Black Creek Floodplain Risk Management Study and Plan

Floodplain Management Committee Meeting
15 February 2016

David Whyte
Presentation Outline

- Project background
- Community Consultation
- Extension and update of hydraulic model
- Flood mitigation option assessment
- Floodplain Risk Management Plan
- Public Exhibition and Comments
- Actions post Public Exhibition
- Next Steps/Finalisation
Project Background

Black Creek Flood Study (DHI, 2010)
- Developed models to identify existing flooding behaviour within the catchment
- Extended and updated by Cardno (2014)

Black Creek Floodplain Risk Management Study and Plan (Cardno, current)
- Evaluation of floodplain management options for existing and future development

Diagram:

1. Floodplain Risk Management Committee
2. Data Collection
3. Flood Study
4. Floodplain Risk Management Study
5. Floodplain Risk Management Plan
6. Adoption and Implementation of the Plan
7. Monitor and Review
Community Consultation

Community engagement is important for the study

- To gather community knowledge to inform the assessments
- To ensure that the proposed mitigation strategies meet community needs

Press Release (2012)
Information brochure (2013)
  - Mailed out to 1,600 properties
Community questionnaire (2013)
  - Mailed out to 1,600 properties
  - Floodengage online questionnaire

Information brochure (2015)
  - Mailed out to 1,600 properties
  - Community drop-in session
Extension and Update of Flood Study Model

Reasons for updates:

- Availability of LiDAR survey data collected in 2011
- Existing model did not have sufficient coverage throughout Cessnock to provide flooding information to inform future development
- Existing model results inconsistent in places
- Extension of 2D model area to give better definition of flooding behaviour in urban areas of Cessnock

Outputs:

- Flood mapping (flood extents, depths, velocities, provisional and true hazard, hydraulic categories)
- Impacts of climate change on flood behaviour
- Flood damages assessment
Flood Damages Assessment

Legend
- 20 Percent AEP Overfloor Flooding Properties
- 10 Percent AEP Overfloor Flooding Properties

Major Creeks
Flood Management Options

Preliminary options assessment
- Results of flood modelling
- Community responses to questionnaire
- Engineering judgement and Council liaison

Options assessment of Preferred Options
- Structural flood mitigation options
- Property modification options
- Emergency response modification options
Structural Option FM1 – Multiple Detention Basins along Black Creek

- Four Detention Basins along Black Creek upstream of Bellbird Creek

- Major reductions in flood levels and overfloor flooding along Balck Creek in all events up to the 1% AEP event

- Large cost of construction due to large volumes to achieve the flood mitigation.

- Option not optimised and potential environmental constraints.
Bellbird Creek channel reshaping from Stephen Street to confluence with Lavender Creek
Detention Basin at former PCYC centre
Local bund at Stephen Street

Minor reductions only on overland flow path adjacent to Bellbird Creek in 1% AEP event
Increased flow in Bellbird Creek adversely impacts flood levels along Black Creek, upstream of the confluence
Structural Option FM3 – Black Creek Widening/Reshaping, Culvert Upgrades

- Black Creek channel widening within available open space from Wollombi Road to Ferguson Street
- Channel reshaping/flood walls downstream of Ferguson Street
- Culvert upgrades at Wollombi Road, Doyle Street, Henderson Street
- Reductions up to 0.3m in 1% AEP flood levels, however increases occur due to flood walls
- Flood walls cause local ponding, could be reviewed at design stage
Structural Option FM4 – Oliver Street Channel Widening

- Existing Hunter Water channel doubled in size along Oliver Street
- Existing channel has reverse grade, widened channel optimised
- Channel flow is controlled by Kearsley Creek which has a larger contributing catchment
- Channel widening does not improve the flooding in this area in the 1% AEP
- Does have some improvement in the lower events
Structural Option FM5 – Bund/Detention Basin Upstream of South Cessnock

- Proposed bund to retain flows on the eastern side of the railway line
- Flow diverted north towards Kearsley Creek and away from South Cessnock residential properties
- Reductions in 1% AEP flood levels up to 0.3m, reductions up to 500mm for 20% AEP event.
- Proposed bund on private land, implications on railway line and existing culverts to be investigated at concept design stage
Structural Option FM6 – Detention Basin DB1 on Bellbird Creek

- Proposed detention basin to retain flows in Bellbird Creek on the eastern side of the railway line.
- Flows detained, reducing flows along Bellbird Creek.
- Reductions in 1% AEP flood levels up to 0.3m, reductions up to 500mm for 20% AEP event.
- Proposed basin on Austar Mining Lease, concept design provided. Good flood damages reductions, however, expensive option.
Reductions in Overfloor Flooding

### Table 11-4 Overfloor Flooding Properties

<table>
<thead>
<tr>
<th>Mitigation Option</th>
<th>20% AEP</th>
<th>10% AEP</th>
<th>5% AEP</th>
<th>2% AEP</th>
<th>1% AEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (9hr)</td>
<td>18</td>
<td>38</td>
<td>126</td>
<td>241</td>
<td>355</td>
</tr>
<tr>
<td>Option FM1</td>
<td>18</td>
<td>30</td>
<td>86</td>
<td>173</td>
<td>261</td>
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<tr>
<td>Option FM2</td>
<td>20</td>
<td>42</td>
<td>124</td>
<td>248</td>
<td>346</td>
</tr>
<tr>
<td>Option FM3</td>
<td>20</td>
<td>34</td>
<td>103</td>
<td>228</td>
<td>328</td>
</tr>
<tr>
<td>Option FM4</td>
<td>18</td>
<td>37</td>
<td>113</td>
<td>236</td>
<td>344</td>
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<tr>
<td>Option FM5</td>
<td>5</td>
<td>14</td>
<td>74</td>
<td>181</td>
<td>338</td>
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<tr>
<td>Option FM6</td>
<td>18</td>
<td>32</td>
<td>100</td>
<td>217</td>
<td>323</td>
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</tbody>
</table>
Property Modification Measures

Objective
Aimed at making structures better able to cope with flooding, and thus reducing the flood damage

Options identified for potential inclusion in the Plan
- LEP Update
- Building & Development Controls Update
- House Raising and Rebuilding
- Voluntary Purchase
- Land Swap
- Council Redevelopment
- Flood Proofing

House Raising

New buildings need to be above the Flood Planning Level
## Property Modification Measures

### 1. Reduction in AAD resulting from Various House Raising Scenarios

<table>
<thead>
<tr>
<th>House raising option</th>
<th>Number of properties with overfloor flooding*</th>
<th>Reduction in AAD per property</th>
<th>Overall reduction in AAD</th>
<th>NPV of reduction</th>
<th>Estimated cost of raising</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% to FPL</td>
<td>18</td>
<td>$5,954</td>
<td>$107,168.34</td>
<td>$1,329,856</td>
<td>$1,440,000</td>
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<tr>
<td>10% to FPL</td>
<td>32</td>
<td>$5,073</td>
<td>$162,345.64</td>
<td>$2,014,554</td>
<td>$2,560,000</td>
</tr>
<tr>
<td>5% to FPL</td>
<td>93</td>
<td>$1,272</td>
<td>$118,313.68</td>
<td>$1,468,159</td>
<td>$7,440,000</td>
</tr>
<tr>
<td>2% to FPL</td>
<td>183</td>
<td>$1,266</td>
<td>$231,598.62</td>
<td>$2,873,917</td>
<td>$14,640,000</td>
</tr>
<tr>
<td>1% to FPL</td>
<td>278</td>
<td>$336</td>
<td>$93,422.64</td>
<td>$1,159,285</td>
<td>$22,240,000</td>
</tr>
</tbody>
</table>
Emergency Response Modification Options

- Changes to how emergency services, Council and residents respond to flood events
- Aimed at improving the response to flood events to reduce the risk to life and property
- They would be applied across the study area

Options identified for potential inclusion in the Plan

- Transfer of information from this study to the SES (updated flood extent, hazard mapping)
- Flood awareness campaigns for residents and businesses within the floodplain
- Flood warning signs at critical locations
### Benefit Cost Ratio

**Table 12-4 Economic Assessment of Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>AAD</th>
<th>Reducltion in AAD</th>
<th>NPW of Benefit*</th>
<th>Capital Cost</th>
<th>Recurrent Cost</th>
<th>NPW of Option*</th>
<th>B/C Ratio</th>
<th>Rank</th>
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</thead>
<tbody>
<tr>
<td>FM1</td>
<td>$2,244,065</td>
<td>$208,425</td>
<td>$2,876,420</td>
<td>$70,315,800</td>
<td>$703,158</td>
<td>$80,019,905</td>
<td>0.04</td>
<td>10</td>
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<tr>
<td>FM2</td>
<td>$2,458,701</td>
<td>-6,211</td>
<td>-$85,718</td>
<td>$19,646,400</td>
<td>$196,464</td>
<td>$22,357,750</td>
<td>0.00</td>
<td>11</td>
</tr>
<tr>
<td>FM3</td>
<td>$2,373,869</td>
<td>$78,621</td>
<td>$1,085,031</td>
<td>$19,726,500</td>
<td>$197,265</td>
<td>$22,448,904</td>
<td>0.05</td>
<td>9</td>
</tr>
<tr>
<td>FM4</td>
<td>$2,411,870</td>
<td>$40,819</td>
<td>$563,338</td>
<td>$2,322,800</td>
<td>$23,226</td>
<td>$2,643,136</td>
<td>0.21</td>
<td>8</td>
</tr>
<tr>
<td>FM5</td>
<td>$1,913,429</td>
<td>$539,081</td>
<td>$694,441</td>
<td>$600,700</td>
<td>$6,907</td>
<td>$786,022</td>
<td>9.46</td>
<td>1</td>
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<tr>
<td>FM6</td>
<td>$2,094,194</td>
<td>$358,295</td>
<td>$4,944,745</td>
<td>$7,278,900</td>
<td>$72,789</td>
<td>$8,283,443</td>
<td>0.60</td>
<td>6</td>
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<tr>
<td>P3</td>
<td>$2,200,764</td>
<td>$272,785</td>
<td>$3,764,656</td>
<td>$2,560,000</td>
<td>$0.00</td>
<td>$2,560,000</td>
<td>1.47</td>
<td>3</td>
</tr>
<tr>
<td>P4</td>
<td>$2,200,764</td>
<td>$272,785</td>
<td>$3,764,656</td>
<td>$2,560,000</td>
<td>$0.00</td>
<td>$2,560,000</td>
<td>1.47</td>
<td>3</td>
</tr>
<tr>
<td>P5</td>
<td>$2,267,260</td>
<td>$206,290</td>
<td>$2,848,963</td>
<td>$5,400,000</td>
<td>$0.00</td>
<td>$5,400,000</td>
<td>0.53</td>
<td>7</td>
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<tr>
<td>P6</td>
<td>$2,267,260</td>
<td>$206,290</td>
<td>$2,848,963</td>
<td>$900,000</td>
<td>$0.00</td>
<td>$900,000</td>
<td>3.16</td>
<td>2</td>
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<tr>
<td>P7</td>
<td>$2,267,260</td>
<td>$206,290</td>
<td>$2,848,963</td>
<td>$4,500,000</td>
<td>$0.00</td>
<td>$4,500,000</td>
<td>0.63</td>
<td>5</td>
</tr>
</tbody>
</table>

*NPW – Net Present Worth is calculated using 7% interest over 50 yrs.*
Multi Criteria Assessment of Options

Triple bottom line approach
- Economic – cost of implementation compared to likely reduction in flood damages
- Environment – considering positive or negative impacts on environment
- Social – Likely positive or negative social impacts

Top ranked options
- Public awareness and education
- Flood warning signs
- Review of LEP and DCP
- Emergency Management
- Proposed bund east of Sixth Street and railway, South Cessnock
- Land Swap, House raising or House rebuilding
- Voluntary Purchase
- Other Structural Options
# Recommended Floodplain Risk Management Measures

## Table 15-1  Floodplain Risk Management Measures Recommended for Implementation

<table>
<thead>
<tr>
<th>ID</th>
<th>Description</th>
<th>Estimated Capital Cost</th>
<th>Estimated Recurring Cost</th>
<th>Funding Sources/ Responsibility</th>
<th>Priority for Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM4</td>
<td>Public awareness and education</td>
<td>$20,000</td>
<td>$5,000</td>
<td>Council/OEH</td>
<td>High</td>
</tr>
<tr>
<td>EM5</td>
<td>Flood warning signs at critical locations</td>
<td>$20,000</td>
<td>$1,000</td>
<td>Council/OEH</td>
<td>High</td>
</tr>
<tr>
<td>P1</td>
<td>Review of LEP</td>
<td>$20,000</td>
<td>$1,000</td>
<td>Council</td>
<td>High</td>
</tr>
<tr>
<td>P2</td>
<td>Review of DCP and Engineering Standards</td>
<td>$40,000</td>
<td>$5,000</td>
<td>Council</td>
<td>High</td>
</tr>
<tr>
<td>EM1</td>
<td>Information transfer to SES</td>
<td>$5,000</td>
<td>-</td>
<td>Council/OEH</td>
<td>High</td>
</tr>
<tr>
<td>EM2</td>
<td>Local Flood Plan and DISPLAN update</td>
<td>$10,000</td>
<td>-</td>
<td>Council/OEH</td>
<td>High</td>
</tr>
<tr>
<td>FM5</td>
<td>Proposed bund/flood wall east of Sixth Street properties and railway line</td>
<td>$690,700</td>
<td>$6,907</td>
<td>Council/OEH</td>
<td>High</td>
</tr>
<tr>
<td>P6/P3/P4</td>
<td>Land Swap or House Raising or House Rebuilding*</td>
<td>$2,560,000</td>
<td>-</td>
<td>Council/OEH</td>
<td>Medium</td>
</tr>
<tr>
<td>P5</td>
<td>Voluntary Purchase**</td>
<td>$5,400,000</td>
<td>-</td>
<td>Council/OEH</td>
<td>Medium</td>
</tr>
<tr>
<td>FM6</td>
<td>Detention basin (DB1) Bellbird Creek - Austar Coal Mine site</td>
<td>$7,278,900</td>
<td>$72,789</td>
<td>Council/OEH</td>
<td>Low</td>
</tr>
</tbody>
</table>

*As per recommendation of Floodplain Risk Management Study (See Chapter 14)

** Voluntary purchase budget allocation presuming that some properties identified could be dealt with under the P6/P3/P4 scheme and therefore not all properties identified in the Floodplain Risk Management Study would need to be purchased.
Completion

- Final Report has been provided to Council by Cardno
- Endorsement of revised Floodplain Risk Management Study and Plan by the FMC
- Report to Council for adoption
- Handover of Study Materials to Council