

IT IS HARD TO LOVE A LEVEE

M Strelow¹, B Holmes²

¹Mayor, Rockhampton Regional Council, Rockhampton, Qld

²General Manager Regional Services, Rockhampton Regional Council, QLD

Abstract

It is hard to love a levee

In June 2013 the Mayor of Rockhampton Regional Council decided to revisit a 1992 proposal to build a flood levee around the Depot Hill and Port Curtis areas of Rockhampton and which are subjected to frequent inundation from both riverine and local creek catchments to the west.

The project had been pulled off the shelf on a few occasions since its 1992 genesis but no serious work had been done to progress or refine the earlier body of work. The Mayor indicated that she was prepared to progress this project for the benefit of those residents and, in turn, the entire local government area by decreasing the disaster operations and recovery costs incurred. This saw the Council embark on a feasibility study closely followed by a design phase that now sees the Council have a comprehensive flood mitigation strategy incorporating a number of proposed levees as well as the South Rockhampton Flood Levee being 'shovel ready' should funding opportunities present.

By their very nature such projects are technically complex and involve processing and interpreting large amounts of data which ultimately brings its own challenges in communicating results to the community in a form that is understandable and acceptable in order to 'sell' the benefits of the project. Governments at all levels seem resistant to committing funding without 100% (or at least a clear majority) community support and this is difficult to obtain given the parochial nature of many of our communities and the no direct benefit then I shouldn't have to pay attitude.

Our timeframes were very ambitious – and our six (6) month program ended up extending to nine (9) months (12 months would have been more practical) and there were many lessons learned through this process both internally and externally and we hope that our journey can provide guidance for others.

Introduction

Flooding in Rockhampton

Rockhampton is situated on the banks of the Fitzroy River – the second largest river catchment in Australia. The 140,000km² catchment includes the Dawson, Mackenzie, Comet, Nogoia, Connors and Isaac river systems. The city has a long history of flooding, with records dating back to 1859. The 1918 flood peaked at 10.1m at the Rockhampton gauge and is the largest on record – isolating the city for six weeks. The next three largest floods peaked at 9.4m, 9.3m and 9.2m in 1954, 1991 and 2011 respectively.

Unlike most urban centres in Queensland, flooding in Rockhampton is characterised by extended flood peaks that persist for weeks rather than days. The duration of flooding increases both the economic and social impacts on the Region.

The 2011 flood wreaked devastation on Rockhampton and isolated the city by cutting all road, rail and fixed-wing air access. The flood waters closed the Bruce and Capricorn Highways for 13 days, not only affecting residents and businesses in and around Rockhampton but also severing critical supply lines to and from 750,000 people in North Queensland.

Approximately 5,311 properties across the Rockhampton Region were damaged including more than 2,800 residential properties, 500 commercial and industrial properties, and critical community facilities.

Flood Management Strategy

The Fitzroy River is a key feature and important resource for our Region. Our local area also features a number of significant creek catchments, many of which provide an attractive natural backdrop for urban areas. While we enjoy the benefits of our rivers, creeks and catchments, they are also subject to periodic flooding. The result can have devastating impacts on people, property and the local economy.

Council and the community have a central role in planning and responding to flood events. The objective for Council is to continue to improve and expand our community's resilience to natural disasters.

Improving flood risk management takes considerable time, cooperation and financial resources. Council is committed to working through these essential processes both in the short and long term. Flood planning and responses will evolve and improve over time and progressively lead to a more flood resilient community.

The Flood Management Strategy outlines how Rockhampton Regional Council intends to work toward improving community resilience and better respond to flooding in the future. We must employ a combination of measures including land use planning, building controls, flood management infrastructure, early warning systems, community awareness and fine tuned emergency management protocols.

Council's role in flood management involves:

- Development Control: Ensuring development is appropriately located and is resilient to flood hazards;
- Resilient Infrastructure: Developing and maintaining flood mitigation infrastructure and infrastructure resilient to flooding;
- Building Community Awareness: Ensuring that flood impacts are understood and flood information is available; and
- Disaster Planning and Management: Achieving a balance of prevention, preparedness, response and recovery.

Project Description

What is proposed

Given recent weather patterns and climate forecasts, Rockhampton will suffer from serious flooding again and perhaps more frequently and there is a clear and compelling

case for a flood levee in Rockhampton. A levee would significantly reduce the threat to lives and the risk to private property and public infrastructure, and reduce the debilitating and enduring economic impacts of flooding.

Rockhampton needs to be proactive in mitigating the impacts of flooding. It is clear that a flood levee will protect thousands of homes and businesses, and reduce damage to infrastructure during significant flood events.

There is evidence that centres such as Tamworth, Goondiwindi and Launceston are reaping the benefits of levee banks. Experience in these centres show the costs have been returned several times over in negating the need for flood repair and recovery works.

The South Rockhampton Flood Levee was first identified in the Rockhampton Flood Management Study 1992, in which a range of flood mitigation options were evaluated.

This comprehensive analysis of flood mitigation options, undertaken in 1992, identified the South Rockhampton Flood Levee as providing the most cost effective solution. Flood modelling of the levee was updated in 2011 and 2014 and confirmed that whilst it will have some impacts on the surrounding floodplain these impacts were limited.

The levee will increase the flood immunity of the Bruce Highway through South Rockhampton and remove the need to raise parts of Lower Dawson Road (Bruce Highway), which starts to be inundated at a flood gauge height of just 8.0 metres – equivalent to a 10 year flood. Raising this 1.5 km section of Lower Dawson Road is estimated in the Fitzroy River Floodplain and Road Planning Study 2011 to cost between \$35 million and \$40 million.

Updated estimates indicate the South Rockhampton Flood Levee will cost \$50-60 million.

The renewed emphasis by all levels of governments on flood mitigation following major flooding in 2011 and 2013, combined with the technical assessments undertaken and a unique combination of benefits generated from the proposed South Rockhampton Flood Levee, provide a real opportunity to move from planning to detailed design and delivery of this project.

A number of projects under way and planned for the Bruce Highway will improve access to Rockhampton when future flooding occurs. The South Rockhampton Flood Levee will provide the final link in keeping the Bruce Highway into and through Rockhampton open.

The South Rockhampton Flood Levee will be 7.2km long, running from the Rockhampton CBD to the Bruce Highway at Upper Dawson Road. It will primarily be constructed as an earth embankment with flood gates and pumps to accommodate internal drainage. It will be constructed to provide 1% AEP flood immunity and protect an area of 724 hectares.

The levee will be largely constructed as an earth embankment. It will be designed and constructed to protect the area inside the levee from flooding from the Fitzroy River. The levee will be fitted with flood gates that will be open when the river is not in flood to allow local rainfall events to drain normally.

The levee will provide necessary improvements to the flood immunity of the Bruce Highway through Rockhampton, protect critical infrastructure and reduce public health and environmental risks, protect highly vulnerable communities, substantially mitigate the commercial and economic impacts of flooding in the protected area, and presents potential urban renewal opportunities.

The Benefits

The South Rockhampton Flood Levee will:

- Protect 1,500 properties including 1,000 dwellings, 350 commercial and 150 rural properties;
- Protect private property, public infrastructure and community facilities;
- Reduce direct flood damage by \$1 million per annum and deliver a benefit cost ratio of 1.33 based on this saving alone;
- Lead to substantial insurance cost savings for residents and businesses;
- Mitigate the impact of flooding on business operations, revenue and 3,000 jobs;
- Reduce public health and safety risks associated with flooding;
- Ease the financial and emotional burden of flooding on a socioeconomically disadvantaged community;
- Offset \$40 million in works remaining to flood proof the Bruce Highway through Rockhampton;
- Mitigate the substantial impacts to the Central and North Queensland economy of flooding of the Bruce Highway (estimated to be \$80.7 million from the 2011 flood);
- Provide a pedestrian and cycle link between the Rockhampton CBD and Botanic Gardens; and
- Provide urban renewal opportunities close to the CBD.

Flood Modelling

Basecase simulations were completed for various flood events to assess flood behaviour prior to construction of the SRFL. Maps showing the peak depths and flood extents, peak water surface elevations, peak velocity and peak hazard for the Basecase simulations were included in a Hydraulic Assessment Report (Volume 2). The Basecase simulations incorporated recent floodplain infrastructure, notably the Yeppen North and Yeppen South projects on the Bruce Highway.

The final levee alignment, configuration and crest levels were developed and further optimised through a comprehensive design and consultation process, including workshops with Council and other key stakeholders. The levee alignment and levels were represented in the TUFLOW Developed Case model and various design event simulations were completed.

Further detailed hydraulic analysis was carried out in order to demonstrate the viability of the SRFL, the likely hydraulic impacts and the hydraulic parameters required for civil and structural detailed design activities.

A number of design flood events were simulated and impacts were summarised for each. Design flood events included the 5% AEP, 2% AEP, 1% AEP, 0.5% AEP, 0.2% AEP, 0.1% AEP, 0.01% AEP and Probable Maximum Flood.

Community Consultation

Elements

Due to the complex nature of the project an integrated proactive methodology was used with four main elements. These are detailed below.

Build awareness of the proposed South Rockhampton Flood Levee

It was fundamental to the engagement of the community that communications would be undertaken regularly, in line with milestones and when relevant information was available.

Initially in July 2013 information was provided to landholders who were considered may be directly impacted by the levee explaining the proposal, the necessary investigations that would take place and a designated contact at Council to discuss any matters or concerns.

A broader awareness campaign was initiated shortly after that focused on what was being proposed, why it was being proposed, where it would be, and what it would protect. To communicate this full/half/quarter page newspaper advertisements were undertaken through the local newspaper, all schools across the region were sent the same information for their newsletters, Regional Voice (on line consultation) members were sent regular information, various local newsletters were provided with ongoing information, media releases were completed and all information was made available through Council's website. This campaign ran from July to December 2013.

In December 2013, the tender was awarded for the South Rockhampton Flood Levee feasibility study. A refocus of the awareness campaign was completed to align itself to when important information would be available from the project team and to build understanding of the proposed flood levee as numerous elements of the project were complex.

Build understanding of the proposed South Rockhampton Flood Levee

A regular gets the facts type of communication was initiated in early 2014 to try and explain numerous elements of the project that were complex. Newspapers and school newsletters were the main message delivery mechanisms.

Once the project team were confident the proposed South Rockhampton Flood Levee was feasible, two main engagement mechanisms were used to further build understanding, the first an interactive Open Day and secondly a comprehensive communication campaign.

The South Rockhampton Flood Levee Open Day was held on the 10 May 2014 with approximately 800 residents attending the event at Littler-Cum-Ingham Park, Rockhampton City. The Open Day was established with 12 information stations that ranged from "where the water will go", "how will it operate", "can we build on a floodplain" all the way to "build your own levee" interactive display. Community members could interact and ask questions of the project team across various disciplines.

The comprehensive communications campaign – "*Let's fix major flooding*" was initiated to build understanding across the entire Region, this consisted of:

- Two "*Let's fix major flooding*" TV advertisements across stations Channel 7, Channel 9 and Channel 10. One advertisement explained what it was, what it

protected, and at a high level where the water went. The second advertisement focused on where it was, and community places that would be protected by the levee. Total TV spots was 772, total average rating points for the advertisements was 1,361 which translates into the community being reached at least 13.6 times across this campaign.

- Two “*Let’s fix major flooding*” brochures sent to every household in the region (2 x 33,100). The first brochure outlined the key elements of the business case for the proposed levee, and the second focused on the design and operation of the flood levee itself.

All information to help build understanding was also placed onto Council’s website, this included maps, diagrams and animations of where the water goes (with and without the levee).

Provide for a community conversation

A variety of techniques were used to help provide a community conversation throughout the engagement. These included:

- Landholder engagements with those directly outside the levee (N=230 landholders) on the Yeppen floodplain. Council proactively engaged landholders outside the levee since July 2013. It was decided that any landholder that may have 7cm or more additional flood water on their property would be in this group and would be engaged more directly. Note that all of these were generally rural properties that would have been already wet in a riverine flood.

In total, seven updates were sent at regular intervals providing key information on the project. Also invitations to one-on-one meetings were communicated with over 90 meetings or telephone conversations undertaken by Council. The consultant also undertook meetings with landholders along the levee alignment, 10 meetings were undertaken in total by the consultant.

- The Community Engagement Register had been undertaken since July 2013. This register was an opt-in engagement mechanism where residents could complete questions, leave their comments and request contact be made to discuss. In total, 166 comments were provided.
- The Mayor undertook numerous community conversations via social media and radio. Also the Mayor held numerous information sessions at various points throughout the project, these included the *Flood Management Strategy* presentation undertaken with Ian Dinham (Chairman, FMA), numerous local leaders information sessions, and also locality based sessions.

Understand whether the community supports the proposal

To understand whether the community supported the proposal two surveys were completed.

Survey of landholders that will pay a special charge per year within the levee

Landholders that would be required to pay a regular special charge to help fund the construction and the ongoing operation of the levee were sent a survey asking whether they supported the construction of the levee on the basis that they would be required to pay a certain amount each year. This was sent to owners of 1000 assessable properties within the defined area from the start of May and ended at the start of June.

Random telephone survey of Rockhampton Regional Council area

In total, 423 random telephone surveys were independently completed by CQUniversity. The sample collected was based on obtaining a statistical level of confidence with a random stratified cross section of the Rockhampton Region according to the ABS Census demographics collected in 2011 based on location, age and home tenure. The key questions asked in this survey were if community members supported the concept of the levee irrespective of how it was funded "AND" whether they supported the levee if the main proportion of it was funded by those that would benefit.

Findings

Survey of landholders that will pay a special charge per year within the levee

This survey essentially asked one question, that being; based on the fact that a special charge was to be paid each year for 20 years by the property owner if the proposed levee was built would they support the construction. This was sent to owners of 1000 assessable properties within the defined area in 8 May 2014 and fieldwork ended early June 2014. The defined area was the traditional Q100 flood inundation area that would be protected from a 1% AEP flood event by the proposed South Rockhampton Flood Levee. It was determined that if a landholder received more benefit from the proposed levee, then the amount of the special charge should reflect this, also a difference between residential and commercial properties was established.

There were five different rating categories which had a proposed annual special charge:–

- Residential 2% AEP - \$150 per year,
- Residential 1% AEP - \$80 per year,
- Non-residential 5% AEP - \$500 per year,
- Non-residential 2% AEP - \$400 per year, and
- Non-residential 1% AEP - \$300 per year.

The surveys sent reflected the special charge that would be required to pay for each assessable property that a landholder owned.

At the due date (6 June 2014), 467 responses had been received from 1000 assessable properties. This represented a 46.7% response rate and a confidence level of 95% +/- 3.31% - a strong response and confidence rate. The results showed that 64.2% supported the construction of the flood levee.

Across residential and commercial properties there was the following support:

- Residential in the 2% AEP and 1% AEP flood area – 64.8% support
- Special charge of \$80 or \$150 per year respectively
- Commercial in the 5% AEP, 2% AEP or 1% AEP flood area – 62.3% support
- Special charge of \$500, \$400 or \$300 per year respectively

Random telephone survey of Rockhampton Regional Council area

The independent telephone survey was completed by CQUniversity's Population Research Laboratory (PRL) and was to understand the community's perception of the proposal.

To guide the number of respondents required for the sample a confidence level calculation was completed. A sample that had a confidence level of 95% with a confidence interval of +/- 5% on a population of 82,551 was used. This calculation indicated a sample of 382 was required. To ensure that this sample was broadly representative of the Rockhampton Region, other quota control mechanisms were used to broadly match the Australia Bureau of Statistics representation of the Region such as location, age and home tenure.

In total, 423 random telephone surveys were independently completed by CQUniversity with demographics being broadly representative of the community with a slight skew towards older persons, those that own property in the Region and those persons that lived in North Rockhampton.

Key results

Two key questions were asked to understand the level of community support:

Question: Would you support the flood levee irrespective of how Council funded its share of the cost of the levee?

Question: Would you support the levee if Council's cost was primarily paid for by those that have property inside the levee, with all other ratepayers contributing around \$10 from the general rate?

By condensing these two questions together, support for the levee can be understood.

Answers condensed	Number	Percentage	
<i>Support both options</i>	98	23.2%	
<i>Support one of the options</i>	178	42.1%	65.3%
<i>Support neither option</i>	106	25.1%	
<i>Unsure/unsupportive</i>	41	9.6%	34.7%

Awareness

Question: Are you aware of the proposed South Rockhampton Flood Levee?

Analysis: An exceptionally high level of awareness (96.5%) of the proposed South Rockhampton Flood Levee. Those that did not know or were unsure came predominantly from North Rockhampton.

Question: Are you aware that the Rockhampton Regional Council is investigating infrastructure options to mitigate flooding for other areas in/around North Rockhampton?

Analysis: The percentage of unawareness (37.1%) tended to be across all demographic groups including those living in North Rockhampton.

The benefits and opportunities

Questions were asked of all respondents on their views of potential benefits and opportunities the South Rockhampton Flood Levee could provide to the Region.

As can be seen in the following table the themes of reducing damage and reducing disruptions were the main benefits seen by community members.

Views on the potential benefits of the South Rockhampton Flood Levee	
Benefits	Agree
Reduce damage to the city	71.9%
Help protect roads and infrastructure	70.0%
Reduce disruptions	69.7%
Highway traffic won't need to be diverted during floods	68.3%
Help protect community members	67.1%
Increase safety from flooding	63.4%
Help protect our economy	61.2%
Improve the city's reputation	54.4%
Help protect jobs	51.8%
Save money in the long run	51.3%
Help bring down insurance premiums	35.0%

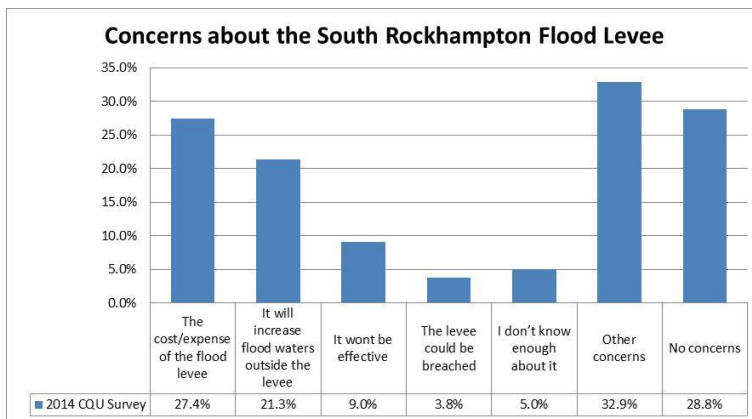
Analysis: For the benefits there was a common trend that younger age groups agreed more with the benefits than older groups. In most cases, the age group that disagreed with the benefits the most was the 65+ age group. There were some benefits that persons on the north side of Rockhampton agreed with more than their southern community members, these were: reduced disruptions, highway traffic won't need to be diverted; and help protect community members. Those that were flood affected were more likely to see the value of the levee in the long run.

Views on potential opportunities of the South Rockhampton Flood Levee	
Opportunities	Agree
Fitness trail, cycle track or walkways could be incorporated	68.6%
Protect the city's road access to the highway	63.4%
A heritage trail linking Quay Street could be incorporated	61.2%
Provide opportunities for improving urban areas in South Rockhampton	58.4%
Viewing platforms for wetlands areas could be installed	57.0%
Provide usable land at Rosel Park for recreation/sports	56.0%
Provide usable land for a sports complex	55.6%
Provide usable land for showgrounds	48.0%

Analysis: A fitness trail rated highly across all demographic groups and in particular those that lived in Allenstown and The Range. Those in Allenstown and The Range also agreed strongly that the levee could provide an opportunity to improve urban areas in South Rockhampton. Persons in Depot Hill had a strong level of agreeance with the flood levee providing more useable land. Those of younger age brackets tended to be more in agreeance with opportunities that related to recreation and fitness.

The concerns across the community

The most common concerns were cost and increasing flood waters outside the levee.

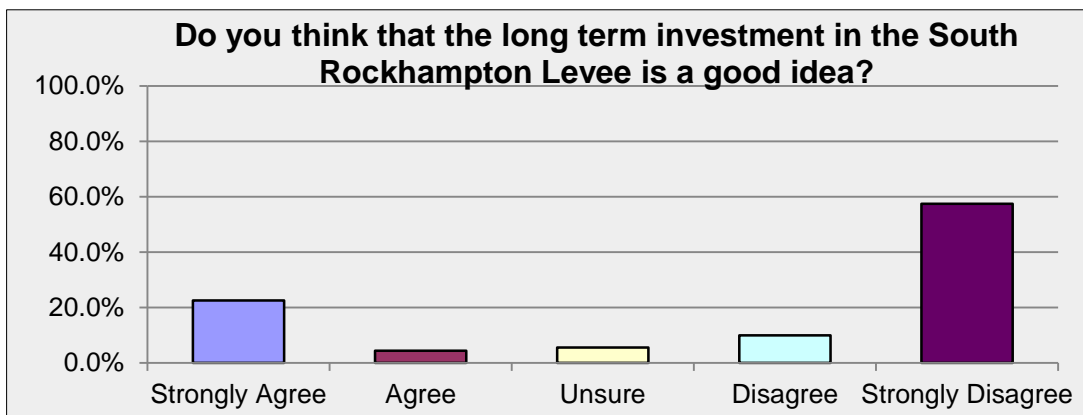


Analysis: Cost and the expense of the flood levee was the main concern across the community with over a quarter of all respondents indicating this. Further analysis provided that those that own a home, those not affected by floods and those that live in Depot Hill, The Range and West Rockhampton were the main drivers of this concern.

Increasing the floodwaters outside the levee was the second highest concern with over 20% of all respondents indicating this. Further analysis provides that for those persons that were older 55-64, and 65+ age brackets, this was a significant concern.

Community Engagement Register Undertaken

166 persons undertook the community engagement register to date. The register asked various questions including closed and open-ended questions.



CE Register Number of responses = 166

Analysis:

There was a strong level of respondents that disagreed (67.5%) with the idea that the South Rockhampton Flood Levee was a good long term investment, many of these persons were located in North Rockhampton. As detailed previously opt-in process may not necessarily reflect a representative view of the wider community.

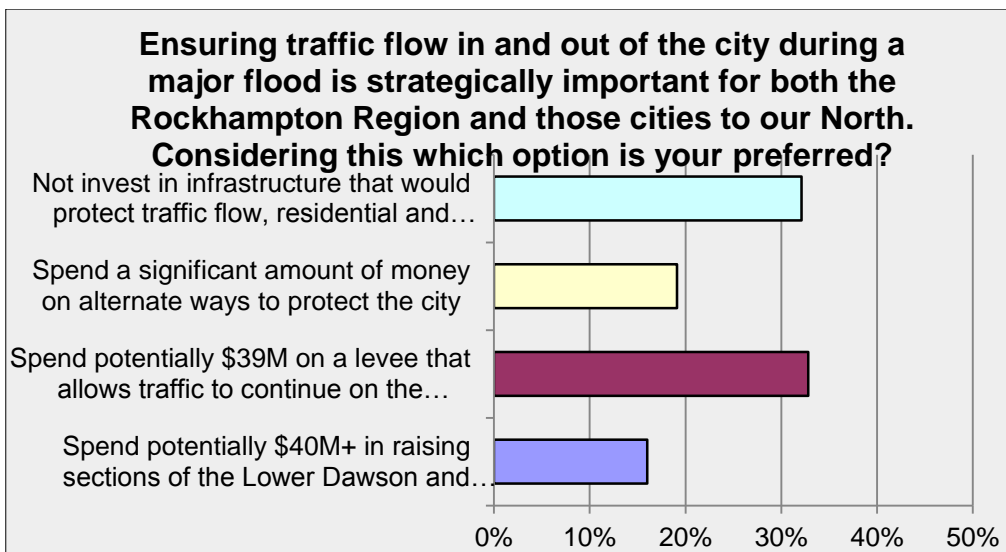
Those that disagreed had the following concerns

1. The displaced water will impact others.
2. Cost of the levee and the maintenance.
3. Rockhampton is on a flood plain.
4. Small amount of the community will benefit.
5. North Rockhampton will be affected.

6. Every flood is different.
7. Residents that bought in the area knew what they were getting into.
8. Other areas need funding more.
9. Drainage system within the levee system will fail.
10. The levee would act as a dam.

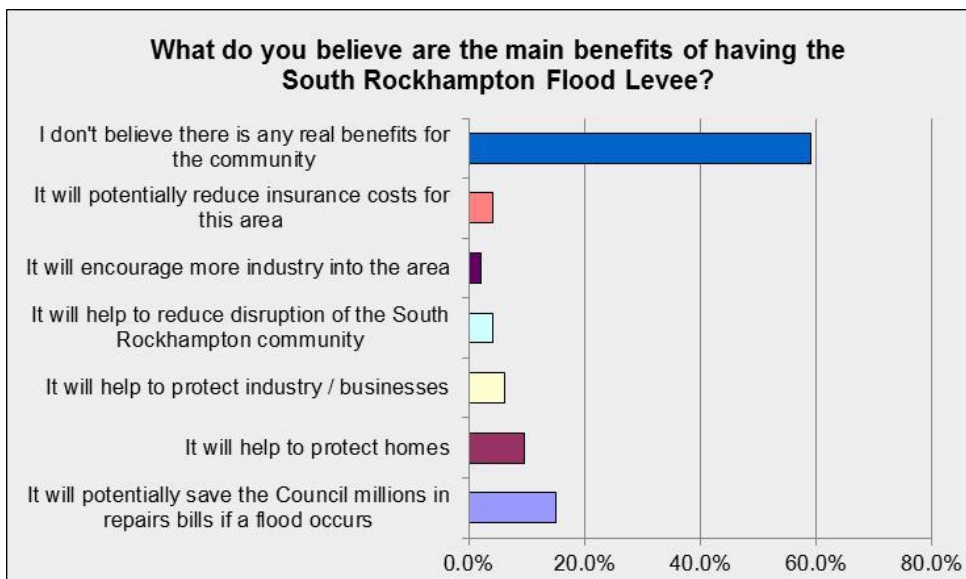
Top Five Answers – What are your initial thoughts of the South Rockhampton Flood Levee

1. A waste of money.
2. A good idea, let's do it.
3. There should be a better way to mitigate against flooding.
4. The levee will provide inadequate protection.
5. Houses should not have been developed there.



CE Register Number of responses = 166

Analysis: Spending a significant amount on a flood levee was still seen as the most preferred method. Those that disagreed with the South Rockhampton Flood Levee being a good investment had mixed views on which was the best option for this question.



CE Register Number of responses = 166

Analysis:

There are 59.2% of respondents that did not believe that there would be any real benefits for the community. These respondents were persons that disagreed with the investment into the SRFL.

Top Five Answers: Do you have any concerns regarding the South Rockhampton Levee?

1. Cost.
2. Properties on the outside of the levee.
3. Every flood is different.
4. Water making its way into the levee area.
5. Not enough planning.

Top five Answers: What are the benefits from having the South Rockhampton Levee?

1. It will give us (the community) better protection.
2. People won't have to move out every time it floods.
3. The city can be developed further in the future.
4. Land values will increase.
5. Would provide for other opportunities into the future.

Conclusion

Community engagement completed for the South Rockhampton Flood Levee was rigorous, detailed and appropriately long (almost a year in total).

The engagement sought to take community members on the journey from having pre-mindset ideas of the flooding situation in South Rockhampton through to having a detailed understanding of what was being proposed, why it was being proposed, where and how it would be built.

This effort was necessary not just from a transparency point of view but also from a funding point of view – no community support, no funding.

How many people loved the levee, probably not too many, however there was community support both from those that were going to have to pay a premium for its protection (64.2% support) and the broader community (65.3% support).

This level of support did not translate into funding as different methods were used by different political representatives that indicated different results. This muddled the waters of what support was out there and therefore prevented a commitment.

What was necessary at the start of the process was to have the funding bodies: Federal, State & Council agree:

- to an engagement/research method that would provide the result of whether the community support the proposal or not – essentially a survey method.
- a formal agreement on what outcomes would occur pending the results of the survey method.

It is hard to love a love but it is only when you don't have one that you realise what you are missing.....