



31 January 2025  
Ref: 25010.Q01 Rev2

PSM

Att: Andrew Wilson

**RE: McCrae Landslip - Monitoring Proposal (Rev2)**

We are pleased to provide PSM with our updated fee proposal to include a provision for automated GNSS monitoring of the landslip and surrounding slopes at McCrae.

As you are aware Diospatial has extensive experience supporting your team, DTP, and various local councils with such monitoring services to inform slope risk assessment, ongoing TARPs, and the immediate need for make-safe and clearance for residents to return to their dwellings.

Further to our discussions and inspections of the site, our monitoring proposal is centred around two key aspects:

- ☐ monitoring of displacement via survey prisms and repeat pick up, providing millimetre level confidence on the actual three-dimensional movements of instrumented locations.
- ☐ 24/7 real time monitoring of the slope via tilt and GNSS sensors installed at key locations, reporting back to a cloud portal and providing automated alerts of movements and low-cost-low-maintenance long term monitoring of slope movements.

Our proposal includes the supply of this equipment and technology, the installation and commissioning, and the ongoing periodic survey of monitoring prisms across the site. We have collaborated with a geotechnical specialist rope access team to provide onsite support for the establishment of the prism and sensor network – ensuring that the slope is adequately instrumented across all key locations and access methods maintain the highest level of safety protocols.

We estimate the installation and commissioning of the system will require two days onsite. This will see, as proposed overleaf, approximately 50no. survey prisms installed across the site area of interest, 20no. tilt sensors and 7 GNSS sensors installed. During the installation and commissioning, the GNSS and tilt sensors will immediately start reporting monitoring data back to the online portal and providing PSM, Council and stakeholders with near-real time information on the behaviour of the slope.

Overleaf, please find brief details of our proposed scope of work, the proposed system and its benefits, and our pricing. We kindly request your instruction to proceed as soon as possible so we can adequately prepare for the works to proceed in a timely manner. As always, please call or email at your convenience to discuss further.

Sincerely,  
For and on behalf of Diospatial

**Personal Information**

Brendon Hol  
B.E. (Mechanical)  
Chief Remote Pilot & Operations Manager

## 1. Scope of Work

We understand the scope of work to include provision of all personnel, equipment, licences, insurances, disbursements, and the like to deliver:

- Supply, install, and ongoing survey monitoring of a prism network consisting of ~50x survey prisms installed across the slope area of interest.
- Conduct double baseline survey to confirm initial positions of the prisms with the highest standard of confidence, and thereafter provide periodic repeat survey at agreed frequency; nominally
  - Weekly for the first 4 weeks, then
  - Fortnightly for the next 8 weeks, then
  - Monthly for 9 months, then
  - Totalling 17 repeat surveys of the prisms unless otherwise instructed due to detected movements.
- ~~□ Provide prisms displacement reports and visualisations of the monitoring network, update with each repeat survey.~~
- ~~□ Prepare 3D vector overlay of displacement(s) following each survey and visualise in the Diospatial digital twin on Pointerra for intuitive display of monitoring observations.~~
- Provide CSV File with prism position coordinates following each repeat survey (DateTime, Point ID, Easting, Northing, Height)
- Supply, install, and commission a network of 20x tilt sensors across the slope area of interest and provide ongoing near-real time data logging to cloud portal accessible to all nominated stakeholders and users with automated alerts if tilt magnitude accelerates or exceeds nominated thresholds.
- Supply, install, and commission a network of 7x GNSS sensors (plus reference station) across the slope area of interest for a 12-month period. Providing ongoing near-real time data logging to cloud portal accessible to all nominated stakeholders and users with automated alerts for displacement.
- Provide technical service and instruction to stakeholders and users of the system, technical support and guidance in calibration of alert thresholds.
- Provide ongoing technical support and services on an hourly rates basis as requested after completion of the proposed scope.

Out of Scope:

- Liaison and consent with private property owners and/or residents for permission to access properties and installed sensors, posts, and the like.
- Decommissioning, removal and 'make good' of the site – we have assumed the monitoring system and hardware will remain in place for a period of 5+ years. Removal of the system and any 'make good' is not included and will incur additional fees.
- Vegetation clearing, trimming, removal, as and if required to support line of site for monitoring prism survey. Minor trimming will be conducted by our team but any significant removal of trees or vegetation will be by others (SES) or at additional cost.

## 2. Programme

- Lead time on hardware: in-stock, 2-days offsite preparation
- Installation and commissioning: 2-days onsite, tilt sensor activation and baseline survey inclusive.
- Availability: 2-3 days following instruction, preferred start date onsite Monday 10<sup>th</sup> February.

### 3. Deliverables

Item	Description	File Format (nominal)
Hardware	WiSen Tilt Sensors System: 4G Gateway w/ solar power; 20x tilt sensors with battery life of 5+ years, depending on frequency of data logging and reporting (~1-2 years @ 6 minutes frequency; ~5 years at 30 minute frequency; 5-10 years @ hourly frequency – adjustable via the cloud portal)	N/A
	Ongoing access to the WiSen Monitoring Portal for the life of the system, no subscription fees or ongoing charges, free and unlimited alerts via email to nominated recipients. (5 year SIM card data plan included in fees)	Username and Password for each nominated user
	Prism Monitoring Network: 6 control prisms for station establishment by resection; 50 monitoring prisms.	N/A
	Kurloo GNSS high-precision displacement monitors for a period of 12 months. Capable of 1no. measurement at ~5mm accuracy or 2-3no. measurements at ~10mm accuracy. Additional fee to extend beyond 12 months.	Username and Password for each nominated user
Monitoring Reports	Prism positions (East, North, Height) at baseline and each repeat survey epoch	CSV
	<del>Survey prism displacement vectors at each survey epoch, displayed in scale exaggerated 3D vector form and overlain on the 3D Digital Twin of the site (Pointerra)</del>	<del>Pointerra (URL + password)</del>
	<del>Monitoring Survey Report following each epoch, graphical and tabulated display of prism displacements for each domain/area.</del>	<del>PDF</del>
Handover and Support	Collaboration with geotech team to establish suitable alert threshold criteria and thresholds	PDF
Included	Project Report: methodology, deliverables, limitations, quality control, accuracy verification	PDF
Included	12-months hosting of all geospatial data on Pointerra	URL + password

### 4. Survey Area



Figure 1 – Indicative layout of tilt sensors over the slope, to be confirmed and refined under the direction of geotechnical SME. Prisms to be installed on tilt sensor locations to provide 3D displacement calibration of tilt data.

## 5. WiSen Tilt Sensor Monitoring



Figure 2 - an omni tilt sensor (left) installed on a roadside embankment, reporting tilt data to the 4G Gateway (right) which uploads the data to the cloud monitoring portal for visualisation and alerts.



### Key Features

- Omni-axis tilt 360° range
- $\pm 0.002^\circ$  accuracy
- $\pm 0.0002^\circ$  precision
- $\pm 0.0001^\circ$  resolution
- Intelligent node/repeater
- Battery life up to 17 years
- 1 second to 1 hour variable readings
- #End user configurable
- Rugged Housing
- IP66
- Gravity Orientation Sensor

## 6. Kurloo GNSS Monitoring



### Automated Daily Static GNSS Survey Solution

Horizontal Accuracy	2mm + 0.5ppm RMS <sup>1,2,3</sup>
Vertical Accuracy	3mm + 1.0ppm RMS <sup>1,2,3</sup>
Latency	Daily solution available at 11:00am (AEST)



## 7. Key Personnel

**Project Director: Zack Wasson** – B.E. (Civil)(Geotechnical); 10+ years in slope stabilisation, risk assessment, monitoring and survey. Including various disaster response initiatives including Bogong High-Plains Road, Lismore Flood Recovery, Great Ocean Road slope stabilisations.

**Reality Capture and Chief Remote Pilot: Brendon Hol** – B.E. (Mechanical); 7 years specialisation in remotely piloted aircraft, reality capture, LiDAR survey and digital engineering solutions for engineering applications.

**Survey and Spatial Lead: Andre Fonzar** – Dip. Survey; 10+ years in engineering survey, spatial data analysis and manipulation, and monitoring surveys. Extensive experience in geotechnical survey monitoring for tunnelling and large scale civil infrastructure projects including Sydney Metro and Snowy 2.0.

**Digital Engineering Lead: Robinson Duenas** – B.E. (Civil); 8 years digital engineering for civil engineering projects, spatial data visualisations and integrations.

## 8. Commercial

### 8.1. Fees

ITEM	DESCRIPTION	UNITS	UOM	Rate (ex.GST)	Extended
<b>1.0</b>	<b>Installation and Commissioning (2 days onsite)</b>				
1.1	Install and Commissioning of monitoring survey prism network and tilt sensor system: - Conduct double baseline survey of monitoring prism network. - Commissioning of sensor network and cloud portal live feed, establishment and tuning of alert thresholds, - Onboarding and handover of users and stakeholders to monitoring system				
1.2	IRATA Certified Rope Access Crew for technical access to slope face and elevation positions. 3 person crew with Level 3 IRATA Supervision for standby rescue and coordination, geotechnically experienced in slope stability, hazards and mitigation. <i>Nominated Subcontractor: Rix Asset Maintenance (RAM)</i>				
<b>2.0</b>	<b>Supply of hardware, fixed materials and consumables:</b>				
2.1	Supply Control Prisms				
2.2	Supply Monitoring Prisms				
2.3	Supply support posts (50x50 SHS DuraGal Steel x 1.5m L)				
2.4	Supply WiSen Portal 4G Gateway, Solar Panel and Charge Controller, 5 years 4G cellular data plan for continuous cloud uploads, mounted to galv. steel post in suitable location with good solar exposure.				
2.5	Supply WiSen Omni Tilt Sensors and ball mount bracket, radio connected mesh nodes with self contained battery life of 5+ years (pending reporting freq.)				
2.6	Miscellaneous Consumables and Fasteners				
2.7	Source and install Kurloo high-precision GNSS sensors and reference station (with additional solar panels) for 12 month period (If required longer, additional fees apply)				
<b>3.0</b>	<b>Monitoring and Reporting</b>				
3.1	Survey Pick Up of Monitoring Prisms and delivery of raw observations (Point, East, North, Height) - no interpretation or analysis. - weekly survey for first ~4 weeks (4x), then - fortnightly for ~8 weeks (4x), then - monthly for ~9 months (9x)				
3.2	(PROVISIONAL) Update photogrammetry model at completion of debris removal and make safe for accurate visualisation and record of post-recovery site condition.				
3.3	(PROVISIONAL) Spatial Manager: Technical Support, alert threshold criteria calibration, handover, training, and the like during the course of the works.				
		<b>Estimated Total ex.GST</b>			

Commercial in Confidence

Irrelevant &amp; Sensitive

- Monthly Payment Claim and Invoice to be paid on 30 day terms.
- Service call outs, repairs, delays outside of Diospatial's control will be charged at hourly/day rates.

## 8.2. Rates

Ref	DESCRIPTION	UOM	Rate
R1	Senior Surveyor and Equipment, in-field	hour	Commercial in Confidence
R2	Surveyor/Service Technician	hour	
R2	2-person Survey Crew and equipment, in-field	hour	
R3	Spatial Manager, office	hour	
R4	Spatial Analyst, office	hour	
NB	Disbursements, Subcontractors, out-of-pocket expenses, Supply of hardware and equipment.	Cost+	