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<p>Corporate Plan Output: 9.3 Asset Improvements</p>	

INTRODUCTION

The purpose of this report is to provide recommendations relating to the flooding of Moncks Bay properties. Concern about flooding has been expressed by the Redcliffs Residents Association.

An investigation has been carried out for the Water Services Unit by City Design.

This report was considered by the Hagley/Ferrymead Community Board at its August meeting. The Board received the information and supported the proposed recommendations now being made to the Committee. Water Services staff have also discussed the content of the report with Mr Malcolm Moore, the Redcliffs Residents’ Association Chairperson. Mr Moore has advised that copies of the report have been distributed to Committee members and that the Committee had met to discuss its contents. The Committee’s view was:

- they understood the Council’s position
- they appreciated the work that had been done in recent years to improve the situation
- they would, nevertheless, still wish to keep the issue to the fore

CAUSE OF FLOODING

There are two principal causes: tidal backflow and secondary flows from Rifle Range Drain Diversion.

1. Tidal Backflow

This arises when high tides in the Estuary backflow up pipelines that drain stormwater from streets. Low lying streets and properties occasionally experience shallow surface flooding which can be exacerbated by rainfall and/or flap-valves at the end of pipelines remaining open.

The area of land protected from tidal flooding by flap-valves is indicated on the tabled sketch.

2. Secondary Flows from Rifle Range Drain Diversion

This drain is located along the eastern side of Barnett Park. It passes under and along Main Road via 1,200 mm dia piping. It drains a 240 ha Port Hills valley catchment to the Estuary. Secondary flow paths will develop when the capacity of the drain and piping is exceeded or when the pipe or its inlet is blocked.

MEASURES FOR REDUCING FLOODING

Frequent minor flooding at high tide can be controlled by efficient and regularly maintained flap valves on pipelines. A recent trial using the “on-the-spot” maintenance services of a local drainage contractor has improved the performance of the flap valves associated with the Cliff Street area stormwater outfalls and it is recommended that this continues.

Installing larger pipes would increase road drainage capacity but this would have limited benefit when elevated high tides coincide with high intensity rainfall. Under these circumstances reliance is placed on the ability of carriageways to temporarily store rainfall until tide levels drop. Fortunately the frequency of storm events that would cause flooding of homes is low. No records of house flooding have been found.

The secondary flow path that developed from the July 1994 storm was caused by:

- a significant build-up of silt within the pipeline
- a blockage-prone grille at the pipe inlet
- unauthorised cutting of channels through bounding on the east side of the drain

These causes have been dealt with. Should the same storm recur, no flooding would arise.

Computer simulation of various storm scenarios has been undertaken. These were intended to provide an appreciation of the frequency of secondary flow paths and to trial possible relief options. This study indicated that while the frequency of events would be reduced they could not be entirely eliminated due to the low level of the flooded area in relation to high tide levels.

The lowest cost relief option, ie a retention basin located above the playing fields, would cost about \$300,000 and has an estimated cost-benefit ratio of less than one.

It is difficult to estimate the frequency of secondary flows. Much depends on highly variable factors such as precedent rainfall (and consequent soil absorption) and tide levels at the time of peak discharge.

Under the worse possible combination of factors, houses would become flooded. However no such flooding is known to have arisen in the 33 years (approximately) since the diversion drain (and piping) was installed. It is considered that the level of risk is acceptable provided there is a long-term strategy relating to future development levels. Under present circumstances there is a maximum flood level that is determined by both tide levels and the level of Main Road. If new house floor levels are set appropriately, no new house flooding would occur even in an extreme event.

The New Zealand Coastal Policy Statement requires district councils to take account of sea level rise when considering development in coastal areas. A rise of 300 mm is predicted for 2050 and 500 mm for 2100.

A report on sea level rise was recently commissioned jointly by the Water Services and Environmental Policy and Planning Units. Information from this report will assist the Council in the preparation of a proposed variation to the City Plan on development levels. This variation should be expanded to include development levels in Redcliffs and other coastal areas of Christchurch's district. In the meantime the Council should set property levels at 11.3 m in terms of its drainage data to ensure new dwellings are above flood levels that arise from secondary flows at high tides in order to satisfy the criteria of the Building Regulations.

DISCUSSION

Work already undertaken by the Council will prevent a recurrence of flooding during moderate storms. These works cost \$52,000 and included:

- Silt removal from the 1,200 mm diameter pipeline from Rifle Range Drain Diversion to the Estuary. The siltation of the pipeline contributed to a significant reduction in storm capacity. The siltation is now monitored as part of routine maintenance.
- The inlet to the pipeline has been reconstructed to create a less blockage-prone grille. The previous arrangement also contributed to stormflow capacity reduction.
- The bank on the east side of Rifle Range Drain Diversion has been raised to eliminate overflows via informal drainage channels from adjoining properties.
- A 225 mm diameter pipeline draining Cliff Street has been replaced with a 525 mm pipeline.

Flooding from Rifle Range Drain Diversion will occur in major storms but the level of risk is considered acceptable. It is not significantly different from other parts of Christchurch where flood risks exist.

It may be desirable to construct a detention basin in the future to overcome drain capacity reduction in the event of rising sea levels. This could be done in conjunction with the provision of an additional sportsfield. However, preparation of the Barnett Park Management Plan revealed some opposition to more playing fields and preference was given to a passive recreation area that formed a transition between existing fields and the natural valley.

It is considered important to safeguard and improve the secondary flow path to avoid the possibility of future development, or road works making the flooding worse. More detailed survey work would be required and information provided to City Streets and the Environmental Services Unit. It would be desirable to redirect secondary flow away from private property and through the park.

Further improvements to tidal backflow prevention should be made. The short maintenance trial provided by a local drainage contractor has proved successful and should be continued for a longer period. Two additional flap valves should be installed, one on the 300 mm pipeline at Cliff/Main Road intersection and one on a 150 mm pipeline east of Cliff Street. The total value of the new flap valves and secondary flow path protection and improvements is estimated at \$20,000.

- Recommendation:**
1. That further improvements to backflow prevention and maintenance be undertaken.
 2. That the secondary flow path from Rifle Range Drain Diversion be improved and protected from modification that would make flooding worse.
 3. That \$20,000 be budgeted for on the five year programme to cover the cost of the above work.
 4. That new development in the locality have ground levels set at 11.3m in terms of the Council's drainage data pending the outcome of the proposed City Plan variation on development levels.
 5. That the Redcliffs Residents Association be advised of the Council's decision.

**Chairman's
Recommendation:** That the above recommendation be adopted.