Summary

Summary

Client report summary:

Key:	CONT-52007-ENDRP-GNS C05X1709-CR-3
Project:	Earthquake-induced Landscape Dynamics
Contract ID:	C05X1709
Investment process:	ENDRP 2017 Endeavour Fund - Research Programmes
Organisation:	GNS Institute of Geological & Nuclear Sciences Limited - Trading as GNS Science
IMS assigned to:	Sarah McDermott
Reporting period:	01/07/2019 to 30/06/2020
Contract total value:	$9,420,932.25
Team:	

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Progress Reporting

Annual Update

2019-20 Annual Update

- **Outcome Benefits to New Zealand:**

Our main highlight this year is that we have now generated Version 2.0 of the 2016 Kaikoura earthquake landslide inventory. This Version 2.0 inventory now contains more than 29,500 mapped landslides triggered by the Kaikoura earthquake. The original Version 1.0 inventory contained only 10,000 mapped landslides. This inventory underpins most of the other research work being done under this programme. This data is already being incorporated into other projects, for example, the GNS Science landslide forecasting project, funded by GeoNet and EQC, which aims to develop national landslide forecasting tools. The dataset has been made public and is already being used by others overseas.

This year we have generated three research papers published in international journals, one book chapter and five invited conference papers. Data and knowledge generated by this programme is already being transferred to end users such as district and regional councils and infrastructure providers, via technical transfer projects. The examples given in the subsequent sections of this report, show how the results and findings from this programme are already being implemented by these stakeholders for the benefit of all New Zealanders.

We now have six PhD students working on the programme, which is the original number of students we budgeted for. Two are at the University of Canterbury, two at Victoria University and two at Auckland University. These students are the future of our research.

A new lidar capable drone was purchased by GNS Science, for use on this programme. This new equipment will be used to survey the slopes, landslides and rivers to provide digital survey models of the study area as specific points in time. These models will be subtracted from one another to quantify changes in the landscape. This is especially useful for RA1.5, where it will be used to survey changes in river erosion and aggradation to compare against the airborne (fixed-wing) survey data. This will be the first lidar-capable drone of its type in NZ. We envisage the drone will be used by other researchers around NZ.

- **Implementation Pathway:**

To ensure the research is implemented by out stakeholders, we held the 4th and 5th Stakeholder Engagement Group meetings in Christchurch on 19th September 2019 and 4th March 2020, respectively. The meetings were attended by GNS, ECAN, Kaikoura District Council, DOC, NEMA, Hurenui District Council, Agribusiness, Beef & Lamb, DOC, NZTA, Victoria Uni and Auckland Uni representatives.

Specific examples of where the research has already been implemented are listed below, per Research Aim (RA):

<u>RA1.1 and 1.2</u>

Data from Research Aims 1.1 and 1.2 are being used to develop landslide forecast tools (funded by GeoNet): GNS Science is developing a series of tools that will forecast the likely location, size and runout of earthquake- and rainfall-induced landslides to provide rapid information for responding agencies and infrastructure operators. The tools are designed to produce information on the likely location, extent and impacts of landslides within minutes of a large earthquake, or in the days and hours before a major storm is likely to hit New Zealand.

<u>RA1.1 and 1.4</u>

Data from Research Aim 1.1 and 1.4 was also used to develop:

1. landslide hazard zones for Kaikoura District Council's (KDC) revised District Plan;

2. for assessing landslide hazards along State Highway 1 for the North Canterbury Infrastructure Recovery Alliance (NCTIR) post the Kaikoura earthquake); and
3. To develop landslide guidelines for the Department of Conservation (DOC).

RA1.6

WSP (formerly OPUS) have been using the data and relationships established from the performance of anthropogenically modified slopes during and after the Kaikoura earthquake, collated as part of this programme. They have used these observations to inform two reports focused on the resilience of transport routes.

RA1.7

Research was carried out to develop a framework that could be used for landslide early warning systems, adopting the Awatarariki catchment debris flow (Matata, Whakatane) event that occurred in 2004, as a real-world example, on which to develop the framework.

- **Research, Science and Technology (RS&T) Benefits to New Zealand:**

We held the 2nd technical workshop at Hanmer Springs from the 3-5th February 2020. The workshop was attended by more than 40 people, including research students, scientists, stakeholders, the Science Advisory Group (SAG) and invited international researchers. The purpose of the workshop was to discuss the science results, progress and future research plans related to this programme. The workshop provides a collaborative environment for students and all other researchers working on aspects of this programme. The SAG also attended and gave some useful feedback on the current scientific results and future direction of the research.

The collaborative nature of this research is shown by the multi-authored journal and conference papers the research team have written this year. There were three main journal paper outputs this year from the programme, two related to Research Aim 1.1 and one to Research Aim 1.7. These were truly collaborative in nature and involved researchers from around the world.

Massey et al. (2020, JGR) use the globally significant Version 2.0 landside inventory of 29,519 triggered by the Kaikoura earthquake to provide a new method to better assess landslide volumes following extreme earthquake events. They used the Version 2.0 inventory of 29,519 mapped landslides triggered by the Mw 7.8 Kaikoura earthquake to accurately calculate volume-area relationships and evaluate how this relationship may be influenced by different landslide failure mechanisms and materials. These relationships are critical to accurately quantify rates of landslide erosion during extreme events that generate many landslides (e.g. earthquakes and extreme rainfall). Given traditional field-based methods are often inaccurate and time consuming the authors used high resolution pre- and post-digital surface models to produce efficient and accurate data on the volumes of debris mobilised from the landslide source areas. The study demonstrates that shallow soil and rock avalanches are the dominant landslide type triggered earthquakes and illustrates how both the geology and the landslide type/failure mode influence the source volumes of landslides.

Massey et al. (2020, Landslides): created Version 2.0 of the landslide inventory for the Kaikoura Earthquake. Version 2.0 contains 29,519 landslides. They use this to re-examine the controls on landslide occurrence. The results from their modelling using the version 2.0 inventory show that: (a) the geological materials have a larger relative contribution to the fit of the overall model, when compared with the previous model based on the version 1.0 inventory, and (b) the “distance to fault” predictor variable continues to have more statistical power in predicting landslide probability than the modelled peak ground acceleration or peak ground velocity. They suggest that future research on the Kaikōura earthquake landslide distribution—and the landslide distributions associated with other similar large earthquakes—might be directed towards investigating the interaction between surface fault rupture, fault damage-zone properties, earthquake-induced ground shaking, and the initiation of slope failures.

Quigley et al. (2020, NHESS, in review) Investigated land-use decision-making practices in Christchurch, New Zealand and the surrounding region in response to mass movement (e.g., rockfall, cliff collapses) and

ground surface fault rupture hazards incurred during the 2010-2011 Canterbury earthquake sequence. They did this to investigate the utility of the earth science information in post-earthquake land-use decision-making, to identify what worked and what didn't work. They found that rapidly fluctuating and diverse demands for post-disaster earth science information may be best met through prior establishment of: (i) land-use policies and technical guidelines tailored for a variety of diverse disaster scenarios; (ii) hazard and risk analyses in land-use plans, including acquisition of geospatial and other earth science data; and (iii) co-ordinated science networks that may comprise sub-groups with diverse goals, operational perspectives and protocols, which allow the many facets of science information acquisition and delivery to be successfully addressed. A companion book chapter was also written by Smith and Saunders (2020) who reviewed the acquisition law, policies and programs around hazard-prone housing both in New Zealand and the USA.

Conference papers

Two conference papers relating to the results from RA1.5, investigating the response of the rivers post-Kaikoura earthquake were written, including a collaboration with NIWA (Hicks et al., 2020).

Mason, D and Brabhaharan, P (2019) of WSP wrote and presented several papers on the resilience of infrastructure (RA1.6).

- **Other information:**

Vision Matauranga

Tania Gerrard (GNS Science Principal Maori Advisor to the Chief Executive) and Wendy Saunders (Research Aim 1.7 leader) developed a strategy to re-engage with Ngai Tahu on this project. A letter was sent in June 2020.

Awards

Doug Mason (RA1.6) - awarded New Zealand Geotechnical Society Research Scholarship to pursue research (to characterise and investigate failures in past pre-Kaikōura New Zealand earthquakes) that is not directly part of this research but will help broaden the understanding of the Kaikōura research and help ensure that the eventual lessons and recommendations (Critical Steps 1.6.4 and 5 of our theme) draw on a wider cross section of data from different parts of the country.

COVID19 - lock down affected several aspects of our programme, mainly fieldwork and the timing of ground investigations. We're currently working with our research partners to scope the magnitude of the impact on the critical steps.

Publicly Available Information

Our main highlight this year is that we have now generated Version 2.0 of the 2016 Kaikoura earthquake landslide inventory. This Version 2.0 inventory now contains more than 29,500 mapped landslides triggered by the Kaikoura earthquake. The original Version 1.0 inventory contained only 10,000 mapped landslides. This inventory underpins most of the other research work being done under this programme. This data is already being incorporated into other projects, for example, the GNS Science landslide forecasting project, funded by EQC and carried out under the GeoNet project.

This Endeavour Programme research is developing capability for landslide forecasting. GNS Science is developing a series of tools that will forecast the likely location, size and runout of earthquake- and rainfall-induced landslides to provide rapid information for responding agencies and infrastructure operators. The tools are designed to produce information on the likely location, extent and impacts of landslides within minutes of a large earthquake, or in the days and hours before a major storm is likely to hit New Zealand.

Key Achievements

Sequence	Key achievements
1	Our main achievement this year is that we have now generated Version 2.0 of the 2016 Kaikoura earthquake landslide inventory. This Version 2.0 inventory now contains more than 29,500 mapped landslides triggered by the Kaikoura earthquake. The original Version 1.0 inventory contained only 10,000 mapped landslides. This inventory underpins most of the other research work being done under this programme. This data is already being incorporated into other projects, for example, the GNS Science landslide forecasting project, funded by GeoNet and EQC, which aims to develop national landslide forecasting tools. The dataset has been made public and is already being used by others overseas. Ref: Massey, C.I.; Townsend, D.B.; Lukovic, B.; Morgenstern, R.; Jones, K.E.; Rosser, B.J.; de Vilder, S.J. 2020 Landslides triggered by the 14 November 2016 Mw 7.8 Kaikoura earthquake : an update. Landslides, Online first: doi: 10.1007/s10346-020-01439-x
2	We held the 2nd technical workshop at Hanmer Springs from the 3-5th February 2020. The workshop was attended by more than 40 people, including research students, scientists, stakeholders, the Science Advisory Group (SAG) and invited international researchers. The purpose of the workshop was to discuss the science results, progress and future research plans related to this programme. The workshop provided a collaborative environment for students and all other researchers working on aspects of this programme to further their research and develop new ideas.

3	We used the globally significant Version 2.0 landside inventory of 29,519 triggered by the Kaikoura earthquake to provide a new method to better assess landslide volumes following extreme earthquake events. They used the Version 2.0 inventory of 29,519 mapped landslides triggered by the Mw 7.8 Kaikoura earthquake to accurately calculate volume-area relationships and evaluate how this relationship may be influenced by different landslide failure mechanisms and materials. These relationships are critical to accurately quantify rates of landslide erosion during extreme events that generate many landslides (e.g. earthquakes and extreme rainfall). Ref: Massey, C.I.; Townsend, D.B.; Jones, K.E.; Lukovic, B.; Rhoades, D.A.; Morgenstern, R.; Rosser, B.J.; Ries, W.; Howarth, J.D.; Hamling, I.J.; Petley, D.M.; Clark, M.; Wartman, J.; Litchfield, N.J.; Olsen, M. 2020 Volume characteristics of landslides triggered by the Mw7.8 2016 Kaikoura Earthquake, New Zealand, derived from digital surface difference modelling. Journal of Geophysical Research. Earth Surface, 125(7): e2019JF005163; doi: 10.1029/2019JF005163

Project Deliverable Status

Click on the deliverable to enter a status

Sequence	Short title	Type	Due Date	Status	Reason	Action
1	Over what time scales do landscapes heal after major earthquakes? Earthquake- and post-earthquake landslide risk in New Zealand is effectively managed using an integrated set of predictive tools within a decision making framework	Impact statement	30/09/2022	On track with issues	Drilling delayed due to COVID-19.	Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021. Will utlise variation request window of early Sept 2020 to request contract variation to accommodate this delay.
1.1	Forecasting landslide severity at different levels of earthquake ground shaking and focal mechanisms	Research aim	30/09/2021	On track with issues	1.1.3 delayed due to COVID delaying drilling.	Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021.
1.1.1	Regional scale landslide distribution (frequency, area and volume) assessed using the Kaikoura landslide inventory	Critical step	30/09/2018	Achieved		
1.1.2	Kaikoura landslide distributions determined at site scale	Critical step	30/09/2021	On track		
1.1.3	Paleo-seismic evolution of the three areas determined	Critical step	30/09/2019	Off track	Delay due to drilling being postponed as a result of COVID lock down and now winter.	Follow up up with Research Aim leaders and drilling contractor to expedite process aiming for summer early 2021.
1.1.4	Fault rocks and other rock properties at the three sites parameterised	Critical step	30/09/2020	On track		

1.1.5	Models generated to describe the Kaikoura distribution	Critical step	30/09/2021	On track		
1.1.6	Models calibrated with New Zealand and overseas datasets	Critical step	30/09/2021	On track		
1.2	Landslide reactivation thresholds	Research aim	30/09/2021	On track		
1.2.1	Slopes classified by type and material properties	Critical step	30/09/2018	Achieved		
1.2.2	Characteristic slope types and materials sampled	Critical step	30/09/2018	Achieved		
1.2.3	Conventional lab testing carried out to characterise the main materials	Critical step	30/09/2019	Achieved		
1.2.4	Specialist dynamic and static lab testing undertaken to establish failure thresholds	Critical step	30/09/2020	On track		
1.2.5	Numerical simulations of landslide reactivation used to test thresholds	Critical step	30/09/2021	On track		
1.2.6	Regional models derived to quantify landslide severity at different magnitudes of rain amount and duration	Critical step	30/09/2021	On track		
1.3	Quantifying the risk of landslide dam failure	Research aim	30/09/2021	On track		
1.3.1	Base line surveys of characteristic dam embankments carried out	Critical step	30/09/2018	Achieved		
1.3.2	Instrumentation with permanent monitoring equipment installed	Critical step	30/09/2018	Achieved		
1.3.3	Periodic laser scanning surveys undertaken	Critical step	30/09/2021	On track		
1.3.4	Geotechnical ground investigation carried out	Critical step	30/09/2018	Achieved		

1.3.5	Laboratory testing undertaken	Critical step	30/09/2018	Achieved		
1.3.6	Instability assessments of dam embankments undertaken	Critical step	30/09/2021	On track		
1.3.7	Landslide dam potential in future earthquakes predicted	Critical step	30/09/2021	On track		
1.3.8	Embankment failure runout defined	Critical step	30/09/2021	On track		
1.4	Landslide runout models	Research aim	30/09/2021	On track		
1.4.1	Empirical-statistical runout relationships established	Critical step	30/09/2018	Achieved		
1.4.2	Physics-based landslide runout models established	Critical step	30/09/2021	On track		
1.5	Sediment cascades; monitoring and modelling the fluvial response to the Kaikoura Earthquake landslides	Research aim	30/09/2021	On track		
1.5.1	Monitor changes in sediment storage in landslide runout zones at the channel interface, within floodplains and in the river channels	Critical step	30/09/2021	On track		
1.5.2	Calibrate models of river channel hydraulics and sediment transfer by verifying key input parameters such as river discharge, sediment grainsize, channel roughness, and flood conveyance	Critical step	30/09/2021	On track		
1.5.3	Model development and validation through hindcasting morphodynamic change monitored in CS1.5.1	Critical step	30/09/2021	On track		
1.5.4	Forward modelling to predict timeframes and magnitude of morphodynamic response to earthquake-induced landslide derived sediment	Critical step	30/09/2021	On track		

1.6	Performance of earthworks	Research aim	30/09/2021	On track with issues	Drilling delayed due to COVID-19.	Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021.
1.6.1	Failures in earthworks infrastructure mapped	Critical step	30/09/2018	Achieved		
1.6.2	Selected characteristic types of earthworks failures investigated	Critical step	30/09/2019	Off track	Ongoing further delay due to drilling being postponed as a result of COVID lock down and now winter	Follow up with Research Aim leader and drilling contractor to expedite the process. ETA summer early 2021.
1.6.3	Earthworks slope failures analysed	Critical step	30/09/2020	On track		
1.6.4	Best practice earthquake resilient design and asset management recommendations made	Critical step	30/09/2021	On track		
1.6.5	Learnings and best practice disseminated	Critical step	30/09/2021	On track		
1.7	Tools for managing landslide hazards and risks	Research aim	30/09/2022	On track		
1.7.1	Stakeholder engagement undertaken	Critical step	30/09/2022	On track		
1.7.2	Scene setting	Critical step	30/09/2022	On track		
1.7.3	Landslide guidance updated	Critical step	30/09/2022	On track		

1.7.4	Produce guidance on establishing a New Zealand landslide warning system	Critical step	30/09/2022	On track		
1.7.5	Online toolbox developed	Critical step	30/09/2022	On track		
1.7.6	Web-based interactive applications developed	Critical step	30/09/2022	On track		

Click on the deliverable to enter a status

Short title
Over what time scales do landscapes heal after major earthquakes? Earthquake- and post-earthquake landslide risk in New Zealand is effectively managed using an integrated set of predictive tools within a decision making framework

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track with issues

Reason

Drilling delayed due to COVID-19.

Action

Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021. Will utlise variation request window of early Sept 2020 to request contract variation to accommodate this delay.

Click on the deliverable to enter a status

Short title
Forecasting landslide severity at different levels of earthquake ground shaking and focal mechanisms

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track with issues

Reason

1.1.3 delayed due to COVID delaying drilling.

Action

Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021.

Click on the deliverable to enter a status

Short title
Regional scale landslide distribution (frequency, area and volume) assessed using the Kaikoura landslide inventory

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Kaikoura landslide distributions determined at site scale

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Paleo-seismic evolution of the three areas determined

Due Date
30/09/2019

Achievement measure
No achievement measure available

Status
Off track

Reason

Delay due to drilling being postponed as a result of COVID lock down and now winter.

Action

Follow up up with Research Aim leaders and drilling contractor to expedite process aiming for summer early 2021.

Click on the deliverable to enter a status

Short title
Fault rocks and other rock properties at the three sites parameterised

Due Date
30/09/2020

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Models generated to describe the Kaikoura distribution

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Models calibrated with New Zealand and overseas datasets

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Landslide reactivation thresholds

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Slopes classified by type and material properties

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Characteristic slope types and materials sampled

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Conventional lab testing carried out to characterise the main materials

Due Date
30/09/2019

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Specialist dynamic and static lab testing undertaken to establish failure thresholds

Due Date
30/09/2020

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Numerical simulations of landslide reactivation used to test thresholds

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Regional models derived to quantify landslide severity at different magnitudes of rain amount and duration

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Quantifying the risk of landslide dam failure

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Base line surveys of characteristic dam embankments carried out

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Instrumentation with permanent monitoring equipment installed

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Periodic laser scanning surveys undertaken

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Geotechnical ground investigation carried out

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Laboratory testing undertaken

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Instability assessments of dam embankments undertaken

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Landslide dam potential in future earthquakes predicted

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Embankment failure runout defined

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Landslide runout models

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Empirical-statistical runout relationships established

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Physics-based landslide runout models established

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Sediment cascades; monitoring and modelling the fluvial response to the Kaikoura Earthquake landslides

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Monitor changes in sediment storage in landslide runout zones at the channel interface, within floodplains and in the river channels

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Calibrate models of river channel hydraulics and sediment transfer by verifying key input parameters such as river discharge, sediment grainsize, channel roughness, and flood conveyance

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Model development and validation through hindcasting morphodynamic change monitored in CS1.5.1

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Forward modelling to predict timeframes and magnitude of morphodynamic response to earthquake-induced landslide derived sediment

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Performance of earthworks

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track with issues

Reason

Drilling delayed due to COVID-19.

Action

Follow up with Research Aim leader and drilling contractor to expedite the process aiming for summer early 2021.

Click on the deliverable to enter a status

Short title
Failures in earthworks infrastructure mapped

Due Date
30/09/2018

Achievement measure
No achievement measure available

Status
Achieved

Reason

Action

Click on the deliverable to enter a status

Short title
Selected characteristic types of earthworks failures investigated

Due Date
30/09/2019

Achievement measure
No achievement measure available

Status
Off track

Reason

Ongoing further delay due to drilling being postponed as a result of COVID lock down and now winter

Action

Follow up with Research Aim leader and drilling contractor to expedite the process. ETA summer early 2021.

Click on the deliverable to enter a status

Short title
Earthworks slope failures analysed

Due Date
30/09/2020

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Best practice earthquake resilient design and asset management recommendations made

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Learnings and best practice disseminated

Due Date
30/09/2021

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Tools for managing landslide hazards and risks

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Stakeholder engagement undertaken

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Scene setting

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Landslide guidance updated

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Produce guidance on establishing a New Zealand landslide warning system

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Online toolbox developed

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Click on the deliverable to enter a status

Short title
Web-based interactive applications developed

Due Date
30/09/2022

Achievement measure
No achievement measure available

Status
On track

Reason

Action

Project Deliverable Status (cont)

End user relationship:
Achieved

End user relationship comment:

Key personnel:
Achieved

Key personnel comment:

Research progress:
On track with issues

Research progress comment:

COVID related delays to the ground investigation, PhD students and field work

Has any change event occurred in the Reporting Year?

Yes

If YES when was MBIE advised?

??

Work Programme Conditions

Outputs

Knowledge Transfer

ModifiedDate	Knowledge transfer type	Number of Events	Knowledge transfer comments (optional)
24/08/2020	Workshops and hui	2	To ensure the research is implemented by out stakeholders, we held the 4th and 5th Stakeholder Engagement Group meetings in Christchurch on 19th September 2019 and 4th March 2020, respectively. The meetings were attended by GNS, ECAN, Kaikoura District Council, DOC, NEMA, Hurenui District Council, Agribusiness, Beef & Lamb, DOC, NZTA, Victoria Uni and Auckland Uni representatives.

24/08/2020	Commissioned reports	7	Data from Research Aims 1.1 and 1.4 was used: 1. to develop landslide hazard zones for Kaikoura District Council's (KDC) revised District Plan; 2. for assessing landslide hazards along State Highway 1 for the The North Canterbury Infrastructure Recovery Alliance (NCTIR) post the Kaikoura earthquake); and 3. to develop landslide guidelines for the Department of Conservation (DOC). KDC: Brideau, M.A.; Massey, C.I.; Lukovic, B.; Morgenstern, R. 2020 Deterministic mapping of potential landslide debris inundation in the Kaikoura District. GNS Science consultancy report 2019/102. 37 p. NCTIR: Massey, C.I.; Lukovic, B.; Taig, T.T.; Rosser, B.J.; Ries, W.F. 2019 The North Canterbury Infrastructure Recovery Alliance : pilot study for assessing landslide hazards along the road and rail corridors. GNS Science consultancy report 2017/185. 108 p. DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 2: preliminary hazard and exposure analysis for landslides. Lower Hutt (NZ): GNS Science. 27 p. Consultancy Report 2020/51. DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 3: analysing landslide risk to point and linear sites. Lower Hutt (NZ): GNS Science. 52 p. Consultancy Report 2020/52. DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 4: a commentary on analysing landslide risk to point and linear sites. Lower Hutt (NZ): GNS Science. 64 p. Consultancy Report 2020/53. Brabhaharan, P (2020). WSP Report on Natural Hazards and Resilience. Ngauranga to Petone Shared Path. Assessment of Environmental Effects and Designation. Mason, D (2020). WSP Report on SH4 Paraparas section- Programme business case. Section on Resilience of the route and enhancement options.

Knowledge transfer type
Workshops and hui

Number of Events

2

Knowledge transfer comments (optional)

To ensure the research is implemented by out stakeholders, we held the 4th and 5th Stakeholder Engagement Group meetings in Christchurch on 19th September 2019 and 4th March 2020, respectively. The meetings were attended by GNS, ECAN, Kaikoura District Council, DOC, NEMA, Hurenui District Council, Agribusiness, Beef & Lamb, DOC, NZTA, Victoria Uni and Auckland Uni representatives.

Knowledge transfer type
Commissioned reports

Number of Events

7

Knowledge transfer comments (optional)
Data from Research Aims 1.1 and 1.4 was used:

1. to develop landslide hazard zones for Kaikoura District Council's (KDC) revised District Plan;
2. for assessing landslide hazards along State Highway 1 for the The North Canterbury Infrastructure Recovery Alliance (NCTIR) post the Kaikoura earthquake); and
3. to develop landslide guidelines for the Department of Conservation (DOC).

KDC: Brideau, M.A.; Massey, C.I.; Lukovic, B.; Morgenstern, R. 2020 Deterministic mapping of potential landslide debris inundation in the Kaikoura District. GNS Science consultancy report 2019/102. 37 p.

NCTIR: Massey, C.I.; Lukovic, B.; Taig, T.T.; Rosser, B.J.; Ries, W.F. 2019 The North Canterbury Infrastructure Recovery Alliance : pilot study for assessing landslide hazards along the road and rail corridors. GNS Science consultancy report 2017/185. 108 p.

DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 2: preliminary hazard and exposure analysis for landslides. Lower Hutt (NZ): GNS Science. 27 p. Consultancy Report 2020/51.

DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 3: analysing landslide risk to point and linear sites. Lower Hutt (NZ): GNS Science. 52 p. Consultancy Report 2020/52.

DOC: de Vilder SJ, Massey CI. 2020. Guidelines for natural hazard risk analysis on public conservation lands and waters – Part 4: a commentary on analysing landslide risk to point and linear sites. Lower Hutt (NZ): GNS Science. 64 p. Consultancy Report 2020/53.

Brabhaharan, P (2020). WSP Report on Natural Hazards and Resilience. Ngauranga to Petone Shared Path. Assessment of Environmental Effects and Designation.

Mason, D (2020). WSP Report on SH4 Paraparas section- Programme business case. Section on Resilience of the route and enhancement options.

Non-peer Reviewed Published Articles

Number of non-peer reviewed published articles

6

Non-peer reviewed published articles comments (optional)

- Feb 10-11: co-lead (B Rosser and C Massey) a field trip to Kaikoura landslides and landslide dammed lakes with Professor Thomas Glade and students from the University of Vienna. Also prepared a field guide.
- Brenda Rosser attended the 11th River, Coastal and Estuarine Morphodynamics Symposium at AUT in Auckland from Nov 16-21. B Rosser presented an oral paper: B. Rosser, C. Massey, S Dellow, J. K. Jones. 2019. Sediment delivery from post-earthquake landslide reactivation caused by Cyclone Gita, February 2018, Kaikoura, New Zealand. An extended abstract is published in the Conference proceedings which is available here: https://storage.googleapis.com/wzukusers/user-30969499/documents/a361e67581b74ac6abff4ad83da6d3e5/RCEM%202019%20Abstracts%20Book%
- Brenda Rosser co-lead the post-conference field trip (along with Jon Tunnicliffe and Professor Gary Brierly of Auckland University) to the Waiapu and Waipaoa River catchments, East Cape and provided material for both the Waiapu and Waipaoa rivers for the field guide, and the recent Queens Birthday storm at Tolaga Bay (https://www.rcem2019.co.nz/post-conference-field-trip). The field trip was partly based in Ruatoria, where we visited and engaged with local experts and community members who work on the rivers and coastline. Locals have been developing a management plan for the Waiapu River, in light of the large sediment loads, and the dynamic behaviour of the lower river reaches. We worked with Tui Warmenhoven and Pia Pohatu of Ngati Porou to develop the field trip, and they hosted us on their marae at Ruatoria for two nights. We also visited the Waipaoa River catchment to observe river aggradation in response to the deforestation in the early 1900's, and efforts to halt the erosion using forestry. I led the discussion around the Waipaoa and also the issues around slash mobilisation by landslides in the Queens Birthday storm at Tolaga Bay.
- Field Guide: Tunnicliffe J, Rosser B, Brierley G, Leenman A, Wheeler N. 2019. RECEM 2019 Post-Conference Field Trip, Gisborne-Ruatoria, 22-24 November, 2019. 38p.
- RCEM conference presentation: B. Rosser, C. Massey, S Dellow, J. K. Jones. 2019. "Sediment delivery from post-earthquake landslide reactivation caused by Cyclone Gita, February 2018, Kaikoura, New Zealand"
- EGU: Rosser, B., Jones, K., Massey, C.I., Strawbridge, G., Morris, S., 2020. Quantifying the effects of the M7.8 November 14, 2016 earthquake on rainfall-induced 806 landslide triggering and reactivation, Kaikoura, New Zealand, in: EGU General Assembly 2020. doi:10.5194/egusphere-egu2020-12409 - Contributed to chat session and presented talk by live video link

New Products, Processes and Services

Number of new products

1

Number of new processes

Number of new services

New products, processes and services (optional)

We created Version 2.0 of the landslide inventory for the Kaikoura Earthquake. Version 2.0 contains 29,519 landslides. This inventirary was made public and has already been shared with numerous researchers from around the world.

Ref: Massey, C.I.; Townsend, D.B.; Lukovic, B.; Morgenstern, R.; Jones, K.E.; Rosser, B.J.; de Vilder, S.J. 2020 Landslides triggered by the 14 November 2016 Mw 7.8 Kaikoura earthquake : an update. Landslides, Online first: doi: 10.1007/s10346-020-01439-x

Science Quality

Peer-reviewed journal articles in the year they are accepted for publication

3

Number of books or chapters

1

Number of published conference proceedings

5

Awards for science achievement (not open internationally)

1

Awards for science achievement (open internationally)

0

Keynote presentations (not open internationally)

1

Keynote presentations (open internationally)

0

Number of masters or doctoral theses

1

Science quality comments (optional)

Book chapter

- Smith, G. & Saunders, W.S.A. 2020. A Comparative Review of Hazard-Prone Housing Acquisition Laws, Policies and Programs in the United States and Aotearoa New Zealand: Implications for Improved Practice. In the Cambridge Handbook of Disaster Law: Risk, Recovery and Redevelopment. Susan Kuo, John Travis Marshall, and Ryan M. Rowberry eds. (forthcoming Cambridge, 2021).C

Conference proceedings

- Tunnicliffe, J. Howarth, D. Lague, P.Upton, Jones, K., Massey, C. The longitudinal development of a coarse-grained sedimentary wave following a major landslide event, Kaikōura, New Zealand. 11th River, Coastal and Estuarine Morphodynamics (RCEM) Symposium. 16 - 21 November 2019, Auckland.
- Hicks, M., Hicks, Baynes, E.R.C., Measures, R., Stecca, G., Tunnicliffe, J. and Friedrich, H. 2020. Morphodynamic research challenges for braided river environments of New Zealand. Submitted to ESPL.
- Mason, D and Brabhaharan, P (2019) of WSP wrote and presented several papers on the resilience of infrastructure (RA1.6). One was called the “Resilience of transport corridors in the 2016 Kaikoura earthquake, to inform recovery and future slope design and landslide hazard management”. Proceedings of the 2nd International Conference on Natural Hazards and Infrastructure, Chania, Greece, 23 – 26 June 2019, Paper No 997, 12 pp.
- Gkeli, E., Brabhaharan, P., Mason, D. (2019). Enhancing the resilience of transportation infrastructure: Resilience and performance-based design approach for high cut slopes and retaining walls. Proc. 2nd International Conference on Natural Hazards & Infrastructure, Chania, Greece. 9 p.
- Brabhaharan, P (2020). Resilience based design of transportation systems. Transportation 2020 conference. 10-13 March 2020. Christchurch. (Keynote)

Provisional Patent and PVR Applications

Number of Patent or Plant Variety Right (PVR) applications

Number of Patent Cooperation Treaty (PCT) applications

Provisional patent and PVR applications comments (optional)

Patent and PVR grants

Number of Patents or Plant Variety Rights (PVRs) that have been granted.

Name the countries in which you have been granted Patents or PVRs.

Revenue and Contracting

Co-funding and Subcontracting

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Select type	Organisation	Listed in the contract	Type	Cash or In-kind	Listed amount (NZD excl GST)	Actual amount (NZD excl. GST)	Comment
Co-Funding	Marlborough District Council	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	Environment Canterbury	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	University of Rennes	Yes	Direct	In-Kind	$37,500.00	$5,000.00	Due to COVID and their researchers not being able to travel to NZ
Co-Funding	Department of Conservation (DoC)	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	Kyoto University	Yes	Direct	In-Kind	$37,500.00	$5,000.00	Due to COVID and their researcher not being able to travel to NZ
Co-Funding	Kiwirail	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	Transpower NZ	Yes	Direct	In-Kind	$2,000.00	$0.00	We have had difficulty engaging with Transpower as their people keep changing
Co-Funding	Durham University	Yes	Direct	In-Kind	$37,500.00	$35,000.00	

Co-Funding	Ngāi Tahu	Yes	Direct	In-Kind	$2,000.00	$0.00	We were told that they were too busy to engage with us on this programme. We have since sent a letter to them to try to re-engage.
Co-Funding	Simon Fraser University	Yes	Direct	In-Kind	$37,500.00	$37,500.00	
Co-Funding	Kaikoura District Council	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	Hurunui District Council	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Co-Funding	New Zealand Transport Agency (NZTA)	Yes	Direct	In-Kind	$2,000.00	$2,000.00	
Subcontracting	The University of Auckland	Yes			$128,025.00	$170,624.00	The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.
Subcontracting	The University of Canterbury	Yes			$37,500.00	$58,800.00	The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.

Subcontracting	University of Rennes	Yes			$66,667.00	$0.00	The original number in the portal is wrong. The Post Doc at the university of Rennes, is subcontracted to Victoria Universerty and is listed in the subcontract between GNS Science and Victoria University.
Subcontracting	Victoria University of Wellington	Yes			$35,625.00	$116,924.00	The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.
Subcontracting	Opus International Consultants	Yes			$47,500.00	$110,875.00	The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.
Subcontracting	Unspecified Engineer	Yes			$56,250.00	$0.00	The original number in the portal is wrong. This is covered under the subcontract with OPUS (now WSP).

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Marlborough District Council

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
2,000.00
(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Environment Canterbury

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
2,000.00
(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
University of Rennes

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$37,500.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
5,000.00
(Excl. GST)

Percentage of listed funding achieved:
13%

Comment

Due to COVID and their researchers not being able to travel to NZ

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Department of Conservation (DoC)

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
2,000.00
(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Kyoto University

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$37,500.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

5,000.00

(Excl. GST)

Percentage of listed funding achieved:
13%

Comment

Due to COVID and their researcher not being able to travel to NZ

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Kiwirail

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

2,000.00

(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Transpower NZ

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

0.00

(Excl. GST)

Percentage of listed funding achieved:
0%

Comment

We have had difficulty engaging with Transpower as their people keep changing

---

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Durham University

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$37,500.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

35,000.00

(Excl. GST)

Percentage of listed funding achieved:
93%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Ngāi Tahu

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

0.00

(Excl. GST)

Percentage of listed funding achieved:
0%

Comment

We were told that they were too busy to engage with us on this programme. We have since sent a letter to them to try to re-engage.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Simon Fraser University

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$37,500.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

37,500.00

(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Kaikoura District Council

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
2,000.00
(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Hurunui District Council

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)
2,000.00
(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
New Zealand Transport Agency (NZTA)

Select type
Co-Funding

Listed in the contract
Yes

Listed amount (NZD excl GST)
$2,000.00 (Excl. GST)

Type
Direct

Cash or In-kind
In-Kind

Actual amount (NZD excl. GST)

2,000.00

(Excl. GST)

Percentage of listed funding achieved:
100%

Comment

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
The University of Auckland

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$128,025.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

170,624.00

(Excl. GST)

Percentage of listed funding achieved:
133%

Comment

The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
The University of Canterbury

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$37,500.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

58,800.00

(Excl. GST)

Percentage of listed funding achieved:
157%

Comment

The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
University of Rennes

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$66,667.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

0.00

(Excl. GST)

Percentage of listed funding achieved:
0%

Comment

The original number in the portal is wrong. The Post Doc at the university of Rennes, is subcontracted to Victoria Universerty, and is listed in the subcontract between GNS Science and Victoria University.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Victoria University of Wellington

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$35,625.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

116,924.00

(Excl. GST)

Percentage of listed funding achieved:
328%

Comment

The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Opus International Consultants

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$47,500.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

110,875.00

(Excl. GST)

Percentage of listed funding achieved:
233%

Comment

The original number in the portal is wrong. The correct value is given and corresponds to what is in the subcontract and what we have paid.

Reporting financial year: 2019 (This report covers the period 01/07/19 - 30/06/20)

Organisation
Unspecified Engineer

Select type
Subcontracting

Listed in the contract
Yes

Listed amount (NZD excl GST)
$56,250.00 (Excl. GST)

Type

Cash or In-kind

Actual amount (NZD excl. GST)

0.00

(Excl. GST)

Percentage of listed funding achieved:
0%

Comment

The original number in the portal is wrong. This is covered under the subcontract with OPUS (now WSP).

Formal Collaborations

Collaborations by Country

Country	Level	Number of collaborations	Comment
United States of America (the)	Medium	2	Co-supervising a PhD student at the University of Washington, Seattle, Washington State, and another at Oregon State University, Corvallis, Oregon.
United Kingdom of Great Britain and Northern Ireland (the)	Medium	1	Co-supervising a PhD student at the University of Durham, UK
Canada	Medium	1	Working with a Post Doc from Simon Fraser University, Vancouver, Canada.

Capability Building

Students

Number of students obtaining Masterate qualifications

2

Number of students obtaining Doctoral qualifications

6

Number of students obtaining Post-Doctoral qualifications

2

Secondments to or from end users

Number of secondments as FTEs from an end user organisation

Number of secondments as FTEs to an end user organisation

End User Relationships

Spinouts and Startups

COVID-19 Information

COVID-19 Information

1) Please provide the amount (as a percentage) of work that was due in the reporting period that was:

a. not completed due to non-COVID-19 related reasons

b. not completed due to the impact of COVID-19

2) Please provide the amount (as a percentage) of work done in the reporting period that has a COVID-19 outcome

3) Has a contract variation request been submitted that has not yet been approved?

4) If 'yes' was selected for question (3), will the existing contract variation remediate all of the current issues with the project?

5) Is a future contract variation required to remediate any current issues with the project?

6) Would a 6-month no-cost extension* to the contract end date remediate all COVID-19 related issues with the contract (without the need for any other variations)?

Declaration

Declaration

The Contractor declares that:

I Agree