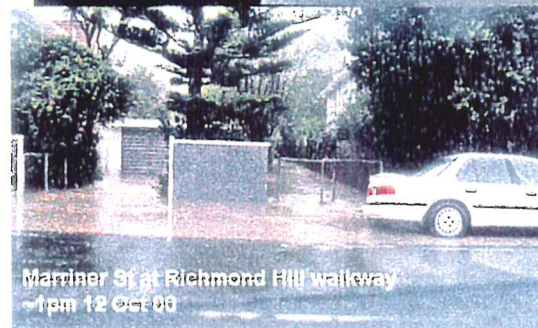
Nayland/ Stoke St
~ 1pm 12 Oct 00



Marriner/Wakenfield/Nayland
~ 1pm 12 Oct 00



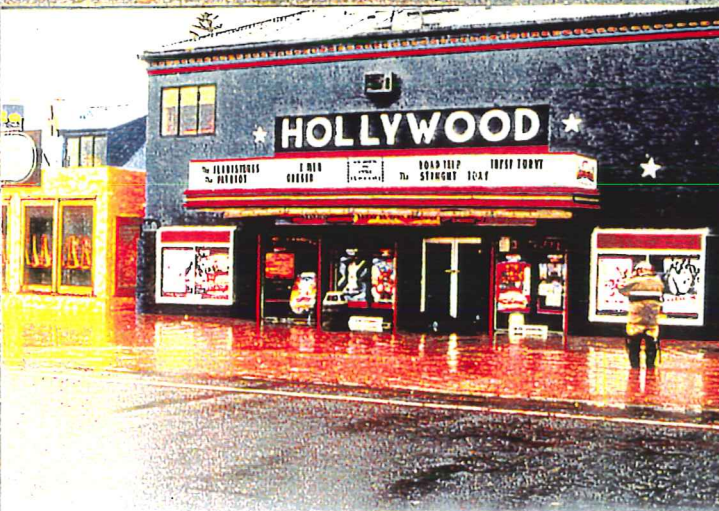
12 Nayland by Richmond Hill Rd
~ 1pm 12 Oct 00



Marriner St at Richmond Hill walkway
~ 1pm 12 Oct 00



Nayland by Richmond Hill Rd
~ 1pm 12 Oct 00



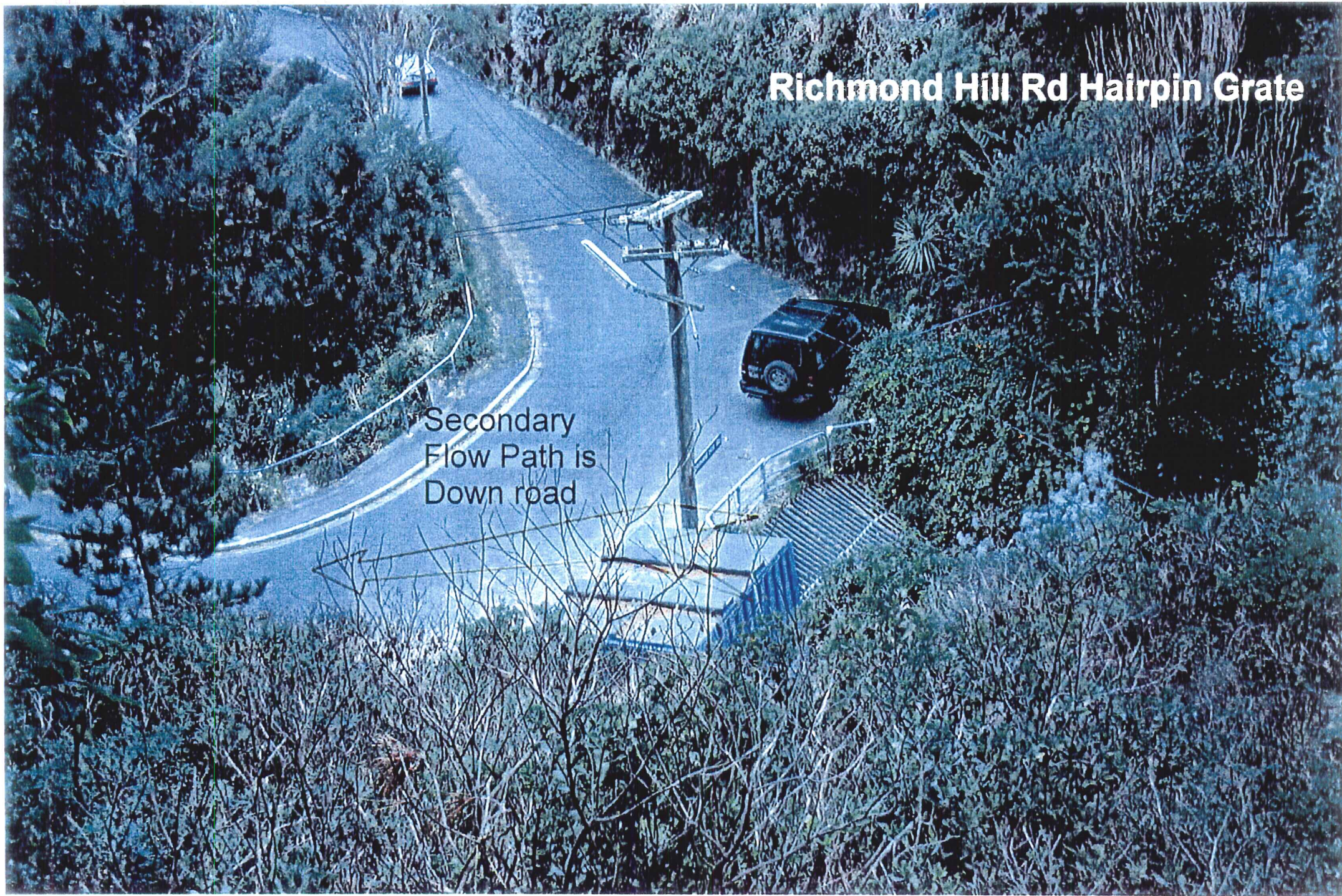
12 Oct ≈ 3:30pm



12 October 5 3:30 pm

Richmond Hill Rd Hairpin Grate

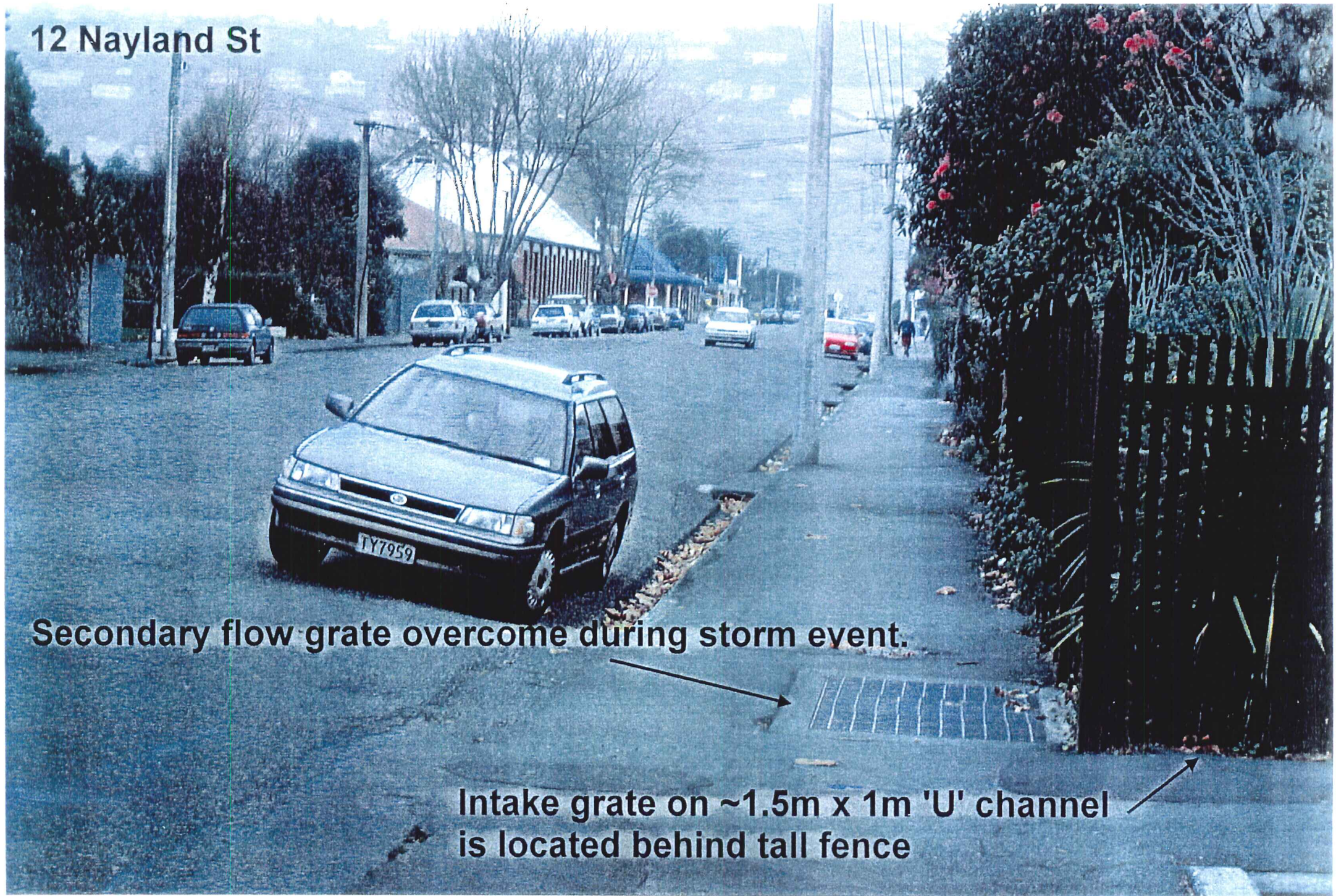
Secondary
Flow Path is
Down road



12 Nayland St

Secondary flow grate overcome during storm event.

Intake grate on ~1.5m x 1m 'U' channel
is located behind tall fence



1350mm Pipe Outlet at Cave Rock



(16)

Emergency Rainfall sites

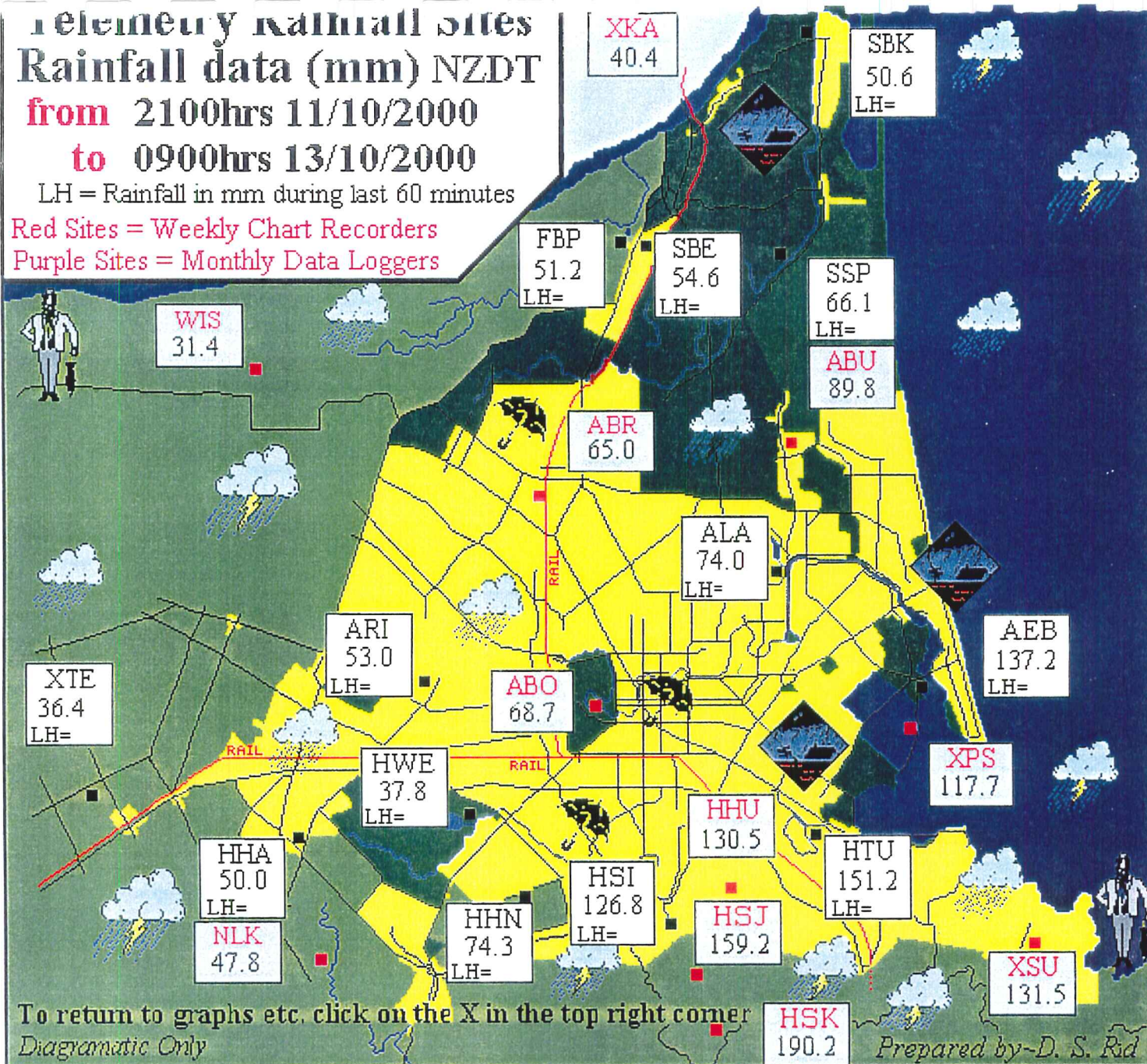
Rainfall data (mm) NZDT

from 2100hrs 11/10/2000
to 0900hrs 13/10/2000

LH = Rainfall in mm during last 60 minutes

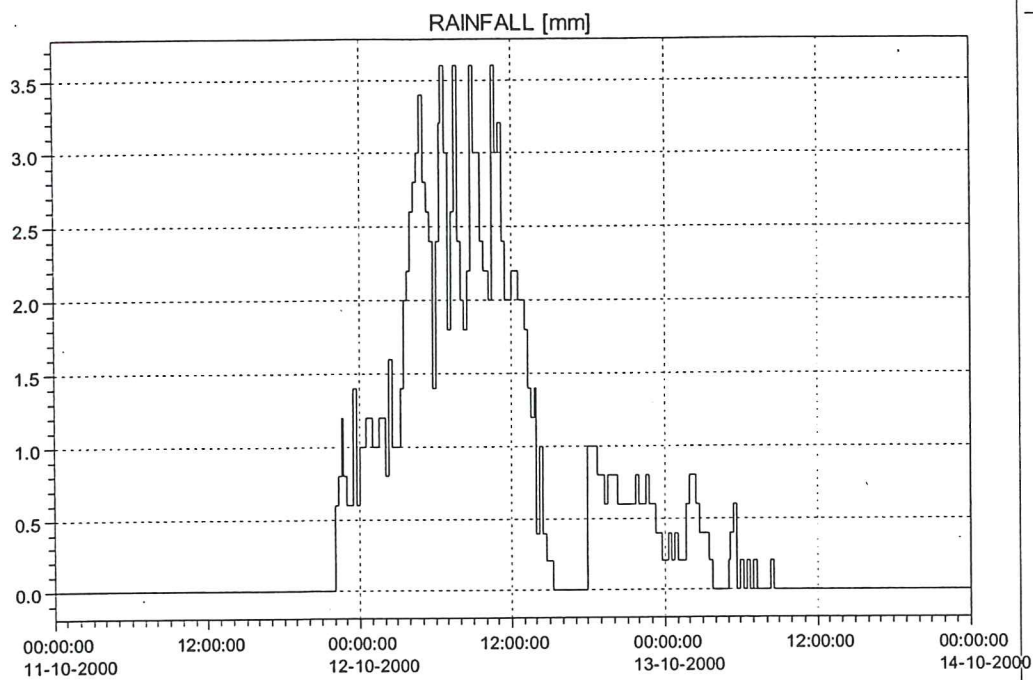
Red Sites = Weekly Chart Recorders

Purple Sites = Monthly Data Loggers

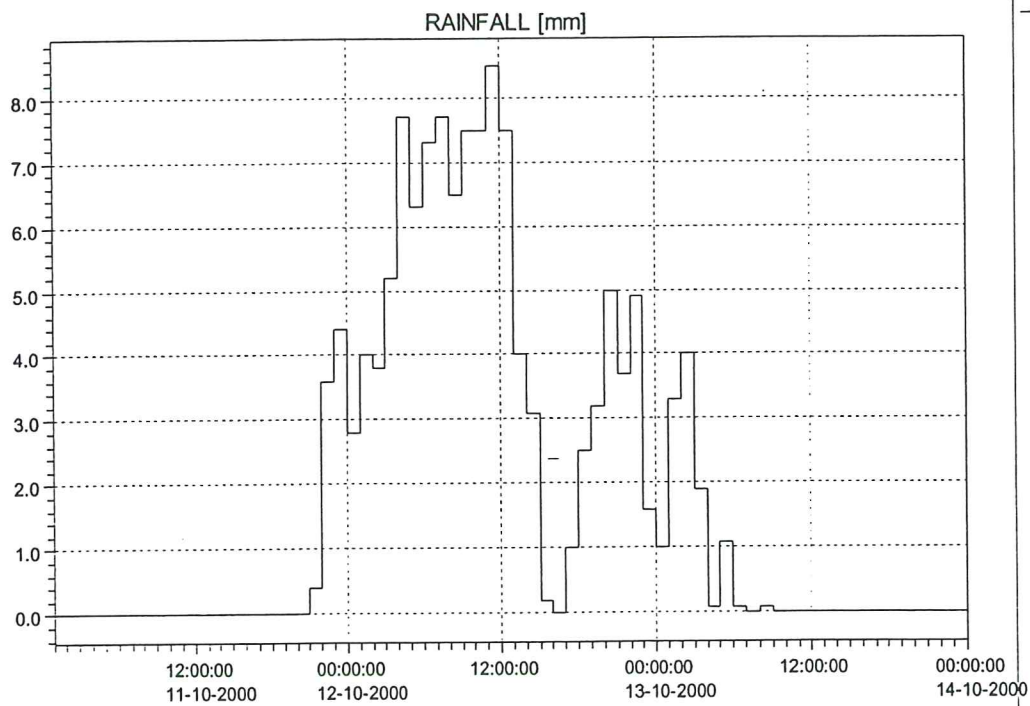


ABO=Botanic Gardens, ABR=Bryndwr, ABU=Burwood Hospital, AEB=South Brighton bridge, ALA=Horseshoe Lake, ARI=Riccarton, FBP=Belfast Ponds, HHA= Halswell, HHN=Hoon Hay, HHU=Huntsbury, HSI=Bowenvale Valley-lower, HSJ=Bowenvale Valley-middle, HSK=Bowenvale Valley-upper, HTU=Woolston, HWE=Wigram East, NLK=Ladbrooks, SBE=Belfast, SBK=Brooklands, SSP=Spenceville, XSU=Sumner, XTE=Templeton, WIS=Isaacs.

Woolston - Tunnel Rd (Rainfall/15minutes)



Sumner-Stoke St (Rainfall /hour)



Mouse Modelling

Richmond Hill Catchment Investigation 2000

30/11/00

Background

The Richmond Hill Catchment is located in Sumner, Christchurch. It has an area of 110 hectares, with a length of 1950 metres. Over the catchment there is a fall of approximately 330 metres. During the storm of 11-13th October 2000 there was substantial flooding in the Sumner area and this investigation aims to establish the cause of flooding.

Hydrological Model

A MOUSE model has been built which simulates the hydrological process of rainfall, which in turn produces runoff. The model is very sensitive to final infiltration rates of the catchment strata. All other hydrological losses are considered insignificant, due to stability in the model. From previous calibration work done in the Bowenvale catchment for the same storm a final infiltration rate of 3.5mm/hour was adopted.

There are two rainfall recorders in the vicinity of Richmond Hill. The Tunnel Road recorder, (HTU) is a telemetry site which takes a reading every fifteen minutes. The Stoke Street (XSU) is a weekly chart recorder which takes a reading every one hour. The Tunnel Road recorder showed the peak intensity of the storm was 14.4mm/hour whereas the Stoke Street recorder only received a peak intensity of 8.5mm/hour. Both recorders showed the peak storm duration was in the order of twelve hours.

The catchment has been divided into three subcatchments with the bulk of the catchment above Richmond Hill Road. The point rainfall-time series, for the storm, has been applied across the catchment to produce runoff hydrographs for the three subcatchments.

The hydrological simulations were run for three days which also encapsulates pre and post storm rainfall data. This produced runoff hydrographs which are used as input for the Hydraulic Model.

Hydraulic Model

A MOUSE Hydraulic Model was built that simulates the routing of the runoff through the catchment into a shotcrete channel, concrete channel and then into a 1350mm diam pipeline, which has a tidal outfall.

The Hydraulic Model has five Manholes located on the 1350mm pipeline, these manholes have had hydraulic entry and exit losses applied, a Mannings value of 0.0133 is used for the concrete pipes and concrete channels, the outlet has a flapgate fitted which prevents the backflow of tidal water.

Results

For both rainfall gauges the actual rainfall series for the storm of 11-13th October 2000, were applied over the Richmond Hill Catchment, and the runoff was routed through the channel/pipe system and into the sea just behind Cave Rock. The Hydraulic Model has a tidal boundary condition which peaks at a level of 10.4m RL, as it did on Thursday 12th October 2000. The tide level can impede the hydraulic performance of the pipeline. This tidal boundary has been aligned with real time so the storm event can produce runoff and then outfall under the same tidal restrictions as on 11-13th October 2000.

Tunnel Road Data

When the Hydraulic Model was run using the Tunnel Road rainfall data, the model indicates the intake/pipeline is at capacity and the intake is overwhelmed which would cause flooding. Overtopping of the Intake occurs on the Thursday 12th October at three times during the morning. First occurring at 7.45am, 9am and again at 10.45am. The model shows the cumulative volume of overflow is approximately 1500m³.

Maximum flow (2.5m³/s), in the pipe occurs at on 12th October 2000, at 11.19am. The maximum flow capacity with out over topping, of the inlet is, 2.3m³/s. Running the model with no tidal boundary produces no difference in peak discharge, which is surprising. The model does not let tidal water backflow into the pipeline, it only lets stormwater exit.

*2 hrs total spillage theoretical
cf. 2 19 hrs
actual
spillage.*

For modelling purposes a manhole has been inserted between Manhole 4 & Manhole 5 at the bend. If there was a manhole at this point it would be overflowing. If there are any pipe connections or sump connections at this point then they would be discharging stormwater at the same times as the Intake.

The velocity just before entering the intake and at No. 24 Richmond Hill Road is approximately 4.3 m/s, occurring at about 12.30pm.

Stoke Street Data

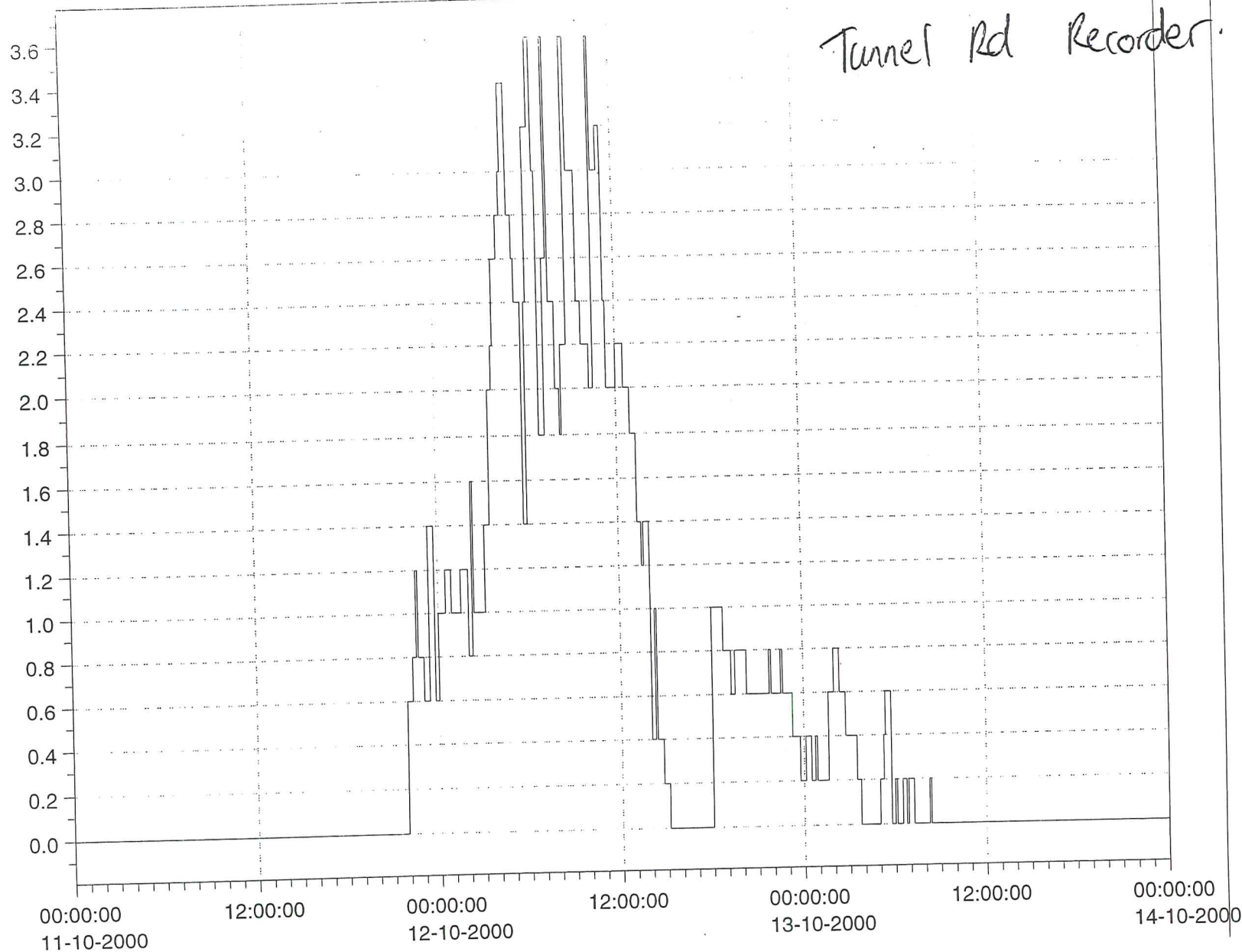
The Model shows for the Stoke Street rainfall data, the system comfortably handles the storm. The 4300 mm diam pipeline is not flowing full, or at full capacity. Peak flow, of 1.5m³/s, through the pipeline is occurs at Thursday 12th October 2000, 12 midday.

1350

OCT00HTU

RAINFALL [mm]

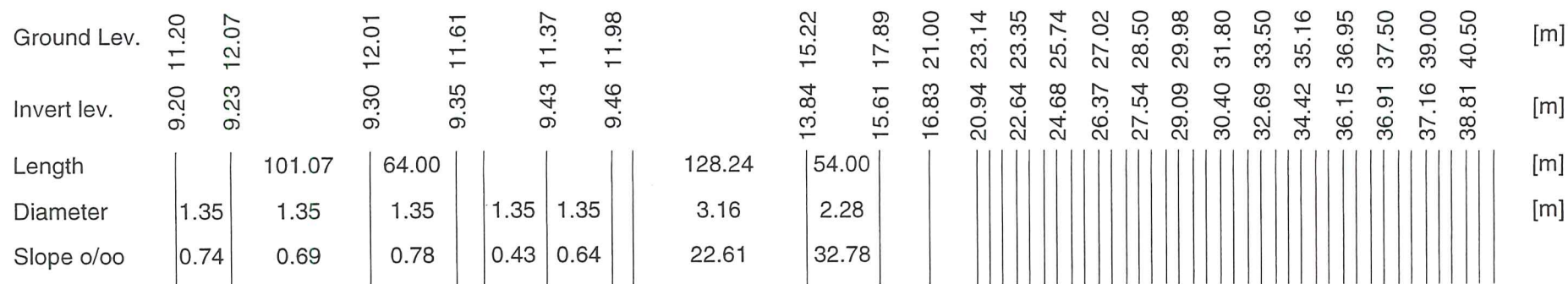
Tunnel Rd Recorder

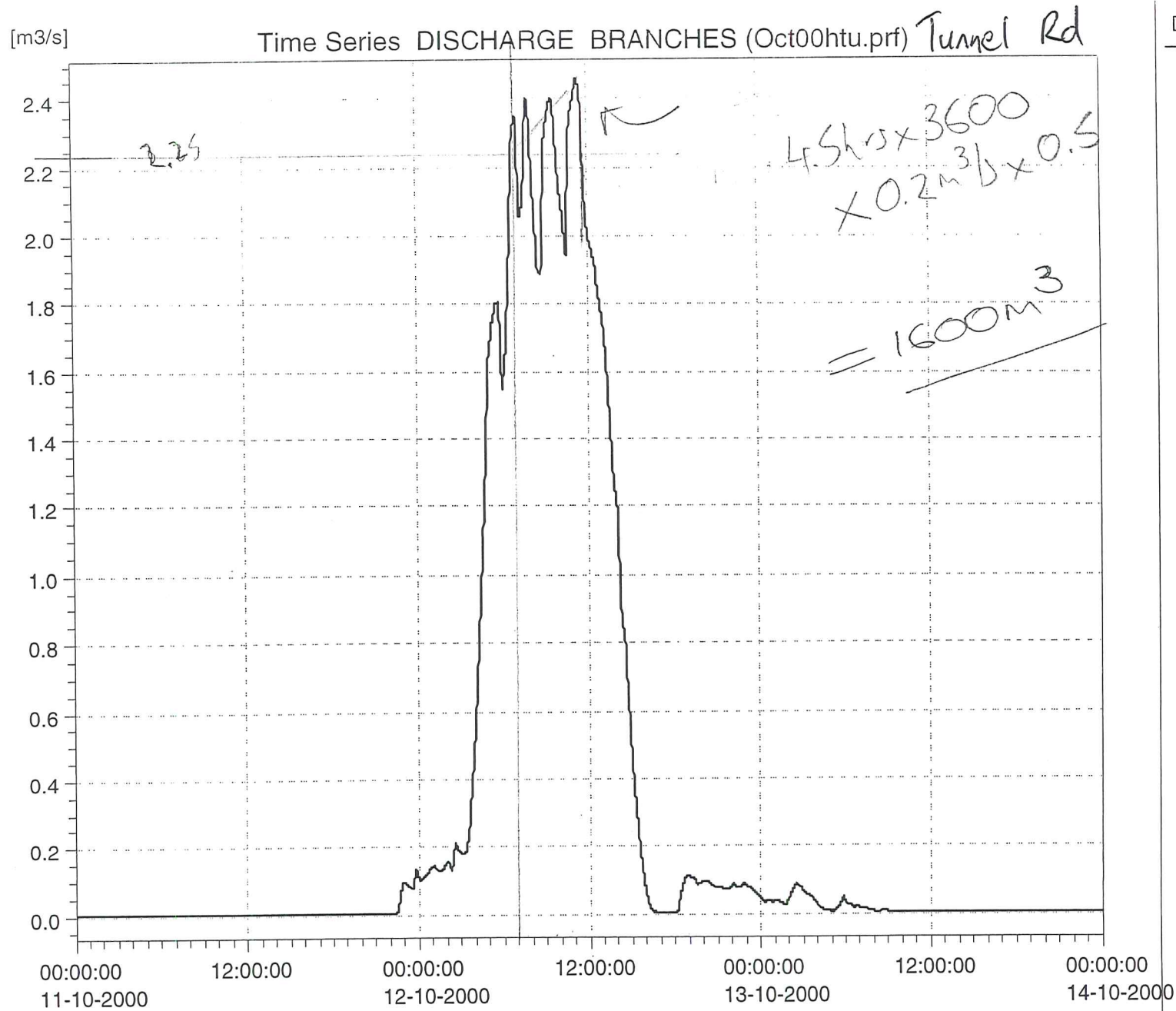


heathcot.txt

285	11/10/2000	(15min rainfall 00:00 - 23:45)										
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.6	2.5	0.8	1.2	0.8	0.6	0.6
	0.0	0.0	0.0	0.0	0.0	0.6	2.5	0.8	1.2	0.8	0.6	0.6
286	12/10/2000	(15min rainfall 00:00 - 23:45)										
	0.6	1.0	1.0	1.2	1.2	1.0	1.0	1.2	1.2	0.8	1.6	1.0
	1.0	1.0	1.4	2.0	2.2	2.6	2.8	3.0	3.4	2.8	2.6	2.4
	1.4	2.4	3.2	3.6	3.0	1.8	2.6	3.6	2.4	2.0	1.8	2.2
	3.6	3.0	3.0	2.4	2.2	2.2	2.0	3.6	3.0	3.2	2.4	2.0
	2.0	2.2	2.2	2.0	2.0	1.8	1.4	1.2	1.4	0.4	1.0	0.4
	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	1.0	1.0	1.0	0.8	0.8	0.6	0.8	0.8	0.8	0.6	0.6
	0.6	0.6	0.6	0.6	0.8	0.6	0.6	0.8	0.6	0.6	0.4	0.4
287	13/10/2000	(15min rainfall 00:00 - 23:45)										
	0.2	0.2	0.4	0.2	0.4	0.2	0.2	0.2	0.6	0.8	0.8	0.6
	0.4	0.4	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6
	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

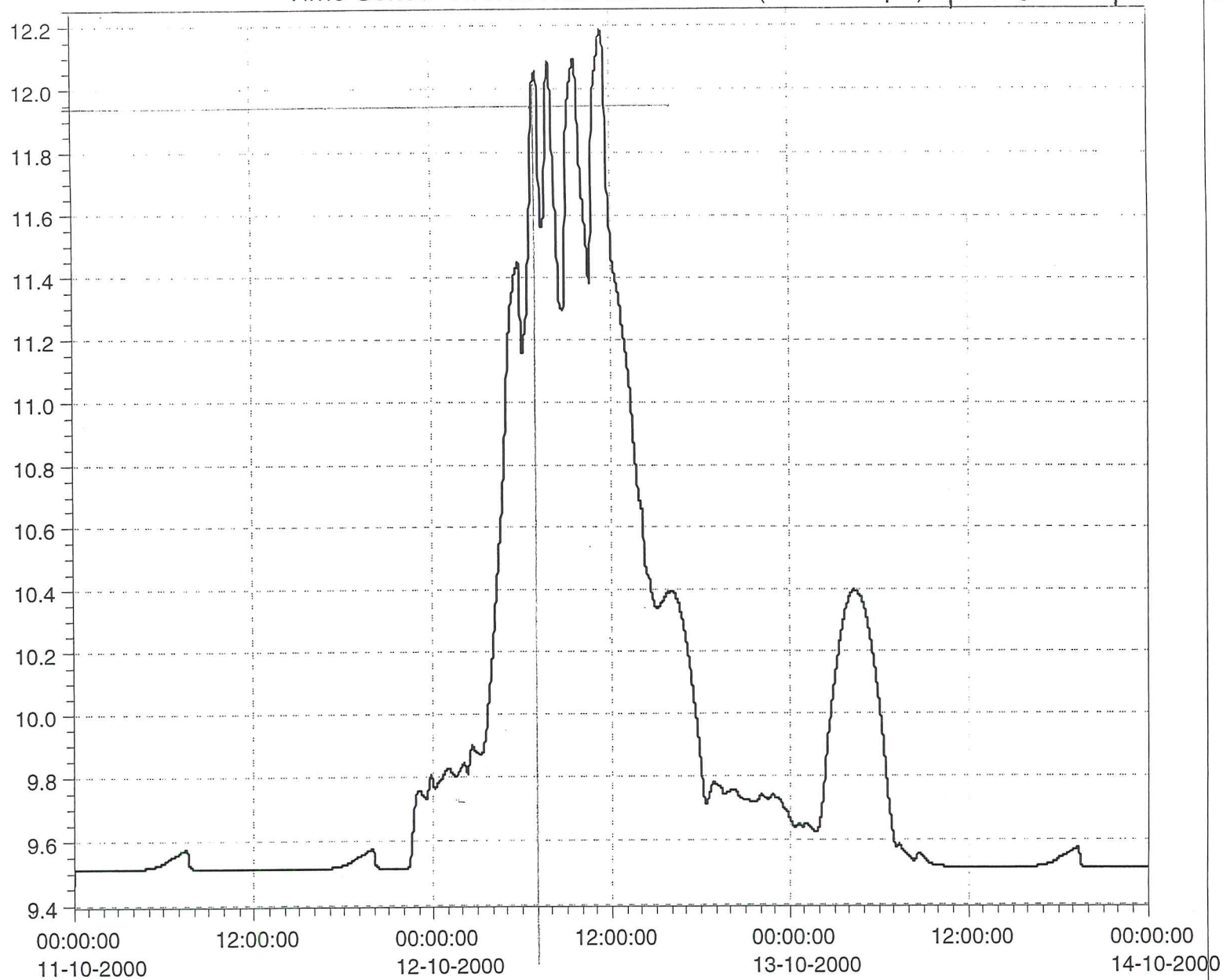
Tunnel Rd Recorder





[m]

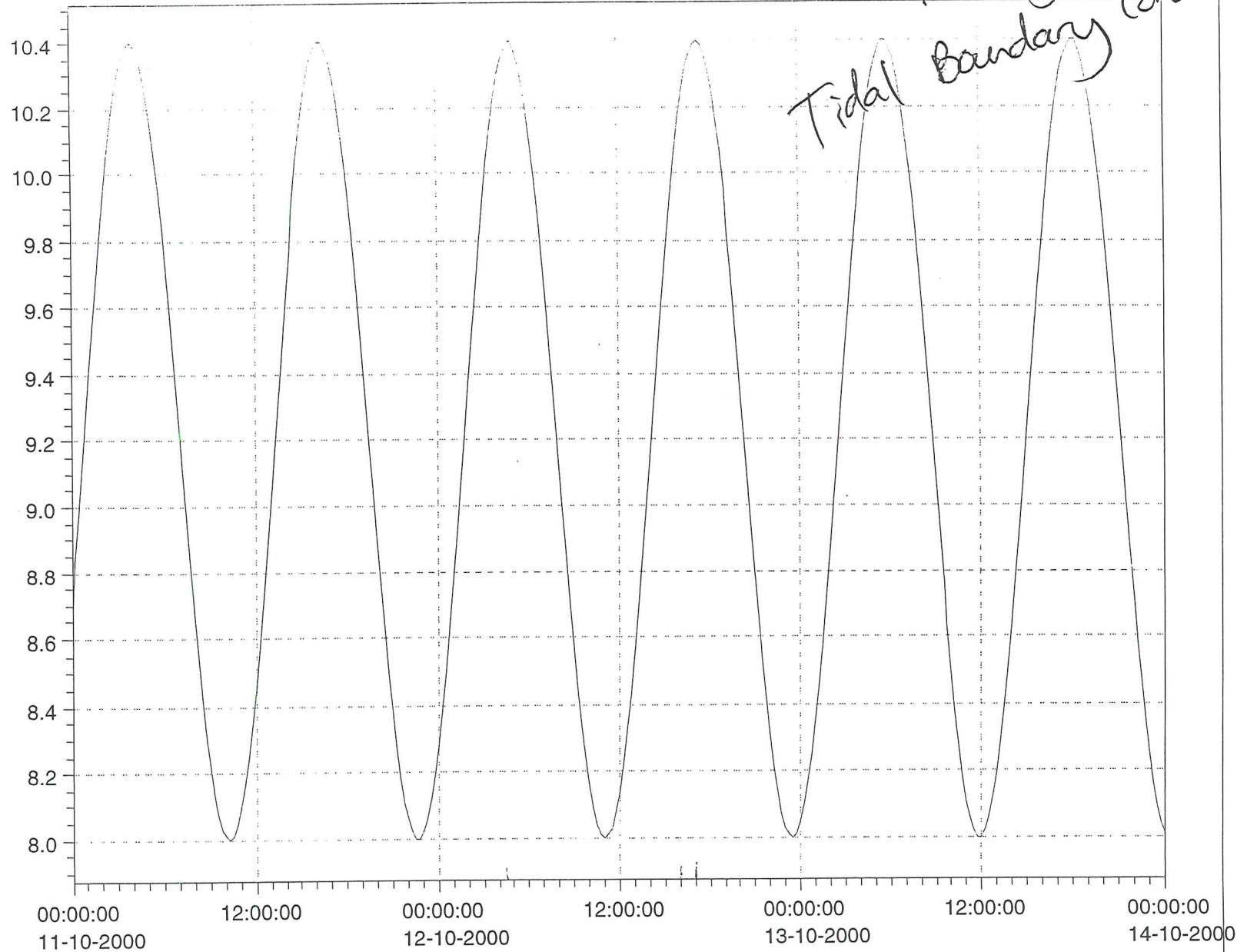
Time Series WATER LEVEL NODES (Oct00htu.prf) Tunnel Rd.

WATER LEVEL NODES
— INTAKE

WATER LEVEL [m]

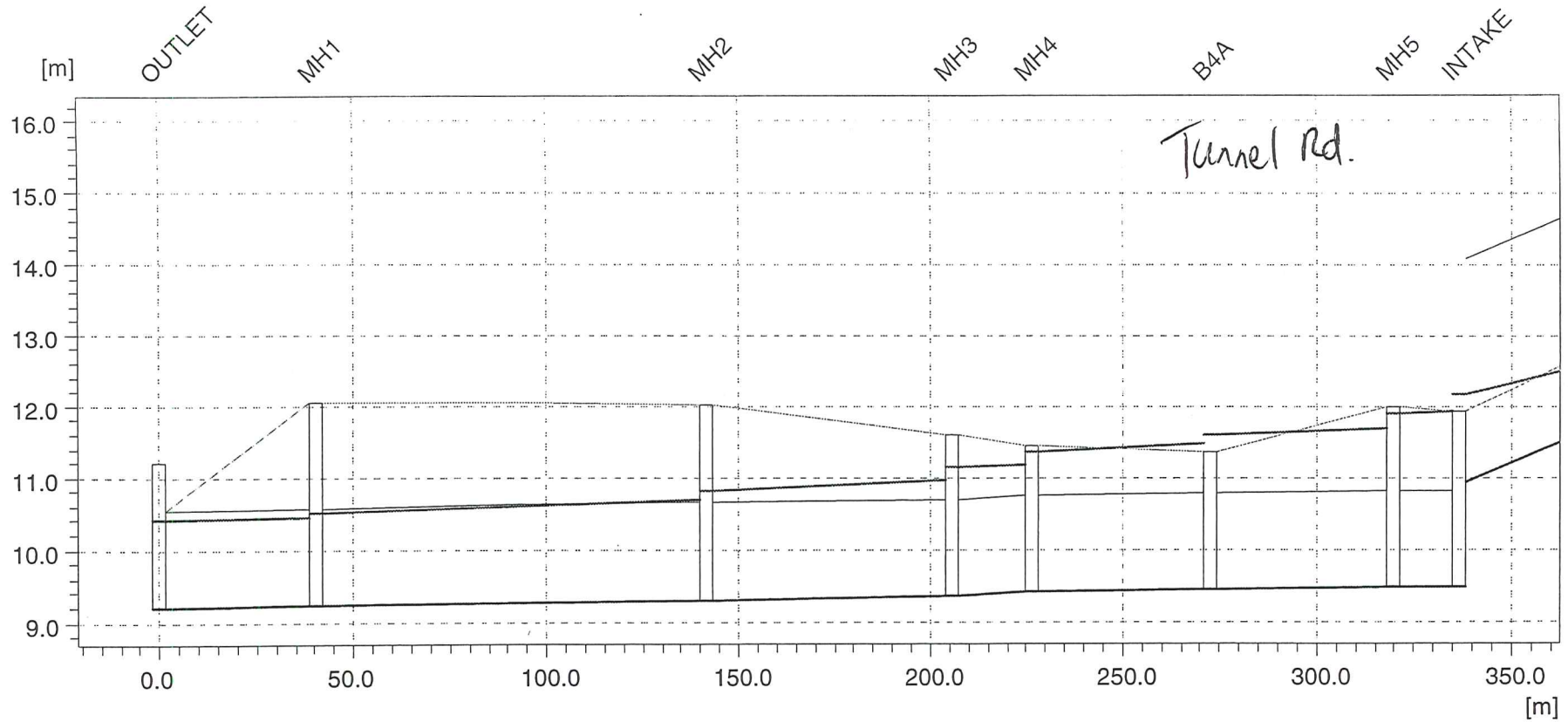
Tide Cycle for
Condition 10.4TIDE

Tidal Boundary



WATER LEVEL BRANCHES - 11-10-2000 00:00 Oct00htu.prp

Discharge	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002 m ³ /s
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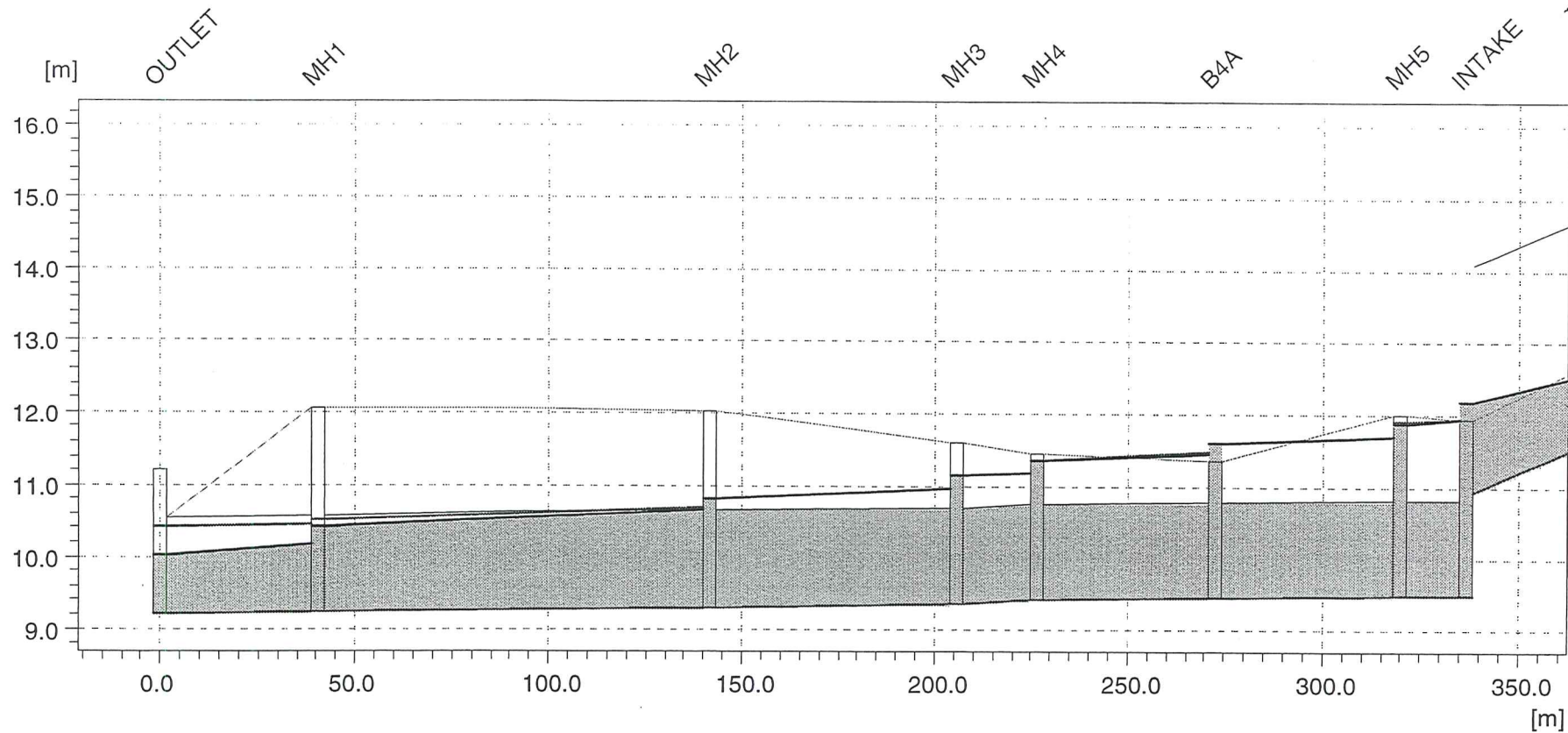


Ground Lev.	9.20	11.20	9.23	12.07	9.30	12.01	9.35	11.61	9.41	11.45	9.43	11.37	9.46	11.98	9.46	11.94	[m]
Invert lev.	9.20		9.23		9.30		9.35		9.41		9.43		9.46		9.46		[m]
Length	40.52			101.07		64.00	20.62		46.20		47.21			128.24			[m]
Diameter	1.35			1.35		1.35	1.35		1.35		1.35		1.35	3.16			[m]
Slope o/oo	0.74			0.69		0.78	2.91		0.43		0.64		0.06	22.61			

WATER LEVEL BRANCHES - 12-10-2000 11:24 Oct00htu.prf

Tunnel Rd.

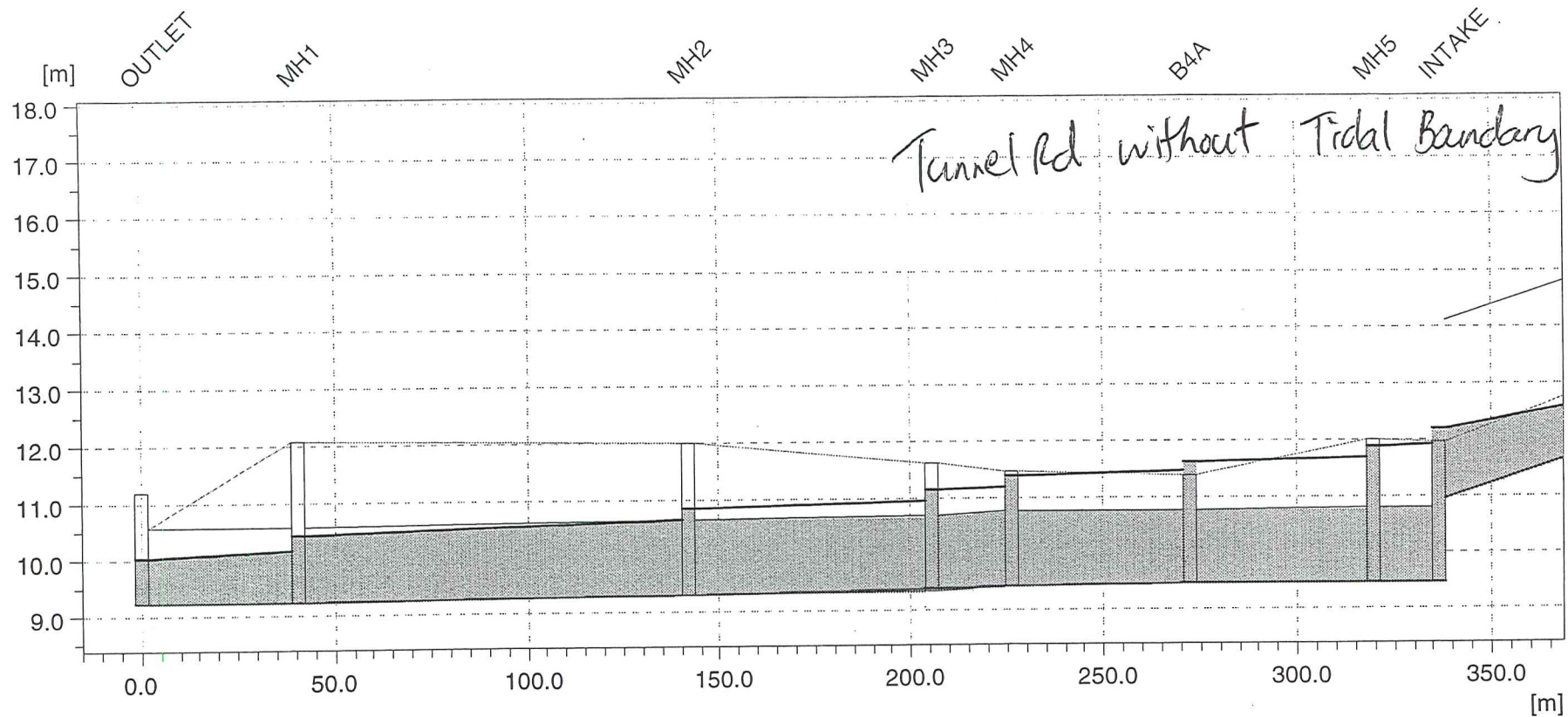
Discharge	2.453	2.452	2.452	2.452	2.452	2.451	2.451	2.381 m ³ /s
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Ground Lev.	9.20	11.20	9.23	12.07	9.30	12.01	9.35	11.61	9.41	11.45	9.43	11.37	9.46	11.98	9.46	11.94	[m]
Invert lev.	9.20	11.20	9.23	12.07	9.30	12.01	9.35	11.61	9.41	11.45	9.43	11.37	9.46	11.98	9.46	11.94	[m]
Length	40.52		101.07		64.00		20.62	46.20		47.21			128.24				[m]
Diameter	1.35		1.35		1.35		1.35	1.35		1.35			1.35	3.16			[m]
Slope o/oo	0.74		0.69		0.78		2.91	0.43		0.64			0.06	22.61			

WATER LEVEL BRANCHES - 12-10-2000 11:24 Octhtunt.prj

Discharge	2.453	2.452	2.452	2.452	2.452	2.451	2.451	2.381	m ³ /s
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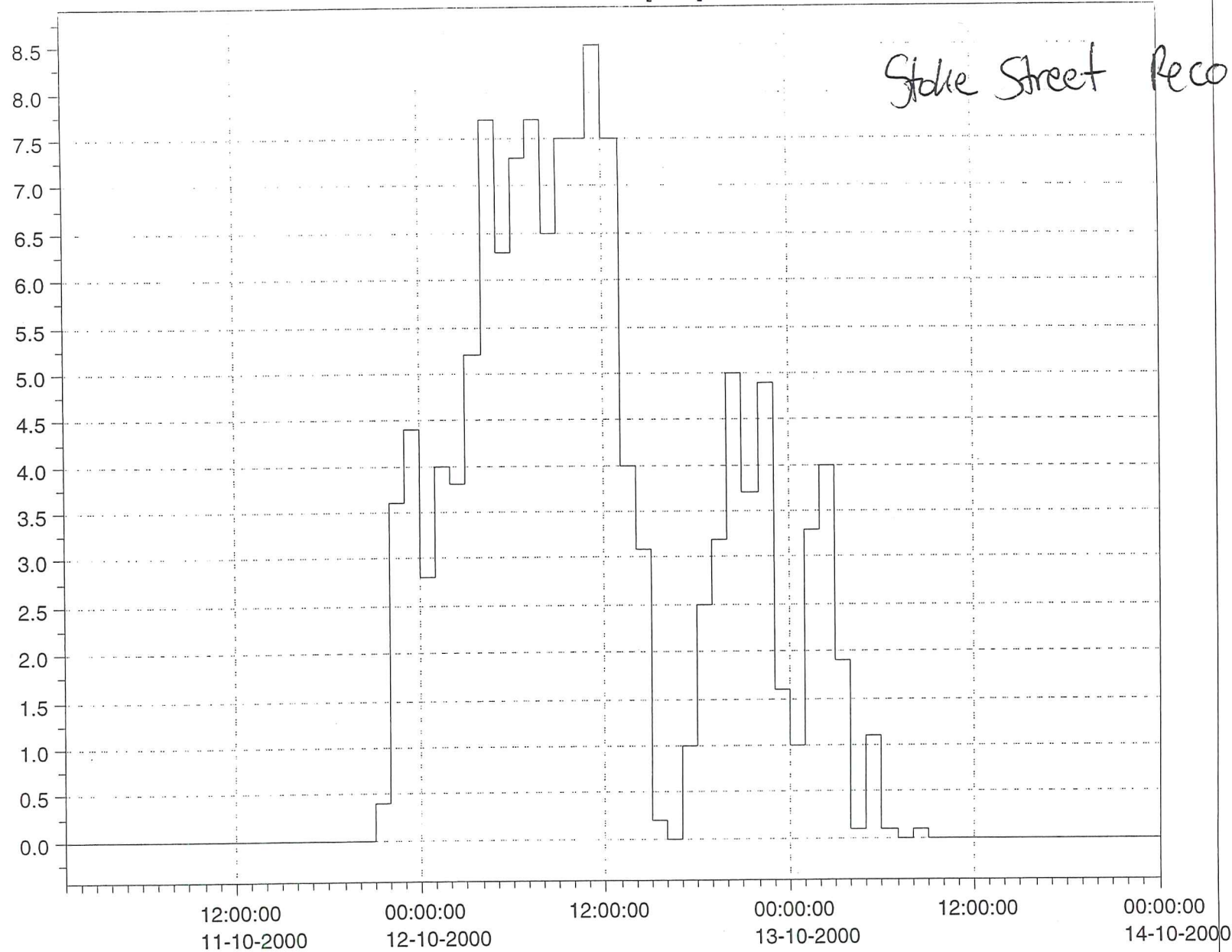


Ground Lev.	11.20	12.07		12.01		11.61	11.45		11.37		11.98	11.94	[m]
Invert lev.	9.20	9.23		9.30		9.35	9.41		9.43		9.46	9.46	[m]
Length	40.52	101.07		64.00		20.62	46.20		47.21		1.35	128.24	[m]
Diameter	1.35	1.35		1.35		1.35	1.35		1.35		1.35	3.16	[m]
Slope o/oo	0.74	0.69		0.78		2.91	0.43		0.64		0.06	22.61	

OCT00XSU

RAINFALL [mm]

Stoke Street Recorder.



State 9

Sumner0.txt

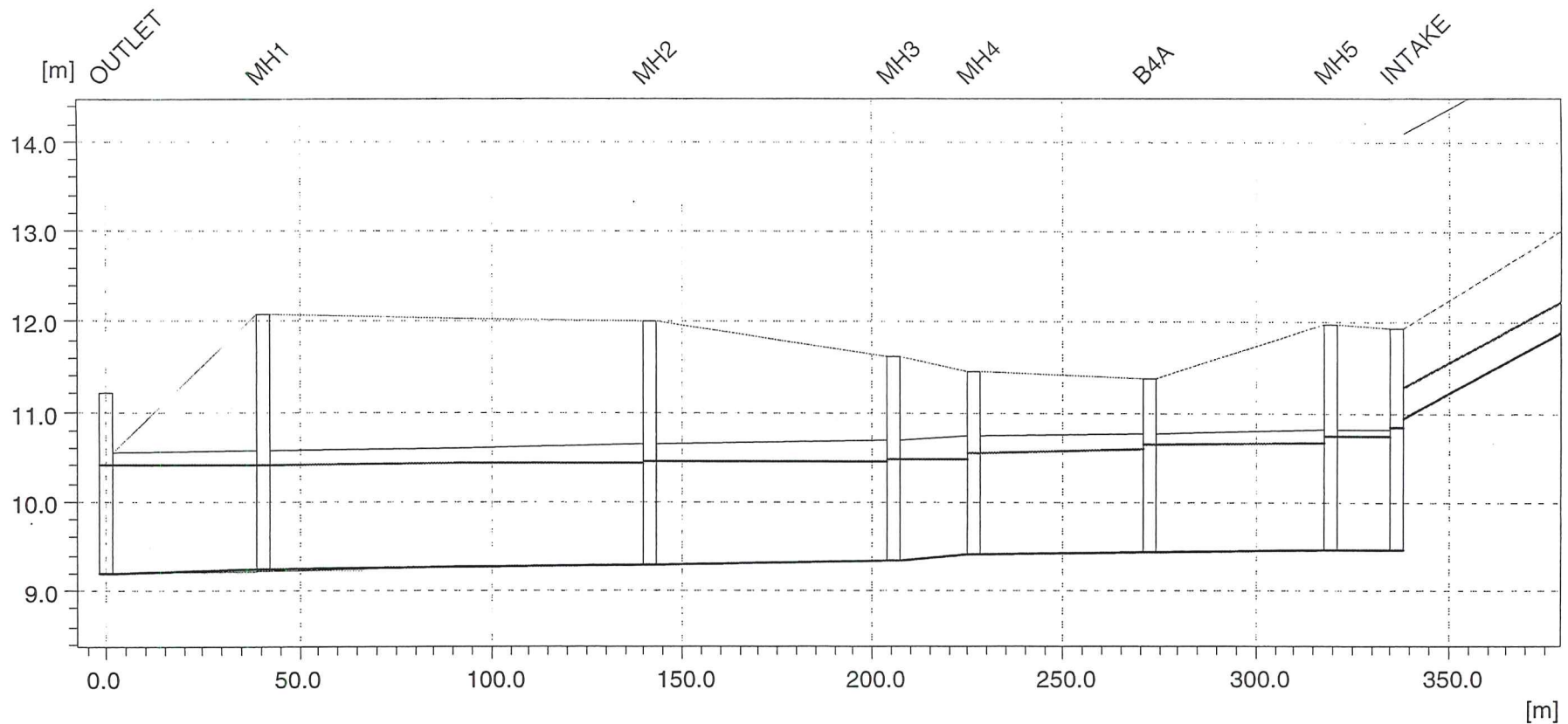
285	11/10/2000	Rainhours: 3.0	(hourly rain 01-24)									
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.6	4.4
286	12/10/2000	Rainhours: 23.0	(hourly rain 01-24)									
	2.8	4.0	3.8	5.2	7.7	6.3	7.3	7.7	6.5	7.5	7.5	8.5
	7.5	4.0	3.1	0.2	0.0	1.0	2.5	3.2	5.0	3.7	4.9	1.6
287	13/10/2000	Rainhours: 7.0	(hourly rain 01-24)									
	1.0	3.3	4.0	1.9	0.1	1.1	0.1	0.0	0.1	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

86.3mm

WATER LEVEL BRANCHES - 11-10-2000 01:00 Oct00xsu.prf

Stoke St Recorder

Discharge	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	m ³ /s
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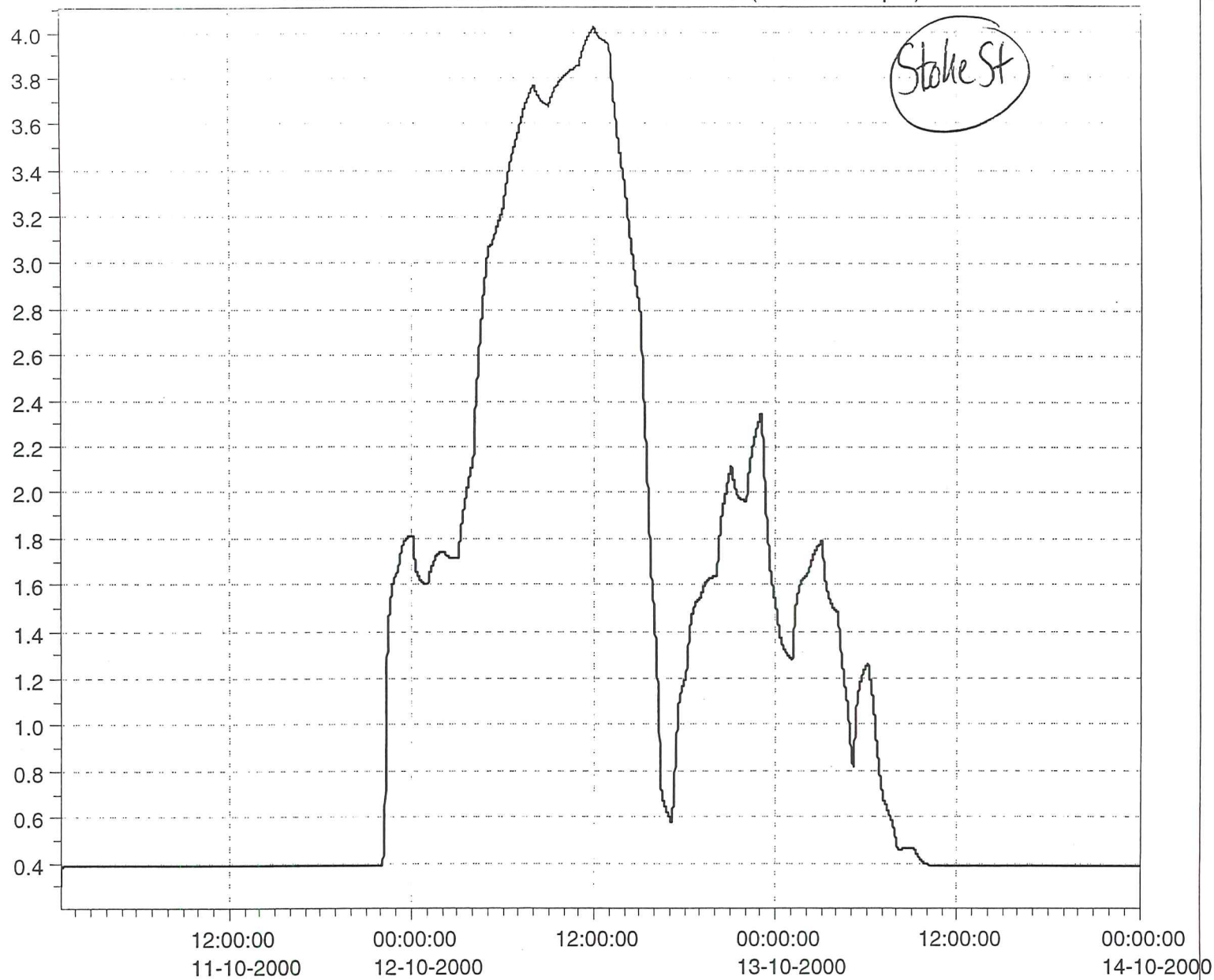


Ground Lev.	11.20	12.07	12.01	11.61	11.45	11.37	11.98	11.94	[m]
Invert lev.	9.20	9.23	9.30	9.35	9.41	9.43	9.46	9.46	[m]
Length	40.52	101.07	64.00	20.62	46.20	47.21		128.24	[m]
Diameter	1.35	1.35	1.35	1.35	1.35	1.35	1.35	3.16	[m]
Slope o/oo	0.74	0.69	0.78	2.91	0.43	0.64	0.06	22.61	

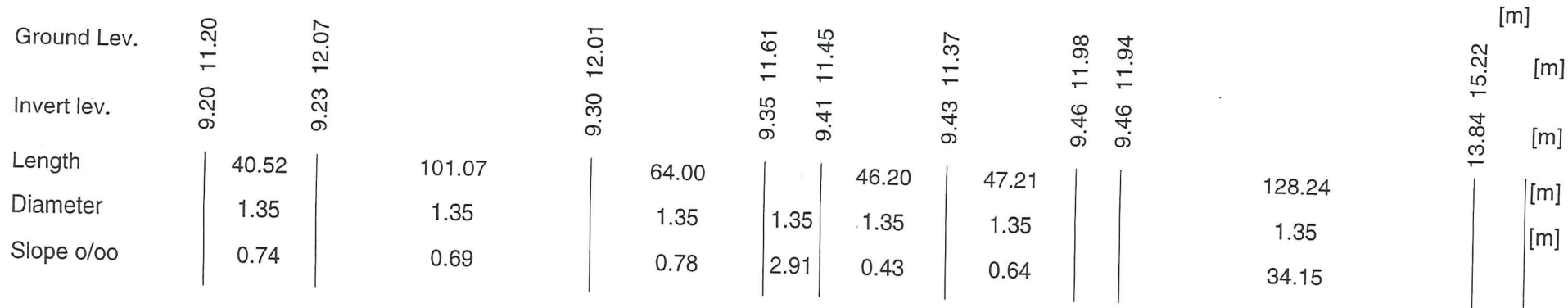
[m/s]

Time Series VELOCITY BRANCHES (Oct00xsu.prf)

VELOCITY BRANCHES
— CH1 -- INTAKE 96.18



- | | | | | | | | |
|-----------|-------|-------|-------|-------|-------|-------|-------------------|
| Discharge | 2.807 | 2.806 | 2.806 | 2.805 | 2.775 | 2.857 | m ³ /s |
|-----------|-------|-------|-------|-------|-------|-------|-------------------|



Discharges for Richmond Hill Catchment (m³/s)

Return Period Storm (yrs)	Duration				
	2hrs	3hrs	4hrs	8hrs	12hrs
5	2.09	2.16	2.17	1.82	1.52
10	3.00	3.14	3.13	2.65	2.20
20	4.07	4.19	4.13	3.59	2.95
50	5.55	5.65	5.48	4.68	3.90

peak

Area = 110 ha

Impervious = 10 %

Length of Catchment = 1950m

Fall of Catchment = 330 m

Greg Whyte
30/11/00

Summary from Incident Data Base for Burgess St, Hardwicke St, Marriner St, Nayland St, Richmond Hill Rd, Stoke St and Wakefield Ave only.

	Date	From		Address				Problem		Comments	
72658	12-Oct-00	POLICE				Streets			Reported	FLOODING OIN SUMNER COMMERCIAL CENTRE	SANDBAGS
72467	12-Oct-00	Anonymous		MARRINER	12	Streets	C/way Maintenance	Flooding	Reported	STORMWATER IS RISING TRYING TO CLEAR IT FLATS ARE ABOUT TO FLOOD 10 MIN OR WHOLE HOUSE IS GONE	POLICE
2856	12-Oct-00	Anonymous		MARRINER	122	Water Services			Reported	Would like someone to lift up the stormwater sump to relieve some of the flooding on his property.	
2516	12-Oct-00	Marshall	Marilyn	MARRINER	20	Streets	C/way Maintenance	Flooding	Reported	Water in Marriner St, Sumner in last 15 mins - complete flooding (Drains have been a problem). Water coming down right-of-way.	Rang thru to contractor 1.20pm - Sharon O'Neill
72656	12-Oct-00	WEALAN	TIM	MARRINER	12	Streets	C/way Maintenance	Flooding	Reported	GOING TO EVACUATE ON HIS OWN MAJOR FLOODING	GNS SANDBAGS
2713	12-Oct-00	Coburn	Sarah	MARRINER	3 24	Streets	C/way Maintenance	Flooding	Reported	Would like someone to lift up the stormwater cover.	
										House flooded inside in lounge/kitchen.	
										resident reports that the water is rising at the intersection of stake and nayland and is within 2 inches of their floor boards. called W&S contracting. liased with pumps.	
2880	13-Oct-00	Anonymous		NAYLAND		Streets	C/way Maintenance	Flooding	Reported	To Fulton Hogan 8am 13/10/00. CB.	
										NAYLAND STREET BETWEEN RICHMOND HILL RD AND WAKEFIELD AVE HAS PILES OF DEBRIS ALONG STREET - CAN IT PLEASE BE CLEANED UP ASAP - IF MORE RAIN IT WILL BLOCK DRAINS AGAIN	
3227	13-Oct-00	Anonymous		NAYLAND		Streets	C/way Maintenance		Reported	Can blocked sumps down Nayland Street between the Marine Tavern and Richmond Hill Road be cleared please as they are causing extreme flooding. Thanks Michelle	
2180	12-Oct-00	GRIFFITH	AINSLIE	NAYLAND		Streets	C/way Maintenance	Flooding	Reported	cnr wakefield channel full blocked sump minor flooding	city care
73148	13-Oct-00	chris		NAYLAND		Streets	C/way Maintenance	Flooding	Closed	Between Aranoni Track and Zig Zag. There is a water flow and it is entering their house. Please investigate/rectify. ASAP.	
72047	12-Oct-00	Gamble		NAYLAND	2 a	Streets	C/way Maintenance	Flooding	Reported	Could be urgent.	
										FLOODING COMING INTO HOUSE	
72237	12-Oct-00	HERBERT	MRS	NAYLAND	20 A	Streets	C/way Maintenance	Flooding	Reported	Another call. Water now 1/2 way up the car tyres!	
72922	13-Oct-00	Berry	Raine	NAYLAND	20 d	Water Services			Reported	would like some assistance at getting water that is trap under her house drained.	
72334	12-Oct-00	Anonymous		RICHMOND HILL		Parks			Reported	TREE DOWN AT 61 RICHMOND HILL ROAD - ACROSS A CAR	
72844	12-Oct-00	Anonymous		RICHMOND HILL		Streets	Amenity Cleaning	Street Sweeping	Reported	heaps of clay on the streets and road could someone please arrange for the street to be swept.	
										Large Gum Tree down right across the road. No vehicles can pass on Richmond Hi9ll Road. Please arrange for a tree crew to get up there as soon as they have some time.	
72653	12-Oct-00	McKay	Helen	RICHMOND HILL	89	Streets	Street Trees		Reported	Road closed at Paisley St due to flooding	
72994	13-Oct-00	Ty		WAKEFIELD		Streets	C/way Maintenance	Flooding	Reported	across the road major blocked sumps	fulton hogan
73083	13-Oct-00	chris		WAKEFIELD		Streets	C/way Maintenance	Flooding	Closed		
										Refer to CSR 72442. More trees down on the hill opposite no 105 Wakefield Ave and they are now starting to slip. Once they get going they could cause considerable damage to porperties at the bottom of the hill. Can you offer any assistance a.s.a.p. when	
72913	13-Oct-00	Hanson	Mrs	WAKEFIELD	105	Streets			Reported	Bad flooding and blocked sumps in Wakefield Avenue. The water is up to the decking on this property. Please clear sumps a.s.a.p.	
72130	12-Oct-00	Alfrey	Julie	WAKEFIELD	125	Streets	C/way Maintenance	Flooding	Reported	Thankyou.	
										TREES DOWN 30 FEET UP HILL ONE TREE DOWN THIS HANGING ON BY ROOTS IF IT FALLS IT WILL GO DOWN TO THE ROAD AND O A LOT OF DAMAGE TO PROPERTY	CITY CARE
72442	12-Oct-00	HANSEN		WAKEFIELD	105	Streets			Reported		



New Zealand
POLICE
Nga Pirihimana O Aotearoa

FAX COVER SHEET

To: PETER WEHRMANN	From: A J LAWN
Fax: 03 3711783	Fax: 03 3267994
Phone: 3711958	Phone: 3264300
Date: 02/11/2000	Pages: 7 (Including cover sheet)
Subject: OCT 12 2000	

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Message

Peter,

Sorry this has taken so long. Hope this is what you wanted. If there is anything else that you require please call.

Thursday the 12th October 2000.

The storm that hit Christchurch on that day seemed to be more intense in and around the Sumner and hill areas.

As early as 6.42am calls were received by our Comms centre in relation to damage being caused by high winds. As the morning wore on the rain seemed to intensify and at about 10am it became apparent that flooding would occur in the back of Sumner.

By 11am we were starting to receive calls from the public re flooding to their houses.

There seemed to be no urgency on behalf of the Council in respect of the flooding to houses in the Sumner area. It may have been that the information was not being passed on and compounded by the fact that Sumner through to Heathcote seemed to be getting more rain and wind than other parts of the City.

As the day evolved and more evacuations took place there seemed to be little response from Council in respect to sandbags and an action plan to evacuate areas that seemed to be at risk with an incoming tide.

We did get some assistance from the 'Rats' team in the afternoon and this was appreciated.

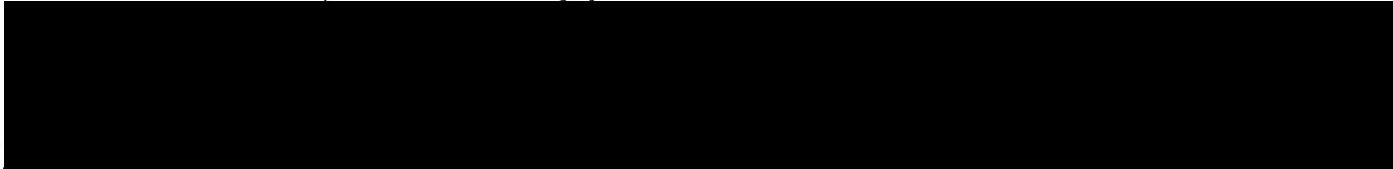
WARNING!

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①

1418hrs - Need to contact Maxine Tavern to organise some bags for sand-bagging.

1420hrs - CHSS directs CHSA to go back to their point because barriers are being moved.



1423hrs Peter Somerford has been in contact with CCC to organise some rubbish bags. The bags will be delivered to the Sumner Police.

1425hrs Taylor's Mistake - ~~big~~ big slip. Coast down to go and check it out. The road is blocked by Scarborough Hill - by the paddling pool.

1429hrs Herbedeen - Scarborough Hill access is totally blocked by a tree. Taylor's Mistake is totally blocked. Conins advise

1430hrs Wind across Conway is very strong. Water is O-Kay under the Ferry Road Bridge. Main Road into Sumner is open & safe.



1435hrs Evans Pass Rd/Summit Road (3rd bend) Rock slip & mud. Passable by vehicles.

1436hrs ~~power~~ power lines ^{down} on Gambell Street - advised by St

1437hrs Police are blocking off Sumner's Road.

1549hrs Power lines down on Bridle Pass Road CHOS 10-2.

1551hrs 117 Sumner Ave - requesting sandbags
Comms called Sumner.
Papanui staff 10-2.

1557hrs Five advise that 117 Sumner Ave are just overreacting

600hrs CHSS advises that the country is O-Key. No need to monitor

201hrs 2 slips behind RSA - Wakefield Ave - SMO 10-2.

604hrs Canterbury Four wheel Drive have been
adjusted by the CCC for sandbagging.
They will be wearing orange overalls.
They are coming to the Sumner area
Advised by 10-1 by Comms.
They are to be permitted access to all areas.

607hrs ~~XXXX~~ We have been advised that the main road -
Gave rock. There are rocks continually falling.
Staff are going to keep an eye on it.

1613hrs 31 Truro Road
Power lines down

1614hrs CH15 - Truro St / Hembledon St
Elderly couple stuck in a car
CH15 10-2! When advised - they are safe.

(5)
1648 hrs. EVANS PASS ROAD IS CLOSED UNTIL TOMORROW MORNING.

1648 hrs. ANOTHER PERSON HAS BEEN EVACUATED FROM THEIR HOME TO THE BOWLING CLUB. UNKNOWN ADDRESS.

1651 Ian Kingdon
MILITARY CIVIL DEFENCE.


He wants to speak to whoever at the Bowling Club. Anyone evacuated from home has to pay for ACCOMMODATION themselves.

1700 Sgt Thompson relieves Sgt Cliff

1724 EBA 2 → Bowling club take lady to Edith Cavel

1800 Rain falling off, levels dropping. $\frac{1}{2}$ troops to use

1815 H. down to Monks Spur. 6-7 power poles - lines down. often informed.

Storm Report

12-10-2000

Red 3/19/00
For Chris Rance.

2

6-45. BECAUSE OF RAIN OVERNIGHT SET UP STAFF ON CRITICAL GRATE CLEANING ROUNDS OVER ENTIRE CITY AREA AS PER NORMAC.

8:00am Staff reported from Wakefield Ave grate that they were having trouble with the amount of debris on grate. Sent Hiab truck to assist. Hiab arrived 8:00am checked grate which was almost overflowing. Main debris on grate blocking water was captured from ponds, illegal drums, corrugated iron sheets, timber, posts, branches and general debris.

9:00am Staff called off Summer Grates Round to attend problem at 25 Port Hills Road grate. Flooding over property and across roadway. Staff cleared rocks, branches, posts, drums and a lot of branches and grass off grate. Had trouble keeping up. Weather eased up a bit around 11am.

11am. Sent staff back to Summer Grates Round. Checked and cleaned both grates at Richmond Hill and Richmond/Naylands St plus Wakefield Avenue plus a lot of others.

1pm. Staff called to Barnett Park to clear grate. Lot of water across park. Locals were in attendance clearing grate. Staff helped locals clear grate. Blocked up with tussocks, grass, gorse, branches. Feet. Tide coming in did not help.

Staff spent rest of afternoon on grates. Summer Grates going from Summer grates to 25 Port Hills Road grate.

REGIONAL BRIEFING

Drug bust uncovers Waiau cannabis crop

Police watched goings-on at a Waiau property for a week before executing a search warrant that uncovered a large hydroponic cannabis crop. Senior Constable Ian Price, of the Culverden police, said the drugs bust on a remote Waiau shed about noon on Monday found a large crop of cannabis seedlings. The darkened shed had a sophisticated lighting and aeration system, and it was obvious the cannabis had not been there long, he said. "It had a potential to produce quite a lot of cannabis, so it was good to knock it on the head before it got going full bore."

Three men appeared in the Christchurch District Court yesterday jointly charged with cultivating cannabis. Mr Price said the nature of the offences was such that the three were likely to be tried in the High Court. The men also face receiving charges relating to a stolen firearm found on the property.

Greymouth meeting on marine reserves

The absence of marine reserves on the West Coast has not prevented Coasters from having their say on the review of the Marine Reserves Act. A public meeting is being held in Greymouth today to get feedback from interest groups and members of the public on questions such as whether fishing should be allowed in marine reserves, and how the reserves should be managed.

Department of Conservation spokesman Ian Gill said Coasters had a close affinity with the ocean and were likely to make a valuable contribution to the review. He emphasised that the review was not intended to modify how New Zealand managed customary food gathering, recreational fishing, or commercial fishing rights.

Canty Peruvians fear for country's future

Peruvians now living in Canterbury fear that the standard of living in their homeland will decline dramatically after the resignation of president Alberto Fujimori.

The Opposition, which controls Congress, is moving to assume rule of the Andean nation after Mr Fujimori formally resigned yesterday from a decade in power. Gerardo Torres emigrated from

Flooding risk at Sumner

by Dean Calcott

Sumner flooding will happen again, with elderly people especially at risk unless something is done, a public meeting has been told.

The meeting, between Christchurch City Council representatives and Sumner residents, was held last night to air concerns about the way floods resulting from the October 12 storm were handled.

Many houses suffered severe flood damage, with some still being repaired six weeks later.

One house in Heberden Avenue had to be demolished.

A local policeman, Constable Alister Lorne, was applauded when he said Sumner had been a disaster waiting to happen and that a planned Civil Defence response was needed. Some elderly residents were especially at risk.

"How are we going to respond next time in a co-ordinated effort? There should have been a state of emergency declared in the area," he said.

There should have been a state of emergency declared in the area.

Constable Alister Lorne

Earlier, the well attended meeting was told that Christchurch City Council switchboards had been jammed on October 12 with worried callers unable to get through, and that sandbags were unavailable when they were badly needed.

Several residents expressed concerns that stormwater pipes and gutters had not been adequately cleaned before the storm struck.

Some feared their houses could be officially marked as "flood-prone" — even though the problem was with the wastewater system — and their properties devalued. Others said the council's communications system needed improvement.

The meeting was told that the city council had inherited a flawed stormwater system in Sumner, and that if it could be redesigned, it would be done differently with an open waterway all the way to the outfall.

A spokesman for the council's wastewater department, Ken Couling, said recommendations to the parks and recreation committee would include that its existing grating and inlet designs be reviewed, as would all critical inlets and debris traps.

Mr Couling said the council would inspect Sumner pipelines for blockages using closed-circuit television.

A review of the way the council handled civil emergency communications was under way after it received 7500 calls on October 12. It had taken time to identify the epicentre of the storm damage being in the Bexley-Sumner-Redcliffs area.

Mr Couling said a permanent supply of sandbags close to Sumner and Redcliffs was needed.

More storage capacity in the stormwater system was also needed.

But the council was stuck with a difficult basic system of steep hill waterways meeting a flat plain, he said.

COMMUNITY COMMENT

I know Erin would like to join me in thanking all those volunteers who assisted the Council and the community during the severe storm of 12/13 August. Those I know of in the local area include, but are not confined to, the Sumner Police Volunteers, the Sumner Volunteer Fire Brigade, members of the Sumner-Redcliffs Historical Association, a

group of local building contractors and night-shift workers who assisted in sand-bagging, and workers of City Care, some of whom worked very long hours in getting roads open and streets cleared. If I have omitted anybody I apologise.

I am always humbled by the way people pull together in these difficult times.

In Sumner, storm levels reached the severity of a one in fifty years event, but city wide it was by no means the worst scenario we could expect to experience. We therefore need to review as a city how well our emergency services worked, and how good the city's co-ordination and how adequate its response was. At the last Council meeting I asked the City Manager to report to elected members on this issue.

I wish to add in these events I am grateful for the forbearance of those residents who have accepted delays in clearing debris from the locality so that more urgent work could be done.

One of the potential problems over the next century for local communities will be sea level rise. Scientists now seem to be agreed that the question is not whether such a rise will take place, but how rapid it will be. Given the low level of land in Sumner and parts of Redcliffs, and given that houses built now may be expected to last maybe 70 years, we need as a community to consider what levels we should set as minimum floor levels for houses in these areas.

Fiona Hill, a consultant planner who worked with the Council for some time, and Tony Oliver of the Water Services Unit of the

by Charles Manning



City Council, have been working on a variation to the City Plan which will address some of these issues. Before notifying it, that is asking for formal submissions, the Resource Management Committee and the local Community Board will meet with members of affected communities to discuss the problem and potential solutions. To give readers some indication of the reason for concern, insurance companies tell us that if flood waters enter a dwelling, the average cost of putting right the damage is \$65,000. In other words, if it were to occur once in every fifty years, the insurance cost for flood alone would be \$1300 per year.

I wish to apologise to Richmond Hill Road residents and the Sumner Bowling Club for what will certainly be delays to the roading project. The Water Services Unit have a proposal for changing drainage arrangements at the same time. Erin and I will ensure that public consultation is properly taken not of and noted what seemed to be the intention of one Council officer to force his views willy nilly onto the community. We will both do our best to ensure that the community is not ignored on this matter.



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Tarot - Numerology
at

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NOV. 20th

Final economy postage date for
cards & calendars for
most overseas
destinations.

POSTshop
People reaching people

Locally owned & operated

Survey 13, 14 November 2000

Terry C.

- No 21 Nayland Street - $\phi 100$ in side channel was blocked - water backed up to level of RL 11.87m - also ran down walkway (over $\phi 1350$) and flooded back of property to approx. RL 11.9m.
- No 15 Nayland Street - approx flood level RL 11.71m at about 11am 12/10/00.
- No 38 Nayland Street (Butcher Shop) - RL (Floor) 11.79m
✓ - flood level approx. RL 11.83m
- No 10 Wakefield Ave (Kids clothing store) - RL (floor) 11.84m - sandbagging prevented ^{bulk} water entry $\rightarrow$ flood level $\therefore$ somewhat higher flood level.
- No 28 ~~Wakefield Ave~~ ^{Marriner St} (Coffee Culture) - RL (Floor) 11.77 - sandbagging prevented water entry $\rightarrow$ flood level somewhat higher.
- No 28 ~~Wakefield Ave~~ ^{Marriner St} (Hollywood Theatre) - RL (Floor) 11.68m - "2 inches deep of water" - $\therefore$ flood water RL 11.73m. (Photos show highest ^{at} 11.85)
- No 24 Marriner St (old historic stone house) - RL (Floor) 11.70m - resident indicated highest water level through house (to top of bottom internal step) of 150mm deep $\rightarrow$ flood level of 11.85m at 3.30/4.00 pm - woman rang 3 times during day to inform of rising waters and after storm spoke to local Fire Station who had not been informed of her plight - subject of insurance claim of maybe \$100,000.
- Flat 4 No 24 Marriner Street - RL (Floor) 11.71m painters indicated a flood depth of approx 0.23m (RL 11.94m) at underside of power points and they claimed owners had quoted "one foot of water through dwelling" ie a flood RL of 12.00m.

(PTO)

Wilmshurst, Lorraine

From: Anthony [REDACTED]
Sent: Friday, 24 November 2000 09:11
To: lorraine.wilmshurst@ccc.govt.nz
Subject: Richmond Hill Water Way

Dear Lorraine Wilmshurst,

I will be out of Chch at your meeting, but could you please present the following.

Thank you for your response and consideration of the matter of the storm and arranging a meeting.

My house was almsot flooded when I was away during the storm. I missed by 3 cm.

Regarding the flooding at Sumner. When the new drain was installed some years ago I was going to walk up through it from the beach in my wet suit.

But it filled with sand to within 300 mm of the top within two weeks.

Then the flap valve door was installed. This has never had a serious test of it capability to my memory . It is often buried to 300 to 500 cm in sand and the pipe is mostly filled with sand.

It is asking too much for the sand blocking the enormously heavy flap valve to be washed clear, the pipe flushed, in time for a storm flood.

It is clear that the flap valve was never engineered with the realisation that at times we need the full clear bore of the pipe immediately, and that the huge weighty flap valve is a further constriction.

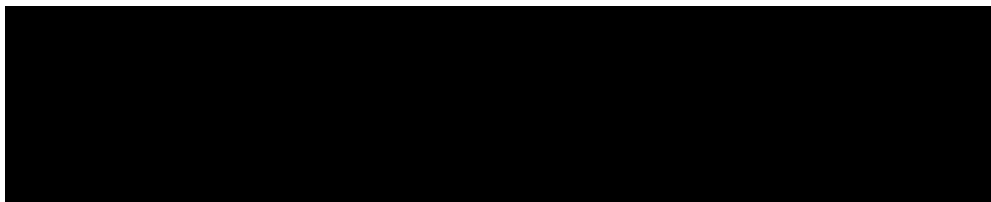
Clearly the pipe needs a well sealed gate valve which will stop sand ingress and at the same time automatically wind up with a control system in response to local floods.

Regular inspection is also needed to ensure that the sand does not build up.

My property is 26 Marriner Street.

Kind Regards

Anthony Lealand



=====

Mail computer is constantly monitored for viruses with Nortons & updated daily.

=====



CHRISTCHURCH

CITY COUNCIL • YOUR PEOPLE • YOUR CITY

16 November 2000

The Householder

Dear Resident,

DWELLING/COMMERCIAL PROPERTY FLOODING 12/13 OCTOBER 2000

Investigations to date indicate that your property may have had floodwaters enter at or above your dwelling/commercial property floor level.

As part of the ongoing monitoring of our stormwater/waterway network we are gathering information about the property floor flooding that occurred in the vicinity of Nayland Street, Marriner Street and northern Wakefield Avenue property recently.

To this end feedback of firsthand experience of the flooding would be greatly appreciated. We would very much welcome your comments and observations of the storm event and how it affected you and your property. Could you please take the time to complete this short questionnaire: If insufficient space provided, please use the back of the letter.

Your Name Sacha Houston Address: 3/24 Marriner St

1. Approximately what time did you notice flooding was occurring? 12 noon

2. Briefly what was the severity, of the flooding, in and around your property or in the street? Describe any damage to your property caused by the storm.

Ground floor flooded to above skirting boards →
garden areas destroyed.
Damage to furniture, walls

3. Could you please estimate the depth of water above your garage floor and/or house floor if these were flooded?

Depth above Garage Floor Level 10-15 cm
Depth above House Floor Level 5-10 cm

Or do you have a known reference point in your property, which could provide a flood level. _____

4. Could you please list the addresses of any other properties nearby that also had flood waters enter above the dwelling/commercial property floor level in case we have not recorded them already.

Address Coffee Culture Comments flooded.

Address _____ Comments _____

Address _____ Comments _____

5. Approximately when did you notice the water was receding? 8 pm

6. Will you be claiming for damage from your insurance company? YES

7. If yes, circle what is your estimate of damage for which you intend to claim:

Value: \$0 - \$500
 \$500 - \$2000
 \$2000 - \$5000
 \$5000 - \$10000
 \$10000-\$25000
 >\$25000

8. Any other observations or comments you would like to add?

NO

Could you please return the questionnaire, in the stamped & addressed envelope provided before Friday 24th November 2000. Thank you for your comments and observations.

Yours faithfully

Peter Wehrmann

Peter Wehrmann
for JOHN WALTER - TEAM LEADER
WATER ENVIRONMENTAL
CITY DESIGN

oops - bit late
Sorry

Kcd 22/11/00

16 November 2000

The Householder

Dear Resident,

DWELLING/COMMERCIAL PROPERTY FLOODING 12/13 OCTOBER 2000

Investigations to date indicate that your property may have had floodwaters enter at or above your dwelling/commercial property floor level.
As part of the ongoing monitoring of our stormwater/waterway network we are gathering information about the property floor flooding that occurred in the vicinity of Nayland Street, Marriner Street and northern Wakefield Avenue property recently.
To this end feedback of firsthand experience of the flooding would be greatly appreciated. We would very much welcome your comments and observations of the storm event and how it affected you and your property. Could you please take the time to complete this short questionnaire: If insufficient space provided, please use the back of the letter.

Your Name Ross Smith Address: 4/24 MARRINER STREET

1. Approximately what time did you notice flooding was occurring? WHEN I WAS NOTIFIED AT WORK BY THE RADIO
2. Briefly what was the severity, of the flooding, in and around your property or in the street? Describe any damage to your property caused by the storm. LPM

we have approx. \$12,000 WORTH OF DAMAGE

3. Could you please estimate the depth of water above your garage floor and/or house floor if these were flooded?

Depth above Garage Floor Level 200 mm.
Depth above House Floor Level 55 mm.

Or do you have a known reference point in your property, which could provide a flood level.

yes
we have Photographs

4. Could you please list the addresses of any other properties nearby that also had flood waters enter above the dwelling/commercial property floor level in case we have not recorded them already.

Address _____ Comments _____

Address _____ Comments _____

Address _____ Comments _____

5. Approximately when did you notice the water was receding? 6 PM

6. Will you be claiming for damage from your insurance company? yes

7. If yes, circle what is your estimate of damage for which you intend to claim:

Value: \$0 - \$500
 \$500 - \$2000
 \$2000 - \$5000
 \$5000 - \$10000
 \$10000-\$25000
 >\$25000

8. Any other observations or comments you would like to add?

Why wasn't a digger sent by
Council to UNBLOCK PIPE in NAYLOR ST
Early Thursday morning

Could you please return the questionnaire, in the stamped & addressed envelope provided before Friday 24th November 2000. Thank you for your comments and observations.

when Flooding Started to occur

Yours faithfully

Peter Wehrmann

Peter Wehrmann
for JOHN WALTER - TEAM LEADER
WATER ENVIRONMENTAL
CITY DESIGN

Ref 29/11/00



CHRISTCHURCH
CITY COUNCIL • YOUR PEOPLE • YOUR CITY

16 November 2000

The Householder

Dear Resident,

DWELLING/COMMERCIAL PROPERTY FLOODING 12/13 OCTOBER 2000

Investigations to date indicate that your property may have had floodwaters enter at or above your dwelling/commercial property floor level.

As part of the ongoing monitoring of our stormwater/waterway network we are gathering information about the property floor flooding that occurred in the vicinity of Nayland Street, Marriner Street and northern Wakefield Avenue property recently.

To this end feedback of firsthand experience of the flooding would be greatly appreciated. We would very much welcome your comments and observations of the storm event and how it affected you and your property. Could you please take the time to complete this short questionnaire: If insufficient space provided, please use the back of the letter.

Your Name ANTHONY LEALAND Address: 26 Marriner St

1. Approximately what time did you notice flooding was occurring? 12:00 - 1 pm

2. Briefly what was the severity, of the flooding, in and around your property or in the street? Describe any damage to your property caused by the storm.

Water almost entered house. One room with a tiled floor lower than the rest had 2cm water in it (measured by items on floor having water marks). No damage other

3. Could you please estimate the depth of water above your garage floor and/or house floor if these were flooded?

than mess.

Depth above Garage Floor Level N/A
Depth above House Floor Level 2cm (low part of house)

Or do you have a known reference point in your property, which could provide a flood level.

~~Lunch time too~~ Yes see above.

4. Could you please list the addresses of any other properties nearby that also had flood waters enter above the dwelling/commercial property floor level in case we have not recorded them already.

Address N/A Comments _____

Address _____ Comments _____

Address _____ Comments _____

5. Approximately when did you notice the water was receding? Called very late - 9pm to say it was going -
6. Will you be claiming for damage from your insurance company? NO.

7. If yes, circle what is your estimate of damage for which you intend to claim:

Value: ~~\$0 - \$500~~
~~\$500 - \$2000~~
~~\$2000 - \$5000~~
~~\$5000 - \$10000~~
~~\$10000 - \$25000~~
~~>\$25000~~

N/A.

8. Any other observations or comments you would like to add?

It is abundantly clear that the Richmond Hill drain whose outlet is blocked with sand contributed in a major way to this. The

Could you please return the questionnaire, in the stamped & addressed envelope provided before Friday 24th November 2000. Thank you for your comments and observations.

Yours faithfully

↳ drain blocked to within 30cm of the roof with two weeks of its

Peter Wehrmann installation some years ago.

Peter Wehrmann
for JOHN WALTER - TEAM LEADER
WATER ENVIRONMENTAL
CITY DESIGN

The ~~great~~ giant flap valve on the outlet is no substitute

for a properly monitored power driven gate & valve & regular attention to flushing any

sand entry.

Kind Regards [Signature]

Sumner-Redcliffs Historical Society Inc.

Copies to Councillor Manning and Sumner Volunteer Fire brigade.

Fax.3841-152.

1 November,2000.

Mr Alan Watson,
Water Services Department,
Christchurch City Council,
P O Box 237
Christchurch.

FILE	REF:	FL-001-51
DOCUMENT	No.	1N100111492
03 NOV 2000		
Mr A. Watson		
MR RANCE		
INFO	DISCUSS	REPORT

Dear Mr Watson,

Ref Flooding in Sumner on Thursday/Friday 12/13-October.

CHRIS *psc discuss*
reply ask
me

I am writing to let you know the conditions which applied to the building which we occupy as a Museum and Plunket and Community Centre on corner of Nayland St/Wakefield Ave Sumner. This is listed as a Heritage Building and owned by the Christchurch City Council. I should point out that this building is 93 years old and and never been flooded in that time. I have discussed this matter with elders who have lived here over 90 years plus researched all the Sumner Borough papers etc. In the Wahine storm of April 1968, my late husband used this building as his Civil Defence H/Q. and actually slept there for 2 days. He was so proud that no water entered the building then. *OK*

When I arrived in the early morning of 13th the Sumner Volunteer Fire Brigade was washing down the village streets, and our building and the rest of the shopping area had been sandbagged by local volunteers. When we opened the door we were met by a rush of water and mud. I understand from the Sumner Library staff that the Council was rung early on the Thursday to say water was getting in the building underneath via the vents. The Plunket Rooms and downstairs museum will not be able to be used for quite some time and the expense to the CCC will be enormous. For more than 2 weeks the heater and de-humidifiers having been going flat out for 24 hours a day. Then the floors must be sanded and new carpets lino etc to be laid and then our main floor to be repolished.

On 13.10.2000.,I dug into the gutter outside the museum and pulled out mats, plastic bags bottles etc. which had been over the grate for some weeks before the flood. Naturally had I realised such a flooding would take place I personally would have cleaned out the gutter but although I am a Volunteer Park ranger, and regularly clean graffiti and the bus stop beside my house, with a hose, I did not consider with the enormous rates we pay that it was my job to clean gutters.

Up to last Saturday even though various phone calls have been made the gutters are still full of silt and you cannot see the sumps where the water is supposed to drain. You will no doubt be aware that in the old days of local Council and Drainage Board staff the men would have known the trouble spots immediately and I do not consider a person living the other side of the city unless instructed so would have any idea where the trouble spots in both Redcliffs and Sumner are.

Yours sincerely,

M O Rule
Mrs M Rule.
Hon.Secretary.

Hon. Secretary: Mrs. M. O. Rule, 5 Main Rd, Redcliffs, Christchurch. Telephone: [REDACTED]