



June 2015 Taranaki and Horizons Regions Storm

Primary Sector Impact Assessment

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Disclaimer

This analysis is based on a collation of data, views and opinions from a range of stakeholders. The information was analysed, reviewed and presented to estimate the magnitude of the storm's economic impact. It is an estimate, rather than a statistical survey, and should not be used beyond the provision an indicative assessment of the economic impact of the storm at a farm level.

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Requests for further copies should be directed to:

Publications Logistics Officer
Ministry for Primary Industries
PO Box 2526
WELLINGTON 6140

Email: brand@mpi.govt.nz

Telephone: 0800 00 83 33

Facsimile: 04-894 0300

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1 SUMMARY

The Ministry for Primary Industries estimates the total on-farm cost of the June 2015 storm in the Taranaki and Horizons regions at approximately \$70 million

The purpose of this report, undertaken by the Ministry for Primary Industries (MPI), is to quantify the scale and severity of the June 2015 storm event on the primary industries. The on-farm cost of infrastructure repairs and production losses were assessed for the sheep and beef and dairy sectors, including insurable losses and clean-up costs at commercial rates. Analysis of the impacts on the forestry, horticulture and other primary sectors were limited to direct production losses or replacement costs.

A severe storm moved over New Zealand from 18-20 June 2015, bringing heavy rainfall on 19-20 June in the Taranaki and Horizons regions. Average rainfall totals over those two days were around 100-150 millimetres across both regions with localised areas receiving up to 300 millimetres. Indicative rainfall return periods generally ranged from 20-50 years with higher return periods of 50-100 years in localised parts of the Wanganui and Rangitikei Districts.

The heavy rainfall combined with already saturated ground conditions from a wet autumn caused flooding in some low lying areas and erosion in the hill country. The Whanganui and Whangaehu Rivers topped their banks with river level return periods of 70-100 years.

Approximately 870,000 hectares¹ were subject to high intensity rainfall and potential damage from erosion. An estimated 5000-10,000 hectares were severely affected by inundation. Most of the flooding had abated by day three and caused little damage overall to farmland, but some farms were severely affected.

The mid-winter storm has provided challenges to farmers who were battling wet conditions from April onwards and many would have gone into winter with lower than desirable feed levels. The storm has been followed up by continued rain events which has delayed the ability for many farmers, particularly in the hill country, to assess the impacts on their farms and begin the recovery process. It will take many months, if not years, for farmers to fully recover from this storm.

Sheep and beef

The greatest impact of the storm is on sheep and beef farms due to landslides and damage to infrastructure. Approximately 460 sheep and beef farms were affected with 100 of those having significant levels of infrastructure damage and lost productive capacity. The estimated on-farm impact is \$57.6 million, with \$37 million in infrastructure damage and \$20.6 million in production losses.

A small number of farms with 'severe' damage have been more impacted than most due to extensive damage to tracks, fencing and bridges or crossings. Damage on these farms could be more than \$500,000. Throughout both regions a large number of bridges and culverts need to be repaired or replaced, with many damaged by forestry slash.

¹ A draft GNS Science report (21 August 2015) prepared for Horizons Regional Council, overlaid with FarmsOnLine data, indicates 870,000 hectares were subject to erosion.

Damaged fences and wandering stock reduce the ability to control pasture utilisation and reduces productivity. Some farmers have been unable to move stock due to landslides preventing normal seasonal work such as shearing and scanning ewes. A number of farmers providing dairy grazing had to return cows and in-calf heifers three to four weeks early through the normal wintering period.

Dairy

Dairy farms were mainly impacted by silt from flooding with an estimated on-farm economic impact of \$6.4 million. Approximately 236 dairy farms were affected overall with 36 having moderate to significant levels of damage to farm infrastructure and pasture. There was little disruption to milking on winter milking farms and the timing of the storm will have little impact on the regions annual milk production. Farmers will focus on clearing silt, repairing fences and recovering pastures heading into spring. Cows will be calving through this recovery period bringing further stress and challenges to dairy farmers, who are also coping with a low forecast payout and poor cash flows.

Forestry

Landslides impacted several young forests less than five years old, bare land prepared for planting and forestry infrastructure. The storm damaged approximately 800-900 hectares (one percent) of plantation forest area. Replanting activity will be determined by the scale of impact and accessibility at each site, with re-establishment of damaged forests estimated to total \$1.2 million. The impact assessment does not include damage to forestry roads and infrastructure.

Horticulture

There was little damage overall to the horticultural sector. Fewer than 20 fruit growers and approximately 600 hectares of market gardens were affected by flooding and surface water to a greater or lesser extent. A small proportion of potato crops and near-to-harvest green vegetables were lost to silt, waterlogging and bacterial contamination. A small number of kiwifruit and pear orchards had areas of silt deposits of up to 30 centimetres deep. Removal of deep silt is a challenge, particularly in kiwifruit orchards as the vine support structure limits machinery access. The cost of horticulture crop losses is estimated to total \$1.2 million. The impact assessment does not include clean-up and infrastructure repair costs for horticultural properties, nor any financial impacts from disruptions to vegetable crop schedules.

Government response

Under the Primary Sector Recovery Policy, the Government classified the storm as a medium-scale adverse event (refer to appendices 1-4 for Ministerial Media Releases to date). Funding has been made available to assist the rural farming community recover from the storm to:

- support the activities of rural support trusts to provide coordination, advice and support;
- contract a regional rural recovery co-ordinator;
- build resilience for future storm events;
- assist infrastructure repairs on severely impacted farms;
- provide assistance for clean up through Enhanced Taskforce Green;

- provide access to Rural Assistance Payments for those in extreme financial hardship.

In addition, grants have been made available to regional councils for land management initiatives through the Hill Country Erosion Fund.

Table 1: Summary of the on-farm economic impacts of the June 2015 Taranaki and Horizons regions storm

Sector	Estimated on-farm economic impact (\$ million)	Description of Cost of Damage
Sheep and beef (incl. deer)	\$57.6	100 farms with less than \$50,000 (small) 260 farms with \$50,000-\$150,000 (moderate) 70 farms with \$150,000-\$500,000 (significant) 30 farms with greater than \$500,000 (severe) 460 sheep and beef farms 274,000 hectares effective
Dairy	\$6.4	200 farms less than \$10,000 (minor) 26 farms with \$50,000-\$150,000 (moderate) 10 farms with greater than \$150,000 (significant) 236 dairy farms
Forestry	\$1.2	600 hectares of 1-5 year age class forests damaged 275 hectares of delayed planting
Horticulture	\$1.2	Up to 100 hectares of vegetable crop losses
Apiculture	\$2.5	c. 3000 beehives lost
Total	\$68.9 million	Up to 800 rural properties impacted

2 Introduction

This report provides an assessment of the physical and economic impacts on the primary sectors at a farm level from the storm of 18-20 June 2015 that affected the Taranaki and Horizons (Manawatu-Wanganui) regions.

A severe storm moved over New Zealand bringing heavy rainfall on 19-20 June 2015 in the Taranaki and Horizons regions. Rainfall over the two-day period was 100-150 millimetres on average over the regions, exceeding 300 millimetres in parts of inland South Taranaki and on the Tararua Ranges.

The heavy rainfall combined with already saturated ground conditions from a wet autumn, caused flooding in low lying areas and erosion in the hill country. The flooding in Wanganui was also exacerbated by a king tide which backed up the river flow. The Whanganui and Whangaehu Rivers topped their banks, as did many smaller streams. Incomplete flood protection works resulted in the Oroua River stopbank breaching and severely affecting dairy farms in the vicinity.

Landslides, washouts and floods caused widespread damage to the road network across the regions. The state highway network was damaged in many places. Local roads in 10 local authorities were impacted by the storm. Around 60 percent of roads were closed or partially closed in Wanganui and Rangitikei Districts, and 30 percent of roads were closed in South Taranaki. Many rural roads remain marginal to use and it will take many months if not years to fully repair road infrastructure.

Impacts were felt by farmers across localised parts of the Taranaki and Horizons regions with damage to farm infrastructure (fencing, farm tracks, races, culverts and bridges) and pasture, particularly calving and lambing platforms from silt and landslides. Difficulties accessing large areas of farms remains a challenge due to landslides, and access to several farms remains limited to four-wheel drive vehicles only.

2.1 PURPOSE

The purpose of this report is to quantify the scale and severity of the June 2015 storm on primary industries at a farm level, in the Taranaki and Horizons regions.

2.2 APPROACH

This analysis is based on a collation of data, views and opinions from a range of stakeholders. The information was analysed, reviewed and presented to estimate the magnitude of the storm's economic impact. It is an estimate, rather than a statistical survey, and should not be used beyond the provision an indicative assessment of the economic impact of the storm at a farm level. The approach involved using:

- a) Regional information sources to map the areas impacted by flooding and erosion damage;
- b) Information from, FarmsOnLine, Agriculture Production Statistics, and NIWA to generate aggregated information on land use in the impacted areas;
- c) The GIS team at MPI to produce spatial information;
- d) Beef+Lamb New Zealand information on farm numbers, average farm sizes and livestock numbers;

- e) A series of meetings with key stakeholders to build the impact assessment; and
- f) Stakeholders to review draft findings.

3 Overview of June 2015 storm event

A series of maps are appended to this report and observations are explained in the next few sections. The maps include:

- Map 1: 48-hour rainfall intensity
- Map 2: 48-hour rainfall return
- Map 3: Sketches of affected areas (landslides and flooding)
- Map 4: Land use overlaid with affected areas
- Map 5: GNS Science landslide severity (detailed)
- Map 6: GNS Science landslide severity (simplified)
- Map 7: GNS Science landslide overlaid with 48-hour rainfall return
- Map 8: GNS Science landslide overlaid with affected areas

3.1 CLIMATIC DETAILS

Data was obtained from NIWA² to chart the rainfall intensity and rainfall return periods (a measure of frequency and scale) for the Taranaki and Horizons regions.

Rainfall intensity observations:

- Horizons region: 125-150 millimetres rainfall band from north of Wanganui down to Bulls, east to Ashhurst, and south to Palmerston North. This scales back heading towards Taihape with even bands of rainfall; 100-125 millimetres, 75-100 millimetres, and 50-75 millimetres. Much of the Ruapehu District received 100-125 millimetres of rainfall, with 125-150 millimetres falling on the Tongariro National Park.
- Taranaki region: 200-300 millimetres rainfall fell on Egmont National Park, scaling down to 125-150 millimetres in central Stratford District. Generally 100-125 millimetres rainfall over South Taranaki District and eastern parts of Stratford District.

Rainfall return period observations:

- 80-100 year rainfall event in a small area centred to the north of Palmerston North.
- 50-80 year rainfall event in the area between Sanson and Ashhurst.
- 50-60 year rainfall event in an area surrounding Wanganui.
- 30-50 year event in the area from the Waitotara River to Palmerston North, and inland past Marton.
- 5-20 year rainfall event in much of the Taranaki Region, Ruapehu District, and northern parts of Rangitikei District.

There is a close relationship between the area in the Horizons Region that received 125-150 millimetres of rainfall and the 40-100 year rainfall return rates.

The heavy rainfall caused flooding, the consequences of which were mainly felt in Wanganui and in rural areas of Manawatu, Rangitikei and Taranaki. The flooding in Wanganui was also exacerbated by a king tide which backed up the river flow. The Whanganui and Whangaehu

² NIWA provided data for 38 weather stations in the Taranaki and Horizons regions.

Rivers topped their banks, as did many smaller streams. The estimated return periods for river levels were:

- Whanganui River: 85-100 year flood
- Whangaehu River: 75 year flood
- Turakina River: 70 year flood

3.2 GEOGRAPHIC AREAS IMPACTED

Information was collected from stakeholders over the 10 days following the storm to create maps showing areas impacted from flooding and erosion. FarmsOnLine information was overlaid to estimate numbers of farms and spatial impact statistics.

A draft report from GNS Science commissioned by Horizons Regional Council, and overlaid with FarmsOnLine data indicates that around 870,000 hectares across the Taranaki and Horizons regions were subject to high intensity rainfall and potential damage from landslides³. The mapping work undertaken by GNS Science reported that landslides were largely confined to areas in pasture, or recently planted or logged forest.

MPI's preliminary estimate of the area potentially damaged by erosion totalled 650,000-700,000 hectares with around 14,000 hectares (two percent of the land area) lost to landslides. The geographic area estimated by GNS Science to be impacted by erosion is similar to the boundaries drawn in the first 10 days following the storm, with additional areas mainly to the east of Hunterville.

The updated estimate of 870,000 hectares equates to 30 percent of the land area in the Taranaki and Horizons regions and is segmented into the following:

- 66,000 hectares (2.3 percent of the regions land area) have severe landslides greater than 10 percent of the land area (6600 hectares total landslides).
- 356,000 hectares (12 percent of the regions land area) have moderate landslides 1-10 percent of the land area (17,800 hectares total landslides at five percent).
- 448,000 hectares (16 percent of the regions land area) have slight landslides less than one percent of the land area (2240 hectares total landslides at 0.5 percent).

There were pockets of flooding from Stratford to Palmerston North, generally located on river systems. A total mapped area of 140,000 hectares had some or all of the land exposed to flooding. An estimated 5000-10,000 hectares have been severely affected by inundation, whereby farmland is under water long enough to destroy pastures and crops and/or become heavily silted.

³ GNS Science report prepared for Horizons Regional Council. Draft report provided to MPI 21 August 2015.

4 Impact Analysis by Sector

4.1 SHEEP AND BEEF

Overview

The on-farm sheep and beef economic impact is estimated to total \$58 million.

Approximately 460 sheep and beef farms are estimated to be impacted in a more than ‘normal winter’ way by the storm event in June 2015. This represents 34 percent of the commercial sheep and beef farms in the Taranaki region and Wanganui, Rangitikei and Manawatu districts. The effective (farmed) area of these farms is estimated at around 270,000 hectares. Based on the percentage of farms affected, the number of stock units on those farms is 1.745 million using the Agricultural Production Statistics⁴.

Table 2: Sheep and beef economic impact assessment summary

Impact	Cost \$	Average impact per farm (based on 460 farms)
General repairs on 100 farms affected to a smaller extent	3,000,000	
Clean-up and silt removal	1,550,000	
Tracks	6,150,000	
Bridges, crossings, culverts, dams, troughs	6,150,000	
Fence repairs	17,500,000	
Pasture renewal	2,650,000	
Total infrastructure impact	\$37,000,000	c. \$80,000
Production impact due to erosion/flooding	14,050,000	
Stock losses	2,650,000	
Reduction in current year's revenue	3,900,000	
Total production impact	20,600,000	c. \$45,000
Total on-farm impact	\$57,600,000	c. \$125,000

Sheep and beef farms impacted

To estimate the number of farms impacted the proportion of farms in the affected areas mapped using FarmsOnLine data was applied to Beef+Lamb New Zealand data of farm numbers by region. Farm numbers were adjusted to reflect that there were farms in the Rangitikei and Manawatu districts impacted by the storm that were outside the mapped areas.

⁴ The GNS Science draft report, overlaid with FarmsOnLine data, indicates 273,500 hectares of sheep and beef farmland and 33 percent of the regions' sheep and beef farms were impacted by landslides of greater than 1 percent.

Table 3: Numbers of sheep and beef farms impacted

Region/district	Total farm numbers (Source: B+LNZ)	Farms impacted (%)	Farms impacted (number of farms)
Taranaki	355	49%	175
Wanganui	179	92%	165
Rangitikei	448	22%	100
Manawatu	379	5%	20
	1361	34%	460

Sheep and beef farm infrastructure impacts⁵

The storm event resulted in significant landslides that damaged access tracks and fences. There was also considerable damage to bridges and crossings/culverts as a result of forestry slash and other debris. Some farms have had more track or fencing damage, or lost more or fewer bridges, crossings and culverts.

Clean-up and silt removal has been estimated on the basis that half the farms would use the equivalent of one team of Enhanced Task Force Green workers for one week, with costs being equivalent to two full-time equivalents over a four-week period.

Track repairs for the 100 most severely affected farms are estimated to require a digger for four weeks initially and one week at a later point (\$24,000 on average); while another 260 farms would require a digger for two weeks initially and one week later (\$14,400 on average). While many farmers have their own equipment there is an opportunity cost associated with its use so this impact is fully costed.

Bridges, crossings and culvert repairs and replacements are a significant costs due to the number of bridges and large culverts lost, predominantly in Taranaki. One Taranaki farm lost a bridge due to forestry slash, which would cost \$700,000 to replace and it was not insurable for replacement cost; however, a cheaper alternative replacement has been proposed. It has been estimated that 50 Taranaki farms lost bridges with varying levels of damage. Some of these were not insurable because they did not have 'sides'.

In addition to 50 farms losing bridges, it is estimated that 15 farms lost numerous large culverts with an average value per farm of \$175,000. A further 345 farms are estimated to have lost culverts with an average cost per farm of \$1500-\$7000. Some culverts were broken but others will just need to be pulled out, cleared and reinstated.

High levels of fencing repairs are required on an estimated 360 farms. Each of these farms are estimated to require an average 2.5 kilometres of temporary fencing and replace on average two kilometres of permanent fencing. This would cost an average of \$48,600 per farm.

Pasture renewal is based on an estimated 3300 hectares with significant silt deposits which damaged pasture beyond recovery.

It is estimated that 100 of the least affected farms will have general repairs averaging \$30,000 per farm to recover from the storm. The infrastructure impact per farm figures above do not

⁵ Note that this assessment does not include damage to buildings, as little damage was reported.

reflect an ‘average farm’ given the variation in total damage or the variation in the different components⁶.

A small number of farms within the ‘severe’ group have been more significantly impacted than most due either to extensive track, fencing or crossing damage. Damage on these farms could be more than \$500,000.

Sheep and beef farm production impact

Table 5: Sheep and beef production impact assessment

Description of impact	\$ million
Impact from erosion and flooding	
Production lost in 2015/16 due to erosion, pasture loss necessitating destocking	5.1
Future lost production due to erosion	7.7
Lost production on flooded/silted land	1.2
	14.1
Stock losses	2.6
Reduction in current year’s revenue	
Reduction in dairy grazing income over four weeks	1.0
Reduction in lamb numbers (@ \$75/hd)	2.1
Reduction in calf numbers (@ \$400/hd)	0.7
	3.9
TOTAL	20.6

The production impact analysis is based on an estimated 28,100 hectares of sheep and beef farmland being impacted in total, the equivalent of 24,800 hectares of landslides (average 54 hectares per farm), and 3300 hectares flooded (average seven hectares per farm). Beef+Lamb New Zealand estimates of the average land area and stock numbers of farms (by farm classes⁷ 3, 4 and 5) were used to calculate the productive land lost to erosion and flooding.

Farmers will reduce stocking rates to match the reduction in feed supply. It was estimated there was a seven percent reduction in stock units on class 3 farms, and a five percent reduction in stock units on class 4 farms. This resulted in an overall 5.85 percent reduction in stocking rate in the first year. This percentage reduction in stock units was applied to Agricultural Production Statistics stock numbers yielding a reduction of 102,000 stock units⁸.

It was reported that many of the landslides were on north facing slopes which are generally higher producing areas. Based on previous experiences it was initially estimated that 20 percent of slipped area would be taken out of production longer term, and the remaining area would take five to 20 years to recover to 75-80 percent productivity. However, stakeholders suggested that most of the slip areas would almost fully recover within five years. The

⁶ One severely impacted farm has estimated that it lost 40 kilometres of tracks, 12 kilometres of fences (\$200,000) and that 25% of its land has slipped.

⁷ Farm class definitions can be found at <http://beeflambnz.com/farm-classes/>

⁸ It is estimated that 6550 hectares (2.5 percent of impacted farmland) is permanently lost to production as an erosion scar. However, this may not result in further production losses as it was not highly productive. Experience from other events shows that, in many cases, stock numbers return to previous levels.

production lost has been assumed to reduce by 20 percent per year and then return to previous production levels.

The analysis assumes that one percent of class 4 effective farmland, and 1.5 percent of class 5 farmland, was flooded. This flatter and highly productive land carries 15 stock units per hectare and productivity is expected to halve due to the delay in pasture re-establishment.

A gross margin of \$50 per livestock unit was used to calculate the impact of the reduced production due to erosion and flooding⁹.

Low numbers of stock were lost during the storm. However, there will be flow on impacts, as the storm impacted the ability of farmers to optimise feeding over winter and during the critical periods around lambing and calving. The analysis assumes one percent of livestock losses, using the Agricultural Production Statistics, and they were valued at Inland Revenue national average market values, averaging \$151 per stock unit.

The storm is expected to reducing lambing and calving rates, and reduce dairy grazing income from animals that were sent back to dairy farms earlier than usual. It was estimated that as a direct result of the event there would be a reduction in lambing and calving percentages of four percent¹⁰.

Sheep and beef farmer responses

The mid-winter storm has provided challenges to farmers, many of whom would have gone into winter with lower than desirable feed levels.

As a result of fencing damage, farmers are unable to control pasture utilisation, which impacts production. Limited management options in terms of shifting stock, potential overfeeding before lambing followed by underfeeding after lambing and additional stress on animals will take a toll on livestock. Pasture covers will be less than optimal for lambing and calving, which will likely lead to metabolic issues and stock losses.

Farmers have also been unable to move stock due to slips and this means they cannot undertake normal seasonal work such as shearing, do lambing beats or in some cases muster stock for sale. Some farmers were not able to scan their ewes, and therefore could not differentially feed multiple-bearing ewes versus those with singles.

Where boundary fences are damaged some farmers will have stock on their neighbours' properties and some have agreed to deal with this by sorting out progeny at weaning.

A number of farmers providing dairy grazing had to return cows and in-calf heifers three to four weeks early through the normal wintering period. This reduces an important source of cash flow.

Some farms were also disrupted by road closures and inability to bring in supplementary feed or to take stock out for sale or slaughter.

The reduction in trading margin from selling lambs and cattle earlier than planned due to lack of feed (or indeed having to hold prime lambs longer than planned due to lack of access) has not been estimated. Similarly the reduction in stock carrying capacity is calculated in terms of its impact on production and gross margins, but not the possible difference between the sale value and the cost of replacement which could be higher or lower.

⁹ This approach was used in preference to calculating the cost of bringing in supplements, as that is not practical in many cases.

¹⁰ A 1 percent change in lambing and calving percentages equates to c. \$0.5 million and c. \$0.2 million in this analysis, respectively.

Some farmers will have bought in feed or used extra nitrogen to lift pasture covers rather than destocking, but in this analysis the impact of reduced feed availability is reflected in the reduction in livestock units. Buying in feed and renewing pastures on slips could be less cost effective options that some farmers may have used.

Farms are also likely to experience increases in sundry repairs and maintenance and vehicle-related costs due to the event and inclement weather over winter and this is not estimated.

Poor winter and spring conditions on some farms may increase costs further and result in more stock losses and reductions in lambing and calving percentages.

4.2 DAIRY

Overview

The on-farm dairy economic impact is estimated to total \$6.4 million.

There are around 33 dairy farms in the Horizons region and three in the Taranaki region that have greater than a moderate level of flood impact from the storm. Of these, around 10 have significant impacts whereby large portions of these farms were inundated for an extended period that damaged pastures.

A further 200 farms are estimated to have low levels of damage, which could be considered typical winter storm clean-up costs associated with farming in these regions.

It must be noted that dairy farms were already suffering from the very wet conditions that plagued both regions from April onwards. Farmers were already making decisions about their herd size as they managed low feed reserves, wet ground conditions, and adjusted to lower payout levels.

Table 6: Dairy economic impact assessment summary

Impact	Cost \$
Stock transport	90,000
Clean-up and silt removal	200,000
Milk production	800,000
Minor damage to 200 farms	875,000
Pasture renewal	900,000
Fence repairs	1,200,000
Tracks, culverts, troughs, buildings	2,300,000
Total	\$6,365,000

Dairy farm impacts

Dairy farms are largely impacted in the short-term through interruption and damage to pastures and infrastructure from silt and floodwaters, and damage to pastures from periods of extended inundation. On the 36 significantly affected farms, it is estimated around:

- 7000 hours of labour is required to clean up silt and debris;
- 86 kilometres of fencing will need to be replaced; and
- 1100 hectares of pasture will need to be renewed.

A large number of farms (200) suffered low levels of damage (\$2500-\$10,000) that is considered normal business risk when farming in these regions, particularly on flood plains. These impacts could arguably be discounted for the purpose of this analysis, however, we have included these impacts in the assessment.

Winter milk production was largely unaffected, with milk collection from four out of 100 farms disrupted for a short period. The winter milking farms are generally in areas that do not flood over winter. One farm north of Marton was unable to have its milk collected for two weeks due to lack of bridge access.

Production is likely to fall on the moderate to significantly affected farms as a result of stress on stock, challenges with feed and a reduction in stock levels. There were mixed views as to

the appropriateness of including a production impact given the existing climatic conditions and economic climate, however, there is an opportunity cost from the loss of pasture. MPI has estimated this could total 200,000 kilograms of milksolids, which equates to 2.7 percent of the total production, or 4.6 percent of production to December, on these farms. The impact across the whole region is very small at 0.08 percent for the season.

The rail line to the Hawera dairy factory was closed for 7-10 days. However, little milk is processed at that time of year in Taranaki and there were negligible impacts on milk transfer or on moving processed dairy products out of the region.

Some areas impacted by inundation were less affected than in the 2004 Lower North Island storm as the floodwaters receded quicker. However, there were some areas not flooded in 2004 that were severely impacted in the 2015 event by a stopbank failure exacerbated by upstream river control works. Around 3000 cows were transported to farms in the region and to some farms out of the region for a short period of time.

There is one milking shed that needs to be relocated (~\$500,000) as the river has undercut the driveway for the milk tanker. This has been excluded from the analysis as the river has gradually been encroaching over 60 years with each subsequent storm event.

Bales of stock feed were lost during the storm, although quantifying this is difficult. These losses are insurable. There will be additional feed costs on the significantly affected farms, although the levels are uncertain, and difficult to separate from the existing feed challenge posed by the wet winter. For the purpose of this analysis MPI assumes the production impact captures the feed deficit through culling cows.

Key farm infrastructure on the significant to severely affected farms was damaged to varying degrees, including farm fences, fencing, water troughs, and buildings. The analysis assumes these losses amount to \$50,000 (moderate) to \$100,000 (significant) for each farm.

Dairy farmer responses

Farmers will decide how to best manage and renew damaged pastures to get yields back quickly, such as using a fodder beet rotation, sowing high yielding short-term pastures, or using damaged paddocks for maize crops. The significant affected farmers might have to bring in feed when for the majority less supplement will be purchased – a typical reaction in tight times.

The low payout will lead to farmers reducing feed inputs and cow numbers as a course of business. Cull cow numbers are up 25 percent, due to seasonal conditions and the economic climate. A number of farmers transported cows to Hawke's Bay and elsewhere for short-term grazing. This was considered to be implementing existing risk management plans on these farms.

Farmers strategically use nitrogen when they can and industry experts considered spring applications will be normal (i.e. no increase in use in response to the storm impacts). Most of the pasture on farms inundated remained alive as water receded within six days. The low temperatures also assisted.

4.3 FORESTRY

The storm damaged around 800-900 hectares (one percent) of plantation forestry out of the 83,000 hectares in the areas impacted by landslides, with costs to re-establish damaged forests estimated at \$1.2 million. Anecdotal comments suggest much of the damage was on north facing slopes. There was significant damage on the following:

- forestry blocks 1- to 5-year-old, estimated to total 600 hectares;
- bare land that had been prepared for planting in 2015, estimated to total 275 hectares; and
- forestry infrastructure.

The economic impact assessment in this report covers only the re-establishment of the damaged 1- to 5-year-old forests at \$2000 per hectare. A number of sources suggest costs can range from \$1200 to \$2800 per hectare, and replanting activity will be determined by the scale of impact and accessibility at each site. Some sites will not be re-established based on economic rates of return.

Where bare land has been damaged, work to establish forests will be deferred, which impacts scheduling of workers/contractors, further preparation work is likely required, and there is a long-term impact on cash flow in regards to a typical harvest cycle. These costs are at the margins and not considered appropriate to quantify.

The damage to forestry infrastructure has not been quantified.

Table 7: Plantation Forestry in Taranaki and Horizons regions

District	Total hectares	1-5 years age class (%)	Estimated hectares 1-5 years
Manawatu District	5,215	9.63%	502
Rangitikei District	22,441	5.90%	1,324
Ruapehu District	48,975	17.72%	1,104*
South Taranaki District	13,589	3.52%	478
Stratford District	7,104	0.31%	22
Wanganui District	28,081	9.23%	2,592
Total	125,405		6,022

Note: *This is 13 percent of the total 8680 hectares of forestry in the Ruapehu District.

Sources: MPI analysis; LUM data v11 (LUCAS New Zealand Land Use Map 1990 2008 2012 (v011); National Exotic Forest Description Report 2014 (MPI).

4.4 HORTICULTURE AND ARABLE

Horticultural crop losses are estimated to total \$1.2 million. MPI has limited its assessment of the economic impact of the June 2015 storm on the horticulture and arable sector to crop losses, primarily for ease and accuracy of analysis. It is acknowledged that growers will incur other costs where clean-up of silt and debris, or repairs to infrastructure are required. There may also be some financial impacts from interruptions to vegetable crop schedules.

The main horticulture and arable crops lost or damaged were winter and spring vegetables, in particular leafy greens (\$300,000), and main crop potatoes yet to be harvested (\$900,000).

The timing of the storm event in June meant that all cereal, summer vegetable and fruit crops were already harvested so the potential for crop damage and loss was much lower. The amount of unharvested maize and potato crops were low. Perennial tree crops such as kiwifruit, apples and pears were dormant. In dormancy these crops are relatively tolerant of flooding in their root zone so tree and vine survival will be good.

Location and type of damage

Damage to horticulture from flooding due to rivers topping their banks occurred south of Wanganui where the Whangaehu River broke its banks. This area is variously described as Mangamahu, Fordell, Whangaehu and Okirae. Otherwise, the damage was due to a combination of:

- a) heavy rainfall;
- b) surface water - in some instances hanging around too long where pumps could not cope, or had failed; and
- c) run-off from higher areas and roads flowing onto cropping land.

A small number of orchards and other horticultural properties (less than 20) south of Wanganui were affected by flooding. Orchards closer to Wanganui and north of Wanganui were reported as undamaged. There was little damage from debris (unlike in the 2004 Lower North Island flood), and silt deposits are generally 1 to 10 millimetres with smaller areas (around two hectares in total) with up to 30 centimetres of silt.

Growers immediately began to remove silt from around the trunks of vines and trees in the severely silted areas to help prevent disease at the base of the trunks. Removal of greater quantities of silt over the medium term is a challenge, particularly in kiwifruit orchards as the vine support structure limits machinery access.

Heavy rain, surface flooding and waterlogging affected vegetable growers in the Horowhenua District and around Shannon and Opiki in the Manawatu District. Impacts are compounded by poor winter growing conditions as soils were already wet from high April and May rainfall, and cold temperatures.

Some properties had fields under water for a week. Small areas of near to harvest greens including lettuce, cabbage and spinach were lost due to silt deposits, bacterial diseases and generally rotting after being waterlogged. This included whole crops and also patches within crops that are otherwise not damaged. Some potato crops still in the ground awaiting harvest will be lost from rots.

Severely damaged crops would be cultivated into the soil once the ground was dry enough to cultivate. Spring crops are likely to be delayed by 10-20 days due to the crop losses to flooding and impact of the combination of conditions on growth rates and planting sequences.

Growers expect some gaps in production during October and November unless there is a warm early spring.

Table 8: Horticulture impacts

Sector	Type of damage	Area Impacted	Estimated cost of crop losses
Kiwifruit, apple and pear orchards	Silt deposits on orchard floor	< 20 orchards	No crop losses Clean up costs not costed
Potato crops	Waterlogging leading to rots; crops unharvested	Circa. 50-75 hectares	\$600,000-\$900,000*
Winter and spring vegetables	Silt deposits and waterlogging leading to bacterial diseases and rotting; crops unharvested	0.5-1.0 percent of the production area of these crops (8-16 hectares)	\$150,000-\$300,000**
Notes: * Value of unharvested potatoes @ \$12,000/ha ** Value of unharvested crops @ \$20,000/ha			

4.5 OTHER PRIMARY SECTORS

4.5.1 Apiculture

At the time of the storm beehives were at their wintering sites, which means some being in low lying sheltered areas with good access for feeding.

It is estimated that up to 3000 of the 25,000 beehives in the Wanganui District have been lost, mainly from flooding. Based on information from MPI's Apiculture Monitoring Reports, replacement hives with honey boxes and bees cost \$600 to \$1000 each. Assuming hive availability, and hence no lost honey production in the 2015/16 season, the cost of replacing 3000 hives is in the region of \$2.5 million.

Manuka blocks for honey production, mainly managed regeneration, are reported to have sustained less damage from slips and landslides than neighbouring pastoral land.

4.5.2 Deer

There are 40 to 50 sheep and beef farms in the affected areas that also have deer (approximately 30,000 head of deer). Farms in the Taranaki region that have deer are mostly located in coastal areas; these areas were not so severely impacted by the storm.

Because of the predominance of mixed farming systems, the impact analysis for sheep and beef farms will also include the impact of the June 2015 storm on the deer sector at a farm level.

4.5.3 Other

Damage from flooding was reported for an individual pig farm and an individual poultry farm in the Taranaki region.

APPENDIX 1: MEDIA RELEASE, MEDIUM-SCALE EVENT

Nathan Guy

23 June, 2015

Medium-scale adverse event declared for primary sector in lower North Island

Primary Industries Minister Nathan Guy has today declared the flooding in the lower North Island as being a medium-scale adverse event for the primary sector.

“The Government recognises that this is a difficult time for many in the lower North Island as they come to terms with the damage caused by the recent floods, as well as the erosion on hill country farms,” says Mr Guy.

“Last night we received a request from regional leaders for support for the primary sector. Declaring a medium-scale adverse event triggers additional Government support for farmers in these areas.

“MPI will continue monitoring conditions very closely. A recovery coordinator will be appointed to coordinate the activities of local Rural Support Trusts and other industry groups in order to provide help where it is most needed, and to provide a liaison point for government agencies,” says Mr Guy.

The areas affected cover the Horizons Region and the Taranaki Region.

“Many rural people can be reluctant to ask for help, but it is important for them to know that support is available,” says Mr Guy.

“An additional \$100,000 of government funding will be available to local Rural Support Trusts, who work closely with farmers, providing support and guidance.

“The Government also recently announced a \$500,000 boost in funding to improve the coordination of rural mental support services, and develop new support programmes and resources for those farmers and communities in great need.

“The Government will be looking to make Rural Assistance Payments (RAPs) available from Work and Income if required. These are equivalent to the Jobseeker Support benefit and will be available to those in extreme hardship.

“Standard hardship assistance is available from Work and Income and flexibility with making tax payments can be set up with IRD through your accountant,” says Mr Guy.

The Minister of Social Development yesterday announced that \$250,000 of additional funding has been made available for establishing Enhanced Taskforce Green teams who can assist with tasks such as clearing debris and repairing fences.

“The effects of this storm are also being felt in the South Island, where farmers are recovering from heavy rain and snow in places,” says Mr Guy.

“Areas of North Canterbury also received their first decent rainfall in months. The South Island Drought Committee continues to meet weekly to ensure appropriate support is in place for farmers and rural communities. These events reinforce the importance of good planning and budgeting, particularly to get through winter,” says Mr Guy.

What are the criteria for declaring a medium scale adverse event?

- There are three levels of ‘adverse events’ – localised, medium and large-scale. These can cover events like droughts, floods, fire, earthquakes and other natural disasters.

- The criteria for assessing the scale of an adverse event are:
 - Options available for the community to prepare for and recover from the event;
 - Magnitude of the event (likelihood and scale of physical impact), and;
 - Capacity of the community to cope economically and socially impact.

APPENDIX 2: MEDIA RELEASE, EROSION GRANTS

Nathan Guy

1 July, 2015

\$8.8m in erosion grants awarded

Primary Industries Minister Nathan Guy has announced \$8.8 million in funding grants over four years to help councils tackle hill country erosion.

“We’ve seen the serious damage that erosion has caused after the severe storm in the Whanganui, Rangitikei and Taranaki regions, both economically and environmentally,” says Mr Guy.

“This funding round is timely, given that \$4.7 million out of the total \$8.8 million is going towards the Horizons Regional Council. This covers the Whanganui and Manawatu regions, which have been badly affected by flooding and landslides.”

The Hill Country Erosion Fund was established in 2007 and is part of the Government’s commitment to improve the sustainability of hill country agriculture. The scheme gives regional councils and unitary authorities the opportunity to submit bids to this \$8.8 million fund every four years.

This latest round saw six regional councils being successful: Northland, Taranaki, Waikato, Horizons, Hawkes Bay and Greater Wellington.

“Severe erosion has the potential to affect more than 1.14 million hectares of pastoral hill country, mainly in the North Island.

“This fund gives councils the opportunity to plan and deliver initiatives over the next four years to tackle this problem. This will include projects like tree planting, farm planning, modelling and targeted treatment works.”

The current round will provide funding that covers 549,724 hectares of erosion prone hill country and is supported by funding from local councils and landowners as well.

The erosion funding is one of a number of initiatives managed by MPI that work to counter erosion and increase afforestation in these vulnerable hill country areas. Other funds include the recently re-launched Afforestation Grant Scheme and the Erosion Control Funding Programme which targets severe erosion in Gisborne.

For more information on HCEF go to <http://www.mpi.govt.nz/funding-and-programmes/natural-resources/sustainable-land-management-and-hill-country-erosion-programme/>

APPENDIX 3: MEDIA RELEASE, RURAL ASSISTANCE PAYMENTS

Anne Tolley, Nathan Guy

7 July, 2015

Rural Assistance Payments for struggling farmers

Social Development Minister Anne Tolley and Primary Industries Minister Nathan Guy say lower North Island farmers struggling as a result of recent flooding are now able to access Rural Assistance Payments (RAPs).

RAPs can be activated after a medium-scale adverse event and cover essential living costs when farmers' income is affected by the event with a payment equivalent to Jobseeker Support.

"We recognise that some farmers are struggling as a direct result of the recent flooding and we want to support them as they work through the clean-up and begin to repair damage," Mrs Tolley says.

"Many rural people may be reluctant to ask for help, but support is available for those in extreme hardship.

"I encourage anyone struggling as a result of the flooding to get in touch with Work and Income to see what support they may be eligible for."

Primary Industries Minister Nathan Guy says local Rural Support Trusts will be coordinating with farmers to facilitate RAPs for those in need.

"The Government has allocated an extra \$145,000 in funding towards these Trusts who do a great job of working with affected communities to ensure they are getting the support they need. This includes funding for a dedicated Rural Recovery coordinator," Mr Guy says.

"Last week we also announced \$8.8 million in funding grants over four years to help councils tackle hill country erosion."

Mrs Tolley has also increased funding for Enhanced Taskforce Green from \$250,000 to the full \$500,000.

"This gives local authorities the option to increase the number of teams from four to eight or extend this support from 14 to 28 weeks," Mrs Tolley says.

Enhanced Taskforce Green covers wages for workers and supervisors employed by local councils to help with the clean-up operation. Local beneficiaries help with cleaning debris and repairing damaged property, fences and infrastructure.

APPENDIX 4: MEDIA RELEASE, EXTRA SUPPORT

Nathan Guy, Nikki Kaye

1 September, 2015

Extra \$2.6m support for storm-affected regions

Minister for Primary Industries Nathan Guy and Civil Defence Minister Nikki Kaye have announced an extra \$2.6 million of Government support for communities worst affected by the severe storm in June.

“Today’s announcement extends the support we can usually draw on to help communities recover from an emergency such as this,” says Ms Kaye.

“This was an unusual event because certain areas were hit a lot harder than others.

“The new support package includes one-off initiatives that take into account the severity of localised damage that occurred in parts of Taranaki, Whanganui and Manawatu.”

Today’s announcement adds to previous Government funding and welfare support, and includes:

- \$1.28 million to help with rural infrastructure repair
- \$457,000 for a Rural Recovery Coordinator, extra psychosocial support and information and advice to help farming communities recover
- additional funding of up to \$500,000 for Enhanced Taskforce Green for further clean-up assistance, taking the amount committed to up to \$1 million if needed
- \$400,000 to help build resilience to withstand and recover from possible future emergencies.

“During my visits immediately after the storm, I saw first-hand the extent of the loss people had experienced, in particular the damage to some farmers’ infrastructure,” says Ms Kaye.

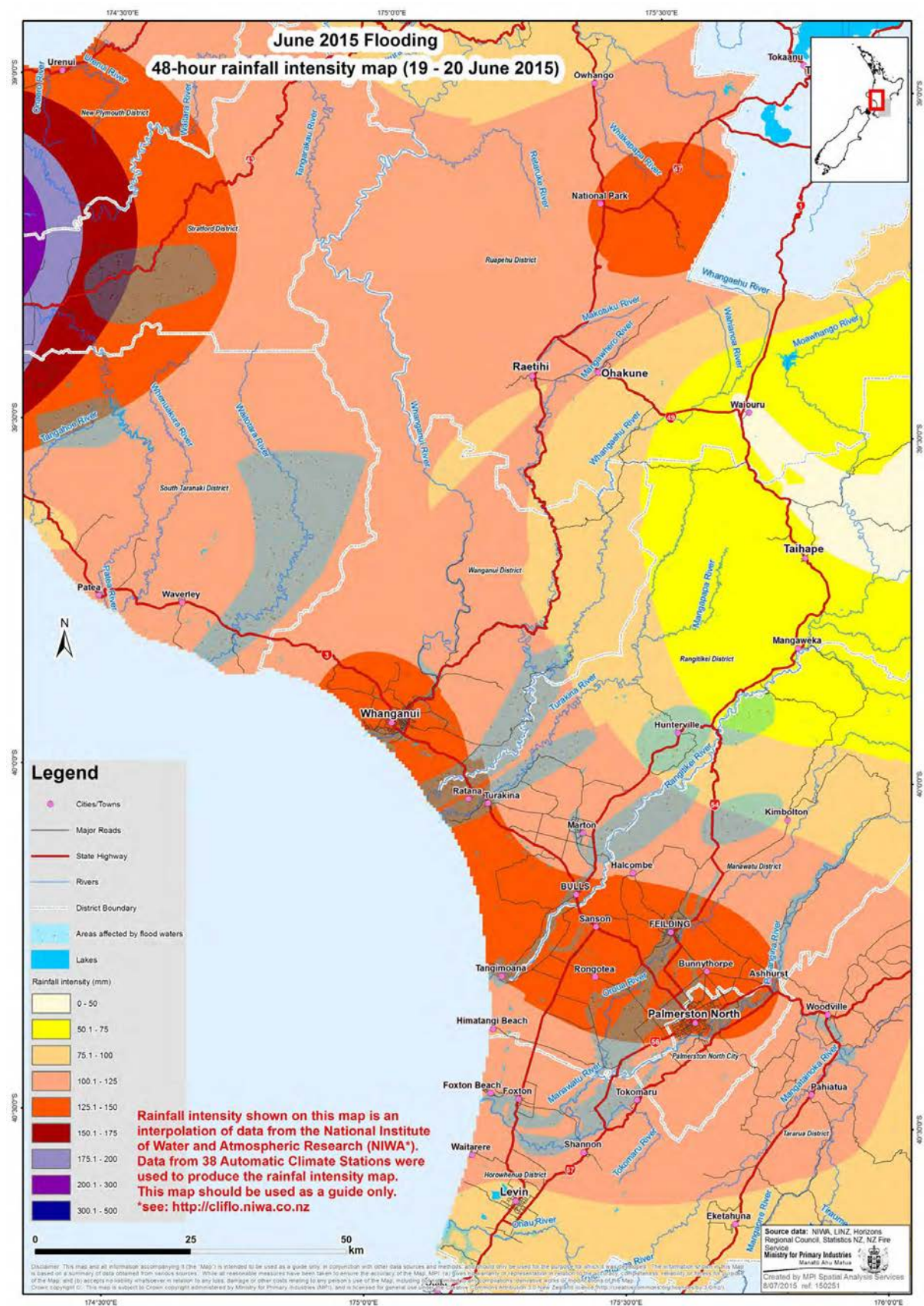
“To help farmers who need to repair essential infrastructure to get back on their feet, \$1.28 million is being made available under today’s package” say Mr Guy.

“The exact criteria for receiving this help will be determined by local authorities, but it could be used towards expenses such as hiring diggers, replacing fences and rebuilding stockyards and farm access roads” says Mr Guy.

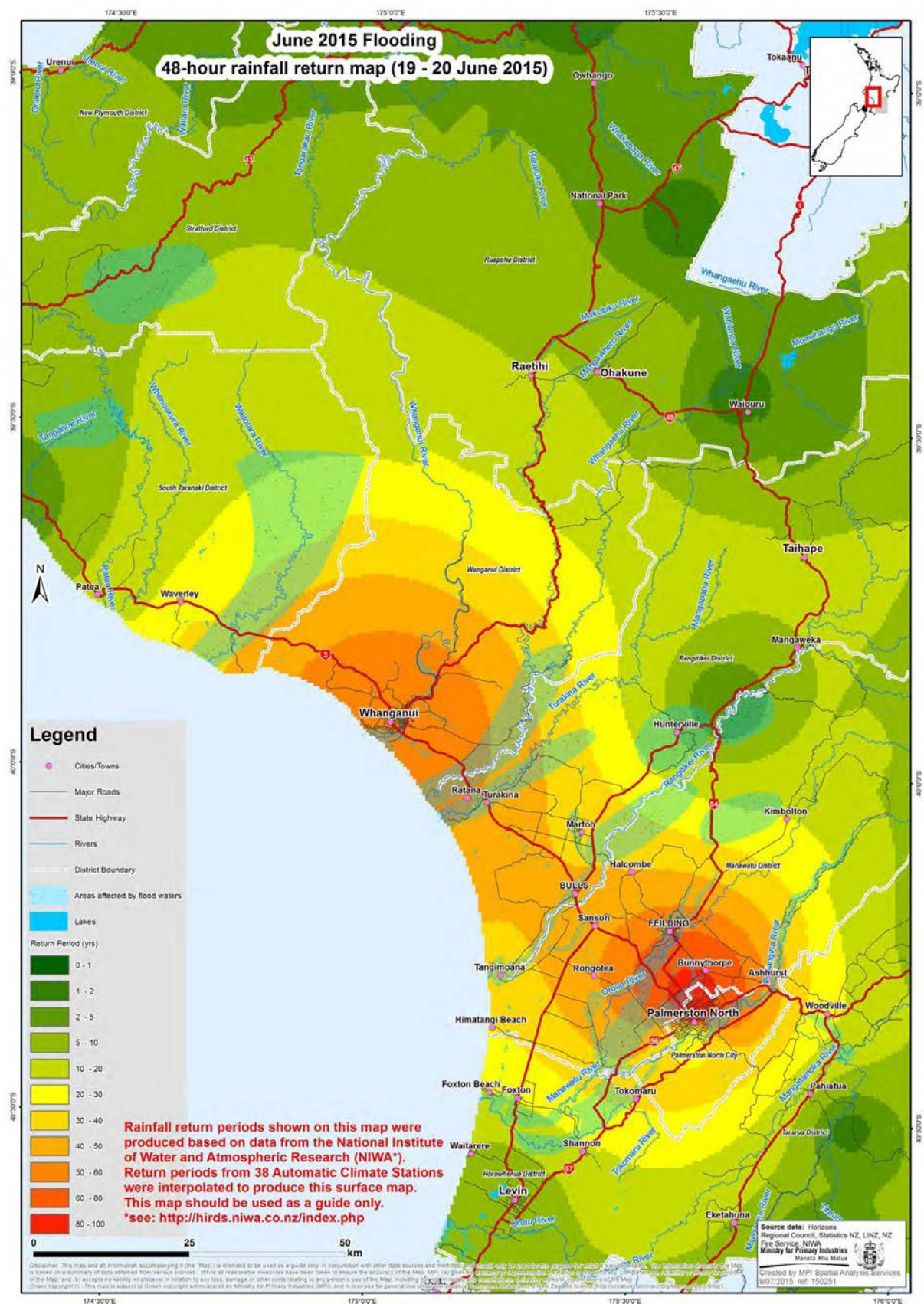
“Just over two months on many people have bounced back, but it was always clear the road to recovery was going to be longer for some”, says Ms Kaye.

“This new package will provide greater support for those still getting back on their feet, and we will continue to monitor the situation and work with mayors, regional groups, businesses and farmers to support their ongoing recovery.”

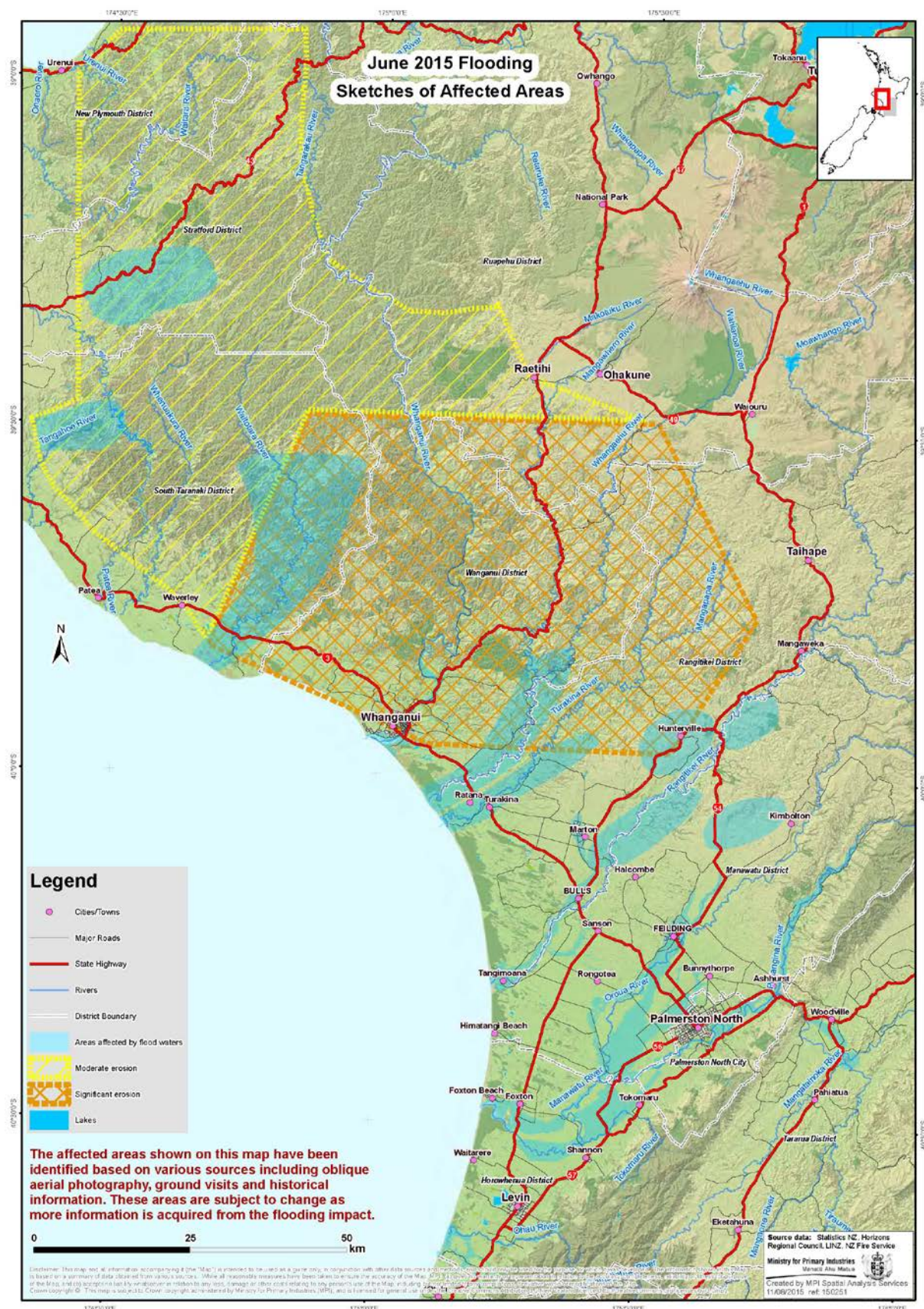
MAP 1: 48-HOUR RAINFALL INTENSITY



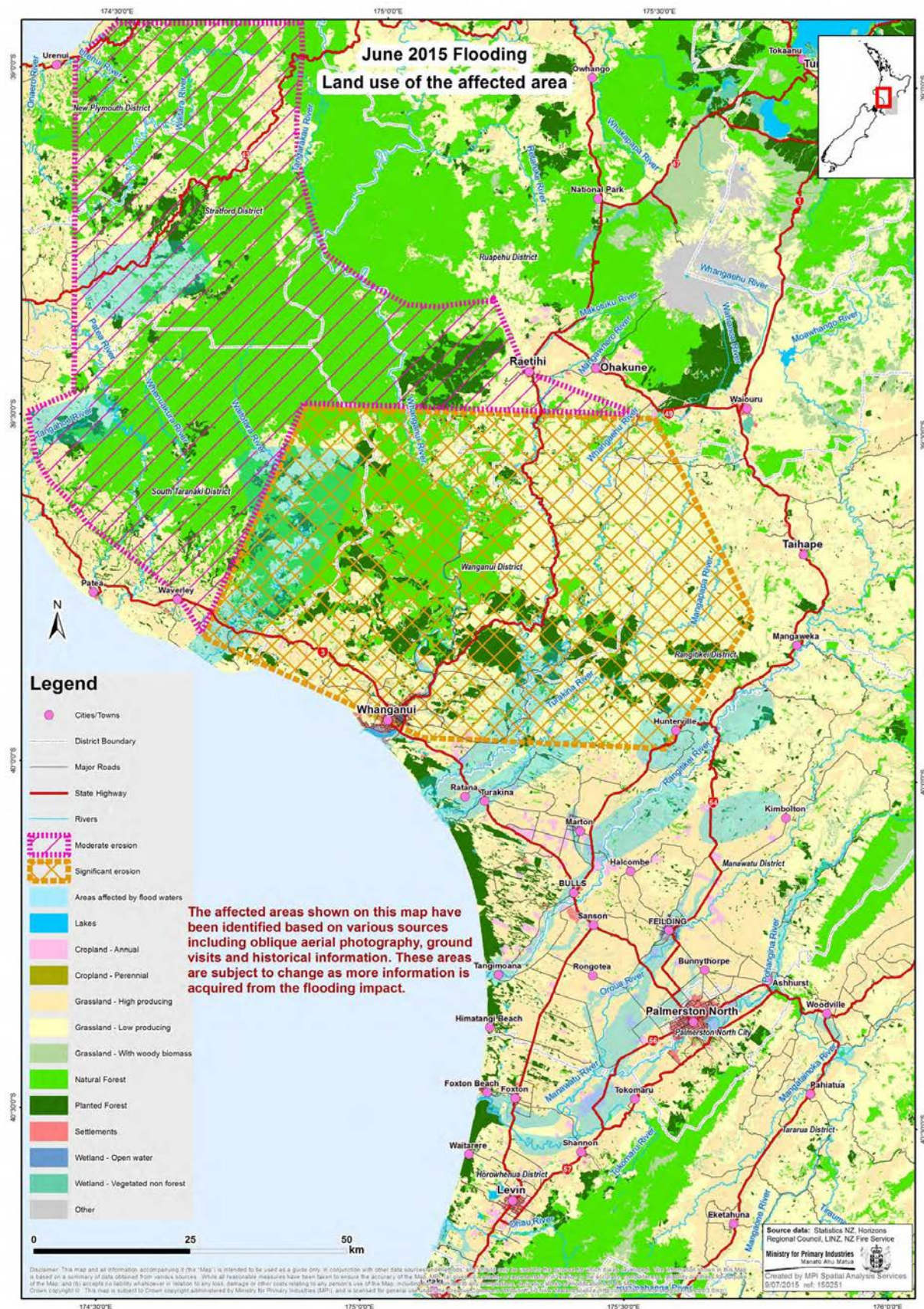
MAP 2: 48-HOUR RAINFALL RETURN



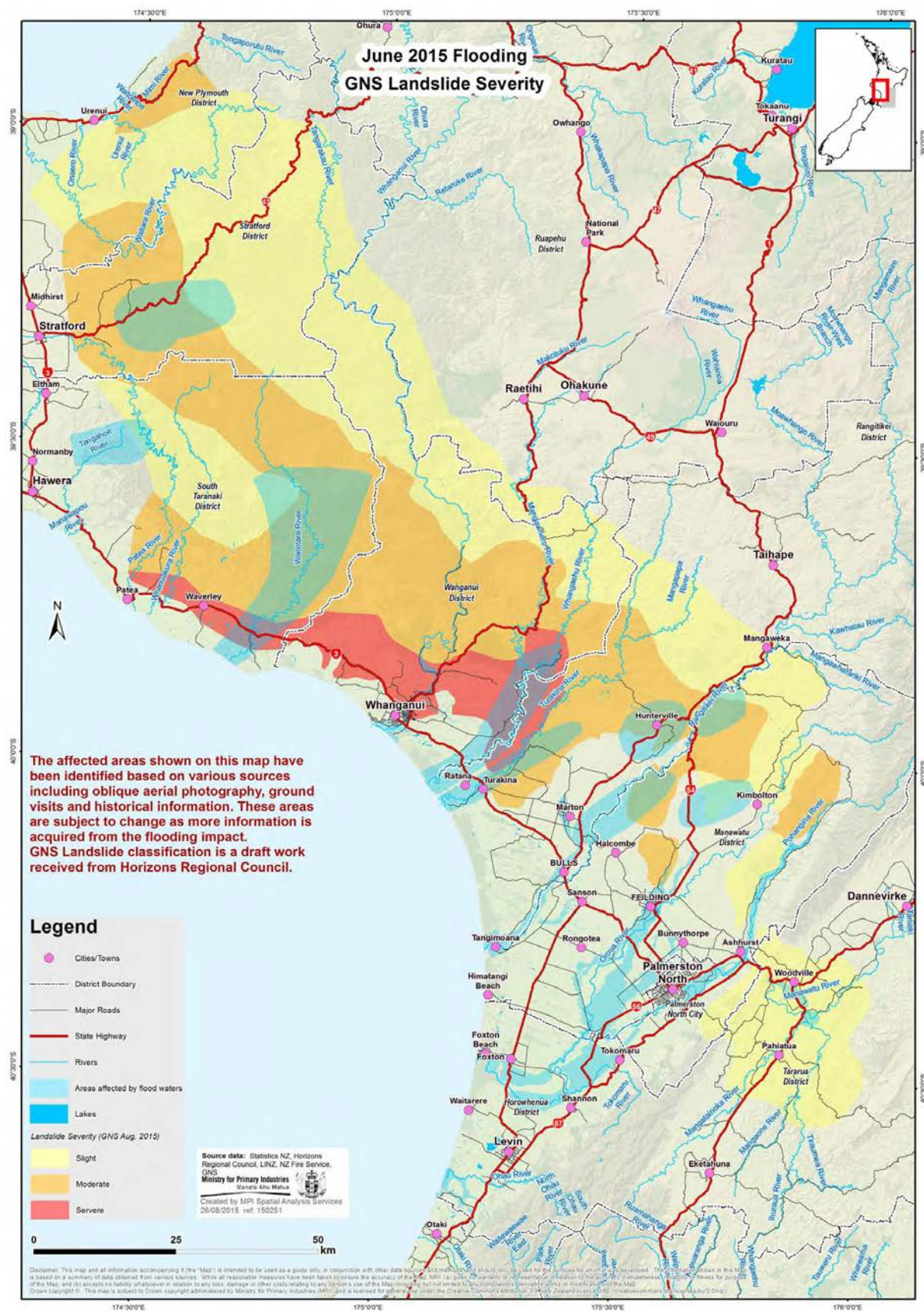
MAP 3: SKETCHES OF AFFECTED AREAS (LANDSLIDES AND FLOODING)



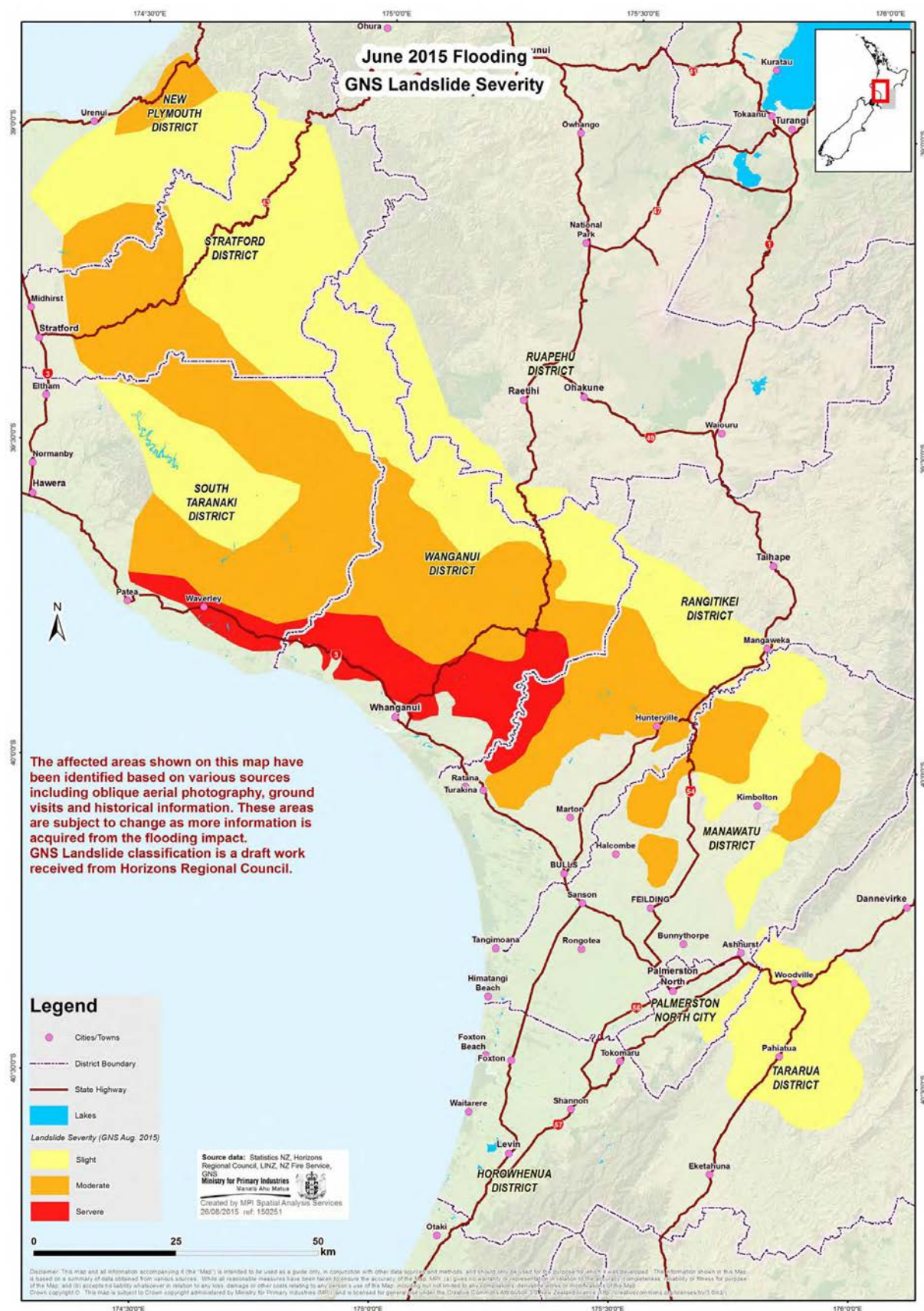
MAP 4: LAND USE OVERLAID WITH AFFECTED AREAS



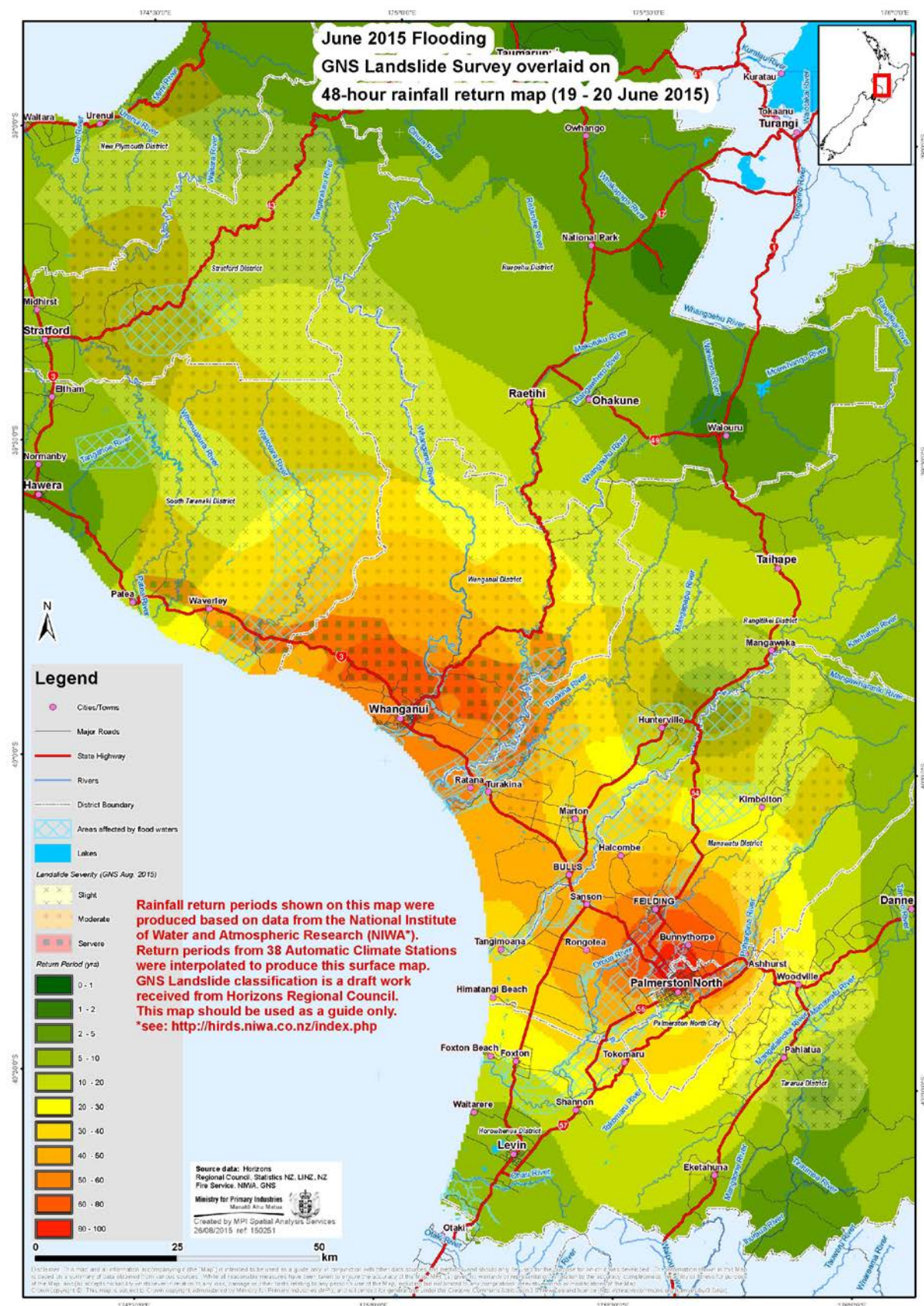
MAP 5: GNS SCIENCE LANDSLIDE SEVERITY (DETAILED)



MAP 6: GNS SCIENCE LANDSLIDE SEVERITY (SIMPLIFIED)



MAP 7: GNS SCIENCE LANDSLIDE OVERLAID WITH 48-HOUR RAINFALL RETURN



MAP 8: GNS SCIENCE LANDSLIDE OVERLAID WITH AFFECTED AREAS

