greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

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Committee	Hutt Valley Flood Management Subcommittee
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Pinehaven Stream Flood Hazard Assessment – Floodplain Management Plan (FMP)

1. Purpose

To update the Subcommittee on progressing the Pinehaven Stream Flood Hazard Assessment. This project is being developed into and follows the process of a Floodplain Management Plan.

2. Significance of the decision

No decision is being sought in this report. The report is solely for receiving and noting.

3. Background

In conjunction with Upper Hutt City Council (UHCC) a flood hazard assessment of the Pinehaven Stream was carried out in the 2009/2010 financial year, which investigated the flood and erosion hazard in the Pinehaven Catchment.

Consultation was carried out with the public and updated flood maps and erosion hazard zones were produced for the catchment. All affected residents and landowners were contacted with information sheets informing them of the updated hazard information for the area. This work was undertaken as part of Phase 1 of the FMP development process.

In November 2010, Sinclair Knight Merz (SKM) was commissioned to undertake Phase 2 of the project which is the Options Investigation stage of the project. A scoping brief was developed with SKM in a partnership arrangement with UHCC, Capacity and Greater Wellington Regional Council (GW) staff.

4. Phase 2 findings to date

4.1 Objectives of Phase 2

The two objectives of Phase 2 of the Pinehaven Stream Floodplain Management Plan are to undertake an assessment of flood mitigation options including both structural and non-structural options, and to develop a Stream Management Strategy that includes a prioritised and costed action plan.

4.2 Options Considered

Based on the agreed process, SKM has undertaken a series of investigations to identify potential upgrades of which the results/outcomes have been work shopped with GW, UHCC and Capacity representatives. Following the workshop on the 3rd May 2011 representatives focused on the following Pinehaven catchment upgrade options:

1. An integrated long term upgrade option to the UHCC target level of service for streams. That is, to provide a 25 year channel capacity (including the mid-range predicted impacts of climate change) and secondary flow paths to prevent the inundation of building floor levels in a 100 year storm event including the mid-range allowance for climate change.

2. An integrated upgrade option to provide a minimum 10 year channel capacity, including the predicted mid-range impacts of climate change. This will help inform what can be done in the short term with a focus on the area between Pinehaven Reserve and Hulls Creek.

3. A ‘do minimum’ option that focuses on preventing blockages and introducing planning controls to help prevent increases in flood risk from further development in the catchment.

4. The potential flood protection benefits that source control could provide in the catchment, through the provision of individual detention storage on residential dwellings.

4.3 Upgrade Assessment Criteria

The hydraulic model was used to investigate the upgrades required to provide a 25 year channel capacity and secondary flow paths for the 100 year flows that escape the channel. In developing the upgrades consideration has been given to:

- Constructability
- Operational practicality
- Environmental enhancement
- Impact on private property
- Safety
- Funding

Attachment 1 summarises: the initial upgrade options for the Upper and Lower Catchments for a 'Do Minimum', 1:10 and 1:25 year Level of Service; upgrade constraints & limitations, as well as the impact on existing stream flood hazard.

A presentation on the options will be given at the meeting.

5. Costs

The cost for the development of the FMP is shared 50%-50% by UHCC and GW. The total budget allocated is $178,000 for the completion of the FMP. The forecast is that this will be achieved.

Indicative costs for the 1:10 year Level of Standard (LoS) option and the 1:25 year LoS have been estimated at $3.5M and $5M respectively.

An allowance has been made to commence implementation of the capital works in each of the respective UHCC and GW Long Term Plans (LTPs). Further work on the apportionment of costs between the Councils and the private property owners is still to be undertaken.

6. Comment

A de-briefing meeting was held at the beginning of October with our partner UHCC on the outcome of Phase 2 and a consultation strategy for Phase 3 implementation was agreed in principal.

Currently a brief is being drafted for the appointment of SKM to commence Phase 3 of developing the FMP. This includes, but is not limited to, the following:

- Development of an evaluation criteria to compare the options benefits, costs and risks;
- Complete a risk assessment on each of the options. To date a preliminary risk assessment only has been undertaken;
- Finalise the costs and utilise the flood damage assessment tool to quantify the financial benefits of the options;
- Option confirmation and consultation strategy.

7. Communication

The detailed brief for Phase 3 of the Floodplain Management Plan is being developed and is envisaged to be completed and agreed by all parties before the end of November 2011.

This brief will also include the development of a detailed project plan and strategy for consultation required as well as a timeframe for completion. Our aim is to substantially complete Phase 3 by the end of the current financial year.

8. Recommendations

That the Subcommittee:

1. ***Receives*** *the report.*

2. ***Notes*** *the content of the report.*

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		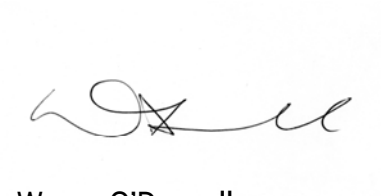
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1. Option1 – 25 Year Channel and 100 year Secondary Flow

1.1 Lower Catchment – Pinehaven Reserve to Hulls Creek

1.1.1 Channel Upgrades

- Box channel sections in constrained areas of Birch Grove, Blue Mountains Road and adjacent to the Dutch Reformed Church on Whitemans Road. The box channels are used to limit the impact on private property, allow for cost effective vehicle crossings and to improve bank stability.

- Trapezoidal channel sections elsewhere between Pinehaven Reserve and the piped stream inlet on Whitemans Road.

- A number of possible options to realign the stream channel in the lower catchment. Significant opportunities include through the residential properties of 50 Blue Mountains Road and 52 Whitemans Road.

- Stream channel upgrades will conflict with the residential building over the stream at 48 Blue Mountains Road. We will have to work with the property owner to ascertain the best way of achieving the desired channel capacity.

1.1.2 Structural Upgrades

- Raising of all private access structures crossing the stream to a level above the 25 year ARI storm event peak water surface level (plus a freeboard allowance).

- Replacement of the existing Sunbrae Drive and Pinehaven Road culverts with bridges

- Upgrade of the existing piped stream inlet on Whitemans Road with a side and slope tapered inlet structure

- Lowering of the bypass inlet weir by 100mm. This is not required to provide a 25 year level of protection, but will divert a greater flow down the bypass in a 100 year storm event to prevent the piped stream inlet overtopping and threatening Silverstream Village.

- Installation/upgrade of debris control structures on the bypass inlet and piped stream inlets

1.2 Upper Catchment Tributaries

1.2.1 Channel Upgrades

Upgrade of channels in all tributaries to a trapezoidal cross section and raising of all private access structures above the 25 year peak water surface level plus

a freeboard allowance. Channel widths required in the upper catchment tributaries range from 4.4m in the Jocelyn Crescent tributary to 6.3m in the Pinehaven Road tributary.

1.2.2 Structural Upgrades

Sections of the pipe network in Pinehaven Reserve are unable to convey the 25 year flow and following a condition assessment, consideration should be given to replacing the whole network. However the hydraulic model indicates that it is possible to retrofit the existing network to maximise its conveyance and limit the overflow to levels that will have relatively low impact. The upgrades include:

- Three upper tributaries meet at a single manhole in Pinehaven Reserve. The pipe downstream of this point is a mixture of 1350mm and 1800mm diameter pipe. The network here is currently undersized which results in flow backing up and restricting the conveyance of the upstream pipes, particularly on the Pinehaven Road tributary pipe network. This constraint could be removed by upgrading the current pipe size or constructing an open channel

- The inlets of tributary branches in Jocelyn Crescent and Elmslie Road are smaller than the pipe networks downstream. These could be upgraded to match the downstream pipe sizes. Furthermore, side and slope tapered inlet structures would increase the entrance capacity.

Other significant structures in the upper catchment identified for upgrades in the long term include:

- Increase pipe size and entrance efficiency for the inlet controlled Forest Road culvert

- Increase pipe size for the culvert adjacent to 108A Wyndham Road

- Increase pipe size of culvert adjacent to 169/173 Pinehaven Road

- Upgrade/install debris control structures at the inlets of the pipe networks in Wyndham Road and Fendalton Road

1.3 Upgrade Constraints & Limitations

In scoping the above upgrades a number of design constraints/limitations have been identified. Key constraints governing the upgrades include:

- 300mm freeboard allowance has been incorporated into the channel design cross sections.

- Where space permits the typical design channel cross sections have utilised side slopes of 2:1. The model indicates that the design flows in the channel could result in high velocities that could cause scour or bank stability issues. To help reduce stream stability problems it has

been assumed that some form of channel lining and riparian planting will be required, such as geotextiles or terramesh.

1.4 Impact on Existing Pinehaven Stream Flood Hazard

The hydraulic model of the Pinehaven Stream, modified to include the identified upgrades, predicts the long term upgrade performs as designed in the 25 year event, including the mid range predictions of climate change. No channel overflows are predicted to occur and peak water surface levels are predicted to decrease by up to 1m with the removal of existing channel and structural constraints.

In the 100 year storm event the design channel capacity is predicted to be sufficient to limit the locations where overflows occur to the inlet of the Pinehaven Road bypass and inlet to the Jocelyn Crescent tributary pipe network. In these instances overflows are predicted to be less than 100mm in depth and are unlikely to threaten building floor levels.

The model indicates that the freeboard included in the cross section designs appears to be adequate to accommodate the increase in peak flows between the 25 year and 100 year ARI storm events including the midrange climate change predictions.

2. Option 2 - 10 Year Channel and 100 year Secondary Flow

Providing a 10 year (including the mid range impacts of climate change) level of service instead of a 25 year level, will decrease the magnitude and complexity of upgrades required within the Pinehaven catchment.

In many areas these upgrades could be constructed as the first stage of a longer term option.

In general, providing a 10 year level of service will decrease the size of the upgrades outlined above for the long term upgrade option. Key points from the design include:

• Phase I investigations found much of the stream channel has less than a 5 year flow capacity. As such, extensive channel upgrades are still required (both in the lower and upper catchments) to provide a 10 year level of service.

- The upgrading of constraints in the stream channel between the Whiteman's Road bypass inlet and the piped stream inlet are not required to provide a 10 year level of service.

- The Pinehaven Road culvert will require replacement with a bridge. Previous work had suggested an upgrade of this culvert may not be required. However with upgrades in the upper catchment this culvert becomes a throttle point increasing the flood risk to surrounding properties and therefore requiring upgrade

The upgrades achieve the 10 year minimum level of service with all flow being contained within the design cross sections and reductions of in stream peak water surface levels of up to 1m.

3. Option 3 - Do Minimum Options

The investigations undertaken to date have identified a number of upgrades with relatively low cost that could have positive benefits on reducing flood risk.

These options include:

- Debris traps at the intakes to the piped networks. Historically blockages are a major contributor to flood damage in the catchment. Reducing the risk of blockage through either debris traps or secondary intakes could have a significant impact on reduced flood damage. In particular should a partial blockage of the Whiteman's Road bypass occur during a major storm event there is considerable risk to the Silverstream Commercial area.

- Removal/modification of bridges in Birch Grove. A number of bridges in Birch grove force water out of the channel and through the adjacent properties. This risk could be reduced by removal and in some cases modification such as raising of the bridges.

- Securing secondary flow paths. Considering that much of the stream network has less than a 5 year capacity managing the overflows could greatly increase the flood protection, particularly in the upper catchments. As an example, repeated flooding of a number of properties in Jocelyn Crescent has lead to residents constructing a temporary makeshift barrier to direct flows down the road carriageway rather than through the properties. This could be made more permanent and safer by incorporating the diversion into a speed bump on Jocelyn Crescent.

It should be noted that these options are unlikely to provide significant improvements in larger flooding events.

4. Option 4 – Source Control using attenuation tanks

4.1 Analysis Assumptions

The Pinehaven catchment, made up out of 15 sub-catchments, has a total maximum available rain water storage capacity of 8,870 m^3.

The investigation of using attenuation tanks as a source control has used the following assumptions during the analysis:

- Existing hydrology was developed for the hydraulic model sub-catchments

- There is no spatial information available on building footprints; this was estimated from available aerial photos checked against parcel boundary information

- The analysis assumed only the current level of development within the catchment

- It was assumed that rainwater tanks are empty at the start of a storm event

- That every building in the catchment has a 10m³ tank retrofitted

The majority of development is situated in the lower catchment with the potential of rain water storage being:

- 75% of the storage is located in catchments that enter the main stream channel in or downstream of Pinehaven Reserve

- 25% of the storage is located in catchments that enter the main stream channel downstream of Pinehaven Road

4.2 Analysis Outcomes

In a 10 year rainfall event the reduction in peak flow from the installation of 900 attenuation tanks would only have a minor reduction on the flood hazard in the catchment. Flood extents are not significantly changed and peak water surface levels are predicted to decrease by up to 100mm in the reach of the stream from Birch Grove to Sunbrae Drive / Willow Park.

In the analysis we aimed to reduce the peak of a 10 year event. In larger events much of the storage is utilised early on in the storm and therefore is less effective during peak rainfall activities.

Source control could provide a minor reduction in the existing flood hazard in Pinehaven. However, there is a considerable cost in retrofitting source control. A 10m³ rainwater tank with overflow and tank connector is estimated at $3,550 each. This would equate to approximately $3.1M (Rawlinson's – 2010) for total material cost.

Based on a recent small scale trial in North Shore City this would equate to $8,400 for each tank with a total $7.5M in material cost for the whole catchment

4.3 Summary

The assessment of source control in the Pinehaven catchment has highlighted that retrofitting rainwater attenuation tanks to existing buildings could reduce peak water surface levels in flood events.

However, any benefits are likely to come at a considerable cost and will have a long implementation period as a stand alone measure.