

## COUNCIL 12.5.2014 - EXTRAORDINARY

### 5. MAYORAL TASKFORCE ON FLOODING

		Contact	Contact Details
<b>General Manager responsible:</b>	(Acting) General Manager City Environment Group	N	
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#### 1. PURPOSE AND ORIGIN OF REPORT

- 1.1 On the 22<sup>nd</sup> April, the Mayor and Councillors met with staff and agreed that a Christchurch Flood Taskforce (the Taskforce) be set up. The leadership of the Taskforce and Terms of Reference were announced on the 29<sup>th</sup> April. This Taskforce was to report back to the Council on 12 May, identifying a range of short term flood mitigation options that would reduce the impact of flooding to particularly high risk properties.
- 1.2 The purpose of this report is to present to the Council the findings of the Taskforce. The report also identifies a number of risks and associated issues that will need to be managed or clarified before decisions on options can be made.
- 1.3 Section 8 outlines an overview of the available funding and high level estimates of the proposed options. Recommendation 10.4 suggests that a programme of actions and costs can now be developed and this should be done by the end of the month.
- 1.4 It also includes information on how the work of the Taskforce links with and will help inform the work of the Council's Land Drainage Recovery programme and work on long term flood management and mitigation issues which the Canterbury Earthquake Recovery Authority (CERA) and Christchurch City Council (CCC) are jointly working on. A further report is due in early June on the engineering options for the Flockton Basin.

#### 2. EXECUTIVE SUMMARY

- 2.1 The large number of recent floods in Christchurch is due to a run of major storms. It is clear that the severity of the floods has been aggravated by earthquake damage to the land and stormwater network, particularly due to land lowering in some places such as Flockton Basin.
- 2.2 The Taskforce focused on the most vulnerable of those households affected by regular flooding since the earthquakes. Vulnerability has been assessed using both physical and social factors. It was determined that the most vulnerable were those with two or more instances of flooding above the floor level. The next most vulnerable were those houses with two or more instances of flooding beneath the house but not up to the floor. Restricted access to dwellings defined the third category of vulnerability.
- 2.3 The Taskforce examined a range of short-term flood defence measures to reduce impacts of regular flooding. These included house defence and local area schemes which benefit more than one dwelling. Where neither of these options was practicable then short-term relocation of the household was considered an option.
- 2.4 House defence typically involves raising the house (permanently), tanking the house (waterproofing just above the level of frequent flooding), bunding (either raised mounds or sandbags) or property re-grading to improve drainage of floodwaters away from the house. Local area schemes are more complex, but typically involve diversions, bunding and pumping, and would typically be located on the street or within drainage easements.
- 2.5 Local area schemes provide wider benefits in terms of addressing the issues experienced by the most vulnerable houses, as well as those considered less vulnerable in the surrounding areas. This helps preserve occupancy within affected areas, which is an important component of strengthening these communities and improving the quality of life.

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- 2.6 The field teams had limited time to carry out all of the above work and so a large amount of judgement and interpolation was necessary. It is considered that the process was sufficiently robust to provide a high level of confidence in the outcomes. However there may be further vulnerable properties within the city which have not yet been identified.
- 2.7 The information gained by the field teams allowed an assessment of which houses were most vulnerable, and a comparison of the costs of individual house defence and a local area scheme. In most instances it was found that the local area schemes were not only more cost effective, but also provided benefit to a much wider area.
- 2.8 In summary, based on recent storm event data and community feedback, there are approximately 994 households assessed as vulnerable to regular flooding in Christchurch. Of those 56 are considered the most vulnerable due to impacts of flood water entering the house. The second most vulnerable are those households that have experienced frequent flooding under their houses. There are 451 households in that category.
- 2.9 The Flockton area has 30 of the most vulnerable households.
- 2.10 Any proposed long term flood defence schemes will not necessarily prevent such flooding in more extreme events, beyond the one in 50 year flood, as experienced on 5 and 6 March 2014.

### 3. BACKGROUND

- 3.1 Christchurch is currently experiencing a period of high rainfall not felt since the 1970's. Frequent large rainstorms have fallen across the city resulting in saturated ground, high river/stream flows and flooding of a number of habitable floor levels, properties and streets. The Christchurch earthquake sequence has worsened flooding in many areas of the city through damage to waterways and land.
- 3.2 The flooding from the 5 March 2014 storm was caused by a moderate to high intensity rainfall over more than 24 hours. The Botanic Gardens recorded about 150 millimetres of rainfall, which caused widespread flooding in the Heathcote and Avon catchments and less so in the Styx catchment where there was less rain. The storm had strong winds which broke tree branches and uprooted trees. These and other debris partly blocked channels and screens on stormwater intakes and contributed to higher flood levels.
- 3.3 The analysis also confirms that the City has experienced about six significant rain events since the earthquakes, of which four have been in the first four months of 2014. It also shows that between 1999 and 2012 there were no significant floods. This compares with three in 1986 and two in 1975. The mid to late 1970s are confirmed as a period of significant floods. The average interval between floods in the 52 year period is less than one every two years.
- 3.4 The focus of the Taskforce was on the more frequent flooding as exacerbated by earthquakes. Although Christchurch and Banks Peninsula experienced an extreme rainfall event on 5 and 6 March 2014 and the effects were worsened in many places by earthquake damage, this was not the focus of the Taskforce as such events are managed through existing programmes, and need longer term solutions.
- 3.5 The Land Drainage Recovery Programme is currently investigating earthquake effects on the city's waterways and identifying options for restoration of pre-earthquake performance with respect to the flood hazard. These options include large scale physical works which may take years to implement.
- 3.6 As a result of the flooding, the Taskforce was commissioned to produce a report for Council by 12 May to report on but not be limited to, the following options:
  - 3.6.1 Street/neighbourhood temporary operational solutions including localised pumps; temporary localised flood barriers; flap gates; bunds; sand bagging, etc;
  - 3.6.2 Individual property level protections including house raising; base water proofing; and;

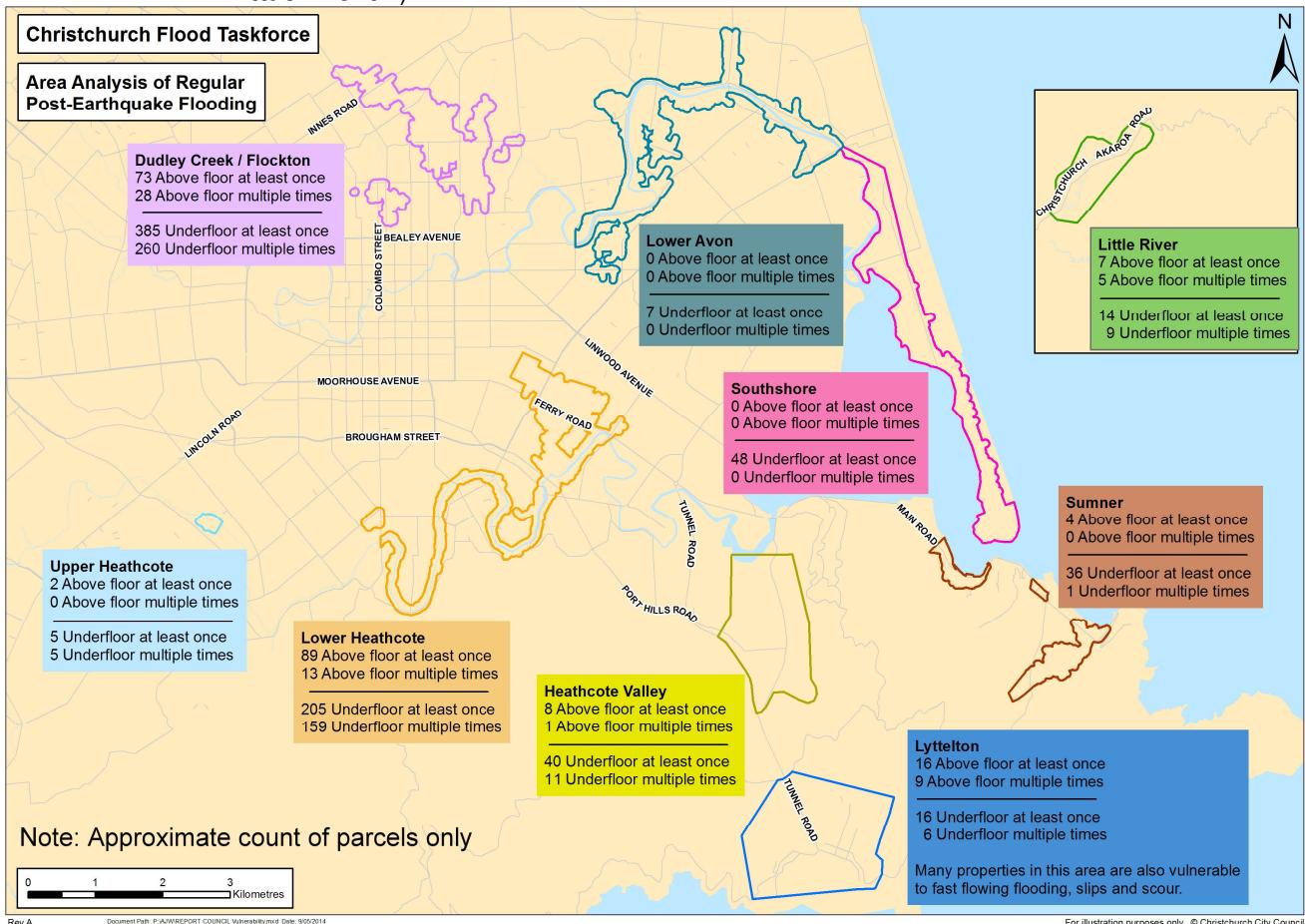
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- 3.6.3 Re-location solutions for most vulnerable households.
- 3.7 There is a need to investigate options for temporary flood protection of residential floor levels while decisions are made on the long term projects that will be determined by the Land Drainage Recovery Programme.
- 3.8 The project focus is on immediate/short term solutions but it will be required to integrate closely with the on-going flood management work programmes already underway within the Council and CERA including:
- 3.8.1 The area-wide flood mitigation options that have been developed by the Council's Land Drainage Recovery Programme team for Flockton;
  - 3.8.2 The 63 land drainage recovery projects that have formed part of the Council's work programme over the past two years has provided information to understand the consequences of the earthquake sequence and the impact on the land drainage network of rivers, streams, drains and structures. The objectives of the overall programme is to:
    - Implement a prioritised programme of investigations.
    - Use a cost benefit approach to determine appropriate responses.
    - Identify and prioritise potential capital works.
- More details can be provided if required.
- 3.8.3 The joint CERA and CCC Flood Management Steering Group which is providing local and central Government oversight and policy advice on flood management and mitigation issues following the earthquakes.
- 3.8.4 Long term land use planning and development decisions including the District Plan review.
- 3.9 The objective of the Taskforce was to prepare a Council report recommending a range of potential temporary short term solutions to reduce the impact on residents of the city's flooding problems as compounded by earthquakes and subsequent weather events. The supporting technical report is to deliver on the following:
- 3.9.1 An area-by-area analysis of the cause/s and scope of flooding problems in each of the priority areas (Flockton; Woolston/Opawa; Redcliffs/Sumner; Heathcote Valley and lower Heathcote river; lower Avon River and Southshore; Lyttelton; Little River) including assessments of the contribution of earthquake-related damage to land and drainage systems.
  - 3.9.2 An assessment of the number of households at future risk of regular inundation in the event of the current weather patterns persisting over the winter.
  - 3.9.3 High level cost estimates and analysis of the leading options, including identification of the responsibilities and capacity of the Council, the Crown, the private sector, communities, and individual property owners to implement and resource these options.
  - 3.9.4 A timeline for the delivery of the leading options and the dependencies with other work being undertaken by the Council, the Crown or the private sector.
- 3.10 It is important to note the part played by many agencies and staff, some of which was at very short notice, and the work of background support staff (e.g. the Council's Customer Centre). Equally important was the positive response to the Taskforce from the community and the willingness of people to contribute in a positive way.

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### 4. SUMMARY OF THE FINDINGS

- 4.1 An area-by-area analysis of the causes and scope of flooding problems was carried out by field engineering teams in each of the priority areas (Flockton; Woolston/Opawa; Redcliffs/Sumner; Heathcote Valley and lower Heathcote river; lower Avon River and Southshore; Lyttelton; and Little River). The field teams identified the flooding issues, assessed the effects of earthquake damage, assessed frequency of inundation above or below floor level, and developed appropriate house defence or local area schemes.
- 4.2 A summary of the flooding impacts for each priority area is shown in Figure 1 (also refer **Attachment 1**).



**Figure 1: Summary of the Flooding Impacts Identified in each Priority Area Investigated**

- 4.3 There are three levels of household vulnerability that have been developed based on community feedback about the impacts of regular flooding.

**Level One: Two or more instances of flooding of dwelling floors since the earthquakes**

- 4.3.1 These are considered to be the most vulnerable dwellings in Christchurch. Multiple flooding bears a high cost in house and contents repair/replacement, high personal disruption and increased health risks.

**Level Two: Two or more instances of flooding under dwellings since the earthquakes**

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4.3.2 The community provided strong feedback that regular flooding under homes was a significant health and property concern. They cannot claim on insurance for mould and rising damp, or for the difficulty of cleaning up contaminated water under homes.

4.3.3 This vulnerability level includes buildings that have flooded only once above floor level and on at least one other occasion, flooding under the floor.

### **Level Three: Two or more instances of flooding restricting resident access to dwellings since the earthquakes**

4.3.4 Flood waters are often contaminated and can be so deep that residents cannot get into or out of their homes. This was particularly a concern for families with young children, and elderly or disabled people. This level of vulnerability was recorded where observed but was not specifically targeted in the development of mitigation measures.

4.4 A breakdown of the dwelling vulnerability levels by area is included in Table 1. This information was based on what could be collected or observed within the available time frames.

Areas Investigated by Taskforce	Number of Properties		
	Current Vulnerability Level		
	1	2	3
Flockton/Dudley Creek	28	260	281
Heathcote Valley	1	11	5
Little River	5	9	14
Lower Avon	0	0	20
Woolston/Opawa/Lower Heathcote	13	159	109
Lyttelton	9	6	0
Southshore	0	0	48
Redcliffs/Sumner	0	1	0
Upper Heathcote	0	5	10
<b>Total</b>	<b>56</b>	<b>451</b>	<b>487</b>

**Table 1: Property Vulnerability by Area**

## 5. CONSULTATION

- 5.1 As previously described in the report, identifying and agreeing solutions to reduce new flood risk areas over the city is complex and involves many agencies and stakeholders. It is imperative that delivery of any future works follows an agreed and robust process so that all the issues involved are considered holistically and achieve the right outcomes.
- 5.2 Given the complex nature of the solutions, the costs of potential mitigation works and the processes that drive decision making, it is important that key stakeholders are brought together to develop thinking and to make recommendations to the lead or leading agencies.
- 5.3 The collection of the views and preferences of the affected communities and key stakeholders provides residents with an opportunity to influence the decision outcome. Community engagement sessions were held on Saturday 3 May in the Flockton area and a community meeting in Sumner on Monday 5 May. The community session held in the Flockton area also included two focus group sessions attended by over 50 people, a face to face survey, which residents in the wider area also completed (over 120 surveys completed), and a drop in information session. The outcomes of the community engagement are included in the technical report.

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- 5.4 As a result, the Taskforce report was informed by their issues and concerns, key local knowledge around storm water flows and impacts, the wider impacts on physical, mental, financial and community wellbeing, and some useful feedback on why certain options would be preferred over others. In the time available there has been no city-wide consultation. City-wide consultation will take place in the coming weeks and months.
- 5.5 Consideration needs to be given to the concerns raised by the community and other key stakeholders outlined in the Social Impact Assessment Report particularly around prioritising the needs of the most vulnerable (people with mobility needs, people with mental and physical health needs, the elderly, families with young children and people with uninhabitable homes).

### 6. COMMENTS

- 6.1 The Taskforce findings indicate a range of solutions for temporary flood defences from increased maintenance, house defence, local area solutions and relocation options which will reduce the impacts of regular flooding on particularly vulnerable households until a more permanent solution is in place.
- 6.2 Within the timeframe, we have not been able to identify what blend of solutions are required to arrive at an optimal outcome at the house level.
- 6.3 More work needs to be done to validate some of the solutions. This could mean some pilot studies need to be undertaken and some initial design work on temporary solutions.
- 6.4 The relocation options in the report need more analysis and extensive engagement with the affected communities to understand the impacts and the alternatives in both the short and the longer term. There is sufficient confidence in the costs of relocation for this to be considered as a viable option, however prioritising relocation within the different layers of vulnerability needs more work
- 6.5 In the time available it has not been possible to investigate where the responsibility and capacity to implement solutions lies. The area analysis indicates that some local area schemes may be implemented through current operational and capital programmes as well as through the Stronger Christchurch Infrastructure Rebuild Team (SCIRT). All the options need further analysis to determine the appropriate funding sources and responsibilities.
- 6.6 Following the earthquake events and the damage caused to the land drainage infrastructure, the Council developed a Land Drainage Recovery Programme. This programme is a series of some 63 projects that investigate, assess, and will put forward long term solutions to the land drainage and flooding problem the City has experienced. Subsequent to the recent storm event in March and early April, the Council and CERA formed steering and working groups to ensure that proposed solutions for flood management and mitigation issues were developed, agreed and coordinated across a range of key stakeholders.
- 6.7 The Taskforce identified that dredging in the Lower Heathcote will reduce flood issues. A pilot study is underway to quantify the benefits and establish an efficient methodology.

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### 7. TEMPORARY FLOOD MITIGATION OPTIONS

- 7.1 A range of options have been identified to provide relief from the frequent flooding to households. **Attachment 2** includes representative illustrations of many of these measures. Any short term actions need also to be cognisant of the possibility of creating future precedent for Council and Government.
- 7.2 Local area schemes consisting of:
- Surface storage
  - Targeted and prioritised maintenance
  - Local traffic management during events
  - Increased “inletting” for road sumps
  - Small local pumping solutions
  - Sand bagging or bunding
  - Street wide bunding
  - Larger scale pumps
  - Replacement of debris screens
  - Local stopbank installation and or raising
  - Reduce flow constraints around stream structures
  - Flap gates on outlets
  - Localised dredging
- 7.3 Property level protection (house defences) consisting of:
- House raising
  - Section bunding
  - Regrade property
  - Sand bagging
  - House tanking/water proofing
- 7.4 Property relocation consisting of:
- Short term relocation to rental accommodation
  - Relocation of dwelling to new site
- 7.5 The financial estimates in 8.2.2 and 8.2.3 below are based on which of the options discussed above are thought to be most applicable. However, more time and dialogue at individual and community level is required before it can be determined exactly the right mix of options for particular circumstances.

### 8. FINANCIAL IMPLICATIONS

- 8.1 Overview of funding available:

8.1.1 Storm water and fresh water infrastructure damaged in the earthquakes is included in the Christchurch City Council and Crown cost share agreement. The cost share agreement includes the Horizontal Infrastructure Rebuild estimate, which covers both permanent and temporary repairs/maintenance. For the period 2014-2019, \$29.4 million (inflation excluded) is included for storm water and fresh water infrastructure temporary repairs/maintenance. As at the end of April 2014 \$2.9 million has been spent with a further \$1.3 million forecast for the balance of the year. The balance of the \$29.4 million has been included in the quarterly prioritisation work undertaken by the Council/Crown. While not specifically defined, this work is given high priority and therefore included as funded. Any flood protection options meeting the earthquake temporary works funding criteria could utilise the storm water temporary works funding source.

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8.1.2 The Council could elect to fund additional mitigation works outside of the cost share arrangement and go beyond the scope of the agreement. Any of the aforementioned options would require additional funding. The only funding source currently included in the Council's financial strategy for additional works is the Building and Infrastructure Improvement Borrowing Allowance. The current unallocated balance of the Building and Infrastructure Improvement Borrowing Allowance stands at \$56 million.

### 8.2 High Level Estimate of Costs:

8.2.1 The following table is a very high level estimate based on a mix of options outlined in section 7 above with a confidence level of +/- 30%

8.2.2 Should both level 1 and 2 vulnerability dwellings be targeted for relief from regular flooding the likely costs are summarised in Table 2 on following page.

Areas Investigated by Taskforce	Number of Properties Benefited			Implementation Costs (Target Levels 1 and 2)	
	Estimated Vulnerability Level				
	1 (Targeted)	2 (Targeted)	3 (Additional)		
Flockton/Dudley Creek	28	260	281	\$9,200,000	
Heathcote Valley	1	11	5	\$105,000	
Lower Avon	0	0	20	\$0	
Woolston/Opawa/Lower Heathcote	13	159	109	\$1,300,000	
Little River	5	9	14	\$50,000	
Redcliffs/Sumner	0	1	0	\$20,000	
Southshore	0	0	48	\$0	
Upper Heathcote	0	5	10	\$100,000	
Lyttelton	9	6	0	\$2,700,000	
<b>Total</b>	<b>56</b>	<b>451</b>	<b>487</b>	<b>\$13,475,000</b>	
<b>Design, consenting</b>	<b>15%</b>			<b>\$2,020,000</b>	
<b>Contingency</b>	<b>30%</b>			<b>\$4,650,000</b>	
<b>Total Cost Estimate</b>				<b>\$20,145,000</b>	

**Table 2: Cost Estimate to Provide Relief from Regular Flooding to the Vulnerability Level 1 and Level 2 Dwellings**

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8.2.3 Should only level 1 vulnerability dwellings be targeted for relief from regular flooding the cost estimate is summarised in Table 3.

Areas Investigated by Taskforce	Number of Properties Benefited			Implementation Costs (Target Levels 1 only)	
	Estimated Vulnerability Level				
	1 (Targeted)	2 (Additional)	3 (Additional)		
Flockton/Dudley Creek	28	160	281	\$6,700,000	
Heathcote Valley	1	11	5	\$105,000	
Lower Avon	0	0	0	\$0	
Woolston/Opawa/Lower Heathcote	13	22	19	\$480,000	
Little River	5	3	1	\$50,000	
Redcliffs/Sumner	0	0	0	\$0	
Southshore	0	0	0	\$0	
Upper Heathcote	0	0	0	\$0	
Lyttelton	9	0	0	\$1,800,000	
<b>Total</b>	<b>56</b>	<b>196</b>	<b>306</b>	<b>\$9,135,000</b>	
<b>Design, consenting</b>		<b>15%</b>		<b>\$1,370,000</b>	
<b>Contingency</b>		<b>30%</b>		<b>\$3,150,000</b>	
<b>Total Cost Estimate</b>				<b>\$13,655,000</b>	

**Table 3: Cost Estimate to Provide Relief from Regular Flooding to only the Vulnerability Level 1 Dwellings**

8.3 The full expenditure of the Flood Taskforce was not included in the current year's financial forecasts. The expected cost of roughly \$600,000 may result in an additional borrowing impact based on the financial position in the Council's March quarterly Performance Report. A large portion of these costs would have been incurred over a longer period, so can still be applied to the Horizontal Infrastructure Rebuild temporary works programme.

- 8.3.1 A team of 47 people, which consisted of a range of Council staff from Land Drainage Operations, and Network Planning, as well as the Strengthening Communities team, consultant engineers, maintenance contractors and physical works contractors was pulled together to form the Taskforce.
- 8.3.2 The team covered the full spectrum of planning and policy, strategy, investigation, design and implementation, as well as improvements to asset management and maintenance.

### 9. LEGAL

- 9.1 No specific legal requirements have been identified other than the normal regulatory processes for the mitigation work.

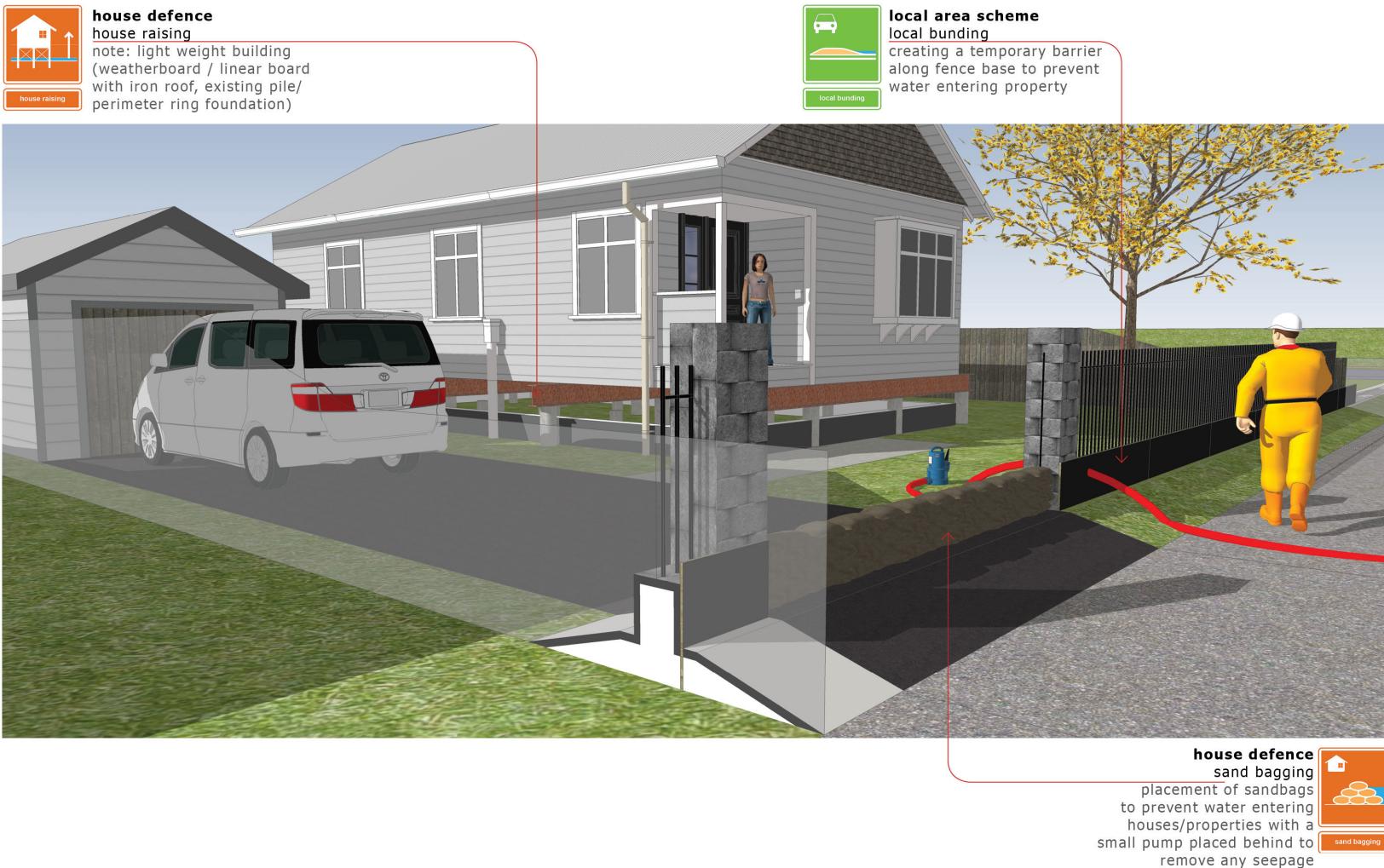
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### 10. STAFF RECOMMENDATION

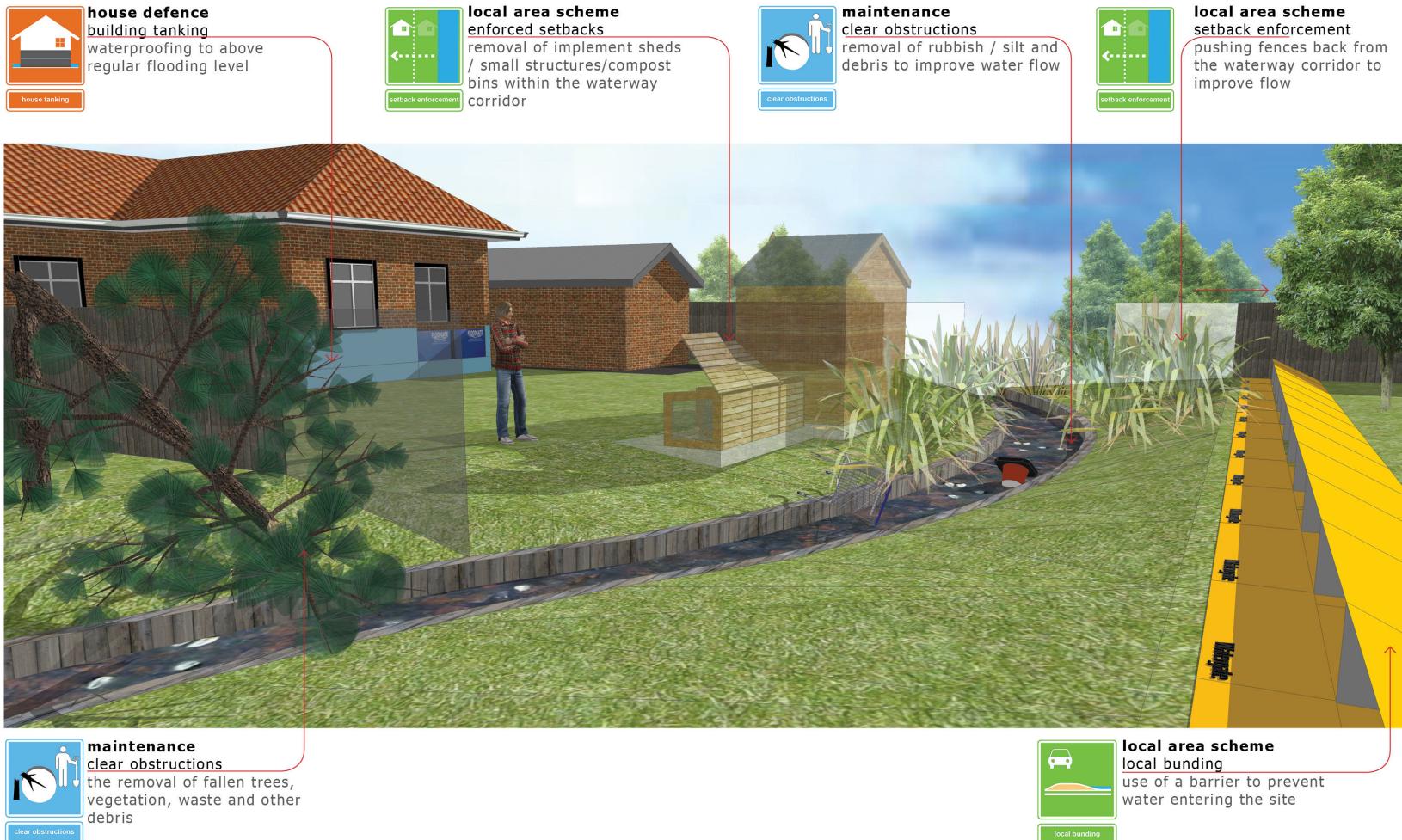
It is recommended that the Council:

- 10.1 Receive the Mayoral Taskforce Report on temporary flood defence.
- 10.2 Retrospectively approves the spend associated to this Taskforce of up to \$600,000. To be applied to the storm water temporary works programme part of the Council Horizontal Infrastructure Rebuild Programme.
- 10.3 Requests Council's Executive Leadership Team (ELT) to capture the learnings from the Taskforce approach and report back to the Environmental Committee.
- 10.4 Request the Chief Executive to provide a recommended programme of actions and costs to address or reduce the flood risks to the specific properties identified as meeting the level one vulnerability threshold by 31 May, and delegate to the Mayor, Chair of Environmental Committee and Chief Executive the authority to agree the implementation of the remediation programme.
- 10.5 That the balance of the results of the Taskforce investigations be forwarded to the Joint CCC/CERA Flood Steering Group for incorporation into their medium and long term work programme.
- 10.6 Direct staff to develop a comprehensive community engagement plan with timeframes that address the priority areas in consultation with Community Boards and community leaders.

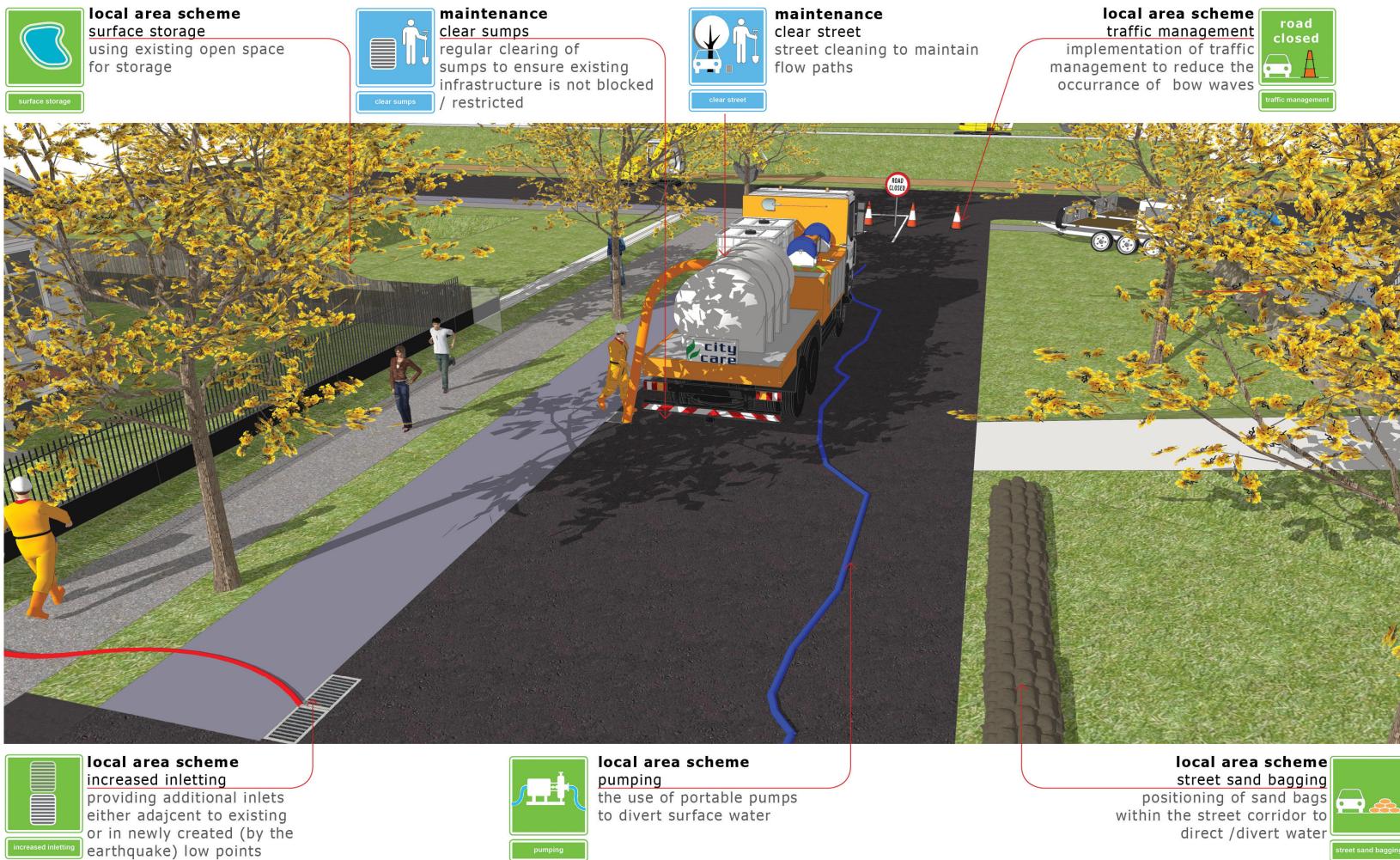
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