

NORTH BYRON FLOODPLAIN RISK MANAGEMENT PLAN

FINAL







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Project North Byron Floodplain Risk Management Plan		Project Number 117098	
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FOREWORD

The NSW State Government's Flood Prone Land Policy provides a framework to ensure the sustainable use of floodplain environments. The Policy is specifically structured to provide solutions to existing flooding problems in rural and urban areas. In addition, the Policy provides a means of ensuring that any new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

Under the Policy, the management of flood liable land remains the responsibility of local government. The State Government subsidises flood mitigation works to alleviate existing problems and provides specialist technical advice to assist Councils in the discharge of their floodplain management responsibilities.

The Policy provides for technical and financial support by the Government through four sequential stages:

1. ***Flood Study***
 - Determine the nature and extent of the flood problem.
2. ***Floodplain Risk Management***
 - Evaluates management options for the floodplain in respect of both existing and proposed development.
3. ***Floodplain Risk Management Plan***
 - Involves formal adoption by Council of a plan of management for the floodplain.
4. ***Implementation of the Plan***
 - Construction of flood mitigation works to protect existing development, use of Local Environmental Plans to ensure new development is compatible with the flood hazard.

The study and development of the North Byron Floodplain Risk Management Study and draft Management Plan were jointly funded by Department of Planning, Industry and Environment (formerly known as Office of Environment and Heritage) and Byron Shire Council.

1. INTRODUCTION

Byron Shire Council engaged WMA Water to deliver the North Byron Floodplain Risk Management Study (FRMS) (Reference 1) and develop a draft Floodplain Risk Management Plan (FRMP).

The North Byron Floodplain Risk Management Plan (this document) is the third phase of the floodplain management process. It has been developed based on the findings of the FRMS which included a comprehensive assessment of the existing flood risk in the catchment. This included consideration of the flood hazard across the catchment; impacts on existing residential, commercial and industrial properties; road flooding; and, emergency response during a flood event. The FRMS also considered how this risk may change under future scenarios resulting from increased development or a changing climate.

The purpose of this draft FRMP is to provide a long-term path to manage flood risk in the North Byron floodplain both now and into the future. Management options recommended in this draft FRMP have been identified through a detailed evaluation of factors that affect and are affected by the use of flood prone land as discussed in Section 2.

1.1. Study Area

The study area of this draft FRMP comprises the towns of Mullumbimby, Ocean Shores and Brunswick Heads, and the villages of South Golden Beach, Billinudgel and New Brighton.

The FRMS (Reference 1) provides a detailed description of the catchment characteristics including flood behaviour, social characteristics and environmental features. A high level summary is provided in the following sections.

The catchment is predominantly green space made up of nature reserve and rural land for primary production and agricultural purposes. There are six townships within the study area, which comprise mainly low density residential development, light and general industrial and some commercial.

Flooding within the North Byron study area can result from either elevated ocean conditions, catchment flooding, or a combination of both. Historically, flooding has occurred as a result of Ex-Tropical Cyclones or East Coast Lows generating flooding from both mechanisms. Whilst catchment flood events represent the dominant form of flooding in the catchment, low lying areas such as Brunswick Heads are more vulnerable to ocean derived flooding.

1.2. Economic Impact of Flooding

A flood damages assessment was carried out within the FRMS (Reference 1) for the inundation of residential and commercial properties. The assessment was based on surveyed and estimated flood levels for all properties in the study area. The annual average damages for residential and commercial/industrial properties was found to be \$2,667,100.

The catchment, and the resulting economic impacts from flooding, was shown to be sensitive to changes in both future development and climate conditions under the various scenarios assessed in the FRMS.

1.3. Floodplain Risk Management Options

The FRMS includes an investigation of possible options for the management of flood risk in the study area. These included flood modification works such as the construction of levees and significant drainage upgrades, as well as property modification measures and response modification options.

The measures were assessed for their ability to reduce flood risk while also considering their economic, social and environmental impacts. A multi-criteria assessment was used to compare the options, which included the following criteria:

- Economic merits
- Technical feasibility
- Long term performance
- Impact on emergency services,
- Impacts on critical and/or vulnerable facilities,
- Impact on properties,
- Impact on flood hazard / risk to life,
- Community flood awareness,
- Climate change adaptability,
- Community and stakeholder support / impacts,
- Environmental and ecological impacts,
- Legislative compliance, including requirement for approvals
- Financial feasibility
- Compatibility with existing Council plans, policy and strategic direction.

The type of management options and their assigned priority represent the considered opinion of the consultants, Council, the Floodplain Management Committee and the local community, on how to best management its flood risk and its flood prone land.

The results from this assessment are discussed in Section 2.

2. RECOMMENDED FLOODPLAIN RISK MANAGEMENT MEASURES

Each option recommended by the FRMS was assessed using the multi-criteria assessment and the resulting scores and overall rank provided in Table 1.

Table 1: Assessment of Floodplain Risk Management Options

ID	Section	Option	Total Score	Overall Rank
PM04	11.6.4	Flood Planning Levels revised based on the recommendations of the FRMS.	20	1
PM09	11.6.9	Section 10.7 (5) certificates to provide further detail of flood behaviour. Consideration to providing property-level flood information via an online GIS platform.	18	2
RM02	11.5.2	Byron Shire Council and SES to consider the findings and recommendations of the FRMS in the development of the Flood Warning Network for North Byron.	18	2
RM05	11.5.5	Identify key roads and implement automatic warning signs and depth indicators.	16	4
PM06, PM07, PM08 (part), PM10	11.6.6, 11.6.7, 11.6.8, 11.6.10	Council consider updating the DCP to incorporate the recommendations detailed in the FRMS; Provide more detailed guidance on the principles of wet proofing, appropriate design and materials, with direct reference to available guidelines; include a requirement for an assessment of property level protection as part of the DCP2014 planning matrix criteria FL4; Implement the recommendations regarding appropriate fill areas in the DCP2014.	16	4
CDM	11.4.6	Development a whole of catchment drainage model and overland flow path investigation.	16	4
PM08 (part)	11.6.8	Undertake more detailed assessment of properties which may benefit from property level protection	16	4
FDC	11.4.6	Implement debris control measures for Federation Bridge and Billinudgel Railway Bridge.	16	4
RM07	11.5.7	Undertake an Evacuation Assessment for Mullumbimby.	16	4
PM03	11.6.3	Changes to land use zoning should consider flood compatibility based on the recommendations of the FRMS.	16	4
PM01	11.6.1	Further investigate raising eligible residential properties to reduce flood damages.	15	11
SC	12.1.4	Further detailed assessment of Saltwater Creek upgrade assessment and mitigation options for Mullumbimby.	15	11
IC	12.3.2	Form a committee, comprising council, state, emergency services and community member representatives to oversee the implementation of the FRMP.	15	11
RM01	11.5.1	Council and the SES to update the Local Flood Plan based on findings of the FRMS.	15	11
PM05	11.6.5	Revise the Flood Planning Area based on the recommendations of the FRMS.	14	15
RM06	11.5.6	Engage with the community to prepare an ongoing flood education program, with appropriate evaluation by Council and SES following implementation.	14	15
AC	12.1.3	Further consideration of Avocado Court drainage modification.	14	15

PM11	11.6.1	Byron Shire Council compliance team investigate illegal builds south of North Heads Road.	14	15
RW02	11.4.3	Develop a sediment transport model to investigate modification to the rock walls, as part of the Coastal Management Program for the Brunswick Estuary.	14	15
BM	12.1.2	Further consideration of Billinudgel infrastructure improvements.	13	20
WFG	11.4.4	Develop guidance on the design and installation of fencing traversing waterways and channels.	13	20
PM02	11.6.2	Consider establishing a Voluntary House Purchase scheme for eligible properties.	13	20
RM03	11.5.4	More detailed assessment of potential raising of River Street to provide improved flood immunity and evacuation.	11	23
SGBA	11.4.1	Implement the recommendations of the South Golden Beach levee audit.	7	24
NCD	11.4.5	Further consider viable options to implement the recommendations of the New City Road drainage assessment.	4	25

Following this, options have been prioritised based on the ability to reduce flood risk in North Byron, and how readily it can be implemented (and funded, if necessary). The recommended measures are as follows (in no particular order within each priority group).

2.1. High Priority Actions

- Flood Planning Levels revised based on the recommendations of the FRMS. (*PM04*);
- Section 10.7 (5) certificates to provide further detail of flood behaviour. Consideration to providing property-level flood information via an online GIS platform. (*PM09*);
- Byron Shire Council and SES to consider the findings and recommendations of FRMS in the development of the Flood Warning Network for North Byron. (*RM02*);
- Identify key roads and implement automatic warning signs and depth indicators. (*RM05*);
- Council consider updating DCP to incorporate the recommendations detailed in the FRMS (*PM06*);
- Provide more detailed guidance on the principles of wet proofing, appropriate design and materials, with direct reference to available guidelines. (*PM07*);
- Include a requirement for an assessment of property level protection as part of the DCP2014 planning matrix criteria FL4. (*PM08 - part*);
- Implement the recommendations regarding appropriate fill areas in the DCP2014 (*PM10*);
- Develop a whole of catchment drainage model and overland flow path investigation (*CDM*);
- Undertaken more detailed assessment of properties which may benefit from property level protection (*PM08 - part*);
- Implement debris control measures for Federation Bridge and Billinudgel Railway Bridge (*FDC*);
- Undertake an Evacuation Assessment for Mullumbimby. (*RM07*);

- Changes to land use zoning should consider flood compatibility based on the recommendations of the FRMS (*PM03*).

2.2. Moderate Priority Actions

- Further investigated raising eligible residential properties to reduce flood damages (*PM01*);
- Further detailed assessment of Saltwater Creek upgrade assessment and mitigation options for Mullumbimby (*SC*);
- Form a committee, comprising council, state, emergency services and community member representatives to oversee the implementation of the FRMP (*IC*);
- Council and the SES to update the Local Flood Plan based on findings of the FRMS. (*RM01*);
- Revise the Flood Planning Area based on the recommendations of the FRMS (*PM05*);
- Engage with the community to prepare an ongoing flood education program, with appropriate evaluation by Council and SES following implementation. (*RM06*);
- Further consideration of Avocado Court drainage modification. (*AC*);
- Byron Shire Council compliance team investigate illegal builds south of North Heads Road (*PM11*);
- Develop a sediment transport model to investigate modification to the rock walls, as part of the Coastal Management Program for the Brunswick Estuary. (*RW02*);

2.3. Low Priority Actions

- Further consideration of Billinudgel infrastructure improvements (*BM*);
- Develop guidance on the design and installation of fencing traversing waterways and channels (*WFG*);
- Consider establishing a Voluntary House Purchase scheme for eligible properties (*PM02*);
- More detailed assessment of potential raising of River Street to provide improved flood immunity and evacuation (*RM03*);
- Implement the recommendations of the South Golden Beach levee audit (*SGBA*);
- Further consider viable options to implement the recommendations of the New City Road drainage assessment (*NCD*).

3. DRAFT FLOODPLAIN RISK MANAGEMENT PLAN

Table 2 provides further details of all mitigation measures which have been recommended for implementation. The tables describe the purpose of the measure, as well as its priority, cost, timeframe and the party responsible for its implementation.

Further information regarding each option is provided in Section 11 and Section 12 of the FRMS, which also contains measures that were assessed but were not viable for recommendation.

Table 2. North Byron Floodplain Risk Management Study and Plan (Part 1 of 3)

	Option ID (FRMS Report Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
Response Modification Options	RM01 (11.5.1)	Council and the SES to update the Local Flood Plan based on findings of the FRMS.	This FRMS provides useful information to inform emergency planning including an assessment of flood behaviour, isolation, access and movement, vulnerable and critical infrastructure and information to support evacuation planning.	Improved flood planning reduces flood risk to life and property, assisting residents of flood prone areas better prepare themselves and their property for flooding.	There are a number of documents to be updated and coordinated.	SES and Council	May be eligible for NSW Government funding.	Moderate initial and ongoing costs.	High	Moderate
	RM02 (11.5.2)	Byron Shire Council and SES to consider the findings and recommendations of FRMS in the development of the Flood Warning Network for North Byron.	This FRMS produced a range of information useful to emergency services and the development of the Flood Warning Network, including but not limited to, the identification of hotspots, areas with evacuation constraints and findings from the community survey.	Improved warning systems will increase the accuracy and timeliness of flood predictions and improve the communication methods to deliver accurate and persuasive messages during flooding.	Cost and ongoing efforts to ensure the effective development of the North Byron Flood Warning Network. Challenges include change of personnel, difficulty in organising meetings and exercises between flood events.	All response agencies, including but not limited to the NSW SES, Council, NSW RFS, Fire and Rescue, and community organisations.	North Byron Flood Warning Network project is already underway.	Low to moderate capital and ongoing costs, partial funding available	High	High
	RM03 (11.5.3)	More detailed assessment of potential raising of River Street to provide improved flood immunity and evacuation.	An assessment into raising River Street to provide 1% AEP flood immunity including design options that mitigate adverse impacts.	While it is not feasible to raise the road to be completely free of flood, improving immunity along these sections of road will improve access for the local community and would allow for evacuation to flood free land.	Raising of River Street would need to be done in conjunction with mitigation works to avoid adverse impacts to properties in Ocean Shores and New Brighton. Capital costs likely to be significant.	Council would be responsible for construction and maintenance.	May be eligible for NSW Government funding.	Low to moderate capital and ongoing costs.	N/A	Low
	RM05 (11.5.5)	Identify key roads and implement automatic warning signs and depth indicators.	Consider investigating automatic warning signs and depth indicators for the Pocket Road and Sherry's Bridge on Main Arm Road.	Option is considered to mitigate the potential risk of motorists and pedestrians using flooded roads by alerting users of flooded roads.	Ongoing community education on the risks associated with driving through floodwaters is required.	Council would be responsible for construction and maintenance.	May be eligible for NSW Government funding.	TBD (varies depending on product), ranging from \$5,000 to \$20,000.	High	High
	RM06 (11.5.6)	Engage with the community to prepare an ongoing flood education program, with appropriate evaluation by Council and SES following implementation..	Engage with community to prepare an ongoing flood education program, with appropriate methods for program evaluation to be undertaken by SES and Council.	Flood awareness significantly improves preparedness for and recovery from flood events by building a more informed and flood resilient community.	Ongoing efforts to ensure information is not forgotten. Potential for residents to become bored or complacent with messaging.	Council in collaboration with other response agencies and community organisations.	May be eligible for NSW Government funding.	Annual Budget to be determined and allocated.	N/A	Moderate
	RM07 (11.5.7)	Undertake an Evacuation Assessment for Mullumbimby.	Undertake a detailed evacuation assessment for the Mullumbimby township for a range of design events.	Will provide an improved understanding of evacuation capability and capacity in Mullumbimby and identify a location suitable for an evacuation centre flood free up to the PMF.	Costs may be associated with outcomes of assessment.	SES and Council in cooperation	May be eligible for NSW Government funding	Moderate	High	High

Table 3. North Byron Floodplain Risk Management Study and Plan (Part 2 of 3)

	Option ID (Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
Flood Modification Measures	AC (12.1.3)	Further consideration of Avocado Court drainage modification.	Increase the network capacity along Avocado Court, Grevillea Avenue and Pine Avenue (600mm pipe increased to 900mm, 750mm to 1200mm and 900mm to 1200mm). Installation of three (3) additional inlets.	Reduction in above floor inundation and in number of properties affected by flood. In the 1% AEP event, flood levels are reduced significantly in Avocado Court and Grevillea Avenue, up to 0.25m and 0.7m.	Require minor ongoing annual maintenance cost is required.	Council	May be eligible for NSW Government funding.	\$550,000	3.43	Moderate
	BM (12.1.2)	Further consideration of Billinudgel infrastructure improvements.	Infrastructure improvements include: - Lowering of the left embankment of the Billinudgel railway for a length of 60m with a depth varying between 1.5m and 2.5m. - Lowering of the left bank of the creek for a length of 150m with 0.5 - 1.0m in depth. - Removal of the railway bridge infrastructure for a width of 50 m across the waterway area.	Peak levels are reduced over a large area by up to 0.5 m in the 1% AEP event. Provides improved flood immunity to flood prone properties and to Wilfred Street (an evacuation road).	Further investigation and assessment required. Limited impact on properties.	Council	May be eligible for NSW Government funding.	\$850,000	1.47	Low
	SC (12.1.4)	Further detailed assessment of Saltwater Creek upgrade assessment and mitigation options for Mullumbimby	FRMS identifies that mitigation works in Saltwater Creek could provide improved flood immunity for properties in Mullumbimby. Four variations of this option were investigated and a preferred configuration was not identified. Option SC calls for more detailed investigation.	Assessment shows that mitigation works to Saltwater Creek have the potential to provide a reduction in flood levels and improved immunity to Mullumbimby properties.	High capital costs. Modification to the riverbed may affect bank stability and sediment transfer behaviour of the creek.	Council	May be eligible for NSW Government funding.	\$2,820,000	N/A	Moderate
	WFG (11.4.4)	Develop guidance on the design and installation of fencing traversing waterways and channels	Council to consider providing guidance on the design and installation of fencing which traverse waterways. A number of existing agricultural fencing cross the waterways in the catchment area causing blockage.	Ensuring that this fencing is designed so as not to cause an obstruction to flood flow will generally improve the conveyance of this system.	Limited impact on properties.	Council	May be eligible for NSW Government funding.	Internal	N/A	Low
	FDC (11.4.6)	Implement debris control measures for Federation Bridge and Billinudgel Railway Bridge.	Introduction of maintenance policies and debris control structures to reduce the blockage potential at Federation Bridge and Billinudgel Railway Bridge.	Debris control structures encourage debris to align with the bridge opening and prevent accumulation and blockages of debris. Drainage maintenance measures are highly supported by the community.	These structures will collect substantial amounts of debris and require regular and continual maintenance, which can become costly and resource intensive.	Council	May be eligible for NSW Government funding.	TBD (varies depending on structure), including ongoing cost of maintenance	N/A	High
	CDM (11.4.5)	Development of whole of catchment drainage model and overland flow path investigation.	A detailed catchment drainage model of the formal pipe network and overland flow paths should be developed.	Will provide an understanding of the flood risk due to overland flow and provide a model fit for the purpose of investigating localised drainage improvements.	Limited concerns with this option. Costs associated with development of this model however funding options are available.	Council	May be eligible for NSW Government funding.	Low to moderate capital costs, partial funding available	N/A	High

Option ID (Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
RW02 (11.4.3)	Develop a sediment transport model to investigate modification to the rock walls, as part of the Coastal Management Program for the Brunswick Estuary.	A detailed sediment transport model to investigate modification to the rock walls for the purpose of improved sediment transport, as part of the Coastal Management Program Scoping Study for Cape Byron to South Golden Beach.	Will provide an understanding of sediment transport processes due to the rock walls and will investigate options for improving sediment transport in Readings Bay.	Limited concerns with this option. Costs associated with development of this model however funding options are available.	Council	May be partially funded through NSW DPIE	Low to moderate capital costs, partial funding available	N/A	Moderate
SGBA (11.4.1)	Implement the recommendations of the South Golden Beach levee audit.	Audit includes a number of recommendations, predominantly regarding the clearing of vegetation and ongoing maintenance of the levee.	Provide benefits to the South Golden Beach community as a method for providing ongoing maintenance of the levee.	Some costs associated with maintenance of levee. Levee audit notes there may be limitations as the inspection was visual only.	Council	May be eligible for NSW Government funding.	Internal	N/A	Low
NCD (11.4.5)	Further consider viable options to implement the recommendations of the New City Road drainage assessment.	The assessment recommended the construction of culvert outlets with flap gates and upgrade the culvert crossings by maintaining the drainage channel.	Limited reduction on the 0.2EY flood levels and extent however reduce the time water ponds at the site.	Significant cost and ongoing maintenance cost. Limited reduction on the 0.2EY floor levels.	Council	May be eligible for NSW Government funding.	Moderate capital and ongoing costs.	N/A	Low

Table 4. North Byron Floodplain Risk Management Study and Plan (Part 3 of 3)

	Option ID (Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
Property Modification Options	PM01 (11.6.1)	Further investigate raising eligible residential properties to reduce flood damages.	Council should consider formalising a voluntary house raising for the 11 properties identified in the assessment. Option includes raising the 11 identified buildings, to the level of the current day 1% AEP level + 500 mm freeboard. Part of this scheme should include a more detailed investigation into eligible properties	The frequency of over-floor inundation (and hence property damage) is significantly reduced by raising the dwelling above the Flood Planning Level. This option can provide benefits to eligible dwellings without impacting others.	Some residents may not want stairs due to health and mobility issues. Economic viability of this scheme would be directly linked with participation rates. Raised houses could encourage residents to 'shelter in place' during floods, however isolation and long durations of floods put them at high risk.	Council in consultation with flood affected property owners.	May be eligible for NSW Government funding.	\$792,000	1.44	Moderate
	PM02 (11.6.2)	Consider establishing a Voluntary House Purchase scheme for eligible properties.	Council should consider formalising a voluntary house purchase (VHP) scheme for the 15 identified properties. Part of this scheme should include a more detailed investigation into eligible properties.	Removal of properties can help to restore the natural hydraulic capacity of the floodplain and reduces the number of people living in high flood risk areas.	Community appetite for or acceptance of VHP may be a challenge. VHP schemes are long term options and may take approximately a decade to implement.	Council in consultation with flood affected property owners.	May be eligible for NSW Government funding.	High capital and ongoing cost	< 0.1	Low
	PM03 (11.6.3)	Changes to land use zoning should consider flood compatibility based on the recommendations of the FRMS.	Option includes consideration of changes to land use zoning for identified areas in Mullumbimby, South Golden Beach and New Brighton. Update flood hazard overlay maps based on hazard classification and design event modelling in the FRMS.	Appropriate land use planning can assist in reducing flood risk and ensure development on flood affected areas is flood compatible. Progressive zoning can be used to encourage long term change in flood resilience, whilst overly restrictive zoning can discourage redevelopment that is more flood compatible causing areas to degenerate over time.	This amendment to the LEP would require Council to submit a planning proposal.	Council	N/A	Internal	N/A	High
	PM04 (11.6.4)	Flood Planning Levels revised based on the recommendations of the FRMS.	Council to adopt residential and commercial Flood Planning Levels as determined in this FRMS&P: - 2050 Flood Planning Level should be based on the 1% AEP with 0.4 m sea level rise and 10% rainfall increase and 500 mm freeboard. - 2100 Flood Planning Level should be based on the 1% AEP with 0.9 m sea level rise and 20% rainfall increase and 500 mm freeboard.	FPLs are effective tools to reduce property damage to new development and redevelopment. FPLs may pertain to minimum floor levels or flood proofing levels depending on the type of development.	A planning proposal is required to amend the LEP and implement the new FPL. May be considered more onerous for developers.	Council	N/A	Internal	N/A	High
	PM05 (11.6.5)	Revise the Flood Planning Area based on the recommendations of the FRMS.	Adoption of FPA based on 1% AEP with 0.9 m sea level rise and 20% rainfall increase and 500 mm freeboard.	The FPA will provide clear guidance on the properties subject to flood related development controls.	A planning proposal is required to amend the LEP and implement the new FPA definition. Consultation would be required.	Council	N/A	Internal	N/A	Moderate

	Option ID (Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
	PM06 (11.6.6)	Council consider updating DCP to incorporate the recommendations detailed in the FRMS.	A review of the DCP identified some suggestions where further refinement may support the objectives of the DCP and the usability of the document by applicants.	A Development Control Plan (DCP) provides guidelines to support the planning controls in the Local Environmental Plan developed by a council.	A planning proposal might be required.	Council	N/A	Internal	N/A	High
	PM07 (11.6.7)	Provide more detailed guidance on the principles of wet proofing, appropriate design and materials, with direct reference to available guidelines.	The current DCP includes provisions for applying flood proofing, depending on the land use and level of flood hazard. To further support this approach, Council may wish providing further guidance on the principles and appropriate materials, with direct reference to available guidelines.	Significantly reduce commercial, residential property damages, and associated stress and trauma. Reduced burden on the SES to help local residents prepare for floods, and decrease recovery times following floods.	Implementation of measures at time of construction and retrofitting may be considered onerous by developers and homeowners.	Council	N/A	Internal	N/A	High
	PM08 (11.6.8)	Undertake more detailed assessment of properties which may benefit from property level protection and include a requirement for an assessment of property level protection as part of the DCP2014 planning matrix criteria FL4.	These temporary measures include sandbags, plastic sheeting and other smaller barriers which fit over doors, windows and vents and are deployed by the occupant before the onset of flooding.	Cheaper option for existing properties and can be useful where there is frequent shallow flooding. Option can be applied to properties where Flood Proofing Measures are not practical.	Require adequate flood warning time as this option relies on someone to implement it.	Individual properties owners and business owners.	Community resilience grants may be available.	TBD (varies depending on product)	N/A	High
	PM09 (11.6.9)	Section 10.7 (5) certificates to provide further detail of flood behaviour. Consideration to providing property-level flood information via an online GIS platform.	Consider providing greater detail of flood information in Section 10.7(2) and (5) certificates to identify the property's flood hazard, hydraulic category and whether flood related development controls apply using high resolution outputs from this study.	The more informed a homeowner is, the greater the understanding of their flood risk. During a flood event this information can help prepare residents to evacuate and reduces the number of residents that elect to take shelter in high hazard areas.	Limited - s10.7(2) certificates already contain basic information. Council to provide further detail from current FRMS&P results. May increase demand on Council staff, however GIS systems can be established to provide this information efficiently.	Council	N/A	Internal	N/A	High
	PM10 (11.6.10)	Implement the recommendations regarding appropriate fill areas in the DCP2014.	To manage the impacts from cumulative development, Council should consider updating the current DCP to include the recommended controls outlined in the FRMS.	Clear development controls to manage the cumulative impacts from development and an agreed future development footprint that produces an acceptable impact.	Additional scenario modelling is needed to understand specifically which areas of the floodplain are dictating the sensitivity of the catchment.	Council	N/A	Internal	N/A	High

	Option ID (Section)	Option	Description	Benefits	Concerns	Responsibility	Funding	Cost	B/C Ratio	Priority
	PM11 (11.6.1)	Byron Shire Council compliance team investigate illegal builds south of North Heads Road.	Development in the area south of North Heads Road is not permitted due to the risk. However buildings still remain and council should take steps to ensure the development controls in this area are implemented.	The flood risk in this area has been identified as incompatible with development and ensuring this is implemented will reduce the potential risk to life.	Controls may continue to not be followed.	Council	N/A	Internal	N/A	Moderate
	IC 12.3.2	Form a committee, comprising council, state, emergency services and community member representatives to oversee the implementation of the FRMP.	A committee similar to the Floodplain Management Committee through Floodplain Risk Management Process should be formed to ensure actions are implemented and align with the intention of the FRMS.	This committee would ensure actions are investigated thoroughly and would provide the community with a forum to voice their opinions.	Additional governance may delay implementation.	Council	N/A	Internal	N/A	Moderate

4. REFERENCES

1. WMA Water
North Byron Shire Floodplain Risk Management Study
April 2020

2. NSW Government
Floodplain Development Manual: The management of flood liable land
April 2005