

Date of Submission	27 March 2019
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## **IPL Project (IPL - 202) Annual Report Form 2019**

**1 January 2018 to 31 December 2018**

1. Project Number and Title:

**IPL-202 RIPLEY LANDSLIDE MONITORING PROJECT (ASHCROFT, BC, CANADA)**

2. Main Project Fields

Technology Development – Monitoring and Early Warning, Hazard Mapping, Vulnerability and Risk Assessment

Capacity Building – Technology transfer and capacity building to government and private sector  
Mitigation, Preparedness and Recovery – Preparedness, and Recovery related primarily to infrastructure

3. Name of Project leader: David Huntley

Affiliation: Geological Survey of Canada, Research Scientist

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Core members of the Project: Dr. Peter Bobrowsky (Geological Survey of Canada); Mr. Peter Neelands (GSC); Mr. Roger MacLeod (GSC); Mr. Robert Cocking (GSC); Mr. Jamel Joseph (GSC); Prof. Michael Hendry (University of Alberta); Prof. Renato Macciotta (University of Alberta); Prof. David Elwood (University of Saskatchewan)

4. Objectives: The Geological Survey of Canada, University of Alberta, University of Saskatchewan, Canadian Pacific Railway and Canadian National Railway are coordinating a multi-partner effort to apply and test a suite of technologies and methods used in the characterization, assessment and monitoring of landslides in Canada funded by Transport Canada. Results are being compared and shared with the professional community to improve global landslide monitoring.

5. Study Area: Primary focus on 1 landslide but expanded to include several others situated along the Thompson River, near Ashcroft, British Columbia, Canada

6. Project Duration: Project may continue indefinitely depending on funding (at least 2020)

7. Report

1) Progress in the project: Fieldwork related to this project in 2018 took place in May, August, September, and October. Collaborative meetings between partners took place in April in Vancouver, BC and December in Calgary, Alberta. Conference presentations specifically on the project took

place in June at the international Resources for Future Generations event (Vancouver, June), the International Association of Engineering Geology meeting (San Francisco, September) and the Annual Meeting of the Geological Society of America (Indianapolis, November).

The main accomplishments in fieldwork dealt with monitoring of changing soil moisture conditions at the Ripley Landslide using the British Geological Survey technology known as PRIME (electrical resistivity tomography based). Data were integrated using the longterm GNNS permanent markers installed in 2009 as well as the more recently deployed 20 GeoKylia Geocubes (2 separate arrays – one on the Ripley Landslide and the second on nearby South Slide). UAV data collection took place twice using the AJI Phantom 4 apparatus. The UAV surveying was conducted using the following autonomous surveying applications: Pix4D Capture (2016, 2017) and Map Pilot (2018); the SfM modelling was undertaken using Pix4D Mapper. Multi-beam bathymetric data were collected again in October of 2018 for parts of the Thompson River.

- 2) Planned future activities or Statement of completion of the Project: 2019 will be an important year for data collection, analysis and publication for the project. This will involve only a few field visits, equipment maintenance and updating, deployment of new equipment as necessary. Ongoing emphasis will be on UAV data, InSAR, piezometric and borehole data, Geocube updates, etc. Attention will be shifting to a new project study in Saskatchewan and Manitoba in central Canada and will be part of a new ICL Project Proposal.
- 3) Beneficiaries of Project for Science, Education and/or Society: initial beneficiaries of the project include the two primary rail companies in Canada (CN and CPR), but this includes sharing with the professional community in Canada as well. Since starting in 2013 work at the Ripley Landslide has been widely promoted globally and is reaching a wide audience. Multiple citations in other publications. A few publications are now in preparation or in press and one or two papers will be submitted to WLF5.
- 4) Results: the following publications were released in 2018
  - Best, M. Bobrowsky, P. Huntley, D., Macciotta, R. and Hendry, M. (2018) Integrating terrestrial and waterborne ERT surveys at the Ripley Landslide near Ashcroft, British Columbia, Canada. *Environmental and Engineering Geophysical Society, Proceedings Volume of 31st SAGEEP*, Nashville, Tennessee
  - Bobrowsky, P., MacLeod, R., Huntley, D., Niemann, O., Hendry, M., Macciotta, R. 2018 Ensuring Resource Safety: Monitoring Critical Infrastructure with UAV Technology. Resources for Future Generations, Conference Abstracts Volume, 1 page, Vancouver, Canada
  - Holmes, J., Chambers, J., Donohue, S., Huntley, D., Bobrowsky, P., Meldrum, P. Uhlemann, S., Wilkinson, P. and Swift, R. (2018) The Use of Near Surface Geophysical Methods for Assessing the Condition of Transport Infrastructure. Civil Engineering Research Association, Special Issue on Structural Integrity of Civil Engineering Infrastructure, *Journal of Structural Integrity and Maintenance*, 6 pages
  - Huntley, D., Bobrowsky, P., Hendry, M., Macciotta, R., Elwood, D., Sattler, K., Reeves, H., Chambers, J., Meldrum, P. Holmes, J. and Wilkinson, P. (2018a) Using multi-dimensional ERT modelling to provide new insight into the hydrogeological structure of a very slow-moving landslide in glacial sediments, Thompson River valley, British Columbia, Canada. *Geological Society of America Annual Meeting, Session T65, Abstract Volume*, 1 p.

- Huntley, D., Bobrowsky, P., MacLeod, R. and Roberts, N. (2018b) New insights into form and function of very slow-moving landslides from bathymetric surveys of Thompson River, British Columbia *Geological Society of America Annual Meeting*, Session T53, Abstract Volume, 1 p.
- Journault, J. Macciotta, R., Hendry, M., Charbonneau, F., Huntley, D. and Bobrowsky, P. (2018) Measuring displacements of the Thompson River valley landslides, south of Ashcroft, B.C., Canada, using satellite InSAR. *Landslides*. Volume 15 (4), pp. 621-636, DOI 10.1007/s10346-017-0900-1
- Rodriguez, J., Hendry, M., Macciotta, R., Bobrowsky, P. and Huntley, D. 2018. High-frequency displacement data for detailed analysis of the relationship between precipitation and landslide kinematics – the Ripley and 10-Mile Slides. *Geo-Edmonton 2018*. Canadian Geotechnical Society, Proceedings and Abstract Volume, 1 page. Edmonton, Alberta
- Sattler, K., Elwood, D., Hendry, M, Macciotta, R., Huntley, D., Bobrowsky, P. and Meldrum, P. (2018) Real-time monitoring of soil water content and suction in slow-moving landslide. *GeoEdmonton 2018*, Proceedings Paper, 8 p.

Note:

- 1) If you will change items 1) - 6) from the proposal, please write the revised content **in Red**.
- 2) Please fill and submit this form by **30 March 2019** to **ICL Network** <[icl-network@iclhq.org](mailto:icl-network@iclhq.org)>