PROPOSED WIND FARM TOWERS
CENTRAL HIGHLANDS TASMANIA

RECONNAISSANCE
LANDSLIDE RISK ASSESSMENT

Cover

View north towards proposed turbine tower T1 (centre), at an elevation of about 975mASL on an un-named hill bordering St. Patricks Plains and about one kilometre east of the Highlands Lake Road. In-situ Jurassic-age high strength dolerite bedrock is fully exposed over the site, showing well-developed exfoliation and columnar jointing.

All of the ten sites visited are underlain by dolerite bedrock.
Photo 21 June 2022

Refer to this report as

Cromer, W. C. (2022). *Reconnaissance landslide risk assessment, proposed wind farm towers, Central Highlands, Tasmania.* Unpublished report for Epuron by William C. Cromer Pty. Ltd., 6 July 2022.

Limitations of this geotechnical report

Site investigations for geotechnical reports usually but not always involve digging test holes and taking samples, at locations thought appropriate based on site conditions and general experience. The reports only apply to the tested part(s) of the site, and if not specifically stated otherwise, results should not be extrapolated to untested areas.

Typically but not always the main aim of the investigations is to reasonably determine the nature of and variability in subsurface conditions at the time of inspection. The number and location of test sites, and the number and types of tests done and samples collected, will vary from site to site. Subsurface conditions may change laterally and vertically between test sites, so discrepancies may occur between what is described in the reports, and what is exposed by subsequent excavations. No responsibility is therefore accepted for (a) any differences between what is reported, and actual site and soil conditions for parts of an investigation site not assessed at the time of inspection, and (b) subsequent activities on site by others, and/or climate variability (eg rainfall), which may alter subsurface conditions at the sites from those assessed at the time of inspection.

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SUMMARY

In June 2022, reconnaissance inspections were done at ten proposed wind farm tower sites in Tasmania's Central Highlands, to assess landslide risk against E3.0 *Landslide Code* in the Central Highlands *Interim Planning Scheme 2015*, and also with C15.0 *Landslip Hazard Code* in the *Tasmanian Planning Scheme*.

One of the ten sites abuts a Low landslide hazard area; the other nine are outside landslide hazard areas, but adjacent to therm.

With appropriate risk management, all ten sites comply with the planning requirements for landslide hazard areas.

1 INTRODUCTION

1.1 Background

In April 2022 William C Cromer Pty Ltd (WCCPL) was commissioned by ERA Planning on behalf of client Epuron to conduct a reconnaissance geotechnical survey of ten proposed wind farm tower sites in Tasmania's Central Highlands (Figure 1).

Seven of the sites are located on *Christian Marsh*, a property owned by S .and K. Bowden straddling the Highlands Lakes Road near Bakers Tier. Three sites are located on *The Ripple*, a property owned by D. and A. Campbell on the eastern side of the Highlands Lake Road adjacent to St. Patricks Plains.

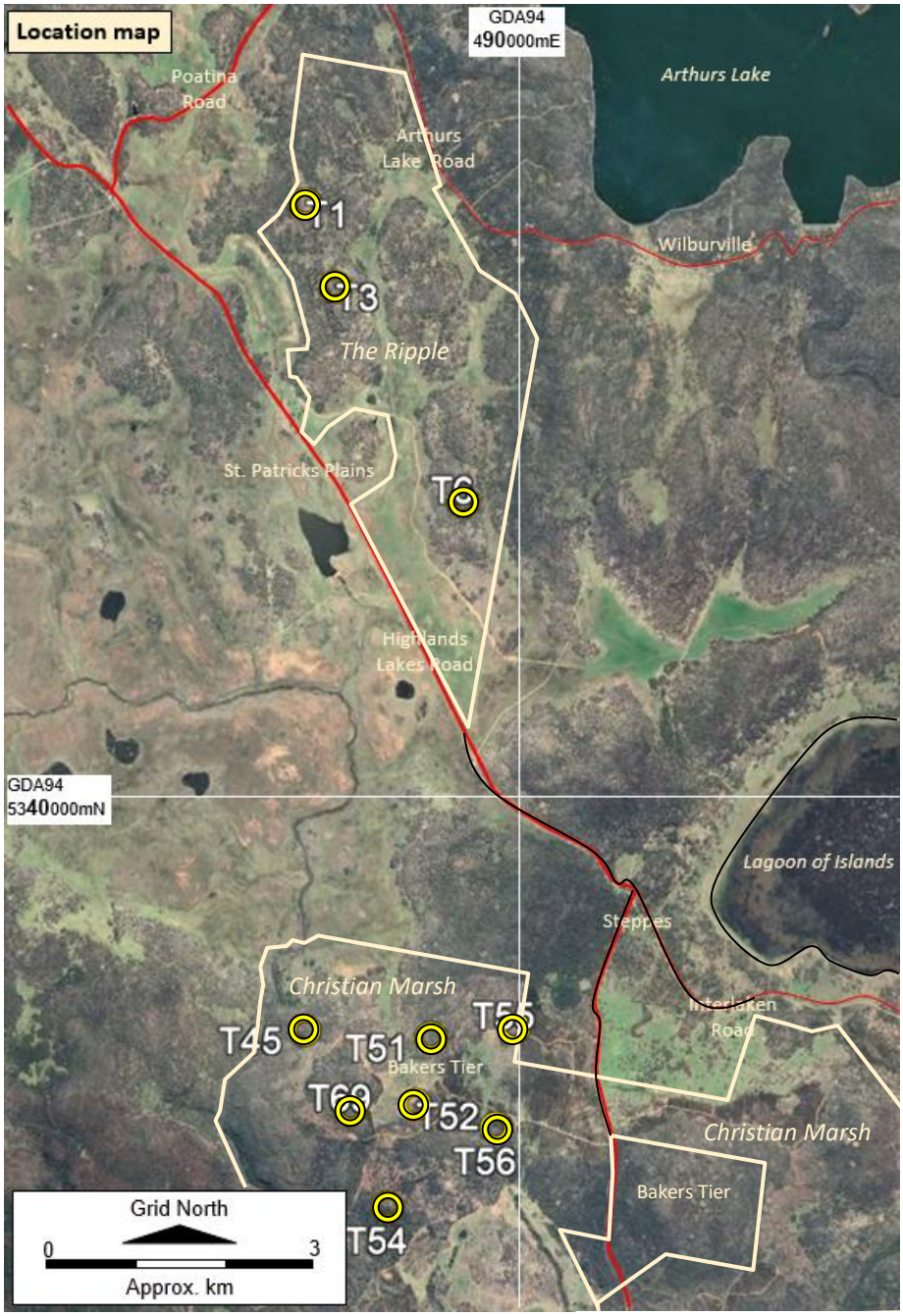


Figure 1. Locations of the ten proposed wind farm towers (T1, T3….) investigated in this report.

1.2 Planning issues

All ten proposed tower sites are within the Central Highlands Council local government area, and all are within or adjacent to Landslide Hazard Bands[1] as depicted on www.thelist.tas.gov.au.

It is understood that planning approval for the towers is currently subject[2] to E3.0 *Landslide Code* in Council's *Interim Planning Scheme 2015*, and specifically Section E3.7.1 *Buildings and Works, other than Minor Extensions,* and/or (depending on the scale of works) *Section E3.7.3 Major Works* (Figure 2).

However, Council is in the process of changing to the *Tasmanian Planning Scheme* (TPS), and Epuron's proposed development may instead be subject Code C15.0 *Landslip Hazard Code*, and particularly Section C15.6 *Development Standards for Buildings and Works* (Figure 3).

E3.7.1 Buildings and Works, other than Minor Extensions

Objective:

To ensure that landslide risk associated with buildings and works for buildings and works, other than minor extensions, in Landslide Hazard Areas, is:

(a) acceptable risk; or

(b) tolerable risk, having regard to the feasibility and effectiveness of measures required to manage the landslide hazard.

Acceptable Solutions	Performance Criteria
A1 No acceptable solution.	**P1** Buildings and works must satisfy all of the following: (a) no part of the buildings and works is in a High Landslide Hazard Area; (b) the landslide risk associated with the buildings and works is either: (i) acceptable risk; or (ii) capable of feasible and effective treatment through hazard management measures, so as to be tolerable risk.

E3.7.3 Major Works

Objective:

To ensure that landslide risk associated with major works in Landslide Hazard Areas, is:

(a) acceptable risk; or

(b) tolerable risk, having regard to the feasibility and effectiveness of any measures required to manage the landslide hazard.

Acceptable Solutions	Performance Criteria
A1 No acceptable solution.	**P1** Major works must satisfy all of the following: (a) no part of the works is in a High Landslide Hazard Area; (b) the landslide risk associated with the works is either: (i) acceptable risk; or (ii) capable of feasible and effective treatment through hazard management measures, so as to be tolerable risk.

Figure 2. Sections E3.7.1 (top) and E3.7.3 (bottom) of E3.0 *Landslide Code* in Central Highlands Council Interim Planning Scheme 2015. This report assesses each of the ten tower proposed sites against E32.7.1 P1 and E3.7.3 P1.
Source: https://iplan.tas.gov.au/pages/plan/book.aspx?exhibit=chiips

[1] Low and Medium Landslide Hazard Bands occur in the district. An area designated as Low Landslide Hazard "has no known landslides; however, it has been identified as being susceptible to landslide by Mineral Resources Tasmania (MRT)." An area designated as Medium Landslide Hazard "has known landslides features, or is within a landslide susceptibility zone, or has legislated controls to limit disturbance of adjacent unstable areas." The purpose of the Landslip Hazard Code is to: "ensure that a tolerable risk can be achieved and maintained for the type, scale and intensity and intended life of use of development on land within a landslip hazard area." Source: C15.0 Landslip Hazard Code in Guideline No. 1 Local Provisions Schedule (LPS): zone and code application. Tasmanian Planning Commission, June 2018.

[2] At the date of this report, Council's *Interim Planning Scheme 2015* is applicable to Epuron's proposed development. However, Council is in the process of changing to the *Tasmanian Planning Scheme* (TPS).

C15.6 Development Standards for Buildings and Works

C15.6.1 Building and works within a landslip hazard area

Objective:	That building and works on land within a landslip hazard area can: (a) minimise the likelihood of triggering a landslip event; and (b) achieve and maintain a tolerable risk from a landslip.

Acceptable Solutions	Performance Criteria
A1 No Acceptable Solution.	**P1.1** Building and works within a landslip hazard area must minimise the likelihood of triggering a landslip event and achieve and maintain a tolerable risk from landslip, having regard to: (a) the type, form, scale and intended duration of the development; (b) whether any increase in the level of risk from a landslip requires any specific hazard reduction or protection measures; (c) any advice from a State authority, regulated entity or a council; and (d) the advice contained in a landslip hazard report. **P1.2** A landslip hazard report also demonstrates that the buildings and works do not cause or contribute to landslip on the site, on adjacent land or public infrastructure. **P1.3** If landslip reduction or protection measures are required beyond the boundary of the site the consent in writing of the owner of that land must be provided for that land to be managed in accordance with the specific hazard reduction or protection measures.

Figure 3. Section C15.6 of C15.0 *Landslip Hazard Code*, a State Planning Provision in the *Tasmanian Planning Scheme*. The current report assesses each of the ten proposed tower sites against C15.6 P1.1, P1.2 and P1.3.
Source: Tasmanian Planning Scheme State Planning Provisions, Amendment 01-2018; Effective date 19 February 2020.

1.3 Scope, field dates and personnel for this report, and reporting

1.3.1 Scope

This report is based on:

Desk-top reviews and data compilation, including:

- a review of published geological maps of the study area, and

- the preparation of detailed maps (satellite imagery, slope angle, and hillshading/flow concentration maps) of each site incorporating the latest LiDAR survey[3]

Field work, including:

- discussions with the owners of *The Ripple* and *Christian Marsh,* and
- reconnaissance inspections/photography of each tower site.

1.3.2 Field dates and personnel

The field work was undertaken on 20 and 21 June 2022, by WCCPL Principal and consulting engineering geologist Bill Cromer, aided by technical assistant Richard Mackintosh.

1.3.3 Reporting

This report assesses the landslide risk at each of the ten proposed tower sites against Code E3.0 of *Council's Interim Planning Scheme 2015*, and Code C15 of the *State Planning Provisions* in the TPS.

1.3.4 Limitations of this report

Refer to the general limitations on page 2 of this report. Also, note that this is a reconnaissance report, with only brief field inspections, and no subsurface investigations.

[3]Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m.Source: www.thelist.tas.gov.au

2 RESULTS

2.1 Published regional geology

The area of the Central Highlands including all ten tower sites is predominantly underlain by Jurassic-age dolerite (Figure 4). Tertiary-age basalt occupies lower areas including the valley of the Shannon River. Quaternary-age alluvium and marsh deposits occur – principally along watercourses.

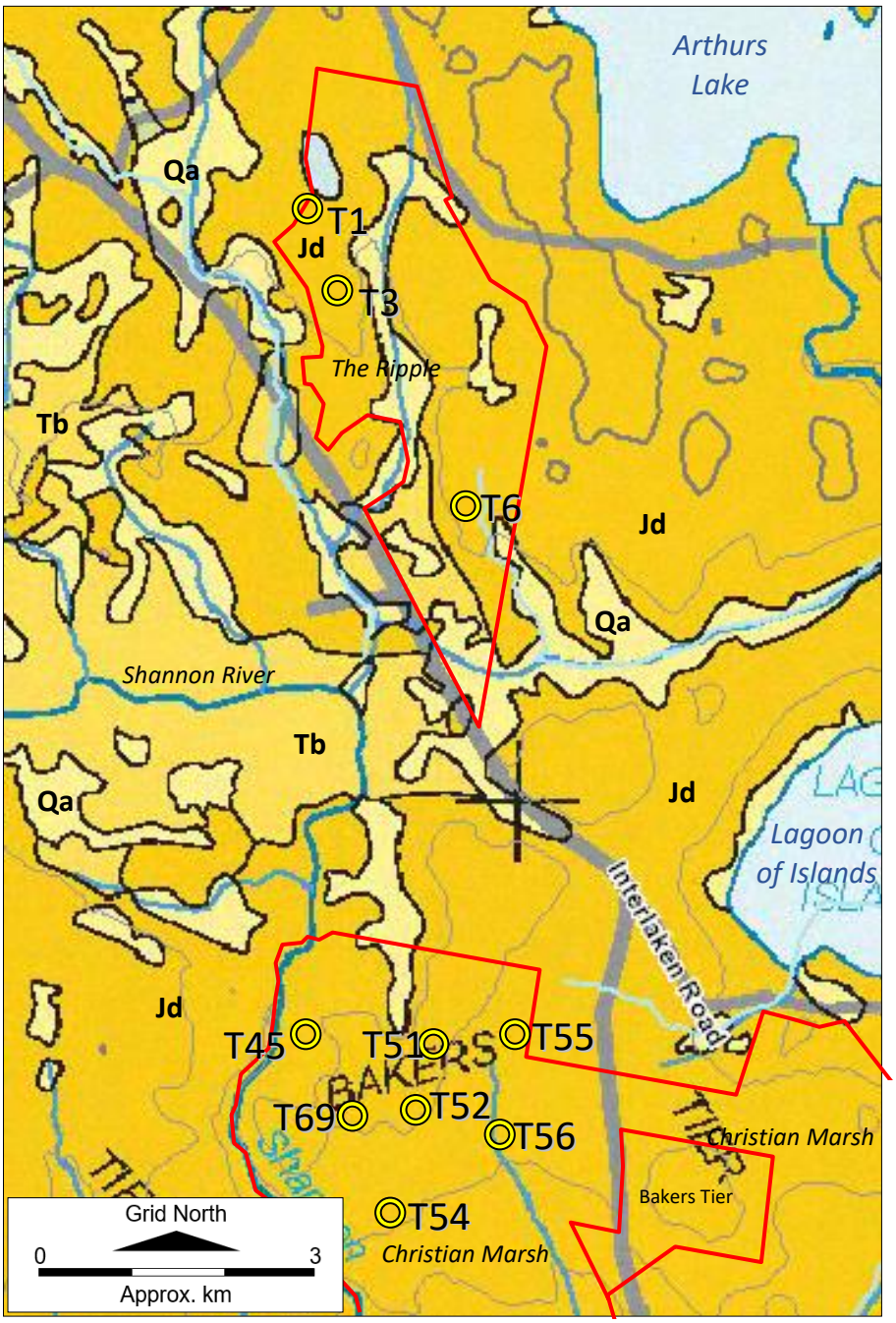


Figure 4. Published geology of the district near Arthurs Lake and Lagoon of Islands, and the ten tower sites investigated for this report.

Source: Forsyth, S. M. *et. al.* (comp.) 2005. Geology of Southeast Tasmania. Edition 2012.1. Digital Geological Atlas 1:250,000 Series. Mineral Resources Tasmania.

Key to colours and symbols

Light yellow (symbol Qa) = Quaternary-age alluvium; Orange (symbol Tb) = Tertiary-age basalt; Dark orange (symbol Jd) = Jurassic-age dolerite

2.2 Observed geology

During the course of investigations, the observed geology corresponded with the published geology.

Jurassic dolerite (and no other rock type) is present at each of the ten tower sites (see the images and photographs in Attachment 1).

2.2.1 Dolerite forms

At the ten tower sites, dolerite variously occurs as:

- surface scatter of cobbles and boulders (float[4]), and
- subcrops[5] and outcrops.

2.2.2 Dolerite jointing

At the ten tower sites, subcrops and outcrops are typically jointed, and of one or more types:

- subvertical and planar, trending roughly north – south, with spacings ranging from less than 0.1m, to more than a metre,
- subvertical or steeply dipping polygonal jointing, forming columns which are inferred to potentially extend to considerable depths, and
- shallowly dipping, curved exfoliation joints parallel to the land surface, with vertical spacings from 2 – 5cm; this jointing tends to create smooth-sided knolls and hillsides, with or without float.

2.2.3 Dolerite weathering and strength

At all visited sites, subcrops and outcrops are typically fresh and unweathered, and of high strength. This is probably due to the alpine climate, where rainfall, snow and freeze-and-thaw action tends to remove weathered material as it develops.

2.3 Published potential or actual slope instability in the district

2.3.1 Landslide hazard bands

Areas of potential unstable ground occur as scattered occurrences of Low and (rarely) Medium Hazard Bands near all ten tower sites. However, apart from site T54 on the boundary between a Low Landslide Hazard Band and no landslide banding, all other actual tower sites are in non-landslide hazard areas and 40 – 100m away from them.

2.3.2 Recorded landslides

The Mineral Resources Tasmania landslide database (www.thelist.tas.gov.au) shows no known landslides in the district.

[4] *Float* is loose rock scattered on a land surface and not attached to bedrock. It is typically cobble or boulder size.
[5] *Subcrop* is an exposure of rock which may or may not be continuous with bedrock, but which appears to be more contiguous than float. Use of the term implies uncertainty.

2.4 Observed and inferred slope instability at tower sites

Table 1 and Figure 5 lists generally recognised types of slope instability (landslide), and Table 2 describes the size ranges and rates of movement of landslides adopted for this report.

Table 3 summarises the forms of actual and/or potential slope instability (in red type) observed or inferred during the site investigations at the ten sites. The three types were rock falls, rock topples and rock slides.

No other forms of landsliding depicted in Table 1 and Figure 5 are regarded as credible at and in the immediate vicinity of the ten sites.

Table 1. Main types of landslide movement

Source: From Appendix B of AGS (2007c). Practice Notes Guidelines for Landslide Risk Management. Australian Geomechanics Vol 42 No 1 March 2007

TYPE OF MOVEMENT		TYPE OF MATERIAL		
		BEDROCK	ENGINEERING SOILS	
			Predominantly Coarse	Predominantly Fine
FALLS		Rock fall	Debris fall	Earth fall
TOPPLES		Rock topple	Debris topple	Earth topple
SLIDES	ROTATIONAL	Rock slide	Debris slide	Earth slide
	TRANSLATIONAL			
LATERAL SPREADS		Rock spread	Debris spread	Earth spread
FLOWS		Rock flow (Deep creep)	Debris flow (Soil creep)	Earth flow
COMPLEX	Combination of two or more principle types of movement			

Table 2. Definitions used in this report for landslide size and rate of movement

Description	Size (m^2)
Very small	0.01
Small	10
Medium	1,000
Large	100,000
Very large	1,000,000

Size is areal extent of failure zone
After: van Schalkwyk, A and Thomas, M.A. (1991). Slope failures associated with the floods of September 1987 and February 1988 in Natal and Kwa-Zulu, Republic of South Africa. Geotechnics in the African Environment, Blight et al. (Eds), pp. 57-63

Description	Typical velocity (mm/sec)	Typical velocity
Extremely rapid	5×10^{3}	5m/sec
Very rapid	5×10^{1}	3m/min
Rapid	5×10^{-1}	1.8m/hour
Moderate	5×10^{-3}	13m/month
Slow	5 x 10-5	1.6m/year
Very slow	5×10^{-7}	15mm/year
Extremely slow		

From Figure B3 of AGS (2007c)

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

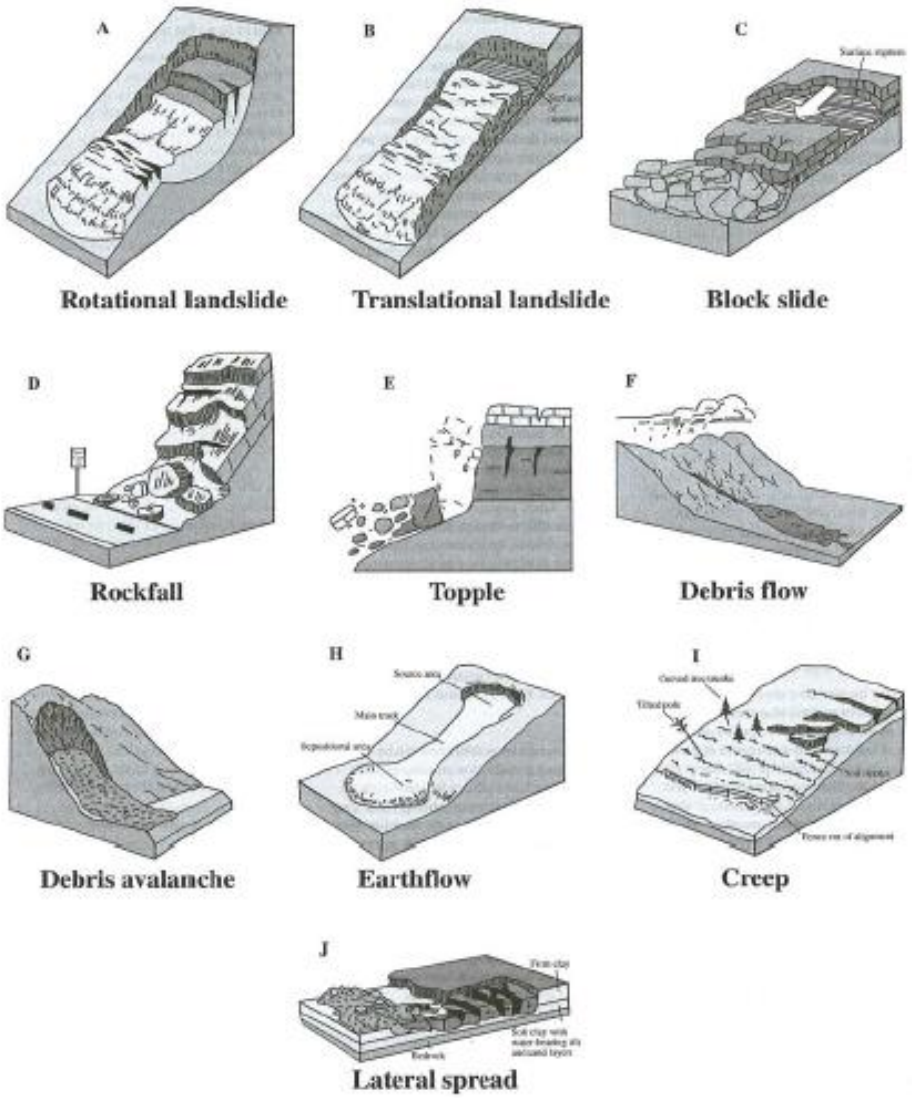


Figure B1: These schematics illustrate the major types of landslide movement.
(From US Geological Survey Fact Sheet 2004-3072, July 2004, with kind permission for reproduction.)

The nomenclature of a landslide can become more elaborate as more information about the movement becomes available. To build up the complete identification of the movement, descriptors are added in front of the two-term classification using a preferred sequence of terms. The suggested sequence provides a progressive narrowing of the focus of the descriptors, first by time and then by spatial location, beginning with a view of the whole landslide, continuing with parts of the movement and finally defining the materials involved. The recommended sequence, as shown in Table B2, describes activity (including state, distribution and style) followed by descriptions of all movements (including rate, water content, material and type). Definitions of the terms in Table B2 are given in Cruden & Varnes (1996).

Figure 5 Main types of landslide movement
Source: From Appendix B of AGS (2007c). Practice Notes Guidelines for Landslide Risk Management. Australian Geomechanics Vol 42 No 1 March 2007

Table 3. Summary of observed types of slope instability (red font) at the ten tower sites

	GDA94				
Site	**Easting***	**Northing***	**Elevation (approx. mASL)**	**Potential or actual slope instability of site and immediate surrounds****	**Reference in Attachment 1**
T1	487523	5346922	975	Small scale, very rapid to extremely rapid rock falls and rock topples, and very slow to very rapid rock slides, on 30 – 40^0 exfoliated outcrops on western and to a lesser extent eastern side of site; no credible issue within 30m of site.	Plate T1-4
T3	487875	5345968	953	Very small scale, very rapid to extremely rapid rock falls and rock topples on 30 – 40^0 outcrops on eastern side of site; no credible issue within 50m of site.	
T6	489373	5343489	942	Very small scale, very rapid to extremely rapid rock falls and rock topples on 45+^{0} outcrops/small cliffs on western and southern sides of site; no credible issue within 30m of site.	Plates T6-2 and T6-3
T45	487556	5337348	900	Small scale, very rapid to extremely rapid rock falls and rock topples on 45+^{0} outcrops/small cliffs on all sides of site; no credible issue within 15 – 20m of site.	T45-4
T51	489025	5337283	935	Small scale, very rapid to extremely rapid rock falls and rock topples, and very slow to very rapid rock slides, on 45+^{0} outcrops/knolls on all sides of site; no credible issue within 10 – 15m of site.	T51-2
T52	488850	5336501	915	Small scale, very rapid to extremely rapid rock falls and rock topples on 45+^{0} slopes on southeastern side of site; no credible issue within 50m of site.	T52-4
T54	488526	5335267	850	Very small scale, very rapid to extremely rapid rock falls and rock topples on 30 – 35^0 slopes on eastern and northern sides of site; no credible issue within 30m of site.	
T55	490000	5337390	884	Very small scale, very rapid to extremely rapid rock falls and rock topples on knoll and localised 30 – 35^0 slopes on eastern and northern sides of site; no credible issue within 30m of site.	
T56	489789	5336214	860	Small scale, very rapid to extremely rapid rock falls and rock topples on knoll and localised 30 – 45^0 slopes on eastern side of site; no credible issue within 30m of site.	Plate T56-5 and T56-6
T69	488093	5336443	933	Very small scale, very rapid to extremely rapid rock falls and rock topples on 30 – 35^0 slopes on eastern approach to site; no credible issue within 50m of site.	Plate T69-1

*Tower grid coordinates were provided by ERA Planning

** "Immediate surrounds" is within a 50 – 100m radius of site

3 DISCUSSION

3.1 Landslide likelihoods, consequences and risks

Arising from the observed and/or potential landslide types (rock falls, topples and slides) described in Table 3, Table 4 assigns subjective likelihoods, consequences and risks to each type at each of the ten sites, for (a) the tower itself, and (b) related infrastructure (mainly access roads to the tower)[6].

Assuming development proceeds at each site, the landslide risks in Table 4 are rated before and after risk treatment (management).

In summary, Table 4 shows:

- before treatment, risks to the towers are in the Low to Very Low range at all sites, and remain in the Low to Very Low range after a recommended range of treatments, and
- before treatment, risks to access roads and related infrastructure are in the Very Low to Moderate range, but reduce to Very Low to Low after treatment.

3.2 Compliance of proposed tower developments with E3.0 and C15.0

Tables 5, 6 and 7 demonstrate that the proposed towers at each of the ten sites described in this report comply with E3.0 Landslide Code performance criteria in Sections E3.7.1 and E3.7.3 of the Central Highlands Interim Planning Scheme 2015, and also with performance criteria in Section C15.6 of the forthcoming Landslip Hazard Code C15.0.

W. C. Cromer

Principal

6 July 2021

This report is and must remain accompanied by the following Attachment

Attachment 1. Aerial images and landslide hazard bands, slope angles, hillshading and flow concentration lines, and site photographs (53 pages)

[6] Landslide risk assessment and management (LRM) in Australia is usually done in accordance with the Australian Geomechanics Society (AGS) *Landslide Risk Management* documents and guidelines (2007). At the reconnaissance level of this report, it was deemed unnecessary to do a detailed LRM in strict accordance with AGS (2007). [The five documents AGS are: AGS (2007a). Guideline for Landslide Susceptibility, Hazard and Risk Zoning. Australian Geomechanics, Vol 42 No 1 March 2007
AGS (2007b). Commentary on Guideline for Landslide Susceptibility, Hazard and Risk Zoning. Australian Geomechanics, Vol 42 No 1 March 2007
AGS (2007c). Practice Notes Guidelines for Landslide Risk Management. Australian Geomechanics Vol 42 No 1 March 2007
AGS (2007d). Commentary on Practice Notes Guidelines for Landslide Risk Management. Australian Geomechanics Vol 42 No 1 March 2007
AGS (2007e). The Australian Geoguides for Slope Management and Maintenance. Australian Geomechanics Vol 42 No 1 March 2007]

Table 4. Likelihoods, consequences and risks assigned to each of the observed or potential landslide types at each of the ten proposed tower sites, before and after recommended risk treatment.

		Before treatment							After treatment					
Landslide type	Tower site	Likelihood of occurrence at tower	Consequences to tower	Risk to tower	Likelihood of occurrence at other infrastructure (eg access road)	Level of risk to other infrastructure	Risk to other infrastructure	Recommended risk treatments	Likelihood of occurrence at tower	Consequences to tower	Risk to tower	Likelihood of occurrence at other infrastructure (eg access road)	Level of risk to other infrastructure	Risk to other infrastructure
Rock falls and rock topples	T1	Barely credible	Medium	Very Low	Likely	Minor	Moderate	Before construction, (a) select actual tower sites based on site-specific geotechnical investigations as appropriate, and (b) select routes for access roads which minimise geotechnical risk [eg in general, and where appropriate and/or feasible, avoid (i) steep slopes, (ii) avoid proximity to rocky knolls, particularly with loose joint blocks, (iii) minimise cut and fill and/or adopt appropriate batter angles or embankment support, (iv) manage stormwater at site and along access roads.]. See AGS (2007e). *The Australian Geoguides for Slope Management and Maintenance*. Australian Geomechanics Vol 42 No 1 March 2007]. Other unlisted treatments may also be appropriate, and any or all of these listed or unlisted management techniques may be varied depending on site-specific conditions provided they mitigate existing Moderate risks and do not increase existing Low or Very Low risks. Post construction, maintain regular inspections of tower site and all other infrastructure.	Barely credible	Medium	Very Low	Unlikely	Minor	Low
	T3													
	T6													
	T45													
	T51	Rare		Low					Rare		Low			
	T52	Barely credible		Very Low	Barely credible		Very Low		Barely credible		Very Low	Barely credible		Very Low
	T54				Rare		Low					Rare		Low
	T55													
	T56				Barely credible		Very Low					Barely credible		Very Low
	T69				Likely		Moderate					Unlikely		Low
Rock slides	T1	Unlikely		Low					Unlikely		Low			
	T3	Rare			Possible				Rare					
	T6													
	T45													
	T51	Unlikely			Likely				Unlikely					
	T52	Rare			Rare		Very Low		Rare			Rare		Very Low
	T54	Barely credible		Very Low	Possible		Mod		Barely credible		Very Low	Unlikely		Low
	T55				Barely credible		Very Low					Barely credible		Very Low
	T56				Rare							Rare		
	T69	Rare		Low	Likely		Mod		Rare		Low	Unlikely		Low
		Before treatment							After treatment					

Note: Geotechnical risk assessment – particularly assigning likelihood to landslide types – is a subjective process. Accordingly, it is acknowledged that landslide practitioners may assign different values to likelihood and consequence, and may arrive at different levels of risk.

Table 5. Compliance of the proposed tower developments with Landslide Code E3.7 1 P1 in the Central Highlands Council *Interim Planning Scheme 2015*.

EPURON

Address

Various wind farm tower sites, Central Highlands

E3 Landslide Code

OBJECTIVE: To ensure that landslide risk associated with buildings and works for buildings and works, other than minor extensions, in Landslide Hazard Areas, is: (a) acceptable risk; or (b) tolerable risk, having regard to the feasibility and effectiveness of measures required to manage the landslide hazard. Section E3.7.1 states that there is no acceptable solution for A1, and for Performance Criteria P1 Buildings and works must satisfy all of the following:

	Buildings and works other than Minor Extensions must satisfy all of the following Performance Criteria: E3.7.1 (P1)	**Compliance**	**Is management required?**	**Management Plan**
(a)	no part of the buildings and works is in a High Landslide Hazard Area;	Complies. Except for site T54, no other proposed tower site is within 40m of a Low landslide hazard band. (Site T54 lies on the boundary between no landslide hazard band, and a Low landslide hazard band.) See Attachment 1.	Yes	Before construction, (a) select actual tower sites based on site-specific geotechnical investigations as appropriate, and (b) select routes for access roads which minimise geotechnical risk [eg in general, and where appropriate and/or feasible, avoid (i) steep slopes, (ii) avoid proximity to rocky knolls, particularly with loose joint blocks, (iii) minimise cut and fill and/or adopt appropriate batter angles or embankment support, (iv) manage stormwater at site and along access roads.]. See AGS (2007e). The Australian Geoguides for Slope Management and Maintenance. Australian Geomechanics Vol 42 No 1 March 2007]. Other unlisted treatments may also be appropriate, and any or all of these listed or unlisted management techniques may be varied depending on site-specific conditions provided they mitigate existing Moderate risks and do not increase existing Low or Very Low risks. Post construction, maintain regular inspections of tower site and all other infrastructure.
(b)	the landslide risk associated with the buildings and works is either: (i) acceptable risk; or (ii) capable of feasible and effective treatment through hazard management measures, so as to be tolerable risk.	Development at each tower site willl comply with P1(b) (ii). See Table 4.		

Table 6. Compliance of the proposed tower developments with Landslide Code E3.7 3 P1 in the Central Highlands Council *Interim Planning Scheme 2015*.

EPURON

Address

Various wind farm tower sites, Central Highlands

E3 Landslide Code

OBJECTIVE: To ensure that landslide risk associated with Major Works in Landslide Hazard Areas, is: (a) acceptable risk; or (b) tolerable risk, having regard to the feasibility and effectiveness of measures required to manage the landslide hazard. Section E3.7.3 states that there is no acceptable solution for A1, and for Performance Criteria P1 for Major works must satisfy all of the following:

	Buildings and works other than Minor Extensions must satisfy all of the following Performance Criteria: E3.7.3 (P1)	**Compliance**	**Is management required?**	**Management Plan**
(a)	no part of the buildings and works is in a High Landslide Hazard Area;	Complies. Except for site T54, no other proposed tower site is within 40m of a Low landslide hazard band. (Site T54 lies on the boundary between no landslide hazard band, and a Low landslide hazard band.) See Attachment 1.	Yes	Before construction, (a) select actual tower sites based on site-specific geotechnical investigations as appropriate, and (b) select routes for access roads which minimise geotechnical risk [eg in general, and where appropriate and/or feasible, avoid (i) steep slopes, (ii) avoid proximity to rocky knolls, particularly with loose joint blocks, (iii) minimise cut and fill and/or adopt appropriate batter angles or embankment support, (iv) manage stormwater at site and along access roads.]. See AGS (2007e). The Australian Geoguides for Slope Management and Maintenance. Australian Geomechanics Vol 42 No 1 March 2007]. Other unlisted treatments may also be appropriate, and any or all of these listed or unlisted management techniques may be varied depending on site-specific conditions provided they mitigate existing Moderate risks and do not increase existing Low or Very Low risks. Post construction, maintain regular inspections of tower site and all other infrastructure.
(b)	the landslide risk associated with the buildings and works is either: (i) acceptable risk; or (ii) capable of feasible and effective treatment through hazard management measures, so as to be tolerable risk.	Development at each tower site willl comply with P1(b) (ii). See Table 4.		

Major Works means any of the following: (i) excavation of 100m³ or more in cut volume; (ii) excavation or soil disturbance of an area of 1,000m² or more; (iii) clearance of vegetation involving an area of more than 1,000m²; (iv) water storages or swimming pools with a volume of 45,000 litres or more

Table 7. Compliance of the proposed tower developments with Landslip Hazard Code C15.6 P1.1, P1.2 and P1.3 in the Tasmanian Planning Scheme *State Planning Provisions*.

EPURON
Address
Various wind farm tower sites, Central Highlands
C15.0 Landslip Hazard Code
C15.6 Development Standards for Buildings and Works

OBJECTIVE:
That building and works on land within a landslip hazard area can:
(a) minimise the likelihood of triggering a landslip event, and
(b) achieve and maintain a tolerable risk from a landslip.

There are no Acceptable Solutions for C15.6 A1. Instead,	**Comment**	**Is management required?**	**Management Plan**
P1.1 Building and works within a landslip hazard area must minimise the risk of triggering a landslip event and achieve and maintain a tolerable risk (a) the type, form, scale and intended duration of the development; (b) whether any increase in the level of risk from a landslip requires any specific hazard reduction or protection measures; (c) any advice from a State authority, regulated entity or a council; and (d) the advice contained in a landslip hazard report.	The proposed development at each tower site complies with P1.1 (a) – (d). See Table 4 .	Yes	Before construction, (a) select actual tower sites based on site-specific geotechnical investigations as appropriate, and (b) select routes for access roads which minimise geotechnical risk [eg in general, and where appropriate and/or feasible, avoid (i) steep slopes, (ii) avoid proximity to rocky knolls, particularly with loose joint blocks, (iii) minimise cut and fill and/or adopt appropriate batter angles or embankment support, (iv) manage stormwater at site and along access roads.]. See AGS (2007e). The Australian Geoguides for Slope Management and Maintenance. Australian Geomechanics Vol 42 No 1 March 2007]. Other unlisted treatments may also be appropriate, and any or all of these listed or unlisted management techniques may be varied depending on site-specific conditions provided they mitigate existing Moderate risks and do not increase existing Low or Very Low risks. Post construction, maintain regular inspections of tower site and all other infrastructure.
P1.2 A landslip hazard report also demonstrates that the buildings and works do not cause or contribute to landslip on the site, on adjacent land or public infrastructure.	The proposed development at each tower site complies with P1.2. See this report. Other site specific reports may be produced as required.		
P1.3 If landslip reduction or protection measures are required beyond the boundary of the site the consent in writing of the owner of that land must be provided for that land to be managed in accordance with the specific reduction or protection measures.	Landowner/developer agreements are or will be in place to comply with P1.3.		

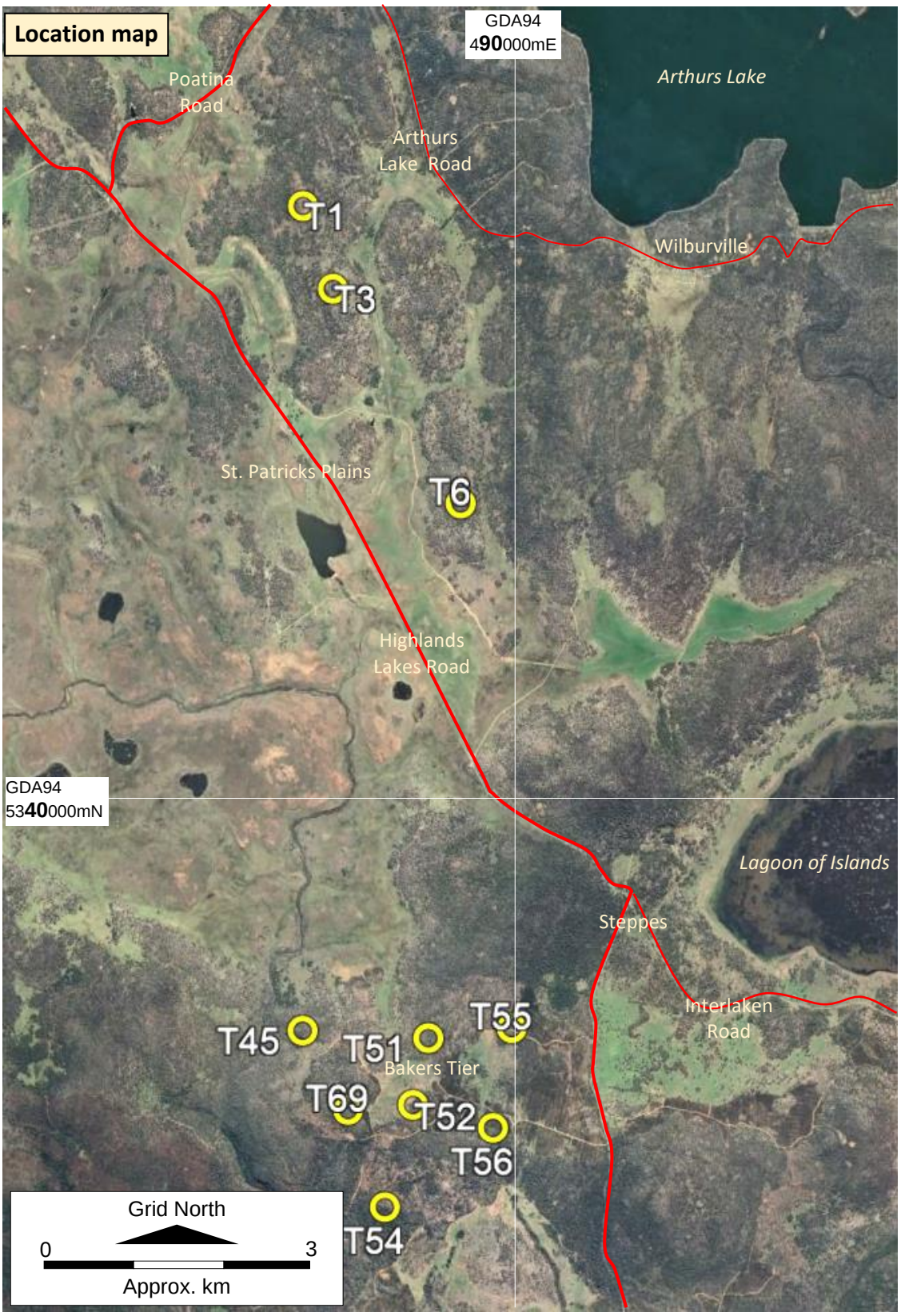
Attachment 1

(53 pages)

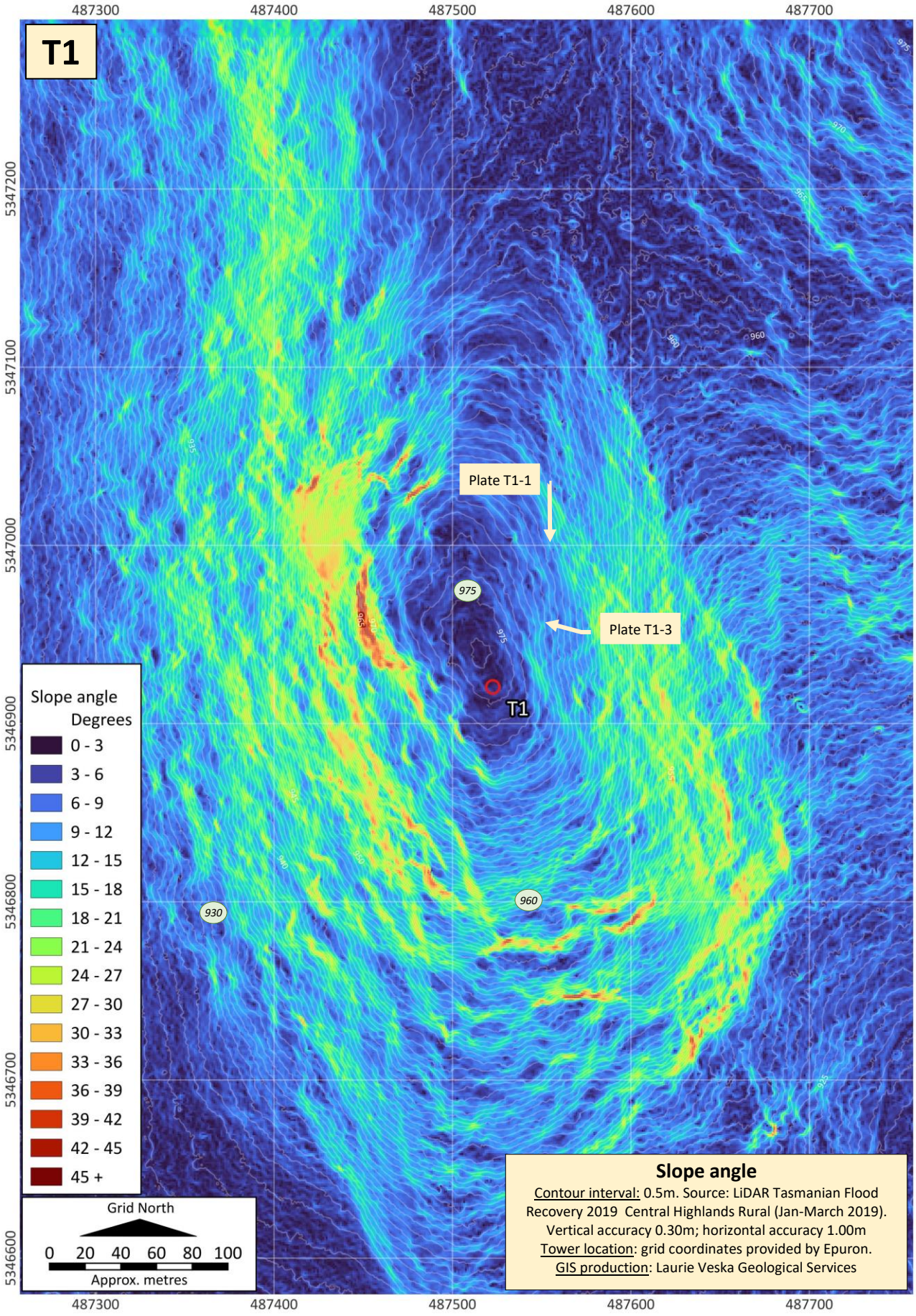
Proposed tower locations

Aerial images and landslide hazard bands, slope angles, hillshading and flow concentration lines, and site photographs

Tower sites are prefixed "T", and are arranged here in numerical order.




T1
487300
487400
487500
487600
487700
5347200
5347100
5347000
5346900
5346800
5346700
5346600
Plate T1-1
Plate T1-3
T1
975
960
930
Landslide hazard bands
Low
Medium
Grid North
0 20 40 60 80 100
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services



Slope angle

Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

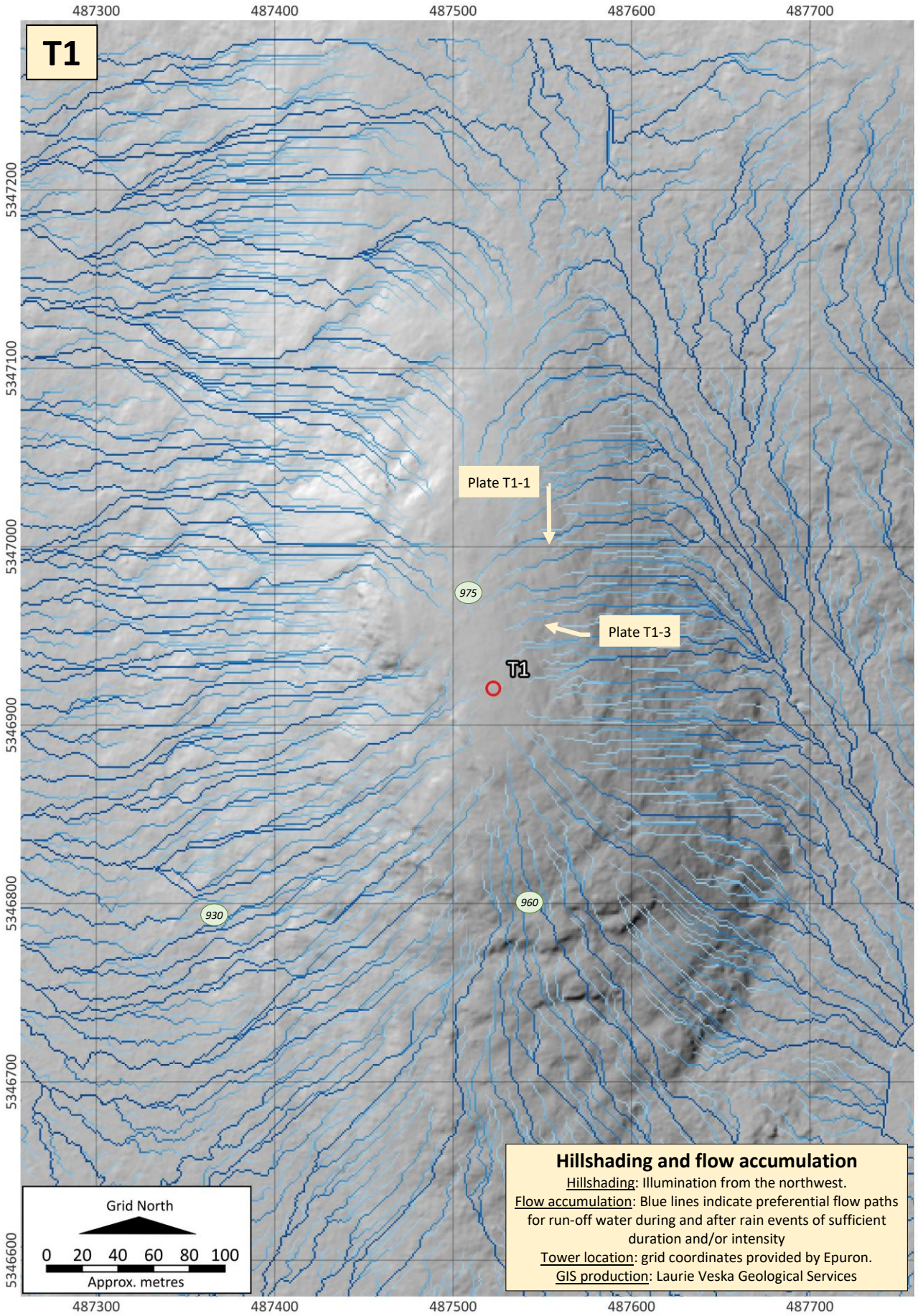
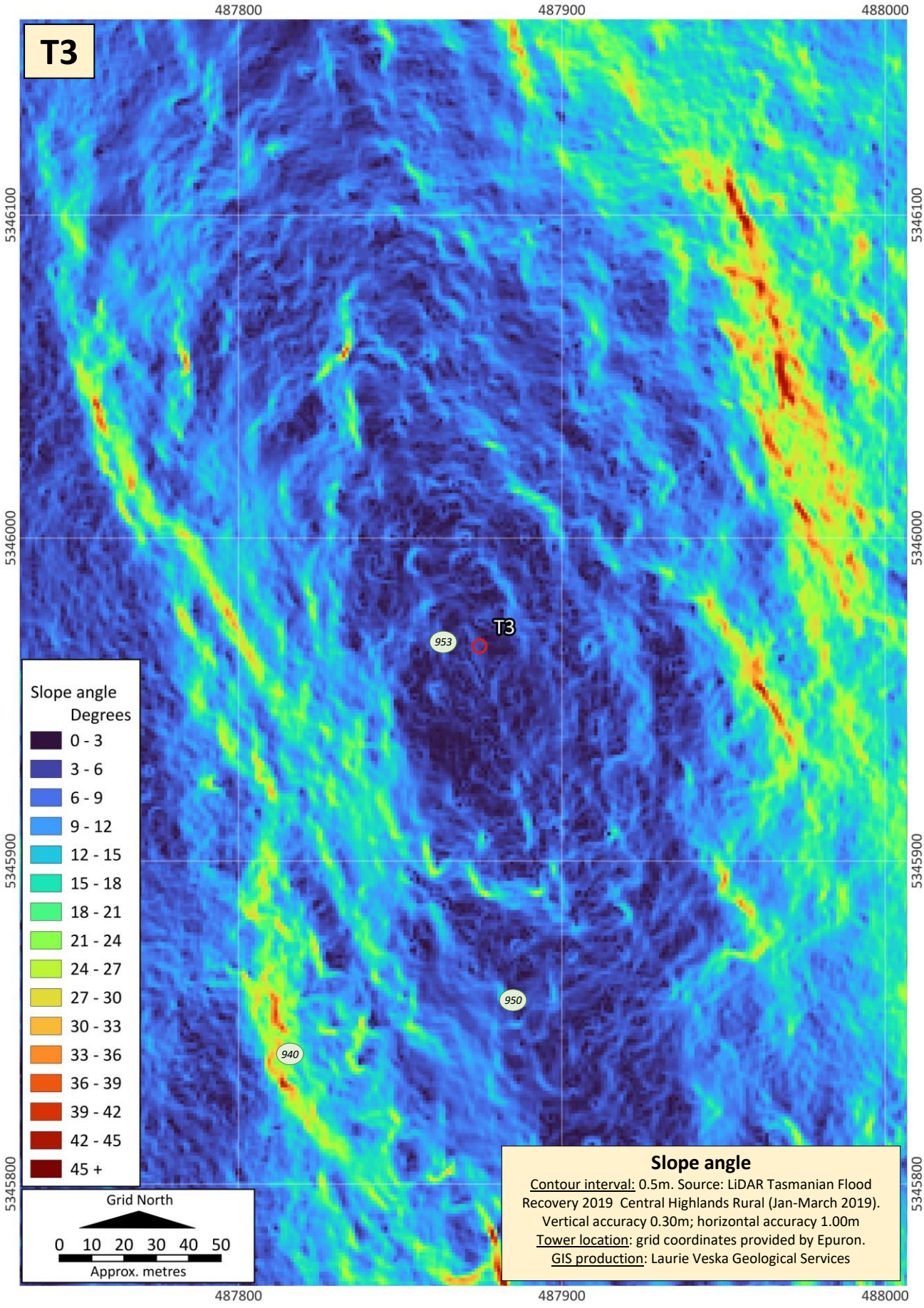
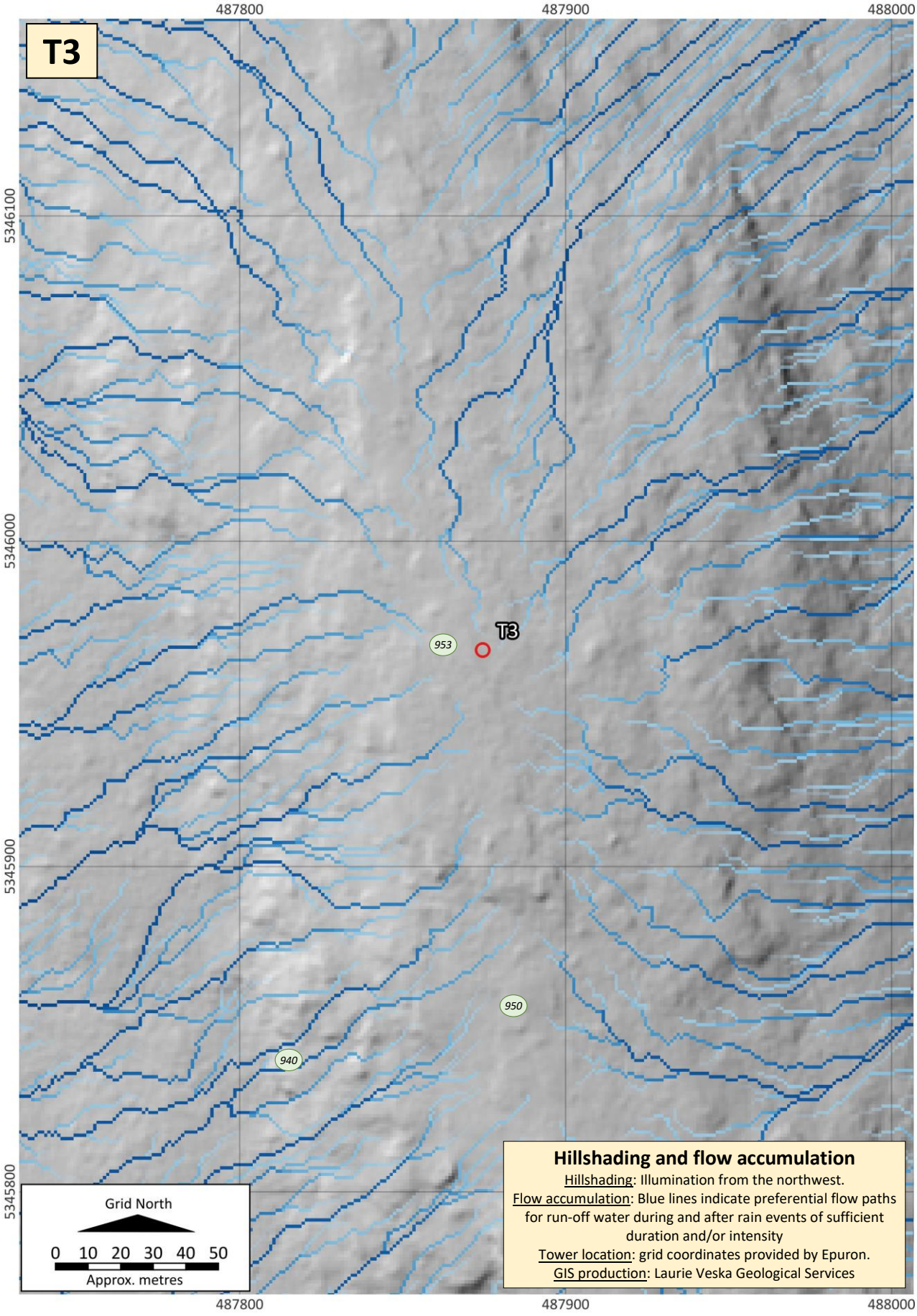

T1
487300
487400
487500
487600
487700
5347200
5347100
5347000
5346900
5346800
5346700
5346600
Plate T1-1
Plate T1-3
975
930
960
T1
Grid North
0 20 40 60 80 100
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T1-1 (above). View south near proposed tower T1 (at right), showing in-situ, high-strength Jurassic dolerite bedrock with well-developed curved exfoliation joints parallel to land surface (vertical spacing c. 0.02 – 0.2m).
Plate T1-2 (below). View southwest near proposed tower T1 (at centre left), showing in-situ high strength Jurassic dolerite bedrock with (a) well-developed curved exfoliation joints parallel to land surface (vertical spacing c. 0.02 – 0.2m), and (b) subvertical polygonal joints (red arrows). These polygons are the eroded tops of subvertical dolerite columns. The jointing may extend for considerable depths into the bedrock., and columns may be cut by subhorizontal joints. The staff is 2m high.

Plate T1-3 (above). Detail of polygonal jointing near T1.
Plate T1-4 (below). View southwest from near T1, over a large exfoliated outcrop of high strength dolerite. St. Patricks Plains are in the background.


T3
487800
487900
488000
5346100
5346000
5345900
5345800
T3
953
950
940
945
935
930
920
915
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T3
487800
487900
488000
5346100
5346000
5345900
5345800
T3
953
950
940
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services


T3
487800
487900
488000
5346100
5346000
5345900
5345800
T3
953
950
940
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

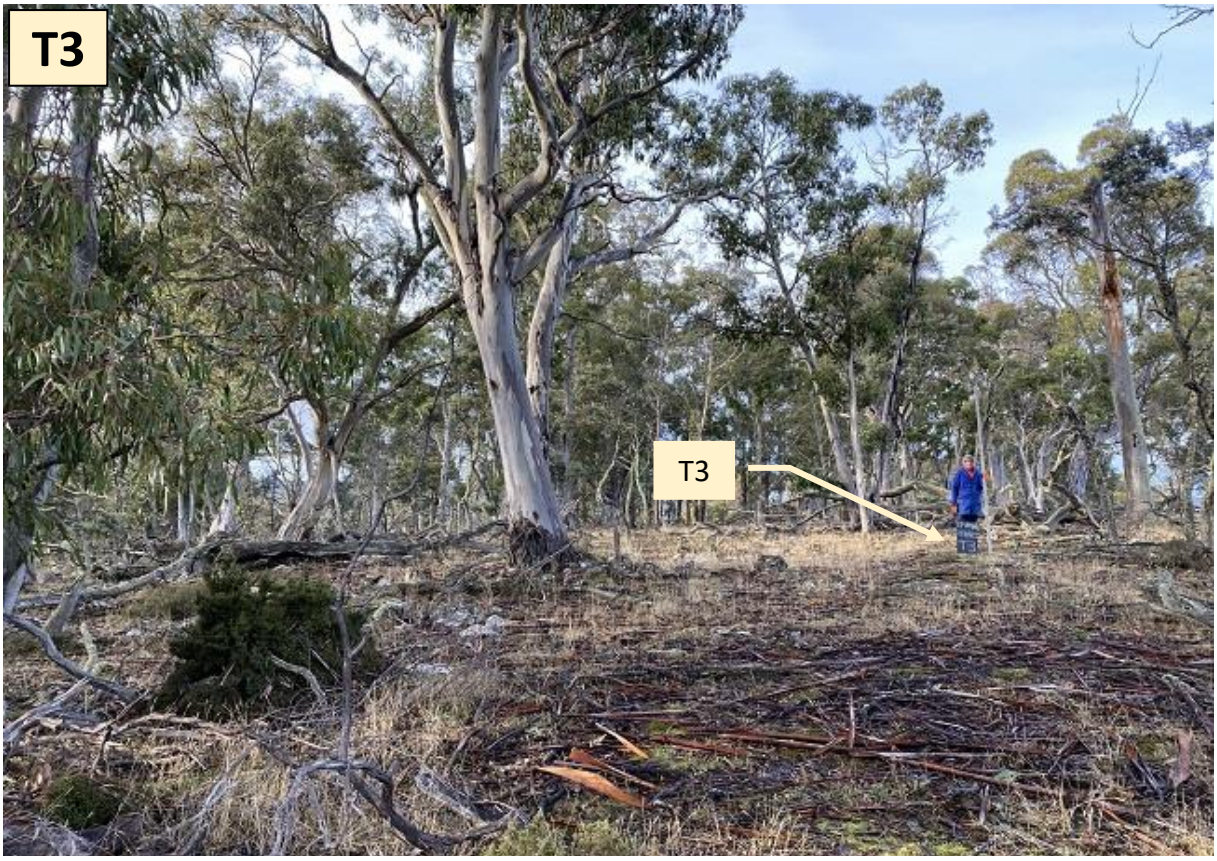
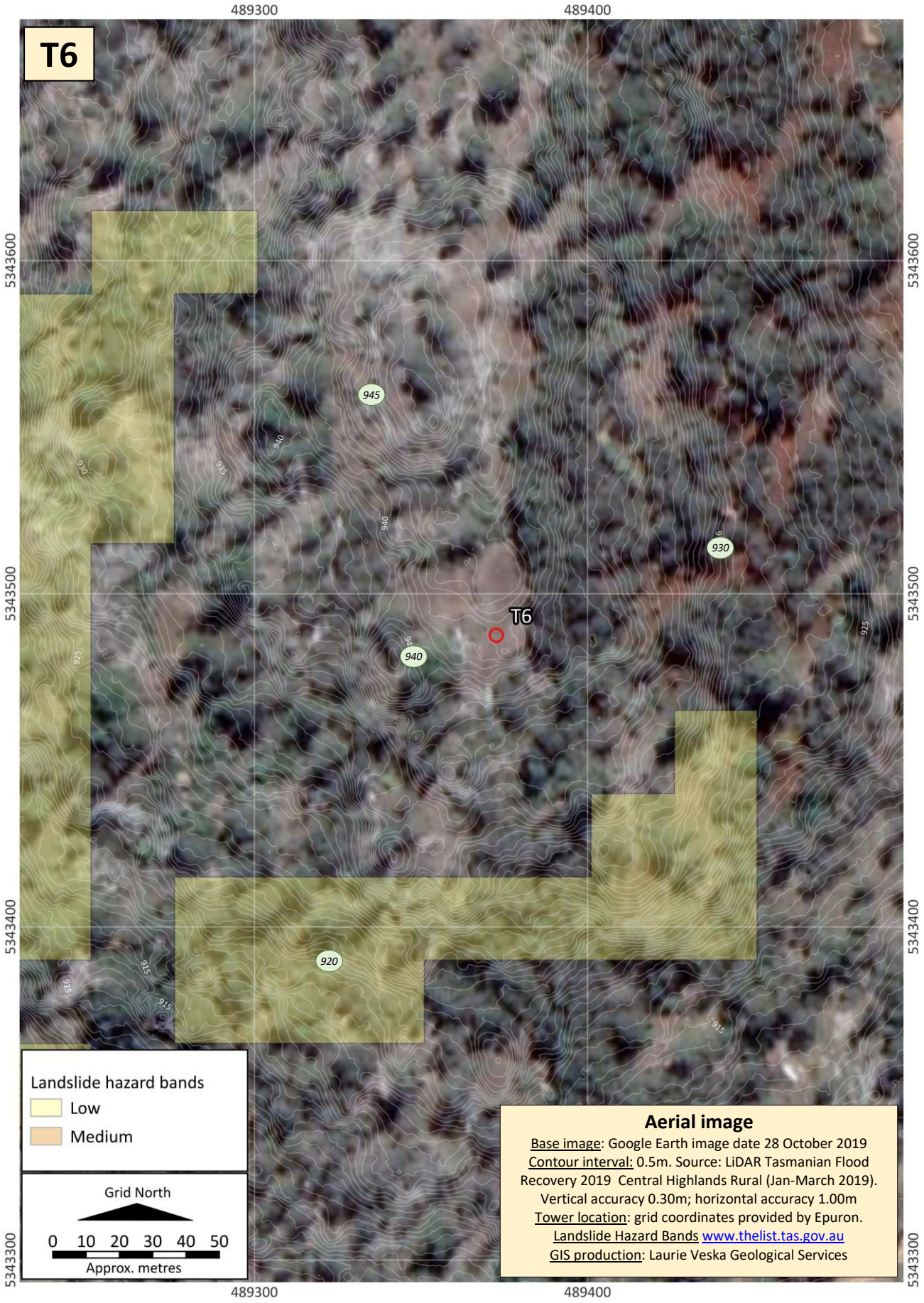
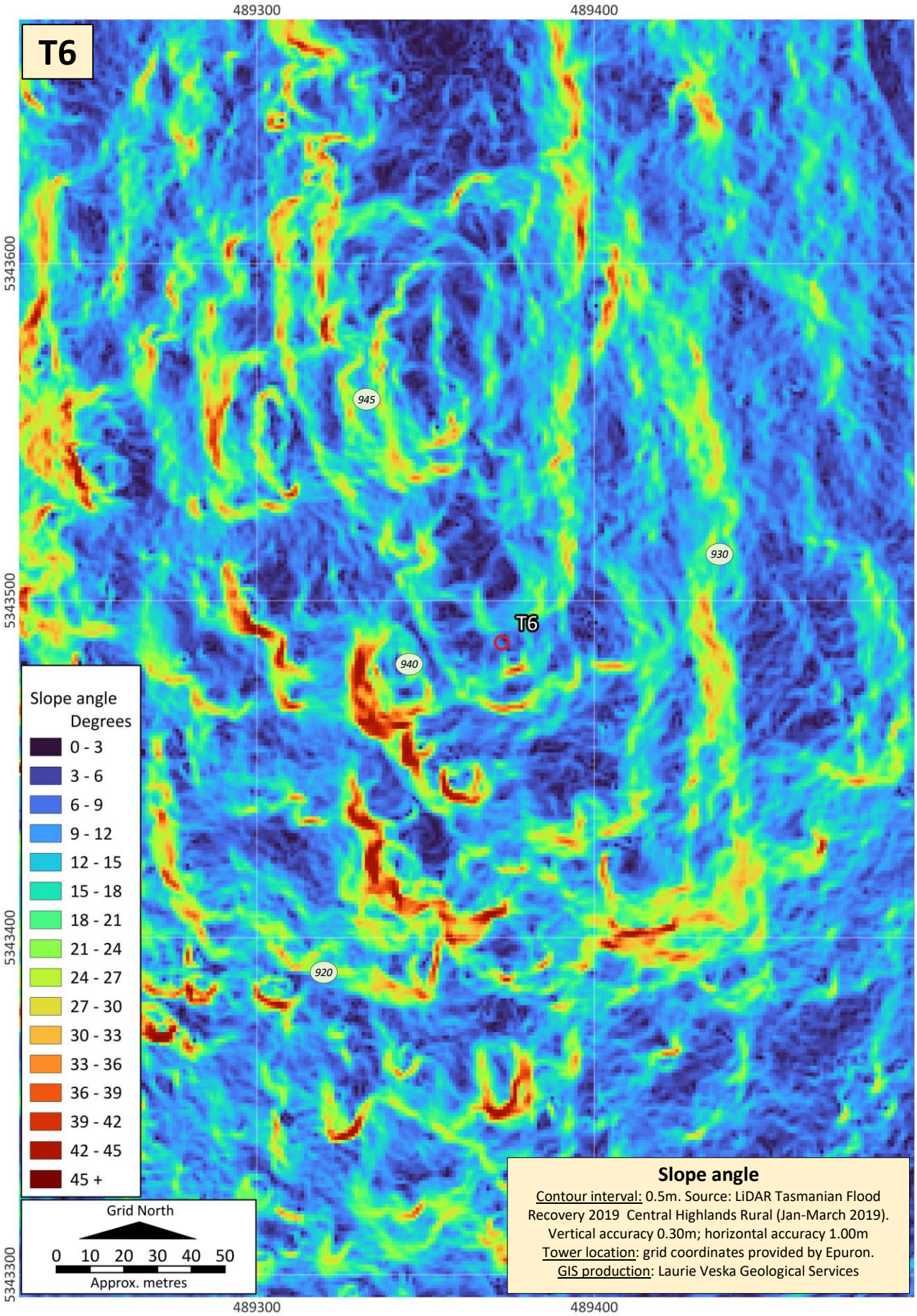


Plate T3-1 (above). View north near proposed tower T3, on the almost flat crest of a broad spur trending NNW – SSE; the ground slopes gently in these directions at angles in the 0– 5^0 range. Slopes steepen to up to 30^0 and more along the sides of the ridge. The staff is 3m high.
Plate T3-2 (below). View north towards T3. Dolerite cobbles and boulders float litters the ground, and subcrops of bedrock are common.

Plate T3-3 (above). View south southeast from near T3. Well-developed exfoliated joint surfaces in high-strength Jurassic-age dolerite. The staff is 3m high.

Plate T3-4 (below). View north towards T3 (off-camera to right). Dolerite cobbles and boulders float litters the ground, and outcrops of exfoliated high-strength bedrock are common. The staff is 3m high.


T6
489300
489400
5343600
5343500
5343400
5343300
945
940
935
930
925
920
915
T6
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T6
489300
489400
5343600
5343500
5343400
5343300
945
930
940
920
T6
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

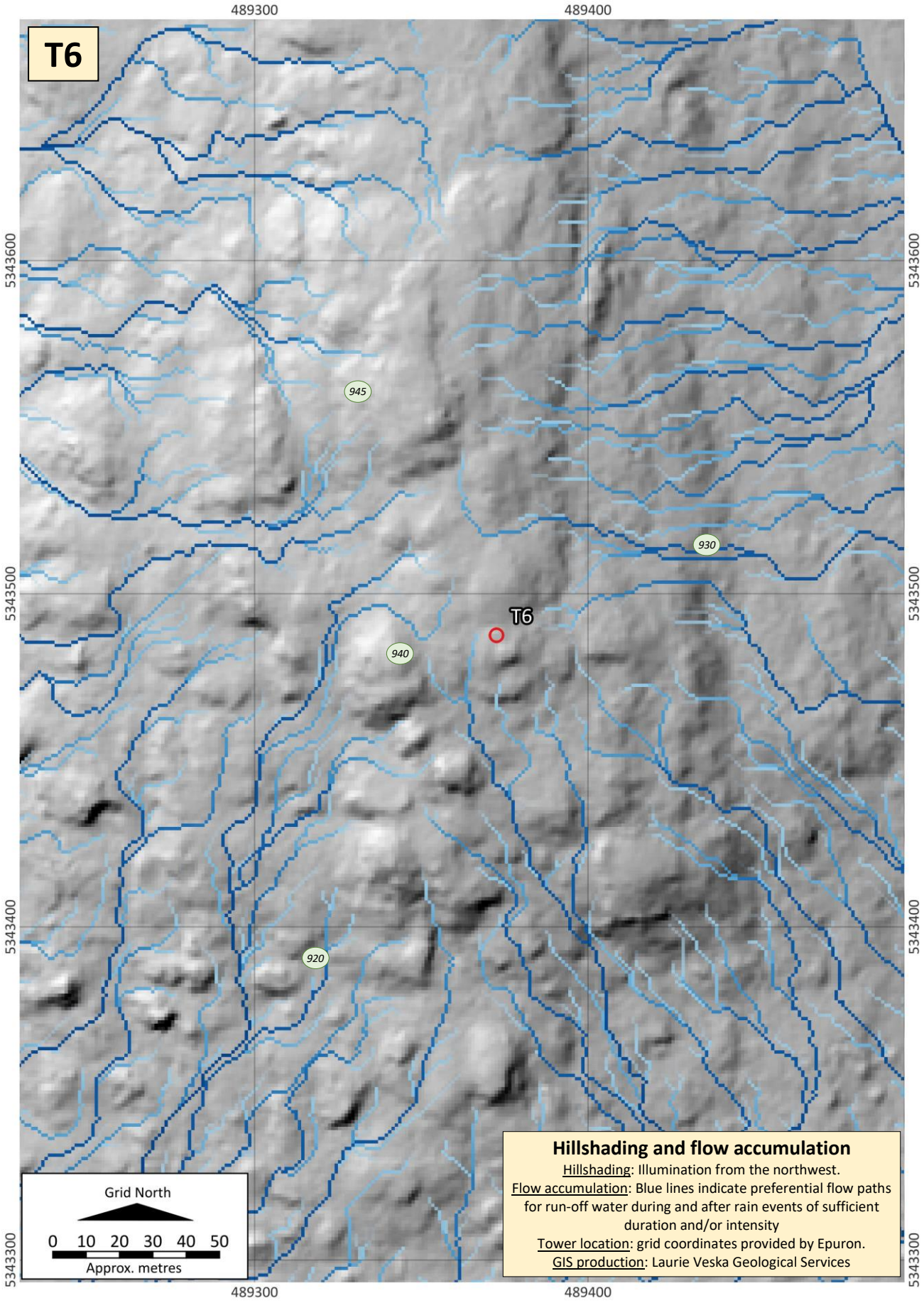

T6
489300
489400
5343600
5343500
5343400
5343300
945
930
940
920
T6
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T6-1 (above) and P**late T6-2 (below).** View south to T6. Dolerite cobbles and boulders float litters the ground, and outcrops of exfoliated high-strength bedrock are common. The staff is 3m high.

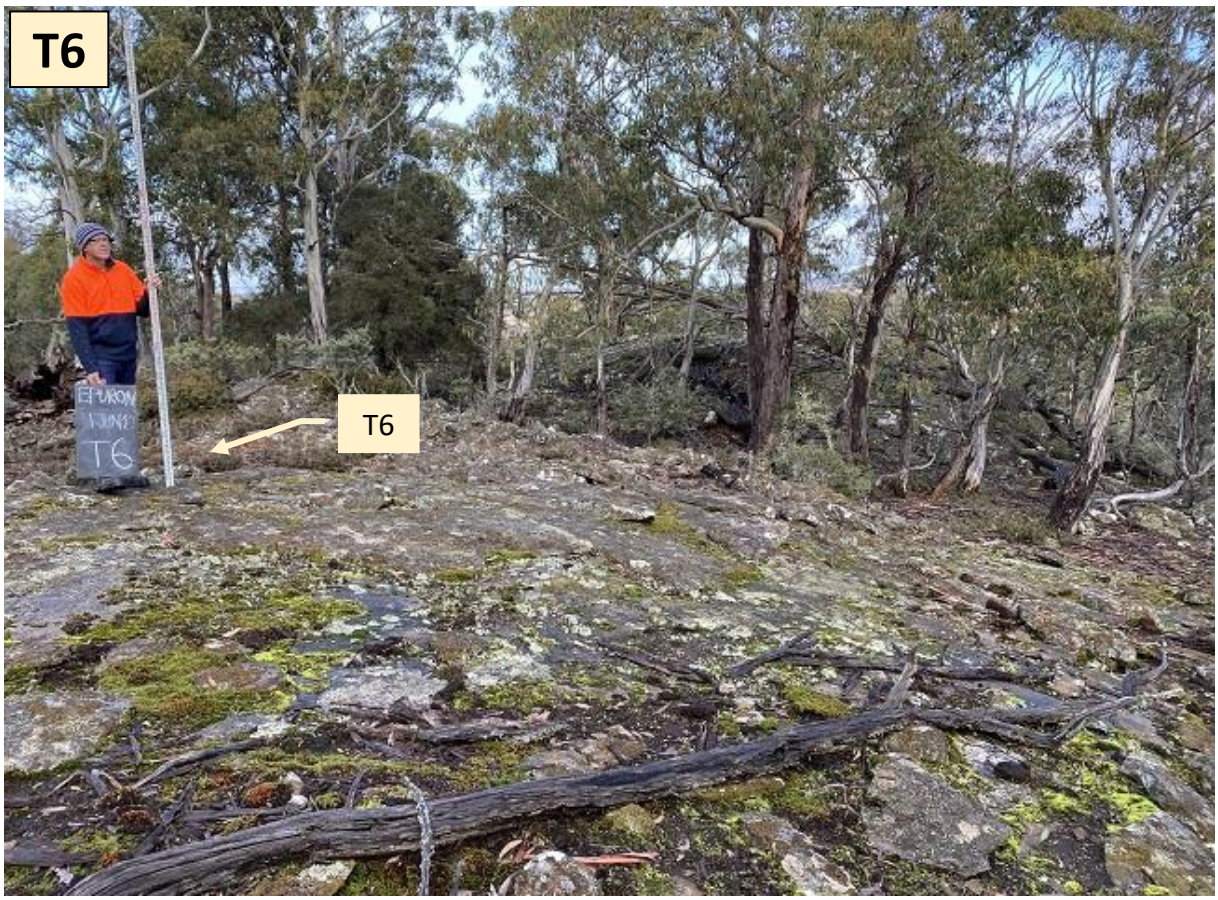
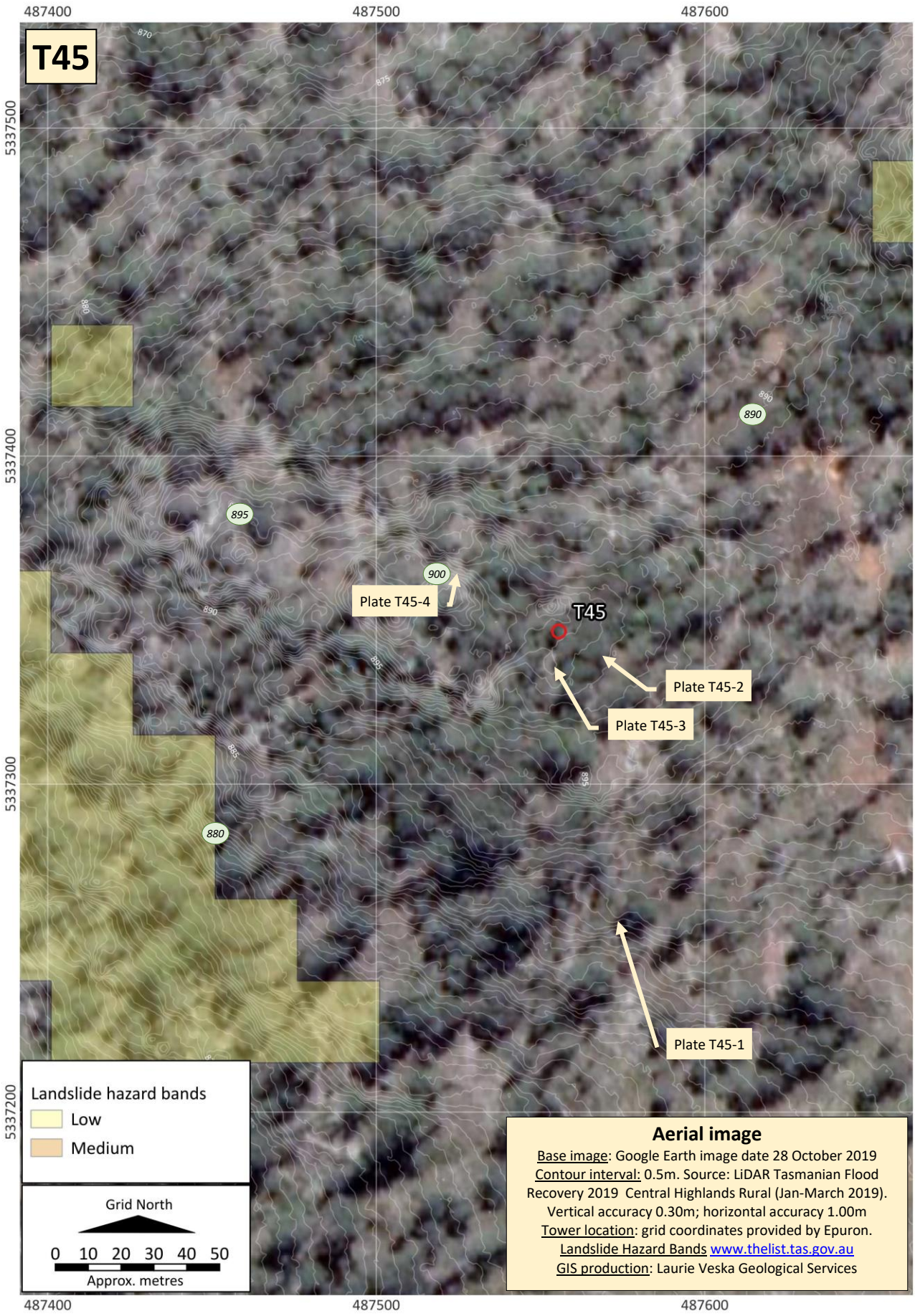
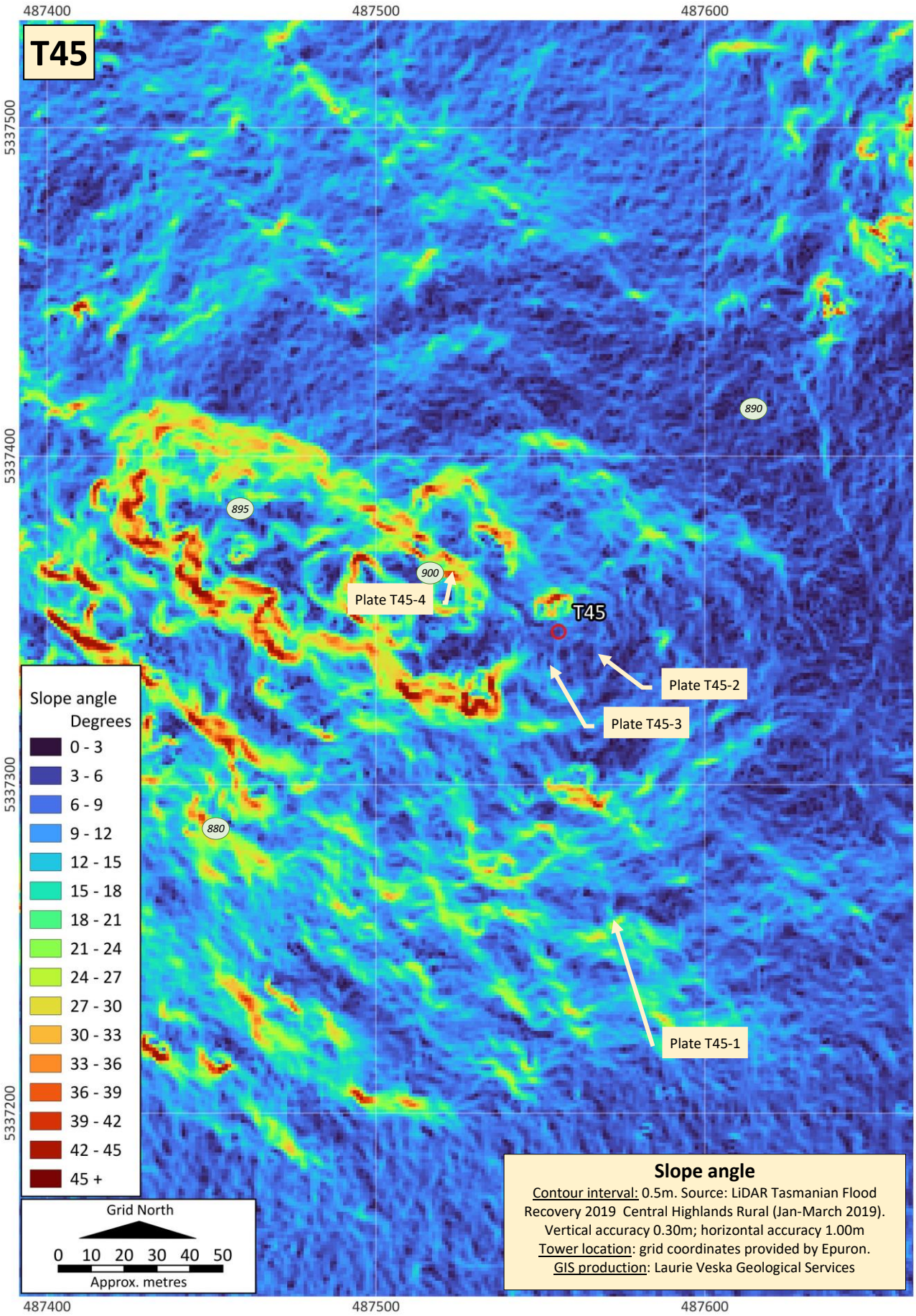
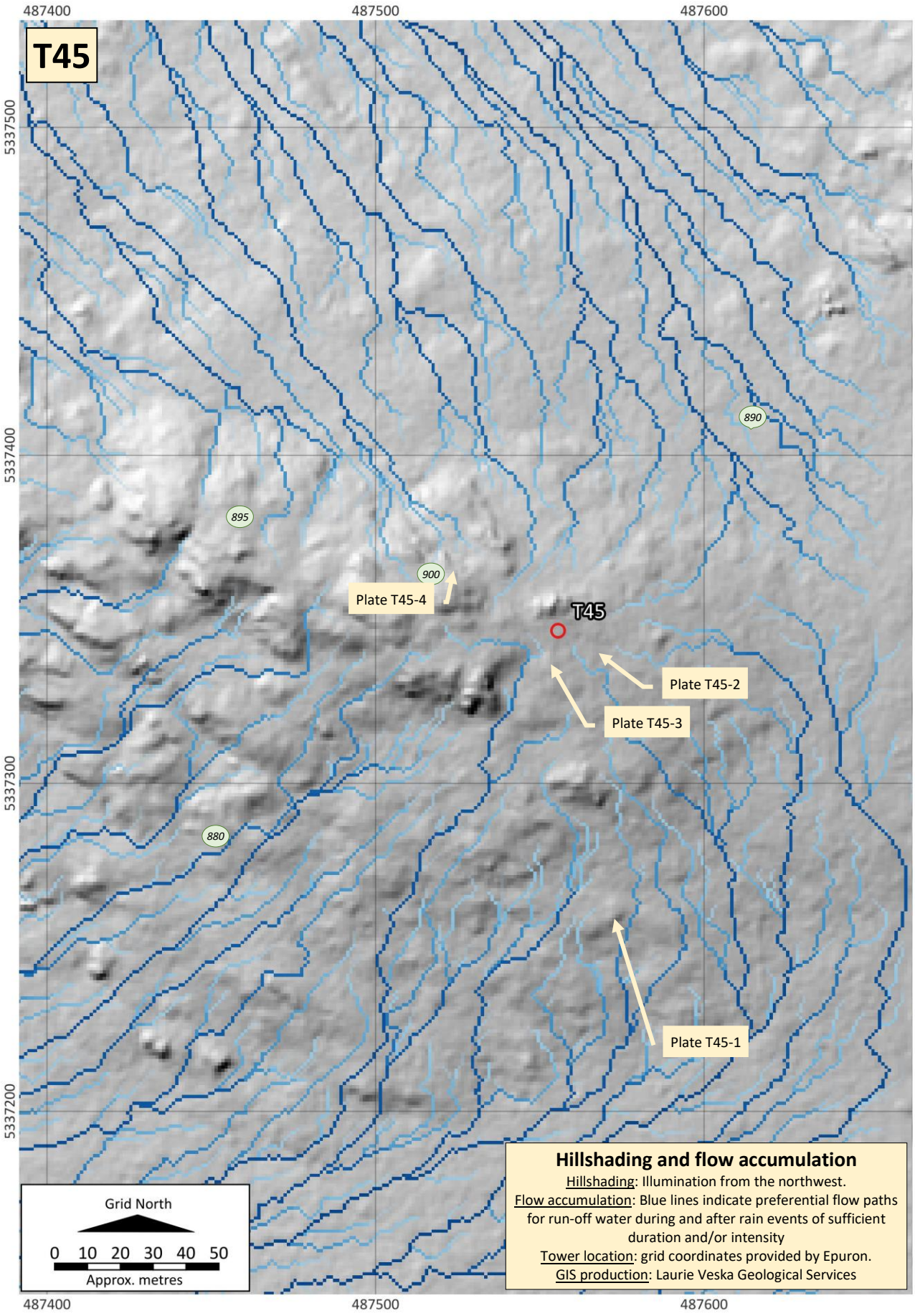


Plate T6-3 (above). View north and slightly upslope towards T6. Dolerite cobbles and boulders float litters the ground, and outcrops of exfoliated high-strength bedrock are common. The staff is 3m high.

Plate T6-4 (below). Exfoliated, high-strength Jurassic dolerite (curved joints parallel to land surface) with subvertical polygonal joints (red arrows). These polygons are the eroded tops of subvertical dolerite columns. The jointing may extend for considerable depths into the bedrock., and columns may be cut by subhorizontal joints.


T45
487400
487500
487600
5337500
5337400
5337300
5337200
870
875
880
885
890
895
900
Plate T45-4
T45
Plate T45-2
Plate T45-3
Plate T45-1
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T45
487400
487500
487600
5337500
5337400
5337300
5337200
890
895
900
880
Plate T45-4
T45
Plate T45-2
Plate T45-3
Plate T45-1
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services


T45
487400
487500
487600
5337500
5337400
5337300
5337200
890
895
900
880
Plate T45-4
T45
Plate T45-2
Plate T45-3
Plate T45-1
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

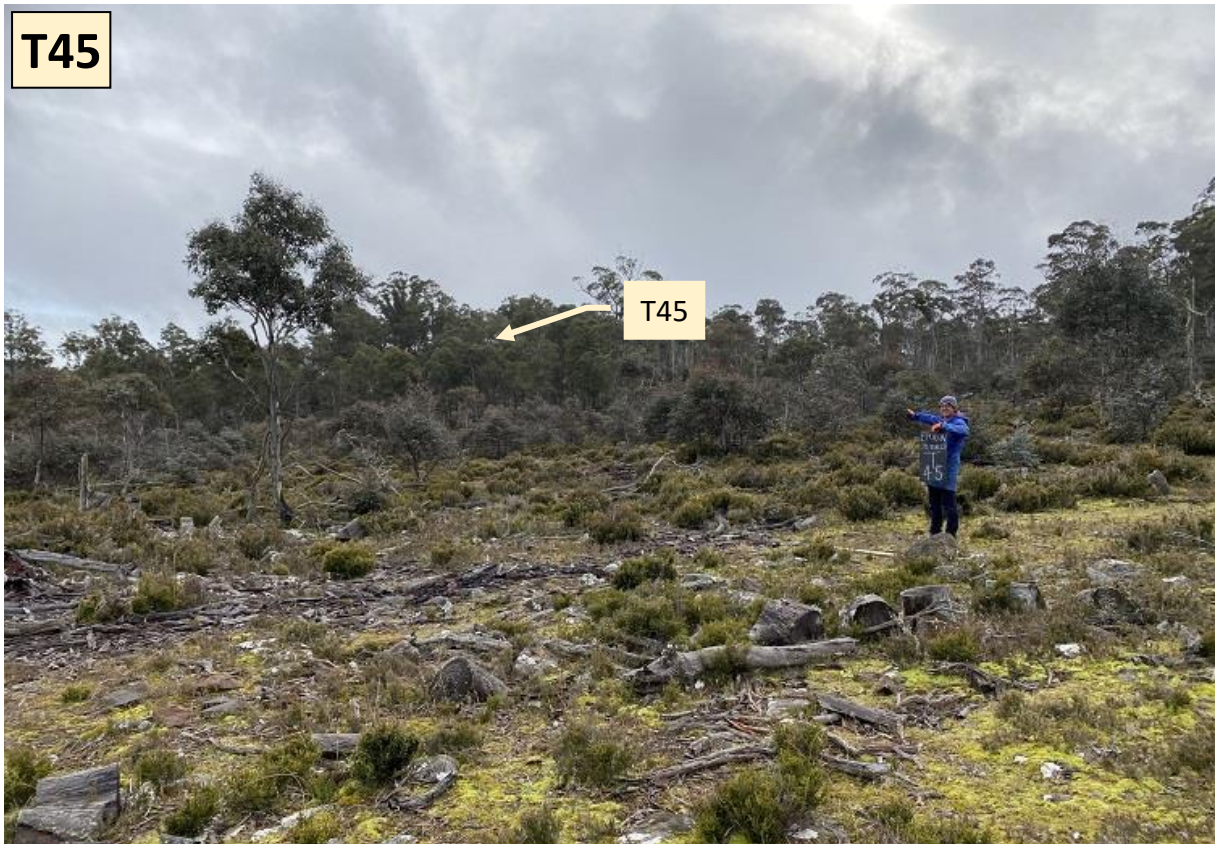
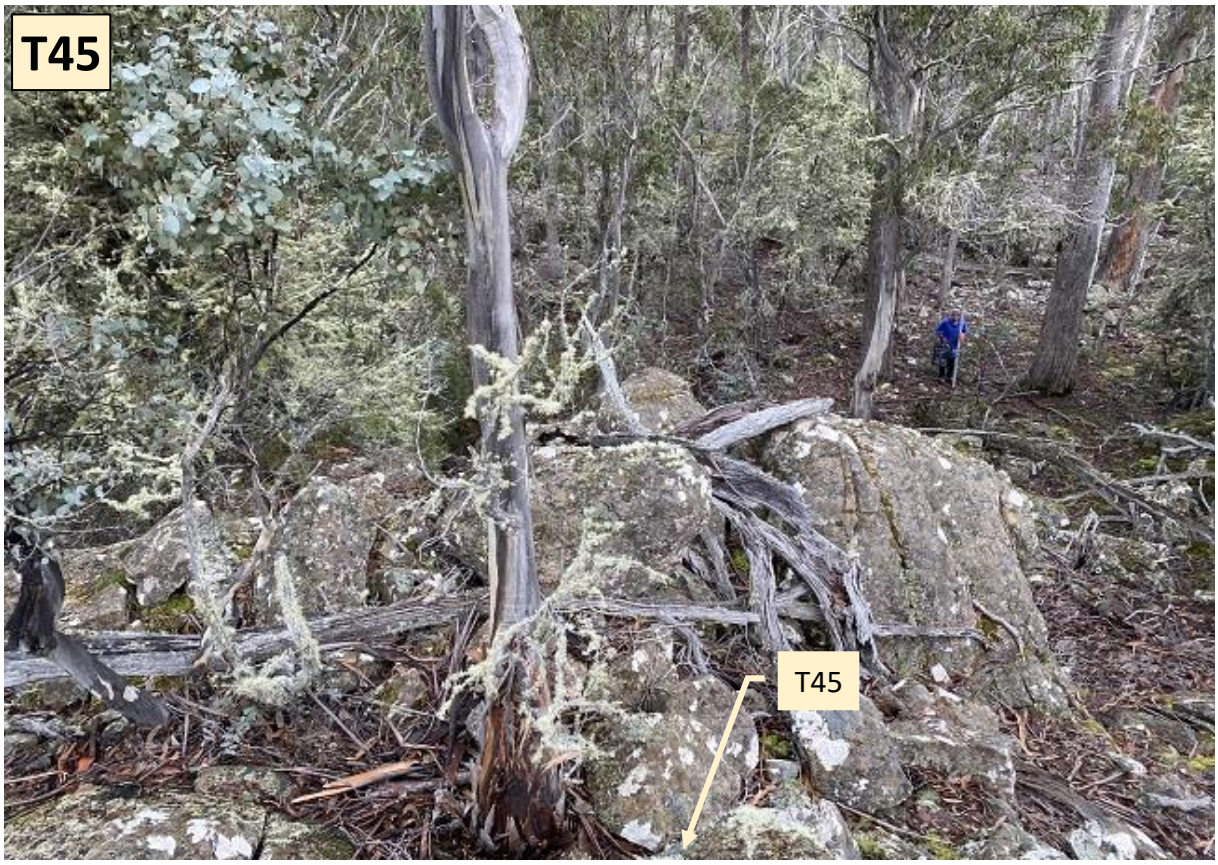


Plate T45-1 (above). View north northwest and slightly upslope towards T45 about 120m away. Dolerite cobbles and boulders litter the ground.

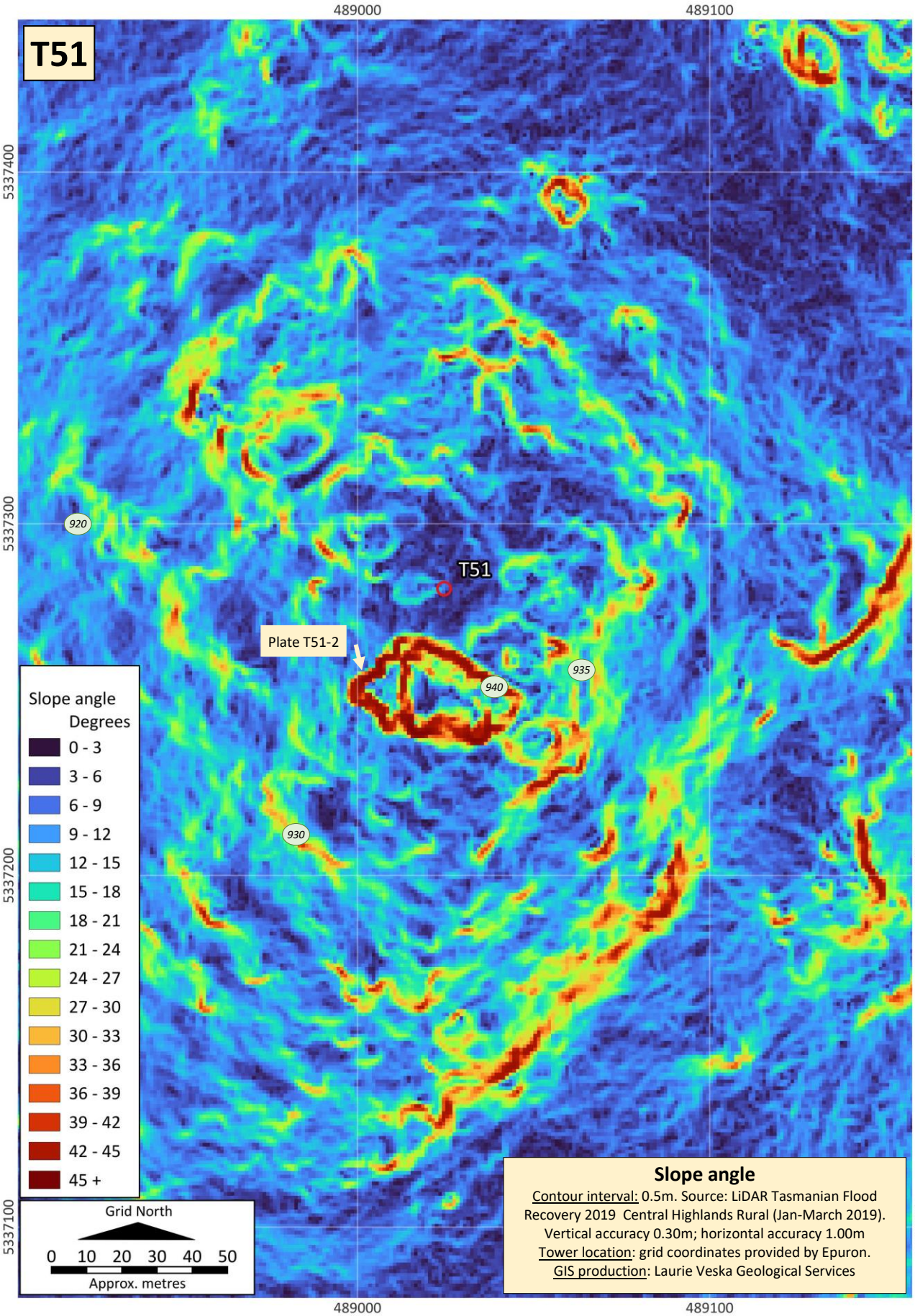
Plate T45-2 (below). View west northwest and slightly upslope. T45 is characterised by numerous subcrops and outcrops of high-strength dolerite. The main subvertical joint directions are north-south.

Plate T45-3 (above). View north northwest and slightly upslope. Dolerite cobbles and boulders float litters the ground.

Plate T45-4 (below). View north and steeply downslope. Site T45 is behind the camera. The main subvertical joint directions are north-south.




T51
489000
489100
5337400
5337300
5337200
5337100
T51
Plate T51-2
920
930
935
940
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T51
489000
489100
5337400
5337300
5337200
5337100
920
930
935
940
T51
Plate T51-2
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

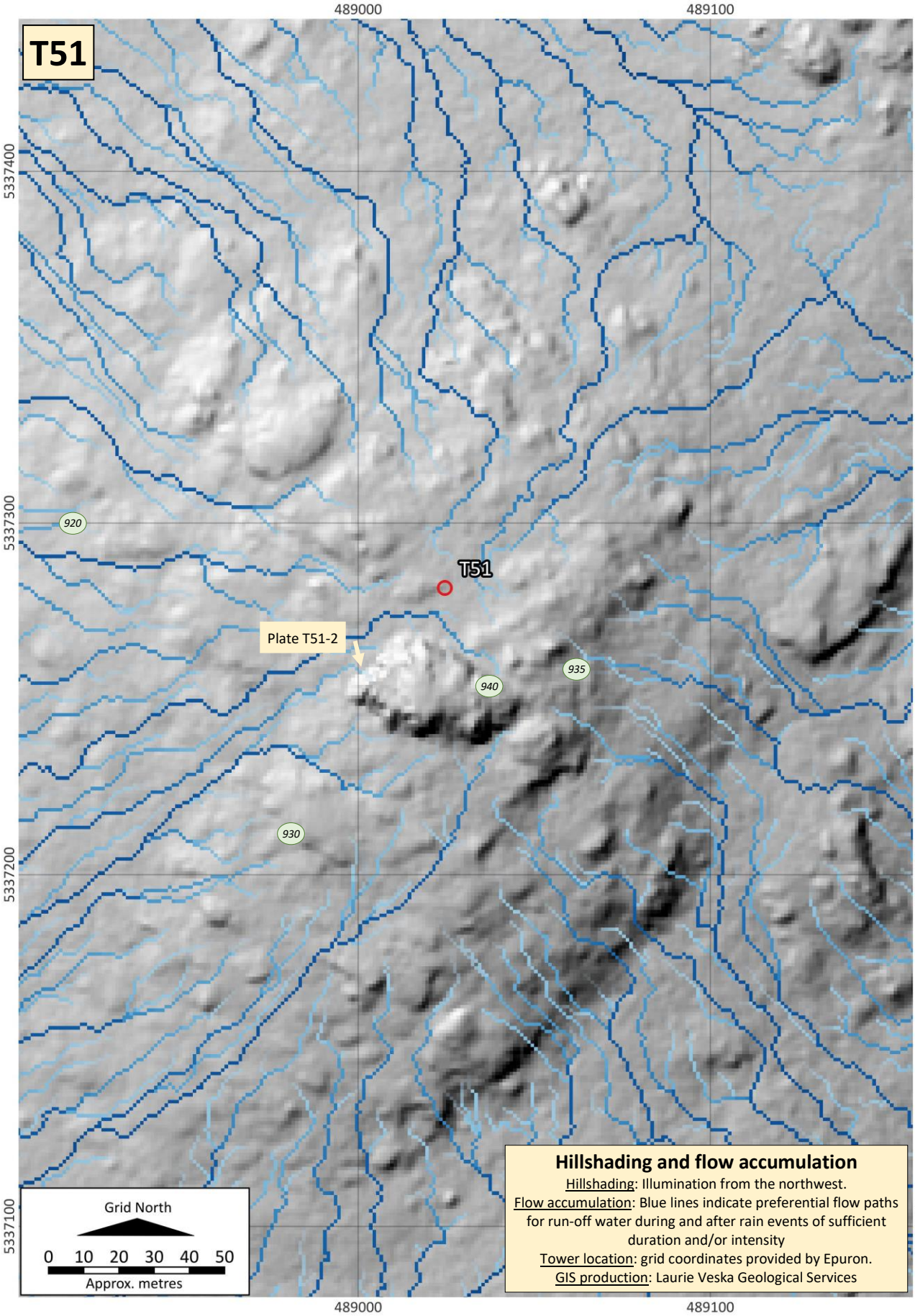
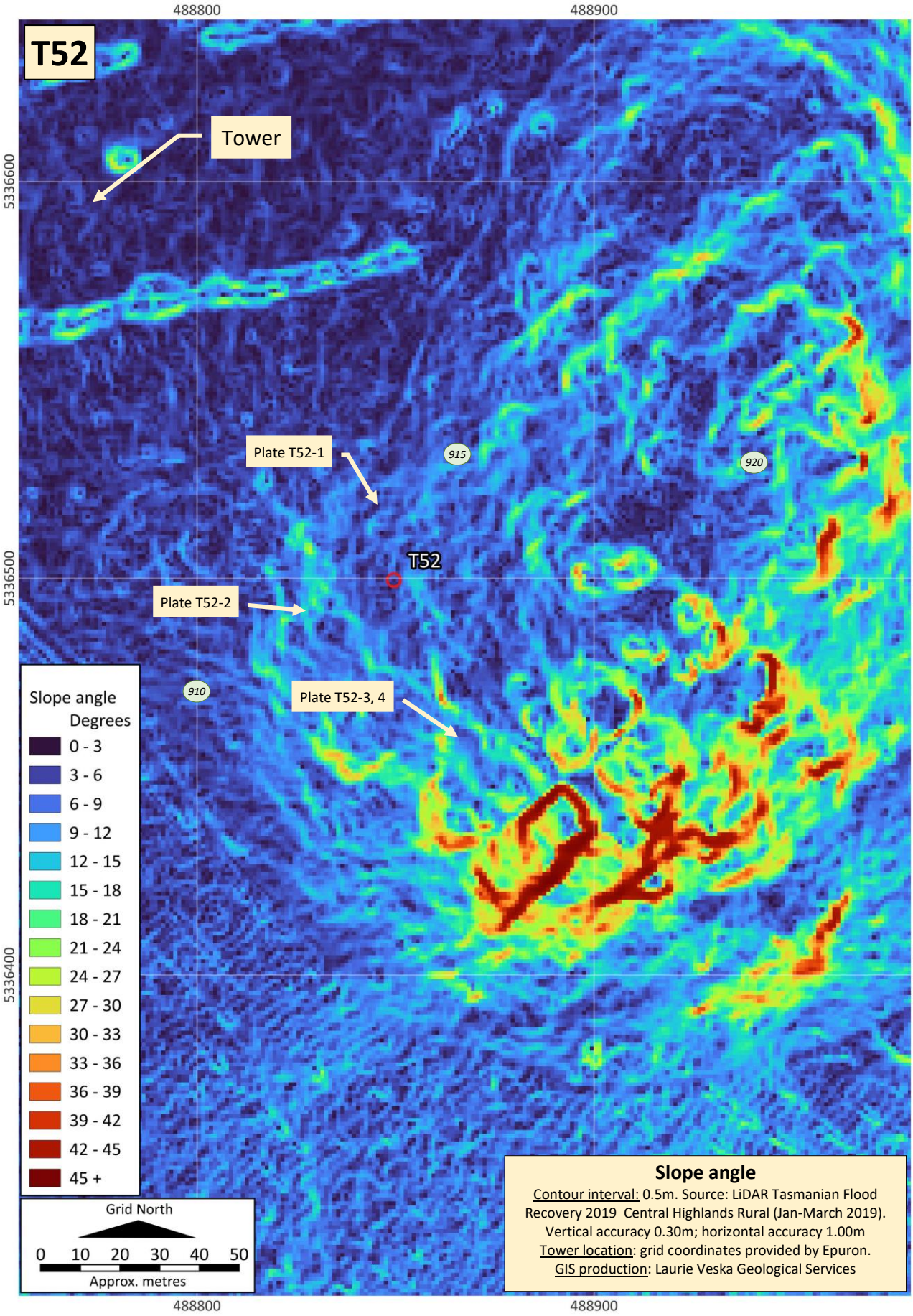

T51
489000
489100
5337400
5337300
5337200
5337100
920
935
940
930
T51
Plate T51-2
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T51-1 (above). View south towards T51, a slightly lower area between two raised dolerite outcrops [a subdued one at camera (see Plates T51-3 and T51-4); the second, higher one in background; see below].
Plate T51-2 (below). View south (site T51 is behind the camera). This outcrop of high strength dolerite shows prominent subvertical north-south jointing. The blocks have slid west (to right) and slightly downslope (yellow arrow), with some topples (red arrows). The staff is 5m high.

Plate T51-3 (above) and T51-4 (below). Views northeast near T51 (at right, off camera), towards a slightly elevated outcrop of high-strength dolerite. Subvertical joints trend north-south.


T52
Tower
Plate T52-1
Plate T52-2
Plate T52-3, 4
T52
488800
488900
5336600
5336500
5336400
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


488800
488900
T52
Tower
5336600
5336500
5336400
Plate T52-1
915
920
T52
Plate T52-2
910
Plate T52-3, 4
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

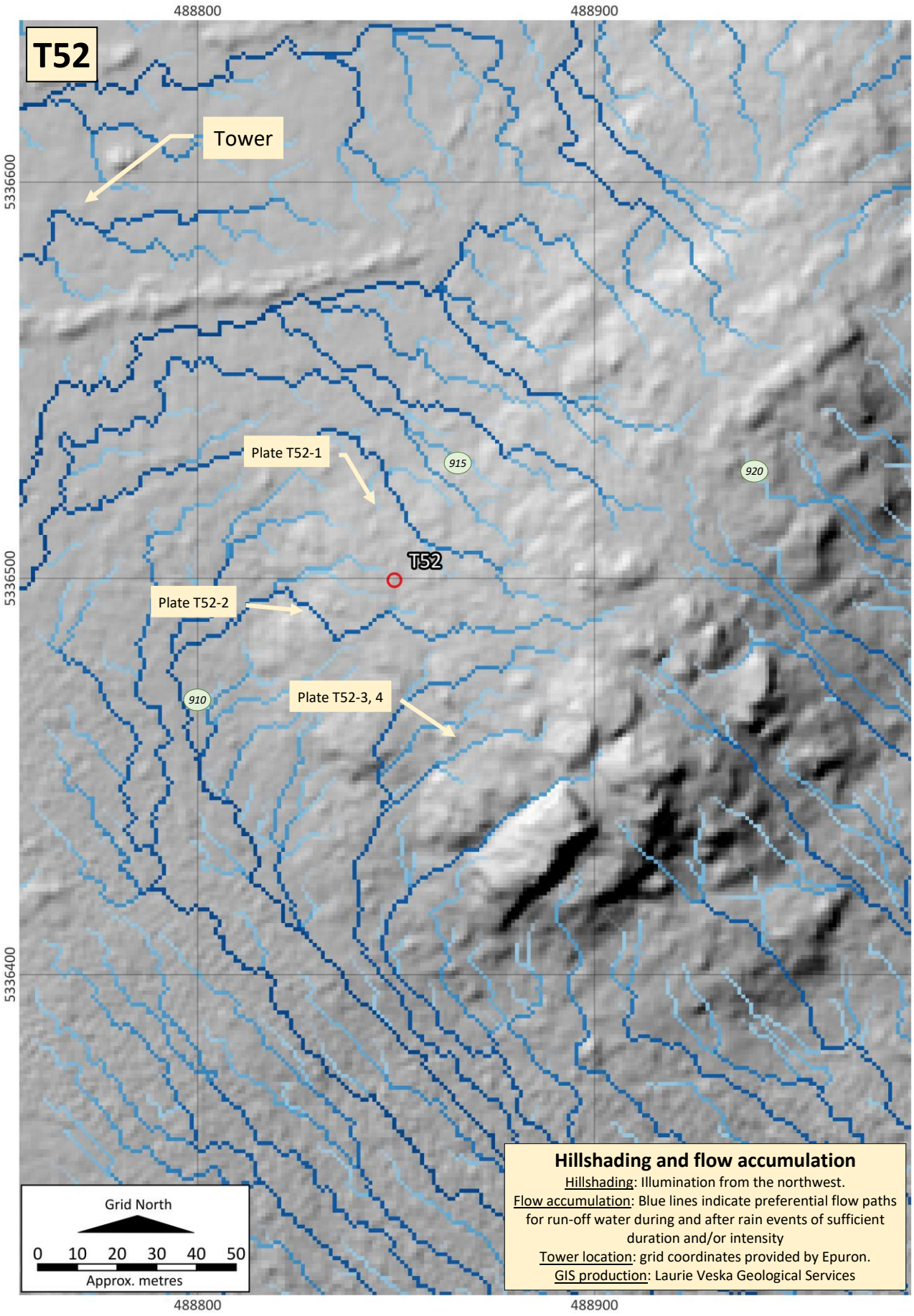
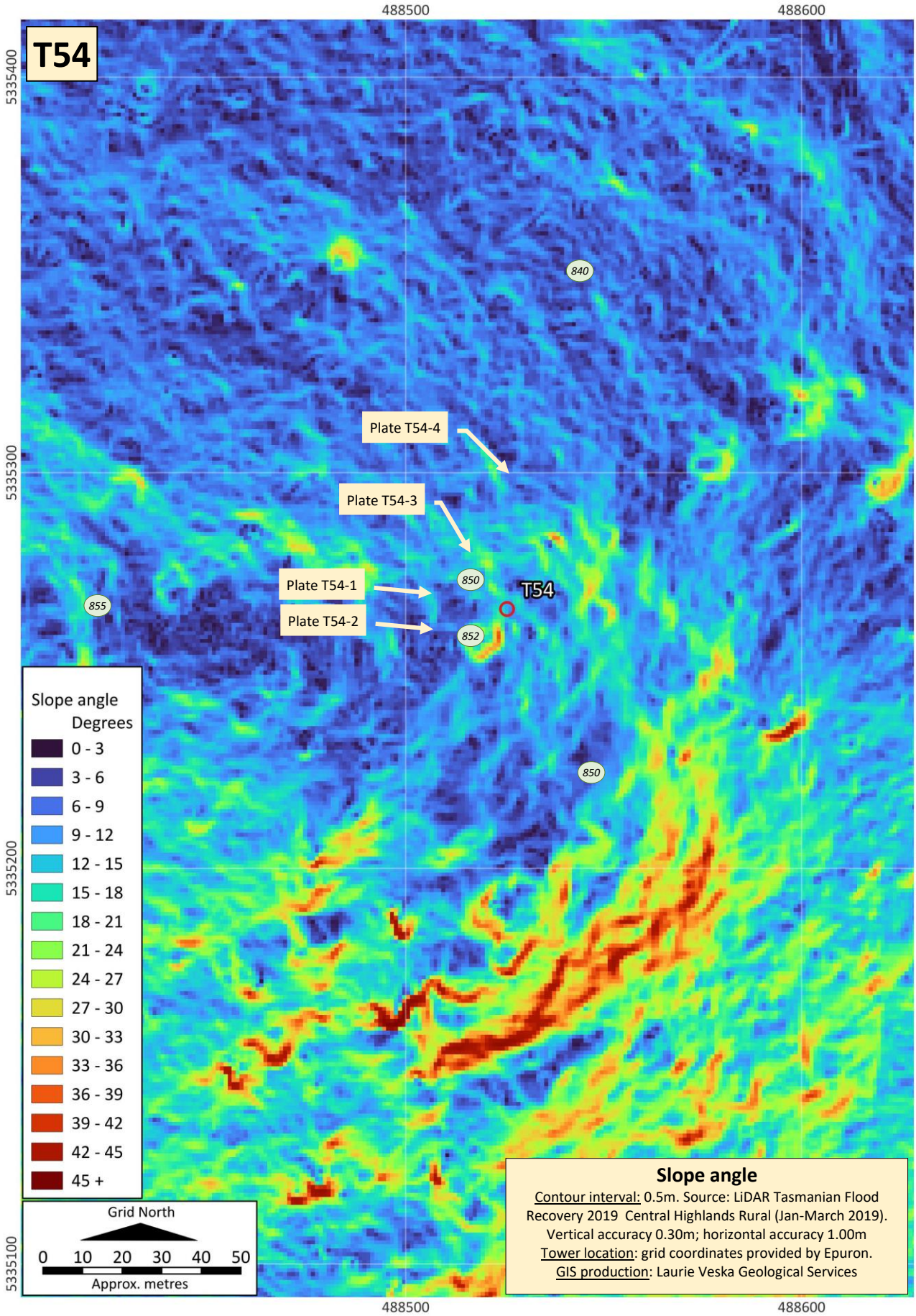

T52
Tower
488800
488900
5336600
5336500
5336400
Plate T52-1
915
920
T52
Plate T52-2
910
Plate T52-3, 4
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T52-1 (above). View southeast towards T52. A float of approx. 80% cover of dolerite cobbles and boulders on gently rising ground.
Plate T52-2 (below). View east towards T52. A float of approx. 80% – 90% cover of dolerite cobbles and boulders on gently rising ground.

Plate T52-3 (above) and T52-4 (below). View southeast. Site T52 is to the left. A float of approx. 80% cover of dolerite cobbles and boulders on gently rising ground. The outcrop of high strength dolerite with subvertical north-south jointing at right (above) and centre (below) falls away steeply at the rear in 10- – 15m high cliff sections. The staff is 3m high.


T54
488500
488600
5335400
5335300
5335200
5335100
Plate T54-4
Plate T54-3
Plate T54-1
Plate T54-2
T54
840
850
855
852
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T54
488500
488600
5335400
5335300
5335200
5335100
840
850
855
852
Plate T54-4
Plate T54-3
Plate T54-1
Plate T54-2
T54
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

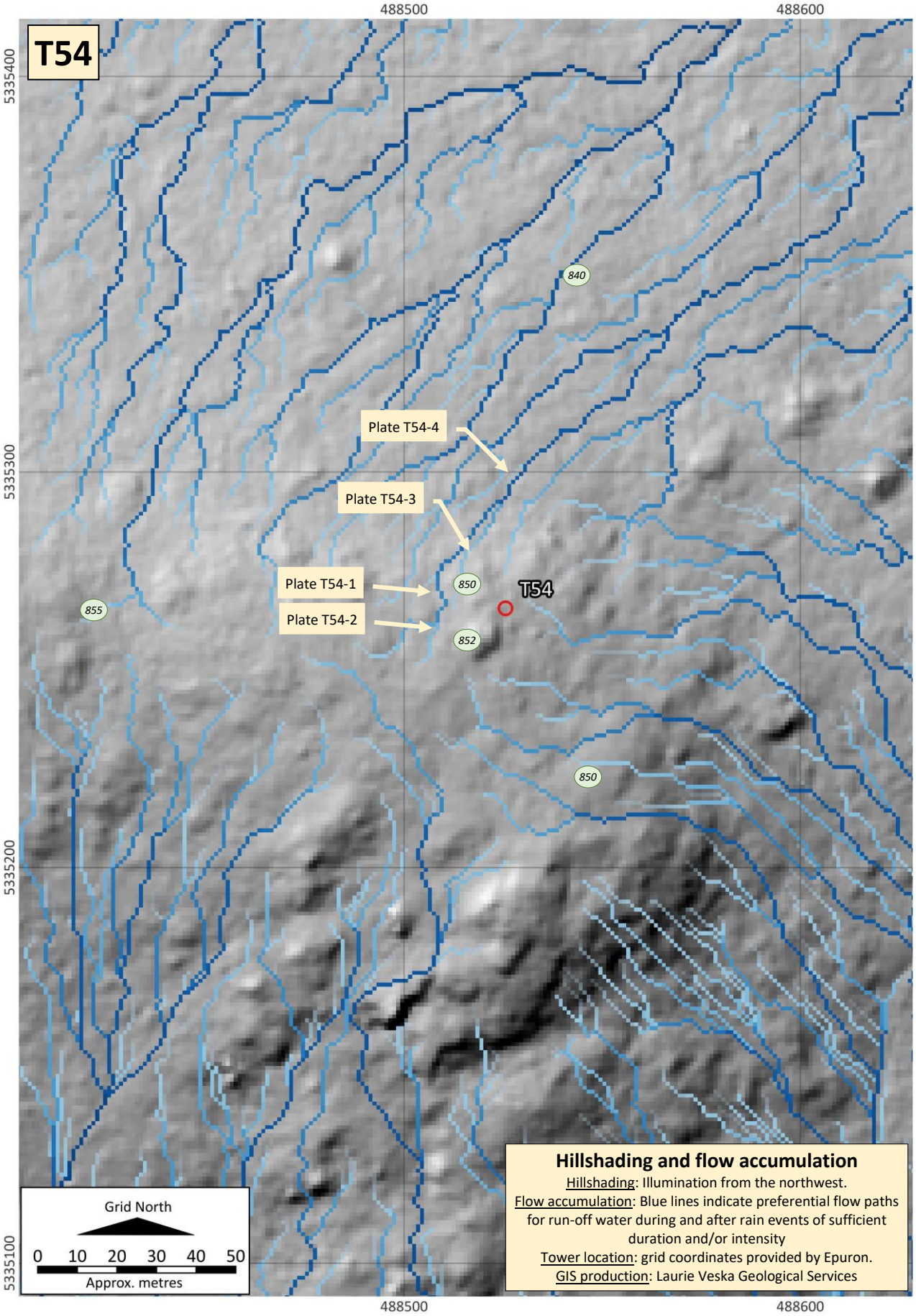
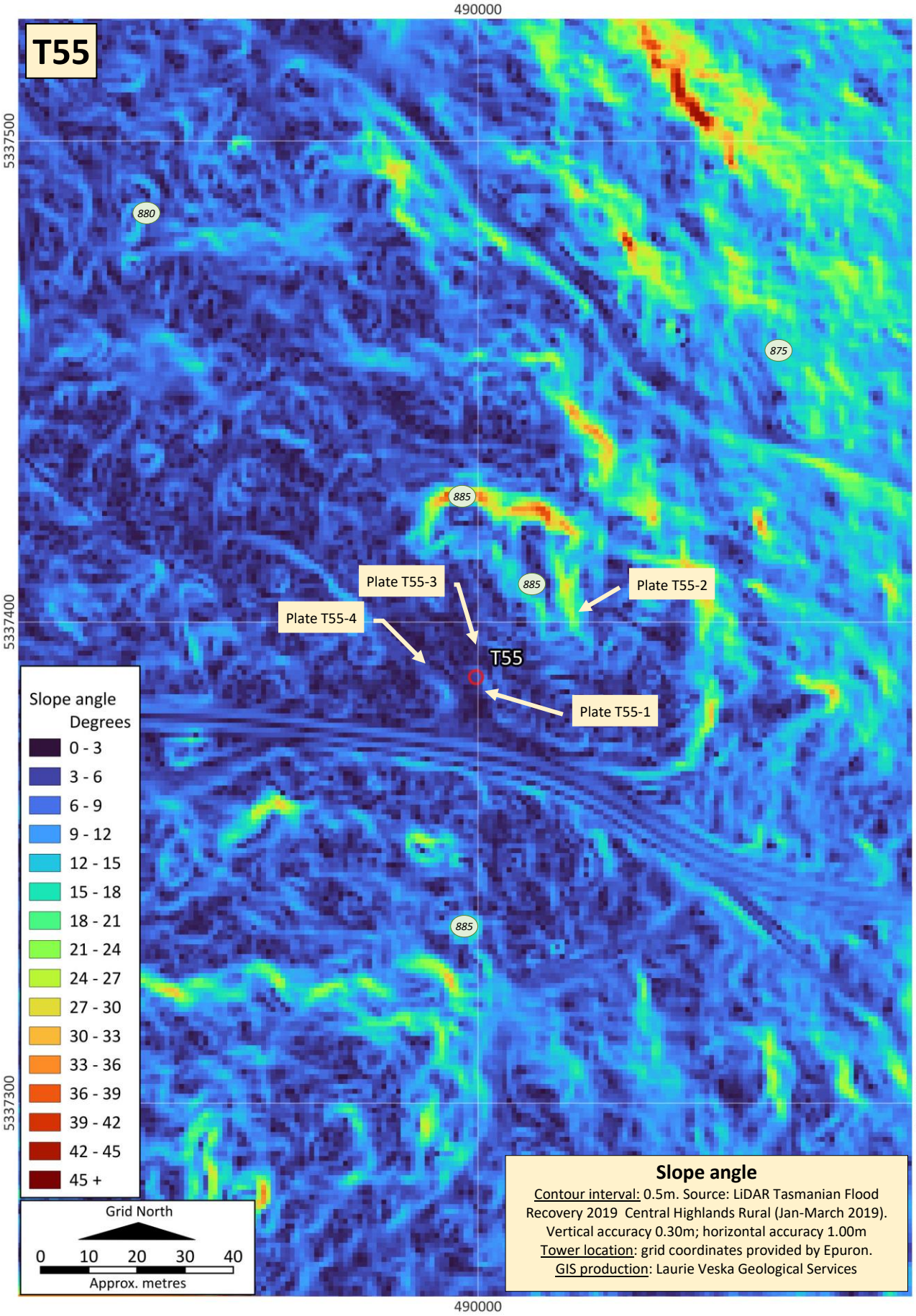

T54
488500
488600
5335400
5335300
5335200
5335100
840
850
855
852
Plate T54-4
Plate T54-3
Plate T54-1
Plate T54-2
T54
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T54-1 (above) and T54-2 (below). Views east towards T54. Gentle slopes with a sparse float of 10 – 20% surface cobbles and boulders to 1m. The boulders at right centre in the photo below are subcrop, well-graded in size to about 1.5m.

Plate T54-3 (above) and T54-4 (below). Views southeast and gently upslope towards T54.


T55
490000
5337500
5337400
5337300
880
885
875
Plate T55-3
Plate T55-2
Plate T55-4
T55
Plate T55-1
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services


T55
490000
5337500
5337400
5337300
880
875
885
885
885
Plate T55-3
Plate T55-2
Plate T55-4
T55
Plate T55-1
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

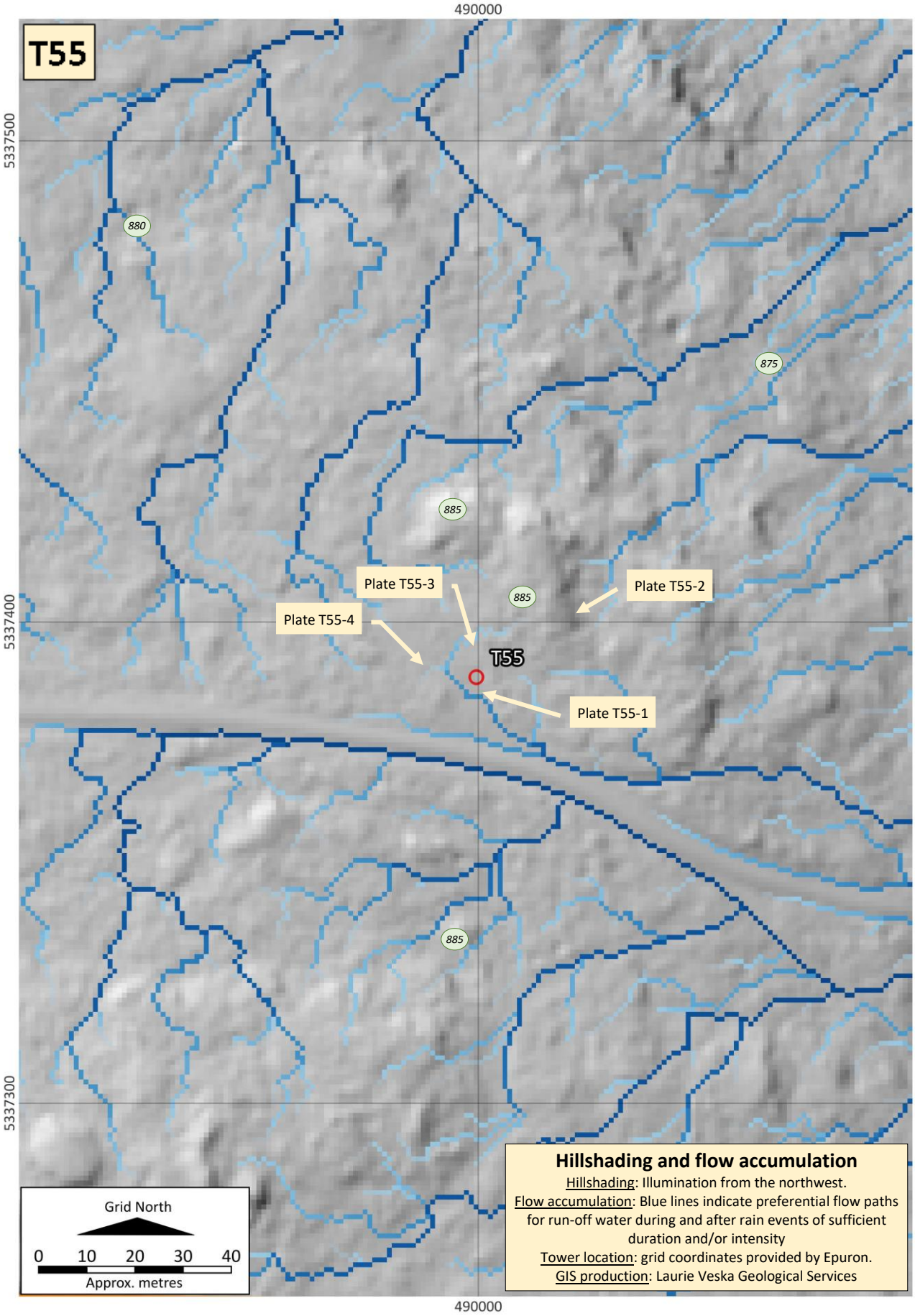

490000
T55
5337500
5337400
5337300
880
875
885
885
885
Plate T55-3
Plate T55-2
Plate T55-4
T55
Plate T55-1
Grid North
0 10 20 30 40
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services
490000

Plate T55-1 (above). View west northwest towards T55, on gently sloping ground with a sparse float of dolerite cobbles and boulders.

Plate T55-2 (below). View southwest towards T55. The higher ground at right includes subcrops and outcrops of high strength dolerite.

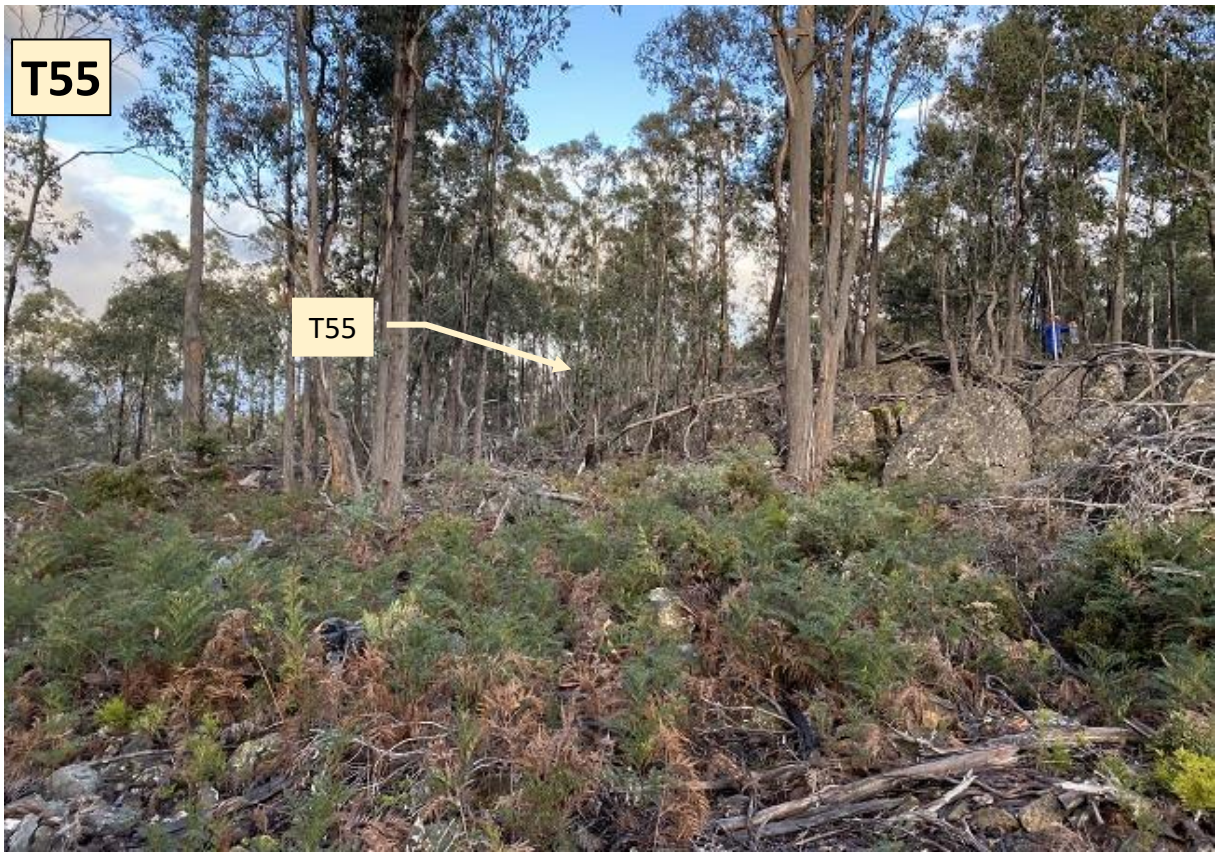
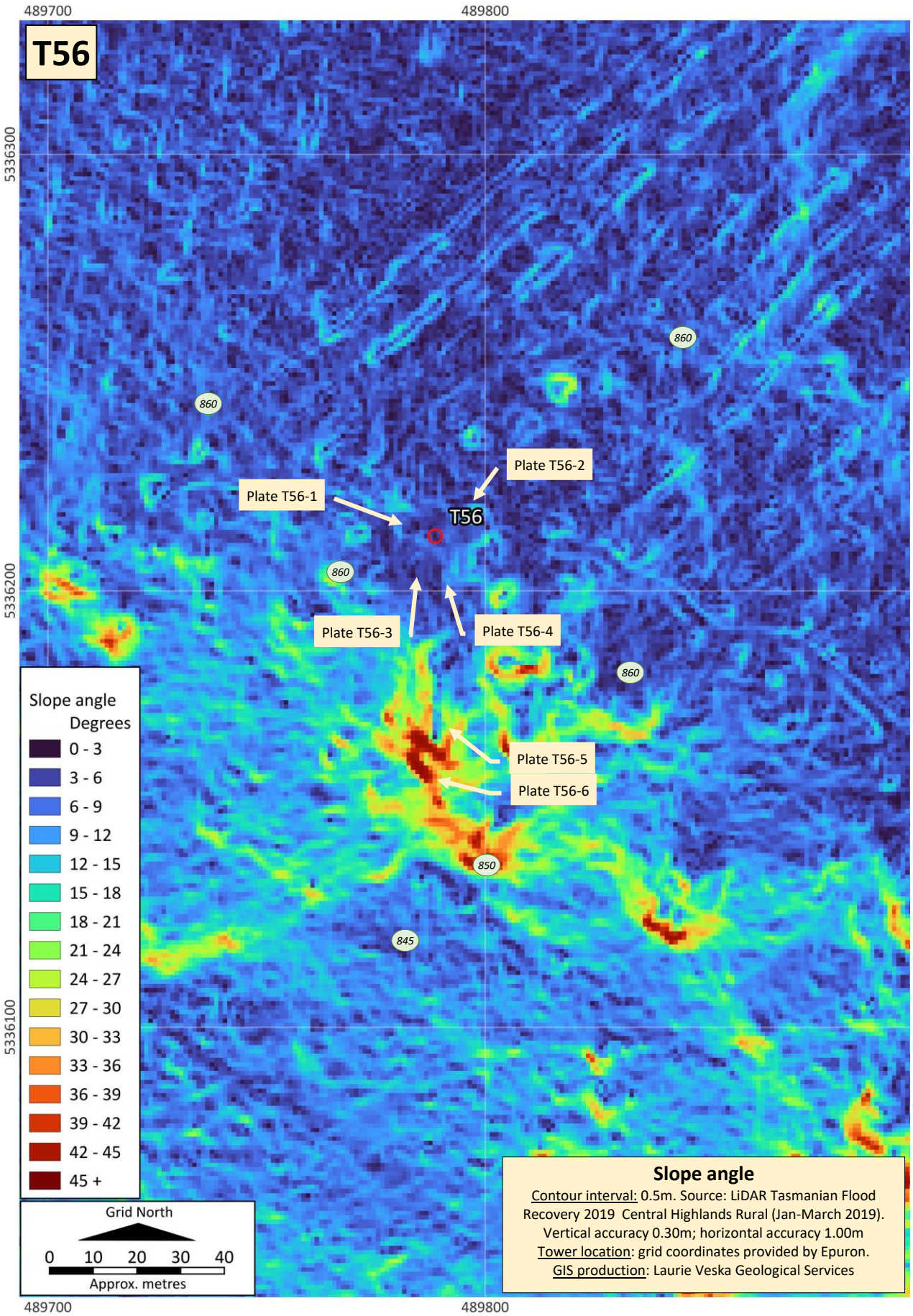


Plate T55-3 (above). View south towards T55, on gently sloping ground with a sparse float of dolerite cobbles and boulders.

Plate T55-4 (below). View southeast towards T55. The ground at the site rises very slightly to the north.


T56
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019).
Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
GIS production: Laurie Veska Geological Services
489700
489800
5336300
5336200
5336100
Plate T56-1
Plate T56-2
Plate T56-3
Plate T56-4
Plate T56-5
Plate T56-6
T56
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40
Approx. metres


T56
489700
489800
5336300
5336200
5336100
860
860
860
850
845
Plate T56-1
Plate T56-2
Plate T56-3
Plate T56-4
Plate T56-5
Plate T56-6
T56
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

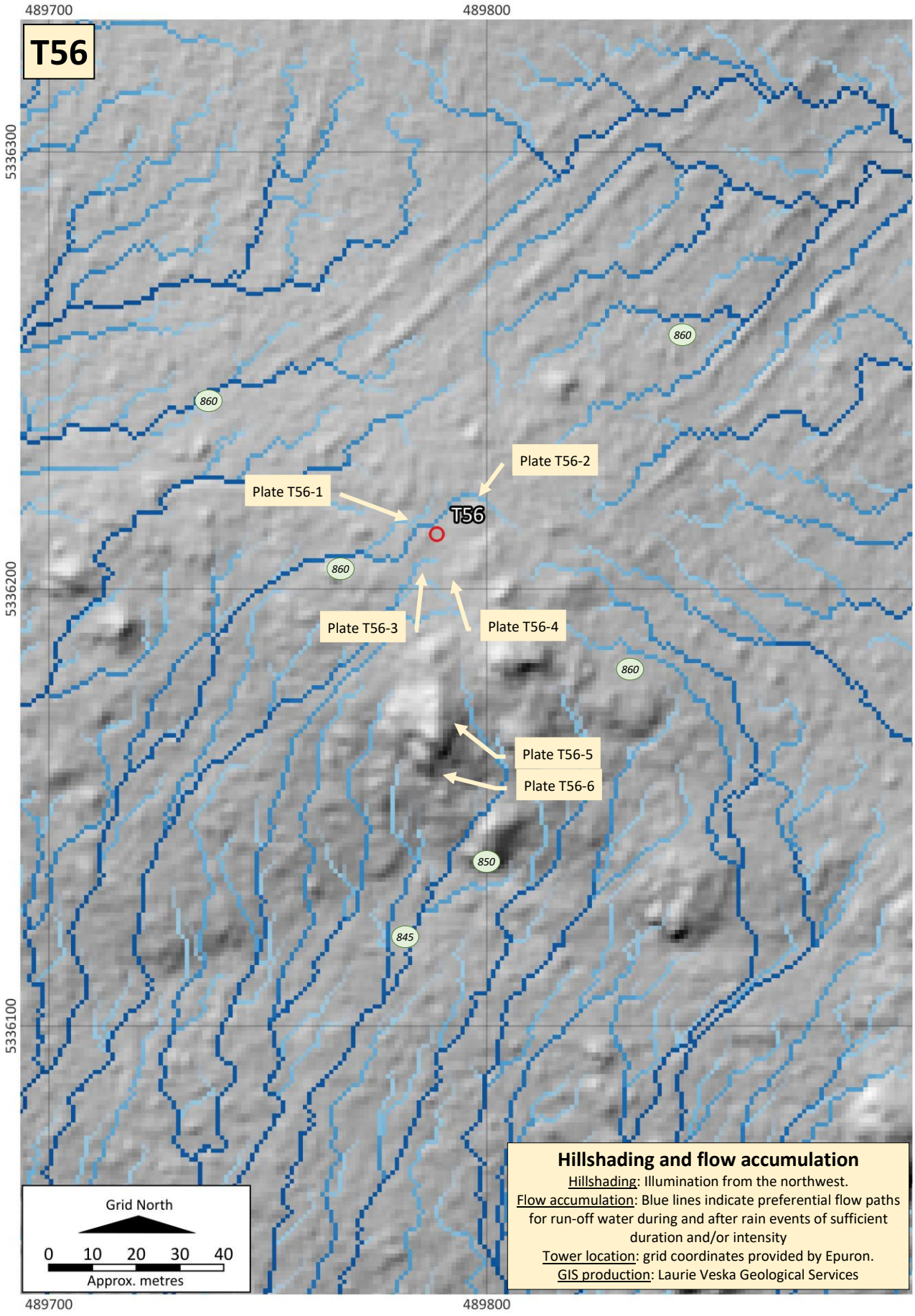

T56
489700
489800
5336300
5336200
5336100
860
860
860
860
850
845
Plate T56-1
Plate T56-2
Plate T56-3
Plate T56-4
Plate T56-5
Plate T56-6
T56
Grid North
0 10 20 30 40
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T56-1 (above). View southeast towards T56, over gently rising ground with a sparse float of dolerite cobbles and boulders.

Plate T56-2 (below). View southwest towards T56 over gently falling ground with a float of dolerite cobbles and boulders.

Plate T56-3 (above). View southeast towards T56, across almost level ground with a sparse float of dolerite cobbles and boulders.

Plate T56-4 (below). View southeast towards T56, across almost level ground with a sparse float of dolerite cobbles and boulders.

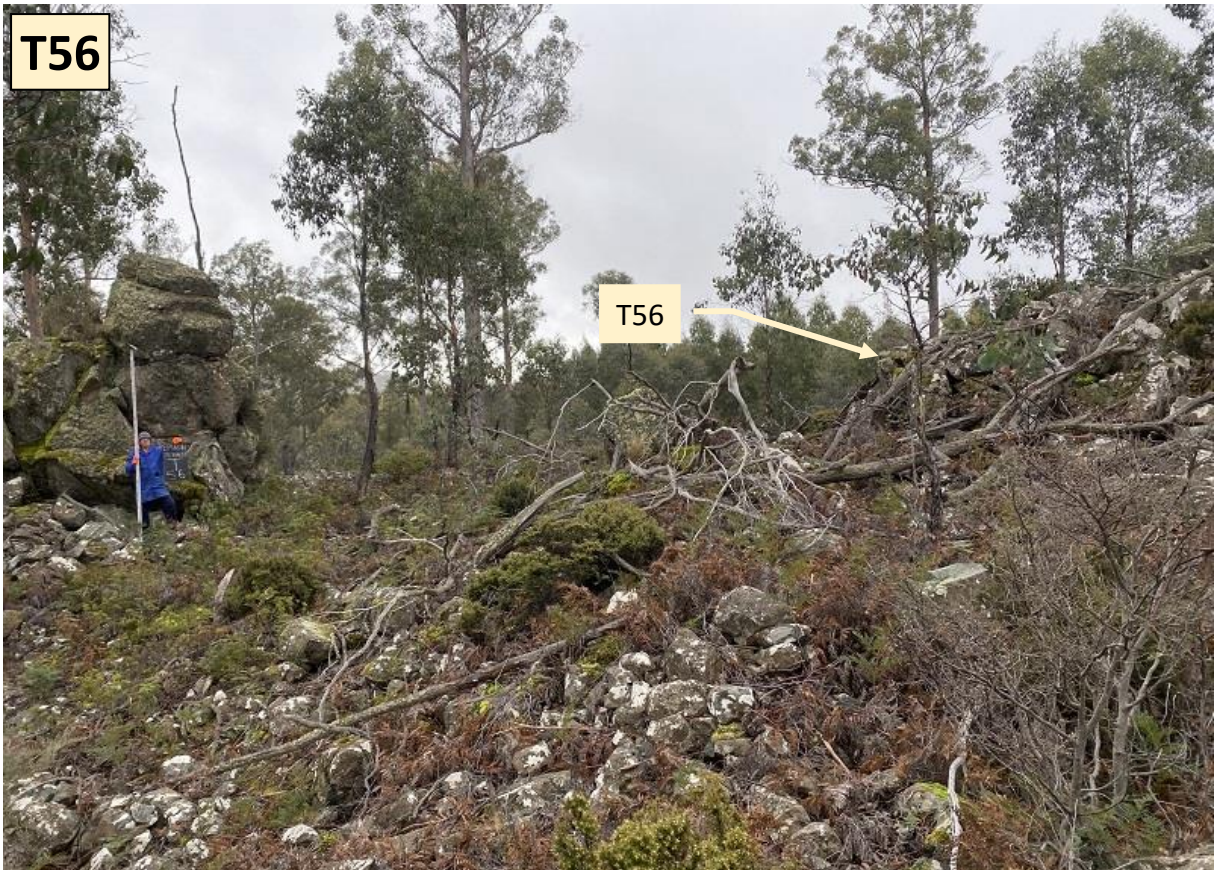
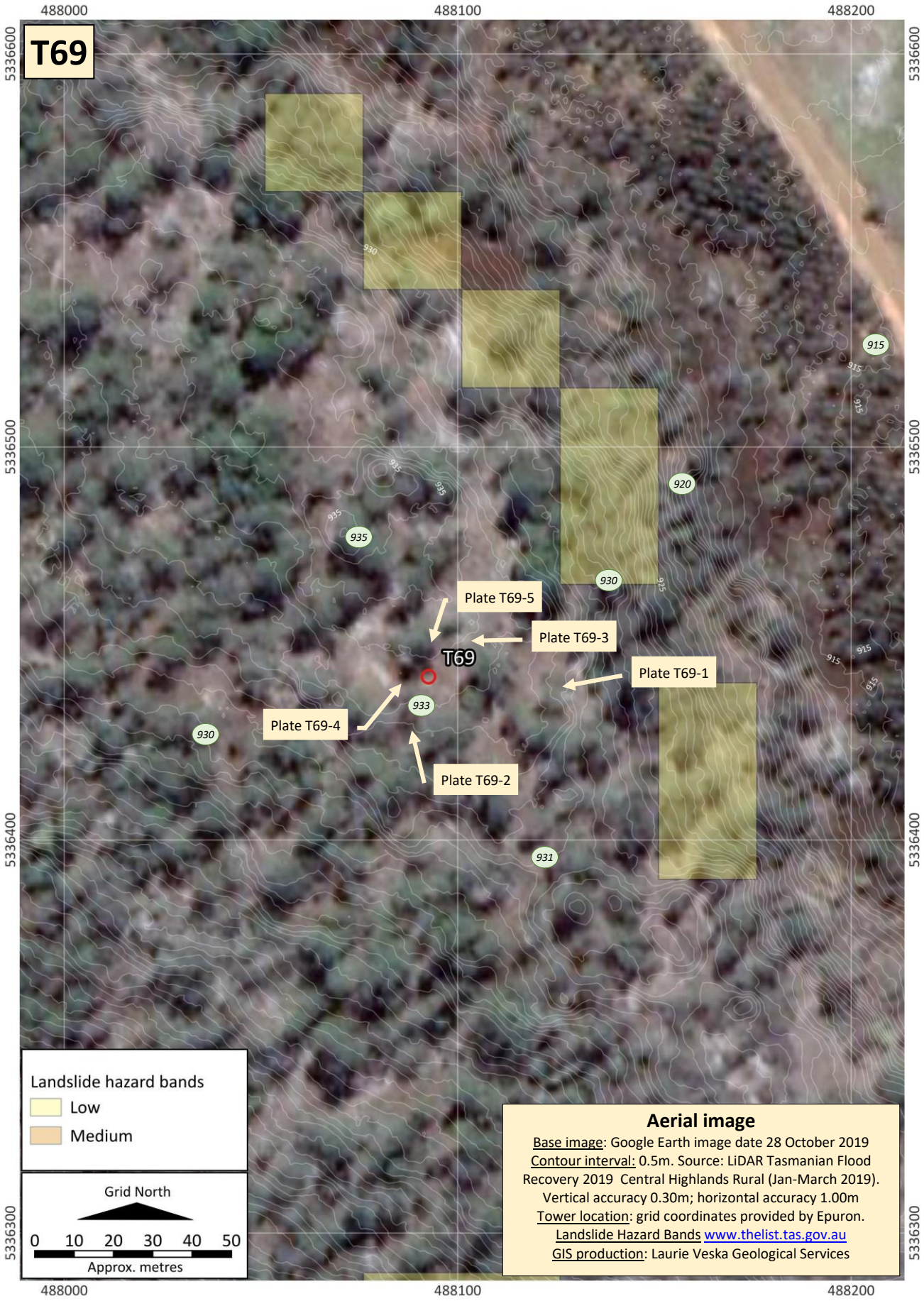


Plate T56-5 (above) and Plate T56-6 (below) View northwest (above) and west northwest near T56. Several knolls of high strength subcrops and outcrops of dolerite with associated float of fallen cobbles and boulders occur. The ground drops sharply to the east.


T69
488000
488100
488200
5336600
5336500
5336400
5336300
Plate T69-5
Plate T69-3
Plate T69-1
Plate T69-4
Plate T69-2
T69
915
920
935
930
933
931
Landslide hazard bands
Low
Medium
Grid North
0 10 20 30 40 50
Approx. metres
Aerial image
Base image: Google Earth image date 28 October 2019
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
Landslide Hazard Bands www.thelist.tas.gov.au
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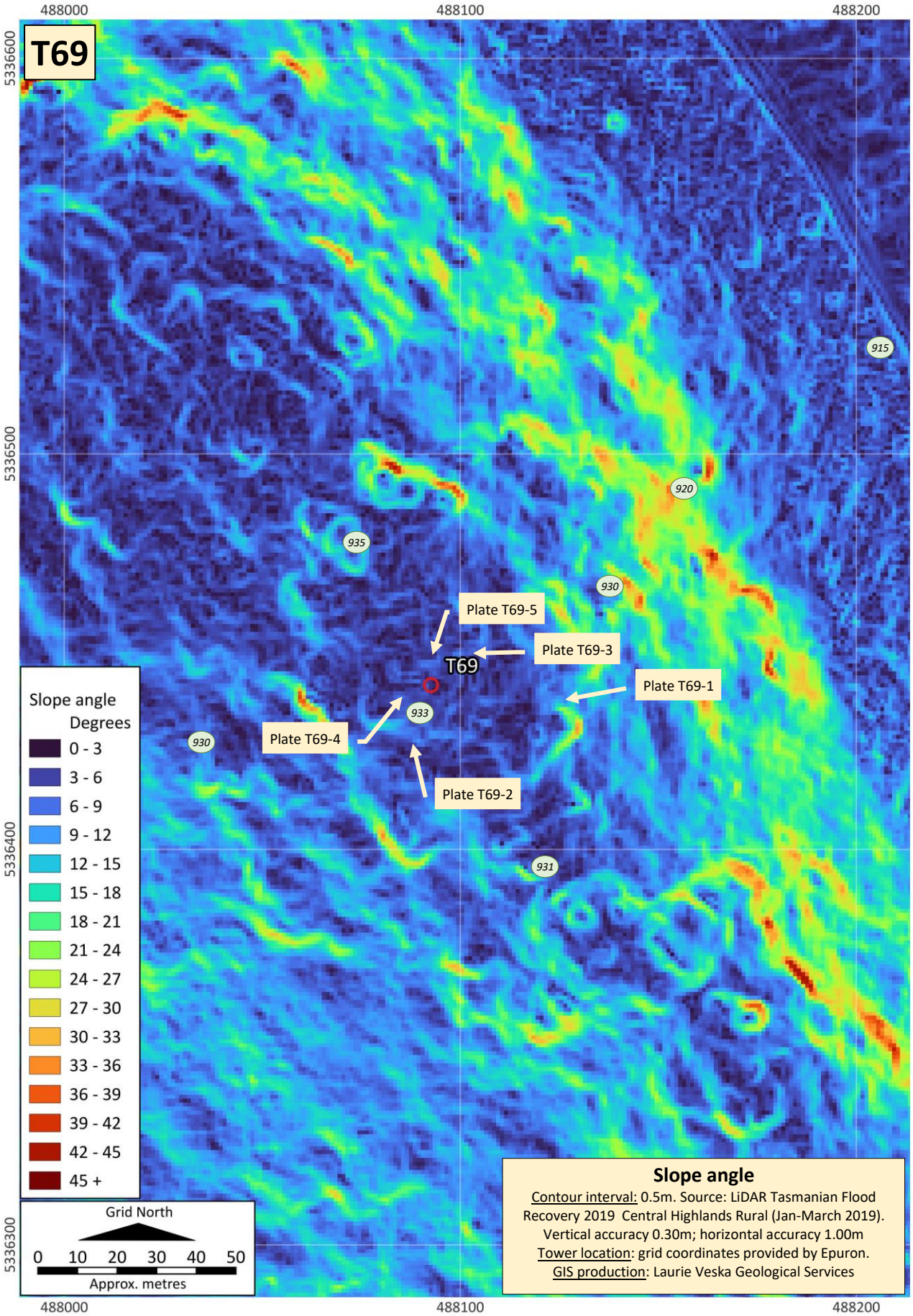
T69
488000
488100
488200
5336600
5336500
5336400
5336300
915
920
935
930
933
931
Plate T69-5
Plate T69-3
Plate T69-1
Plate T69-4
Plate T69-2
T69
Slope angle
Degrees
0 - 3
3 - 6
6 - 9
9 - 12
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 +
Grid North
0 10 20 30 40 50
Approx. metres
Slope angle
Contour interval: 0.5m. Source: LiDAR Tasmanian Flood Recovery 2019 Central Highlands Rural (Jan-March 2019). Vertical accuracy 0.30m; horizontal accuracy 1.00m
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

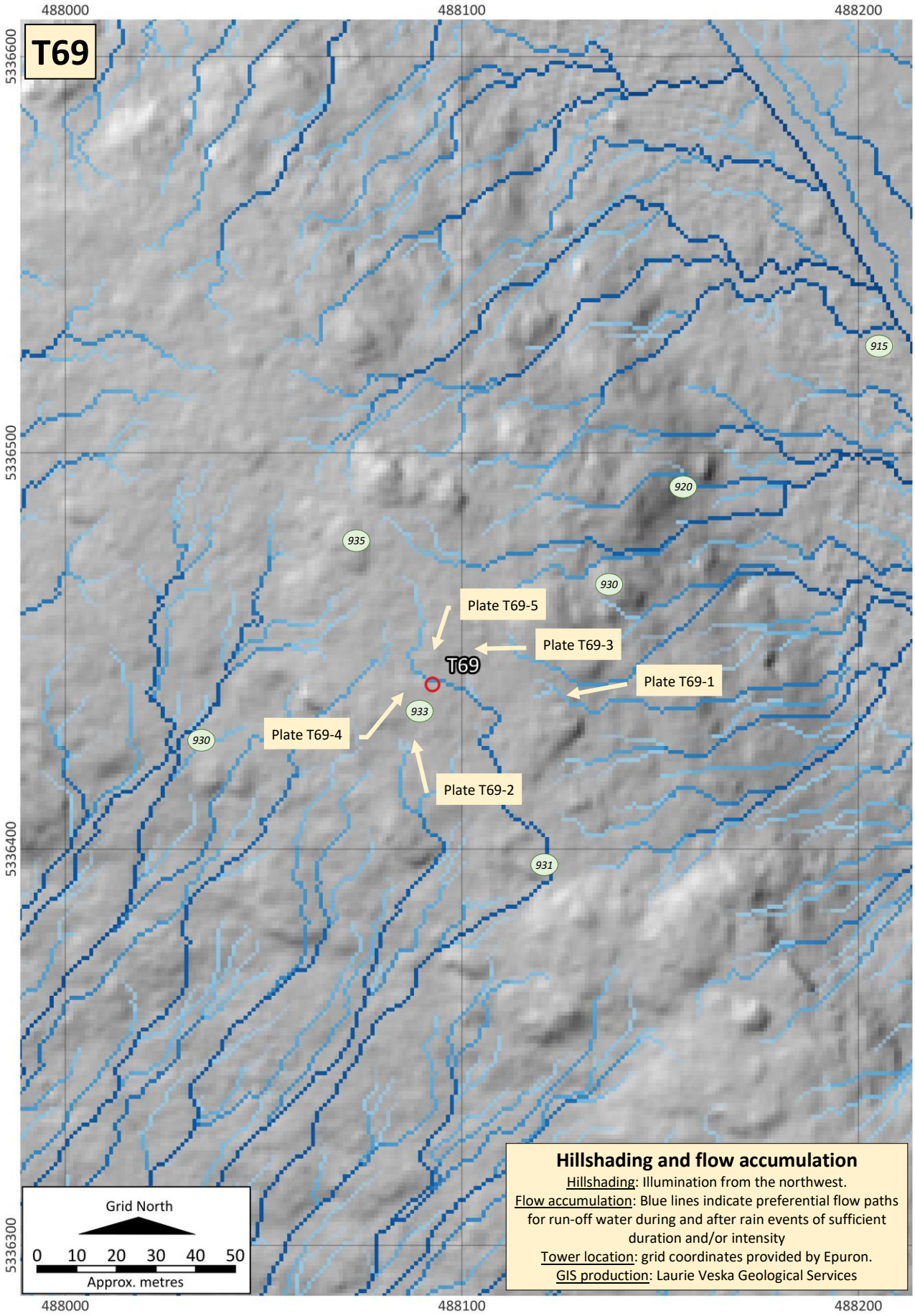
T69
488000
488100
488200
5336600
5336500
5336400
5336300
915
920
935
930
930
933
931
Plate T69-5
Plate T69-3
Plate T69-1
Plate T69-4
Plate T69-2
T69
Grid North
0 10 20 30 40 50
Approx. metres
Hillshading and flow accumulation
Hillshading: Illumination from the northwest.
Flow accumulation: Blue lines indicate preferential flow paths for run-off water during and after rain events of sufficient duration and/or intensity
Tower location: grid coordinates provided by Epuron.
GIS production: Laurie Veska Geological Services

Plate T69-1. View west and steeply upslope, near the top of the east-facing hillside with a heavy float of dolerite cobbles and boulders, and isolated outcrops of high strength rock. T69 is located about 50m west.

Plate T69-2 (above). View north towards T69, across gently rising ground with a float of dolerite cobbles and boulders.

Plate T69-3 (below). View west towards T69, across almost level ground with a sparse float of dolerite cobbles and boulders.

Plate T69-4 (above). View northeast towards T69, across gently rising ground with a float of dolerite cobbles and boulders.

Plate T69-5 (below). View south southeast towards T69, across uneven ground with dolerite cobbles and boulders float, and isolated outcrops of high strength rock.