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Livestock flood refuge mounds

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This Primefact can help local councils to maintain sustainable primary production and minimise land use conflict when assessing a Development Application (DA) for a flood refuge mound for livestock. The issues and checklist are relevant to small and large rural holdings on coastal floodplains.

Filling rural land to construct a flood refuge on a floodplain typically requires local council consent.

Consent for works in a floodplain may also be required under the *Water Management Act 2000* from the Department of Environment, Climate Change and Water.

This guideline is part of a series that helps streamline the Development Application (DA) process, by setting out the key agricultural issues, impacts and recommendations for consent authorities to consider.

Integrated Development proposals that trigger provisions of the *Fisheries Management Act 1994*, the *Mining Act 1992*, or the *Plantations and Reafforestation (Code) Regulation 2001* should still be routinely referred to the relevant section of the Department of Industries and Investment (I&I NSW).

The guideline may also help applicants, developers and consultants to design effective flood refuge mounds.

The guideline focuses on agricultural issues and does not consider the full range of issues that consent authorities must address.

Flood mound applications, may also require the applicant, or Council to seek additional specialist advice from independent consultants with relevant expertise.

Livestock issues on coastal floodplains

The productive alluvial soils of NSW coastal floodplains can sustain relatively high stocking rates for cattle and other grazing animals. They are also prone to flooding.

Livestock caught in flood flows or fences can be injured or drowned. Exposure to boggy, wet and cold conditions can also be deadly if cattle are unduly stressed or not in peak condition. This is a particular risk for animals stranded on small pockets of higher ground, unable to access feed or clean drinking water.

Dairy cattle may develop mastitis or other health problems and lactating dairy cows may go dry if unable to be milked.

Floodwaters can also damage or remove fodder reserves (eg silage bales) stored on floodplains. Feed shortfalls can also occur if pastures and crops are submerged for more than a few days.

Significant soil degradation and ongoing production losses also occur if hard hoofed animals move across saturated pastures immediately after a flood.

Changing weather patterns and rising sea levels are likely to increase the frequency and severity of flooding in NSW coastal areas.

A stranded coastal dairy Photo: Alistair Hills

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Coping with coastal flood events

Historical larger grazing properties often allowed the farmhouse and farm buildings to be located on higher ground. Farm businesses comprising multiple holdings also provided flexibility to relocate livestock in advance of floods.

The subdivision of grazing properties can alienate flood prone farmland from adjoining higher ground.

In broader coastal valleys the only higher ground for river front farms is the river bank, so this is where the house and farm buildings are located. When the river breaks its banks these areas become islands stranding cattle and people.

In coastal flood plains, an artificial mound of land can provide a **vital temporary refuge for livestock** and is an important part of flood preparedness.

Flood refuge mounds may not be valid for all properties. For instance, consent authorities may not approve a flood mound that significantly affects flood flows, or unduly compromises the capacity for productive agriculture.

Holding livestock in confined circumstances also requires owners to provide additional care and management.

I&I NSW recommends that:

- ☑ Councils and landholders undertake relevant studies to identify flood prone rural lands.
- ☑ Councils prevent inappropriate development on flood prone rural lands. This includes residential development and subdivision that isolates flood prone lands from adjoining higher ground.
- ☑ Flood mounds are used as a temporary or back-up option for coping with floods and do not occupy more than 20% of the property.
- ☑ This guideline is used to ensure an appropriate level of risk assessment, flood mound design and flood preparedness.

Be aware of local flood risks

It is important to know what parts of your property (including any flood mounds) will stay above water at what flood height, and to monitor flood level warnings to allow livestock to be shifted before livestock are stranded.

An approved well-designed flood mound can provide critical temporary refuge, but may not be suitable for all livestock or properties. It may also not be feasible to build a flood refuge mound to cope will all likely flood events.

The benchmark for flood planning is a 1 in 100 year average flood level. The extent of inundation during a 1 in 100 year flood event is mapped when flood studies are prepared for local councils.

Major floods, however, can occur more frequently For example at Kempsey a major flood event corresponds with a 1 in 10 yr average.

The duration of flood events in the local area is also critical for farm management responses.

The extent and duration of flooding on coastal floodplains is highly variable because it depends on the combined effect of; local and catchment wide rainfall, stream flows, the timing of flood peaks in contributory river systems and the impact of floodgates and tidal forces on local drainage.

Local flood studies and stream flow records provide useful information about the relative risks of flood events.

The State Emergency Service (SES) and farm managers with knowledge of local conditions over several decades may also be able to advise about the duration and extent of recent floods.

Good planning avoids livestock loss during floods.. Photo Scott Richards.

Retain access to natural higher ground.

When properties bordering floodplains are being subdivided or rezoned for residential development the farming property should retain sufficient higher land (above the 1 in 100 yr flood level) on which to build critical infrastructure (eg farm sheds) and to hold livestock during floods.

The area of higher ground needed to safely hold livestock during a flood depends on the;

- Number of animals on the property and how long they should be kept off the floodplain
- Type of livestock and grazing enterprise (for instance steer cattle need less space and feed than lactating cows with calves at foot)
- Supplementary feeding options
- Environmental risk factors (eg soil types, slopes, pastures, risk conflict with neighbours).

- ☑ As a rough guide at least 10% of the total grazing property should be of low flood risk.
- ☑ Keep livestock off water logged soils for 2 - 4 weeks after flood waters subside to avoid soil degradation and allow pastures to recover.
- ☑ If sufficient higher ground or flood mounds are not available be prepared to relocate livestock when a flood alert is issued for the locality.

Livestock flood refuge mound checklist

1. Accessibility and welfare.

To ensure appropriate livestock welfare a flood refuge mound must be accessible;

- ☑ Help at risk livestock get to a flood mound as soon as the alert is issued
- ☑ Care for livestock on the mound for up to 14 days until the surrounding soils dry out. They will be distressed and dependant on supplied feed.
- ☑ If uncertain about being able to monitor floods or safely relocate and care for livestock, make *specific, definite* agreements with a suitably capable person (eg a neighbour, farm manager or livestock transport agent) to do this for you.
- ☑ On dairy farms incorporate the dairy bails and feed shed on the flood mound to allow milking and feeding to continue.
- ☑ For other livestock locate the flood refuge mound near the most accessible point of the property (eg close to a formed road, or ridge that 4WD vehicles might access).
- ☑ Improve access to the mound via a formed access track or a compacted, gravel surface.
- ☑ Mark access routes and / or boat landing points.
- ☑ During a flood advise the SES or the local I&I NSW flood response team if you need help to monitor and care for animals on a flood mound.
- ☑ Contact your local Veterinarian if animals are injured or sick.
- ☑ Use the flood mound periodically through the year so livestock become familiar with it.

2. Suitable livestock for a flood mound

Not all animals are suitable for a flood refuge mound. It is also difficult to care effectively for mixed mobs of differing species or age.

- ☑ Flood refuge mounds are most appropriate for dry cows or mares, steers, un-calved heifers and geldings.
- ☑ Seperate horses and cattle on different flood mounds if possible. Alternatively arrange to evacuate the horses when a flood alert is issued.
- ☑ Relocate bulls and stallions from flood prone areas when a flood alert is issued. They are not suitable for holding in confined spaces on a flood mound with other livestock.
- ☑ Cows with calves at foot and mares with foals at foot will be particularly stressed during floods and require special care.

  Ideally they should be moved to higher ground or another property when a flood alert is issued.
- ☑ When moving weaner age cattle and young horses in flood emergencies, if possible have a few older animals accompany them to provide ‘leadership’ and a calming influence.
- ☑ If floods are likely to be frequent or long lasting, identify agistment, or selling options in advance so that stranded animals can be moved from the mound at the first safe opportunity.
- ☑ Consider safety risks for animals and humans before making any decision to move livestock.

Dairy cattle held near the dairy, with feed and water supplies. Photo Alistair Hills,

3. Flood mound infrastructure

Holding yards

- ☑ Design fences and gates so livestock and people can readily move on and off the flood mound as required.
- ☑ Fence the mound to secure livestock and protect waterlogged pastures.
- ☑ Provide basic holding and loading facilities to keep livestock safe from further injury and allow them to be moved off site if need be.
- ☑ If relevant provide separate yards to allow different species to be separated and to allow larger herds to be split into manageable groups of a similar age. A small holding yard is also useful to care for any injured or sick animals.

Feed supplies and storage

Beef cattle require at least 1.5% of their bodyweight in feed daily to survive. Lactating Dairy cows

require about 3.5% of their body weight, if milk production is to be sustained.

- ☑ For small livestock mobs feed supplies might be delivered on a daily basis by boat or vehicle.
- ☑ Lager mobs (esp dairy cattle) need to have sufficient hay or silage stored on the mound in advance of likely floods.
- ☑ Provide a feed trough or 'self feeder' to prevent up to 50% of the available feed being wasted spoilt by trampling and manure contamination.
- ☑ Allow a 300mm length of feed trough for each yearling calf and 400mm for adult beef cattle. This can be reduced to 1m for every six head of cattle if feed is continually available via a self-feeder.[1]

Cattle on a flood refuge with water troughs and yards. However, without feed troughs the hay will be largely wasted. Photo Scott Richards;

Water

Stagnant, subsiding floodwaters may become unsuitable for stock water. Hence, an alternative source of clean drinking water is desirable.

- ☑ Allow 50 litres of water / head of beef cattle for each day they are held and sufficient space to store up to 14 days supply on the mound.
- ☑ Lactating dairy cows require about 120 litres of water per day increasing to 250 litres during hot summer periods.
- ☑ Allow 300mm length of water trough for every 10 head of cattle to ensure all animals can readily access the available water.[3]

4. How Many Animals?

The maximum number of animals to be held on the flood mound is normally the maximum number that can be sustainably held on a flood prone property.

Council might require the applicant to provide independent verification as to the number of animals held on the property. This might comprise;

- ☑ The stated livestock rating on the LHPA (formerly RLPB) assessment for the property
- ☑ A report from an independent farm consultant.
- ☑ If further help is required Table 3 in the Primefact Pastures for Horses indicates the average stocking rates for horse reliant on pasture for feed.
- ☑ A method for calculating the average number of cattle per hectare for coastal grazing properties is provided in the I&I NSW publication Beef cattle stocking rates - Hunter Region

5. How large should the mound be?

The amount of room each animal needs depends on their size and behavioural needs, and to a lesser extent how long they need to be held.[2] Animals need time to adjust to being in a confined space.

Dairy cattle are accustomed to being in very close quarters. Smaller, young cattle also require less space than adult cattle, or cows with calves at foot.

Table 1 summarises the recommended space required to care for livestock on a flood refuge mound in an emergency. These can be inserted in the formulae overleaf to calculate the useable surface area of a flood mound.

Table 1 Recommended livestock factors for coastal flood refuge mounds [1, 2, 3].

Holding Space per head	
Dairy Herds	9 m^2 per head
Young weaner / yearling cattle	12 – 20m^2 per head
Adult cattle	15 – 25 m^2 per head
Horses	40m^2 per head
Feeding Space per head	
Self feeder	0.5m2 per head
Feeding Troughs	0.8m2 per head
Storage Space per head	
for 14 days feed (if required)	3m^2 per head
Watering Space per head	
(if required)	0.5m^2 per head

[1] Australian Model Code of Practice for the Welfare of Animals; Cattle 2004.

[2] National Consultative Committee on Animal Welfare Position Statement - June 1990

[3] NSW Feedlot Manual, NSW Agriculture 1997

To estimate the useable surface area of a livestock flood refuge mound needed for a particular property or paddock;

1. ***Calculate the total Holding space (H)***
   Identify the relevant space for holding that particular type of animal (see Table 1) and multiply by the number of animals of that type

   Use the upper end of the range if cattle are temperamental, not used to close contact or need to be held for longer periods.

   Repeat this for each type of animal to be held on the mound and add the holding space sub-totals together.
2. ***Calculate the total Feeding space (F)***
   Identify the relevant feeding space for the type of feeder used (see Table 1) and multiply by the total number of animals being fed.
3. *If relevant similarly* ***calculate the Storage space for feed (S)*** *and* ***Watering space (W).***
4. ***Add all sub totals together*** **= H + F + S + W**

The footprint of the mound will be considerably larger. Other relevant factors are the height of the flood refuge mound (relates to flood levels) and the angle of side slopes to ensure stability.

It may not always be feasible to build a flood refuge mound of sufficient size to hold all the livestock on a flood-prone property, or a mound that can cope with all likely flood events. So be prepared to relocate livestock when flood alerts are issued.

Case study example;

10 young yearling cattle and 5 small adult cattle who are already in the one mob (ie familiar with each other) need to be held on a refuge mound for 2 weeks. They will be fed using a self feeder. Feed does not need to be stored on the mound. Water will be provided in troughs. From table 1:

Holding space =

12m^2 x 10 yearling cattle	=	120 m^2
15m^2 x 5 small adult cattle	=	75 m^2
H = 120 + 75	=	195 m^2

Feeding space = 0.5m^2 per head .

F = 0.5 x 15 head = 7.5m^2

Storage space for feed = not required

S = 0 x 15 head = 0 m^2

Watering space = 0.5m2 per head.

W = 0.5 x 15 head = 7.5 m^2

Total useable area = H + F + S + W

= 195 + 7.5 + 0 + 7.5 **= 210 m^2**

6. Constructing the mound

- ☑ Avoid fill from unknown sources, it may contain contaminants (eg pesticides, asbestos or heavy metals) that can create environmental or animal health risks and limit livestock trading options.
- ☑ Exclude livestock during mound construction and check for hazards before allowing access. Exposed wire and hard plastics can cause injuries, especially if swallowed.
- ☑ Create a suitable surface by capping the fill with 200mm of compacted clay-based material and filling hollows. Uneven hard surfaces can cause lameness, pool water and cause bogging.
- ☑ The flood mound surface should have a slight slope (less than 4 %) to encourage drainage.[4]
- ☑ Minimise erosion by sowing pastures on the top and sides of flood mounds. On the mid and north coast of NSW the growth habit and feed value of Kikuyu grass is ideal for this.

7. Pasture management

Lower lying coastal areas can be inundated for 2 - 14 days during major floods. Pastures may also be buried by debris and mud. Pasture survival and regrowth will depend on the species and temperatures and depth of coverage.

- ☑ Consult an agronomist or refer to Primefact Pastures options after a coastal flood for pasture advice.
- ☑ Keep livestock off flood sodden pastures for as long as possible to avoid ‘pugging’ and productivity losses. Allow 2 - 4 weeks.
- ☑ A shower of rain to remove mud from leaves is the best means of boosting plant growth.

If necessary use temporary yards to relocate stock during a flood to prevent pasture damage. Photo Scott Richards.

[4] NSW Feedlot Manual, NSW Agriculture 1997

Additional information

The I&I NSW website (www.dpi.nsw.gov.au) has additional information about planning for primary industries, adapting to climate change and best practice guidelines for livestock management and animal welfare.

This includes a section to help landholders prepare for and respond to a flood. This includes various Primefacts and advice to help landholders recover from floods and downloadable transport rebate forms. Relevant guidelines include;

- Flood emergencies: helping your animals.
- Risk management for stock owners in times of fire and flood
- Planning for emergencies - a guide for animal holding establishments
- Emergency assistance for horse owners

Further information on adapting to climate change is also available from the Department of Environment and Climate Change website.

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