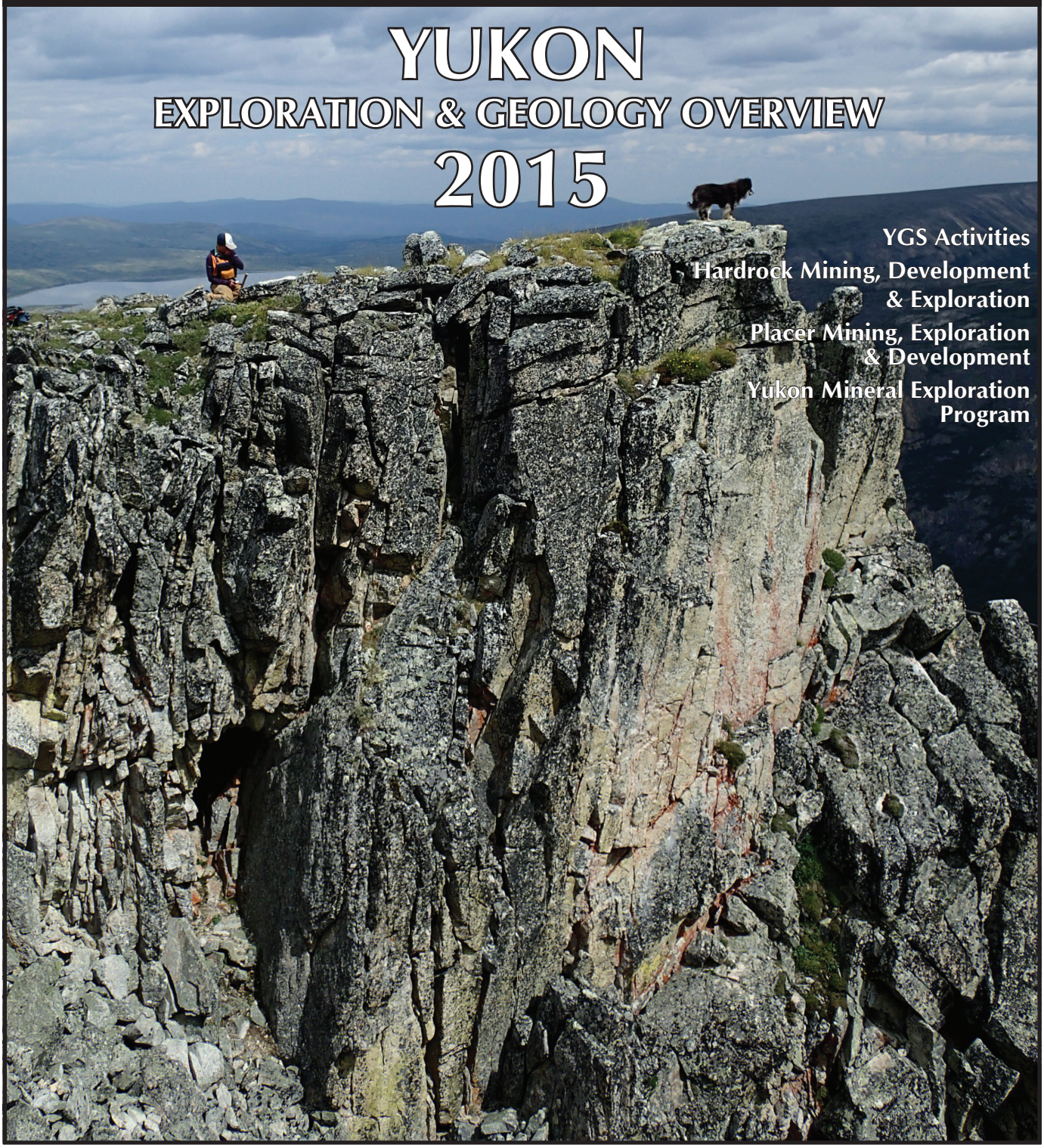
Energy, Mines and Resources • *Yukon Geological Survey*

YUKON
EXPLORATION & GEOLOGY OVERVIEW
2015



YGS Activities

Hardrock Mining, Development & Exploration

Placer Mining, Exploration & Development

Yukon Mineral Exploration Program

Yukon Geological Survey

Yukon
Energy, Mines and Resources

Yukon Geological Survey staff - (left to right) Monica Nordling, Patrick Sack, Derek Torgerson, Kathy Walker, Sarah Laxton, Olwyn Bruce, Esther Bordet, Matt Hutchison, Brett Elliot, Johann Slam, Karen MacFarlane, Charlie Roots, Leigh van Drecht, Maurice Colpron, Scott Casselman, Steve Israel, Rob Deklerk, David Moynihan and Rosie Cobbett.
Missing from photo: Carolyn Relf, Lara Lewis, Jeff Bond, Kristen Kennedy, Bailey Staffen, Panya Lipovsky, Tiffani Fraser and Syd van Loon.

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Edited by

K.E. MacFarlane and M.G. Nordling

Yukon Geological Survey

Energy, Mines and Resources

Government of Yukon

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This overview is available for download from the Yukon Geological Survey website.

Front cover photograph: Looking north at cliffs above Long Lake; composed of Early Jurassic granodiorite of the Long Lake suite. Photo by Steve Israel.

PREFACE

Yukon Exploration and Geology (YEG) and the Yukon Exploration and Geology Overview continue to be the main publications of the Yukon Geological Survey (Energy, Mines and Resources, Government of Yukon). Individual YEG papers, with colour images, are available in digital format only and can be downloaded from our website. The YEG Overview is available in a digital format; hard copies are available from a limited colour print run.

YEG 2015 contains up-to-date information on mining and mineral exploration activity, studies by industry and results of recent geological field studies. Information in this volume comes from prospectors, exploration and government geologists, mining companies and students who are willing to contribute to public geoscience for the benefit of the scientific community, general public and mineral and petroleum industries of Yukon. Their efforts are appreciated.

Joining me once again in YEG editing was Monica Nordling. A big thank you to Monica for keeping me focused and allowing editorial discussions to take place in her much warmer office. I would like to acknowledge the work of many of my Yukon Geological Survey colleagues who have submitted papers and reviewed manuscripts prior to them getting to me. Their work makes my job easier.

Sherry Tyrner of the Queen's Printer ensured that the printing process went smoothly.

We welcome any input or suggestions that you may have to improve future YEG publications. Please contact me at (867) 667-8519, or by e-mail at karen.macfarlane@gov.yk.ca.

Karen MacFarlane

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Carolyn Relf[1] and Maurice Colpron
Yukon Geological Survey

Relf, C. and Colpron, M., 2016. Summary of Yukon Geological Survey 2015-16 Activities. *In*: Yukon Exploration and Geology Overview 2015, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 1-22.

INTRODUCTION

Staff at the Yukon Geological Survey (YGS) carried out fieldwork on 12 projects in 2015-16 (Fig. 1). These multi-year projects included regional bedrock mapping, detailed surficial mapping, stratigraphic studies (in sedimentary basins and surficial materials), and a thematic metallogeny study. In addition, field reconnaissance was carried out in preparation for the installation of an array of seismometers in southeastern Yukon, and planning is currently underway to deliver one or more thematic geophysical projects.

Three desktop studies are currently underway or completed: these include modeling of stream sediment geochemical data, creation of a new mineral potential map of the Selwyn basin (currently focused on the traditional territory of Ross River Dena Council) and a compilation of historic placer data from Dominion Creek.

In addition to the above, YGS funded the field and/or analytical work of seven university-based studies, some of which are supporting more than one graduate or undergraduate thesis.

YGS continued to monitor hard rock and placer exploration and production, and provided clients with information on Yukon geology, both in person and online. Public outreach is an important part of the survey's program; activities in 2015 included educator workshops, hands-on classroom activities, geology-themed hikes and engagement of communities in the monitoring of permafrost.

Highlights of YGS' activities are summarized in this paper; overviews of hard rock and placer activities and highlights of YGS's Yukon Mineral Exploration Program are presented elsewhere in this volume (Lewis *et al.*, 2016; Bond and van Loon, 2016; Torgerson, 2016, respectively). More detailed descriptions of individual geology projects results will be released separately, either in the upcoming Yukon Exploration and Geology 2015 (available early in 2016) or in stand-alone publications.

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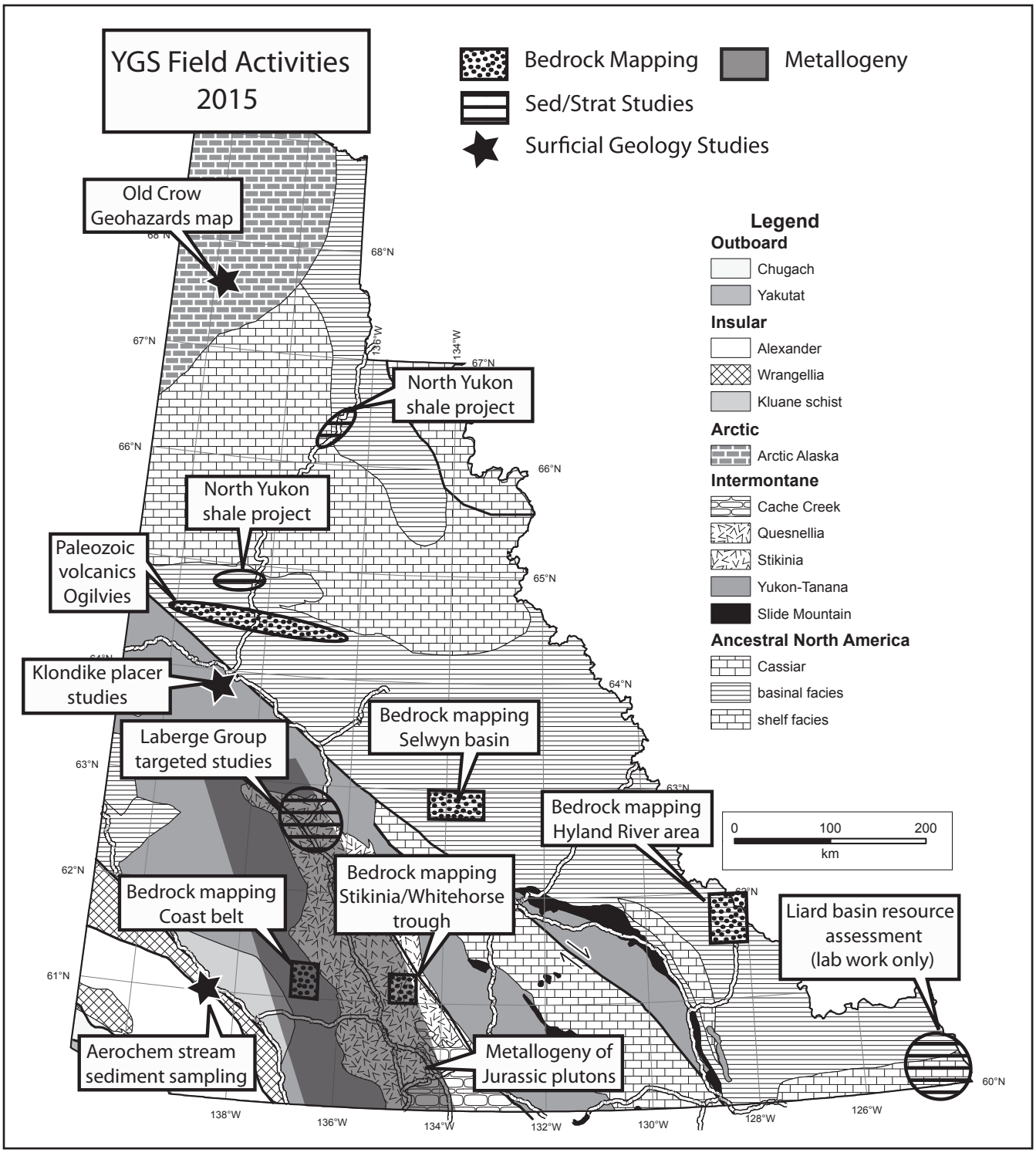

Figure 1. *Locations of field activities carried out or supervised by YGS staff in 2015. Descriptions of individual projects provided in the text.*

YUKON GEOLOGICAL SURVEY PROGRAM FUNDING AND OVERSIGHT

YGS' mandate is to support the stewardship of Yukon's energy and mineral resources, and to contribute to the sustainability of Yukon's communities. To that end, the projects delivered by the survey are developed with specific intended outcomes, such as regional mapping to attract exploration investment, delineating aggregate resources to assist infrastructure development, collecting baseline data to support regulatory decisions and assessing geologic hazards to protect Yukon communities. A beneficial upshot of the work carried out by the survey is the training opportunities provided to seasonal field assistants; YGS has employed and trained numerous Yukon students over the years. All of YGS' data and the products derived from the data (maps, sections, reports) are made publicly available; most can be downloaded from the YGS website (www.geology.gov.yk.ca).

Annual work plans are developed with input from two Technical Advisory Committees (one for minerals; one for oil and gas). Yukon Government priorities and collaborative research opportunities (*e.g.*, with Yukon College, university researchers and Yukon First Nations) also influence work planning, as does the Yukon geoscience needs report which is updated every five years.

YGS OPERATING BUDGET

Yukon Geological Survey's 2015-16 operating budget totaled $3 615 000. The budget includes $1 265 000 in O&M funds, $1 400 000 for the Yukon Mineral Exploration Program (for grants) and $950 000 from the Canadian Northern Economic Development Agency's Strategic Investments in Northern Economic Development (SINED) Fund. This report provides highlights of projects that were funded with O&M and SINED funds; a summary of YMEP-funded projects is provided elsewhere in this volume (Torgerson, 2016).

SINED FUNDING

The current 2015-16 fiscal year marks the second year of a two-year SINED grant ($950 000 per year). Projects funded by this grant are intended to support economic development in the territory and require leveraged funding from YGS or other non-federal research partners (*e.g.*, universities). SINED funding has been supplementing YGS' program activities for over a decade, and the program has had a major impact on YGS' productivity by funding a number of targeted geophysical surveys and geophysical data processing projects, supporting numerous university researchers, upgrading regional geochemical datasets and allowing YGS to digitize over 100 Gb of data that would not otherwise be easily accessible to clients.

As in previous years, YGS is seeking feedback on the value and impact of SINED-funded projects. Readers are encouraged to contact the authors to provide comments on YGS' SINED-funded projects.

YUKON GEOLOGICAL SURVEY ORGANIZATIONAL OVERVIEW

STAFF CHANGES

Yukon Geological Survey's organization chart is shown in Figure 2. Survey staff are divided into four units: Bedrock Geology, Surficial Geology, Minerals Geology and Technical Services.

Over the past year, a number of staff changes have impacted the survey. Don Murphy, previously head of the bedrock geology unit, retired in June after 23 years, although he continues to have a presence at the survey as an emeritus scientist. Maurice Colpron was appointed as the new head, Bedrock Geology in July. Esther Bordet joined YGS in April 2015 as the newest member of the Bedrock Geology unit. She is filling the vacancy left by Maurice's move into the head of Bedrock Geology position.

Lara Lewis was formally appointed as head, Minerals Geology in April, filling a gap that was created when Lee Pigage retired in June 2014. She will be taking eight month's deferred leave between February and September 2016 and Patrick Sack will be acting head in her absence.

Johann Slam, Core Library manager, left the survey in November to pursue an opportunity in southern BC. Johann joined the survey just as the new H.S. Bostock Core Library building was completed, and he was the key force behind setting up the facilities. His legacy will be a well-organized and highly functional core library, lapidary facility and warehouse.

In addition to the above, several temporary changes were accommodated. Tiffani Fraser started a year's deferred leave in August; she will be returning to YGS in September 2016. Scott Casselman joined the Minerals Geology unit in April for a term of 10 months; his extensive exploration

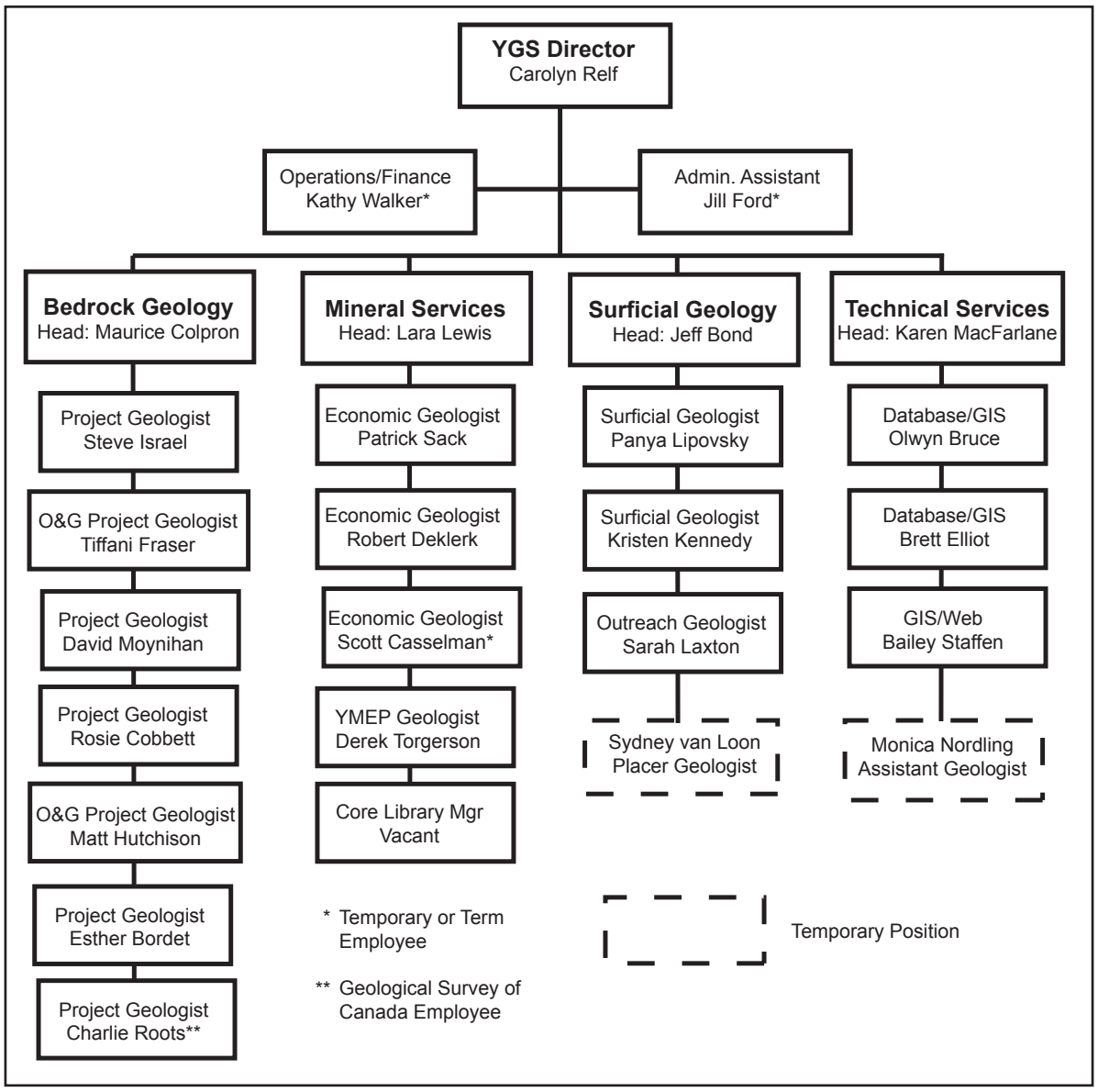

Figure 2. *2015 Organizational chart of Yukon Geological Survey.*

experience has been an asset to the survey. Suzanne Roy, manager, Finance and Operations, has been on an extended leave and Kathy Walker has been back-filling on a temporary assignment since March 2015. Following the retirement of Brian Love (Assistant Deputy Minister of Oil, Gas and Mineral Resources), Carolyn Relf was acting ADM from May until December. During that time, Maurice Colpron and Lara Lewis back-filled as the director for YGS.

The first author would like to take this opportunity to acknowledge Maurice and Lara in their new roles, welcome Esther to the survey and to thank Johann for the excellent work he did setting up the core library facility. Finally, Don is acknowledged for his long and distinguished career with YGS.

NEW STAFFING

YGS will be recruiting for a new Economic Geologist early in 2016, followed by recruitment for a new Core Library Manager. Positions will be posted on https://yukongovernment.ats.hrsmart.com. Interested individuals are encouraged to contact the first author for more information.

HIGHLIGHTS OF YGS FIELD ACTIVITIES

BEDROCK MAPPING

Hyland River Area

David Moynihan continued bedrock mapping in the Hyland River area, extending 2014 mapping in 105H/9 southward into 105H/8 (Fig. 1). Work to date has resulted in significant revisions to the stratigraphy of the Neoproterozoic Hyland Group, which comprises the oldest exposures of Selwyn basin. Clastic sedimentary rocks previously interpreted as Yusezyu Formation (lower Hyland Group) have been assigned to 12 newly-defined stratigraphic units (Moynihan, 2016). These revisions link to stratigraphic correlations established in the eastern Rackla belt (Moynihan, *in press*), and will be tested with follow-up geochronological data.

Structures identified include southwest-verging folds and faults in the eastern part of the map area (Fig. 3), and a younger crustal-scale fault in the Hyland River valley indicated by truncation of map units and expressed in aeromagnetic maps. These stratigraphic and structural observations help improve understanding of the setting of gold prospects such as the Justin and 3 Aces occurrences (Yukon MINFILE 105H 035 and 105H 066, respectively).

Stikinia/Whitehorse trough

Esther Bordet initiated a new 1:50 000 scale bedrock mapping project east of Lake Laberge in the Teslin Mountain area (105E/2; Fig. 1). The area is underlain by rocks of the Middle Triassic Joe Mountain Formation and Upper Triassic Lewes River Group (both part of Stikinia), and Lower-Middle Jurassic Laberge Group rocks of the Whitehorse trough. Mapping focused on the stratigraphic and structural relationships within and between these three units.

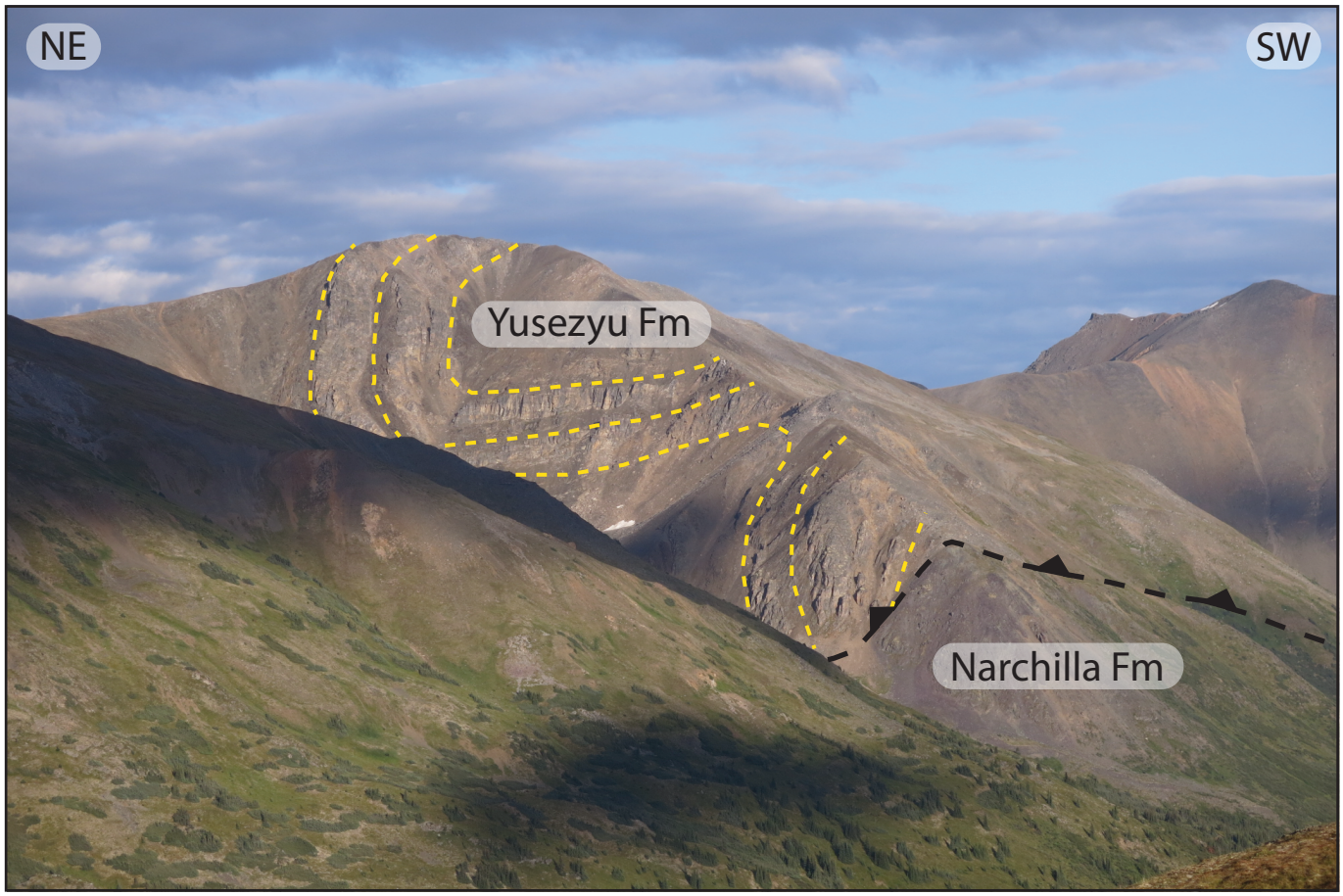

Figure 3. *Folded strata of the Yusezyu Formation thrust over Narchilla Formation; Hyland River area. Photo by D. Moynihan.*

Bordet (2016) documents complex lateral and vertical lithological and facies changes across the area; particularly within the Lewes River Group. Resolving these complexities will be key to understanding the latest stages of Stikinia arc volcanism and the initiation of Whitehorse trough sedimentation. Future work will include geochronology, geochemical analysis and further mapping to better characterize Stikinia's stratigraphy in Yukon, and how it relates to coeval, prospective strata in northern British Columbia. This will help refine models of Mesozoic arc development and terrane accretion in the Canadian Cordillera (*e.g.*, Mihalynuk *et al.*, 1994; Colpron *et al.*, 2015).

Southwestern Selwyn basin

Rosie Cobbett carried out bedrock mapping in the Tay River (105K) and Glenlyon (105L) map sheets in 2015 (Fig. 1). This was the second field season mapping in this area. The purpose of the project is to upgrade stratigraphic correlations and improve understanding of the structural history of this part of the Selwyn basin. Results of 2015 fieldwork are presented in Cobbett (2016).

Field work in 2015 delineated two distinct stratigraphic domains in the area separated by the Twopete thrust fault. South of the fault, metamorphosed Neoproterozoic to Silurian rocks of the Selwyn basin (Fig. 4) are intruded by mid-Cretaceous plutons. These strata host important SEDEX lead-zinc-silver deposits in the region, including the previously-operating Faro Mine (Yukon MINFILE 105K 061). North of the fault, a belt of Devonian to Triassic sedimentary and volcanic rocks are intruded by small mid-Cretaceous plutons and deformed by northeast-verging folds and thrust faults. This belt is host to numerous silver-bearing mineral occurrences on the Tay River map sheet, including the Keg deposit (Yukon MINFILE 105K 078).

As a result of this project, significant areas of previously un-mapped Upper Devonian to Mississippian quartz-rich clastic and volcanic rocks of the Earn Group have been identified. These rocks were deposited in grabens and half-grabens that, along with volcanism, formed in response to rifting along the western edge of Laurentia during the Late Devonian to Early Mississippian; rifting that presumably led to development of the Yukon-Tanana terrane and opening of the Slide Mountain Ocean (*e.g.*, Nelson *et al.*, 2006).

Coast belt project

Mapping continued in the Coast belt area of southwestern Yukon, led by Steve Israel. Work in 2015 focused on the geology of the Yukon-Tanana terrane and its contact relationships with the Early Jurassic Long Lake suite and Paleocene Ruby Range suite, as well as the distribution of metallogenically important Late Cretaceous Casino suite rocks. The area mapped covers parts of NTS 115H/2 and 7 (Fig. 1), near the southeastern part of Aishihik Lake. Several intrusion-related mineral occurrences are found within this area, including the Hopper porphyry/skarn occurrence (Yukon MINFILE 115H 019). The new mapping better defines the distribution of the Hopper pluton and the age-equivalent Aishihik dikes, themselves associated with several mineral occurrences. The work from the summer of 2015 has been compiled and released as YGS Open File 2015-32 (Israel and Borch, 2015).

Figure 4. *Strongly foliated, quartz-rich, cordierite-bearing marble of the Cambro-Ordovician Vangorda Formation, southwestern Selwyn basin. Photo by R. Cobbett.*

Paleozoic magmatism along the Dawson fault corridor

In July 2015, Maurice Colpron spent three days with Jim Crowley (Boise State University) and Justin Strauss (Dartmouth University) examining magmatic rocks, of presumed Paleozoic age, occurring on both sides of the Dawson fault in the Ogilvie Mountains of western Yukon (Figs. 1 and 5). On current compilation maps (Gordey and Makepeace, 2001; Colpron *et al.*, *in press*), most Paleozoic volcanic units in continental margin strata (mainly in Selwyn basin) are lumped under unit CSM (or Marmot Formation), although it is generally recognized that these represent several distinct pulses of magmatism. Recent mapping in the Rackla belt, near the eastern termination of the Dawson fault, indicated at least four distinct episodes of volcanism (Colpron *et al.*, 2013; Moynihan, *in press*). The objective of 2015 fieldwork was to sample volcanic and plutonic rocks near the west end of the Dawson fault for lithogeochemistry and U-Pb geochronology, in order to facilitate correlations with volcanic rocks in the Rackla belt and other parts of Selwyn basin. Part of the 2015 collection supports an Honours thesis by Peter Mamrol at Dartmouth University. Preliminary results already indicate that volcanic rocks, previously considered to be early Paleozoic in age, are in fact Neoproterozoic.

SEDIMENTARY BASIN STUDIES

North Yukon upper Paleozoic shale project

The North Yukon upper Paleozoic shale project was initiated in 2013 to determine the age, depositional controls and petroleum potential of shale in the region, and develop regional stratigraphic correlations (Hutchison and Fraser, 2015). Fieldwork carried out in 2014 examined the Trail River section of the Canol Formation and resulted in the definition of a formal reference section for this prospective shale unit. Results of this work are expected to be submitted for publication by this spring (Fraser and Hutchison, *in prep*).

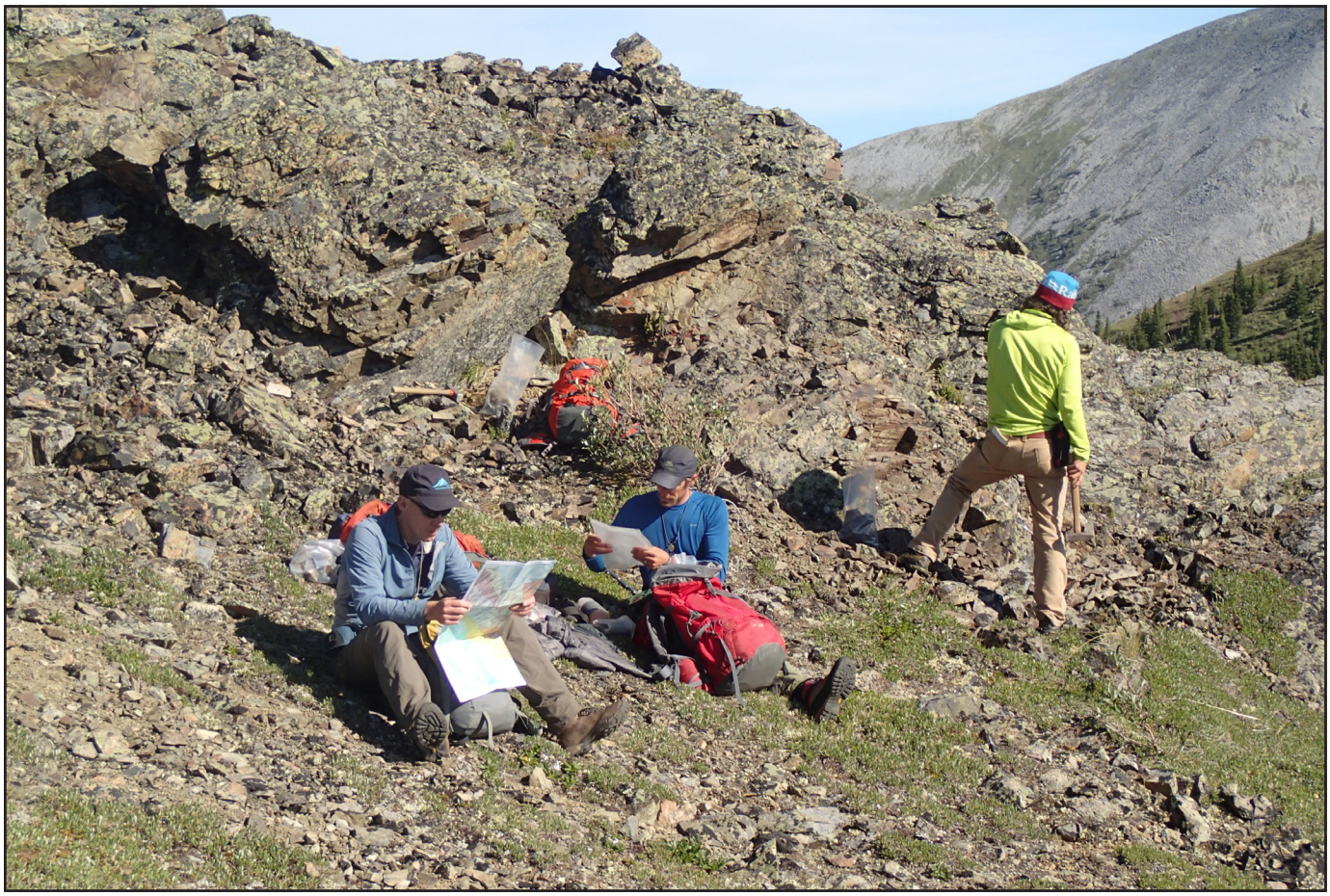

Figure 5. *Jim Crowley, Justin Strauss and Peter Mamrol examining volcanic rocks in the Ogilvie Mountains. Photo by M. Colpron.*

The Ford Lake Shale is also being targeted by this study (Fig. 1). Carbon isotope and palynological dating of shale exposed in southeastern Eagle Plain and the northern Ogilvie Mountains have yielded Viséan ages, confirming their correlation with the Ford Lake Formation. The compilation map of Gordey and Makepeace (2003) assigned the outcrops to either Canol Formation or the 'un-named' shale. This north Yukon C-isotope data will be presented at the upcoming American Association of Petroleum Geologists conference in June 2016.

The Ford Lake Shale is of interest as an exploration target for hydrocarbons. Analytical data gathered over the last year have allowed preliminary oil/gas maturity zones to be delineated. The data indicate this shale is likely oil-bearing in the Peel Plateau, transitioning westward to dry gas in southern Eagle Plain.

Liard basin shale project

In 2014, YGS engaged with British Columbia, Northwest Territories and the National Energy Board (NEB) to complete an assessment of unconventional resources of the Liard basin (Fig. 1; Relf, 2015). The assessment, initiated by the BC Oil & Gas Commission, originally focused on the portion of the basin south of 60°N, but it was expanded last year to include parts of Liard basin north of 60°. The targeted units in Yukon are the Exshaw Formation, and the Evie, Otter Park and Muskwa formations of the Horn River Group. The area being assessed is that portion of the basin that lies east of the main Cordilleran deformation front.

Over the past year, Matt Hutchison and Tiffani Fraser have sampled extensively from well cuttings stored at the Geological Survey of Canada's core facility in Calgary. Samples were analyzed for RockEval, vitrinite reflectance, whole rock lithogeochemistry, carbon isotopes and porosity (the latter for the Exshaw and Evie formations only). These data comprise the first publicly-available analytical data from subsurface samples in Yukon; they have been provided to NEB to support the resource assessment. The data will also be presented at the upcoming Canadian Society of Petroleum Geologists conference in March, and published in a joint YGS-GSC Open File publication by spring 2016.

The resource assessment is expected to be published by spring 2016. The shale gas volume estimates will be used to inform an economic analysis to be led by Yukon's department of Economic Development. The economic analysis is one of several studies recommended by the Select Committee on the Risks and Benefits of Hydraulic Fracturing, to fill knowledge gaps identified by the Committee.

While the primary driver for generating the analytical data was the Liard basin resource assessment, the data are proving valuable for other studies such as regional stratigraphic correlations between Liard basin and basins in north Yukon based on C-isotope signatures.

Laberge Group study, Whitehorse trough

A new study was initiated in the Whitehorse trough in 2015 by Matt Hutchison. The project builds on the recently-published bedrock geology compilation map (Colpron, 2011) and provenance study (Colpron *et al.*, 2015) of Whitehorse trough, and is linked to efforts by Bordet to redefine the stratigraphy of Stikinia and Whitehorse trough near Lake Laberge (Bordet, 2016).

The study is documenting the regional distribution of proximal sandstone (in the northern part of the trough) and more distal shale (in the southeastern part of the trough) and their associated hydrocarbon reservoir quality (Fig. 6). Of particular focus is the potential sandstone reservoirs in the north, where preliminary net/gross ratios were estimated from measured outcrop and Division Mountain diamond drill core sections. Samples were collected for porosity, horizontal and vertical permeability, thin sections, X-ray diffraction, lithogeochemical analysis, and scanning electron microprobe analysis to support more detailed characterization and correlation of potential reservoirs.

METALLOGENIC STUDIES

Metallogeny of Late Triassic – Jurassic plutons

Patrick Sack completed a second field season examining the magmatic and metallogenic framework of Late Triassic to Jurassic plutons adjacent to the Whitehorse trough in south-central Yukon (Fig. 1). The study is being carried out in collaboration with the Geological Survey of Canada (under their Geo-mapping for Energy and Minerals Program) and the Mineral Deposit Research Unit at the University of British Columbia (MDRU).

Based on field observations coupled with preliminary geochemical and geochronological data, the plutons can be subdivided into at least four distinct plutonic suites. The Stikine suite (*ca.* 220-206 Ma) occurs mostly south of

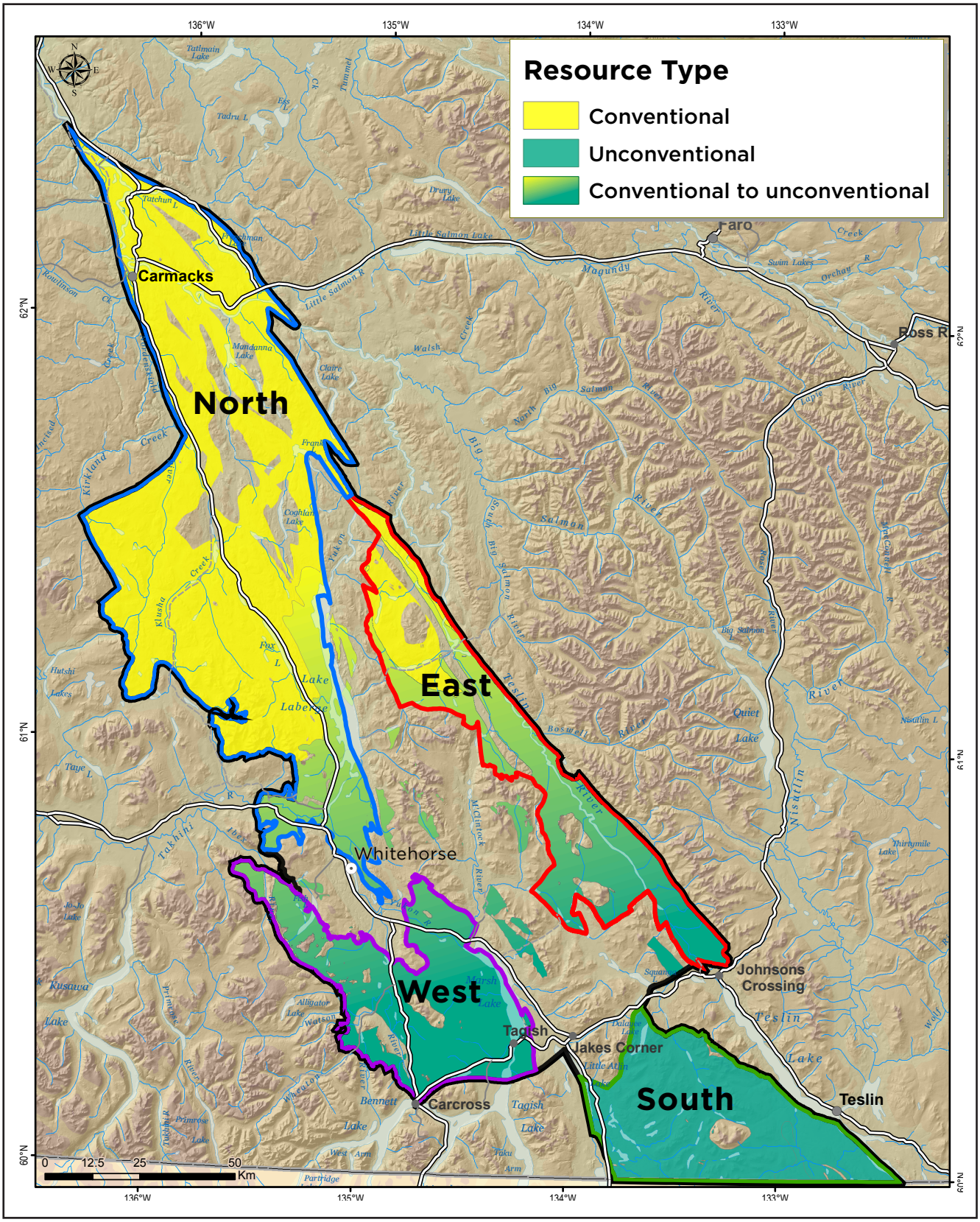

Figure 6. *Distribution of hydrocarbon resource type for the Laberge Group in the Whitehorse trough.*

Whitehorse and hosts the Inco porphyry occurrence (Yukon MINFILE 105D 100). The Minto suite (*ca.* 204-195 Ma) comprises granodiorite to quartz diorite that host copper + gold ± silver mineralization near Carmacks, including the Minto and Carmacks Copper deposits (Yukon MINFILE 115I 021 and 115I 008, respectively), and the Stu occurrence (Yukon MINFILE 115I011). The Long Lake suite (*ca.* 190-180 Ma) is best represented in the Aishihik batholith, but also occurs as small plutons in the Teslin map area. The Middle Jurassic Bryde-Bennett suite (*ca.* 176-160 Ma) is mostly exposed south of Whitehorse; it is host to the Mars occurrence (Yukon MINFILE 105E 002) northeast of Whitehorse.

Petrographic studies are underway to define the compositional and textural characteristics of these suites, and petrological and geochronological studies will help to determine their magmatic character, timing of emplacement and metallogeny. Results of some of this ongoing work are presented elsewhere in this volume: Joyce *et al.* (2016) present new U-Pb geochronological data from the Aishihik batholith, and Sack *et al.* (2016) provide more detailed description of the Minto suite-hosted Stu copper-gold-silver occurrence. The paper by Topham *et al.* (2016) presents results of thermobarometric studies conducted on the Aishihik and Tatchun batholiths. Other work underway includes a BSc Honours thesis study of the Bennett Lake pluton; the study is described in more detail in the section titled "University Collaborations".

SURFICIAL GEOLOGY PROJECTS

Paradise gravel

In 2015, Jeff Bond investigated the White Channel Gravel deposits in lower Hunker Creek in the Klondike area (Fig. 1; *see* Bond, 2016). Stratigraphic reinterpretation of the unit led to the definition of a pre-White Channel Gravel deposit – the Paradise gravel – which is the primary source of gold on benches in the area (Fig. 7). The discovery of this distinct pay unit has implications both for the evolution of placer deposits in the region and for the potential discovery of new reserves on high level benches in the Klondike.

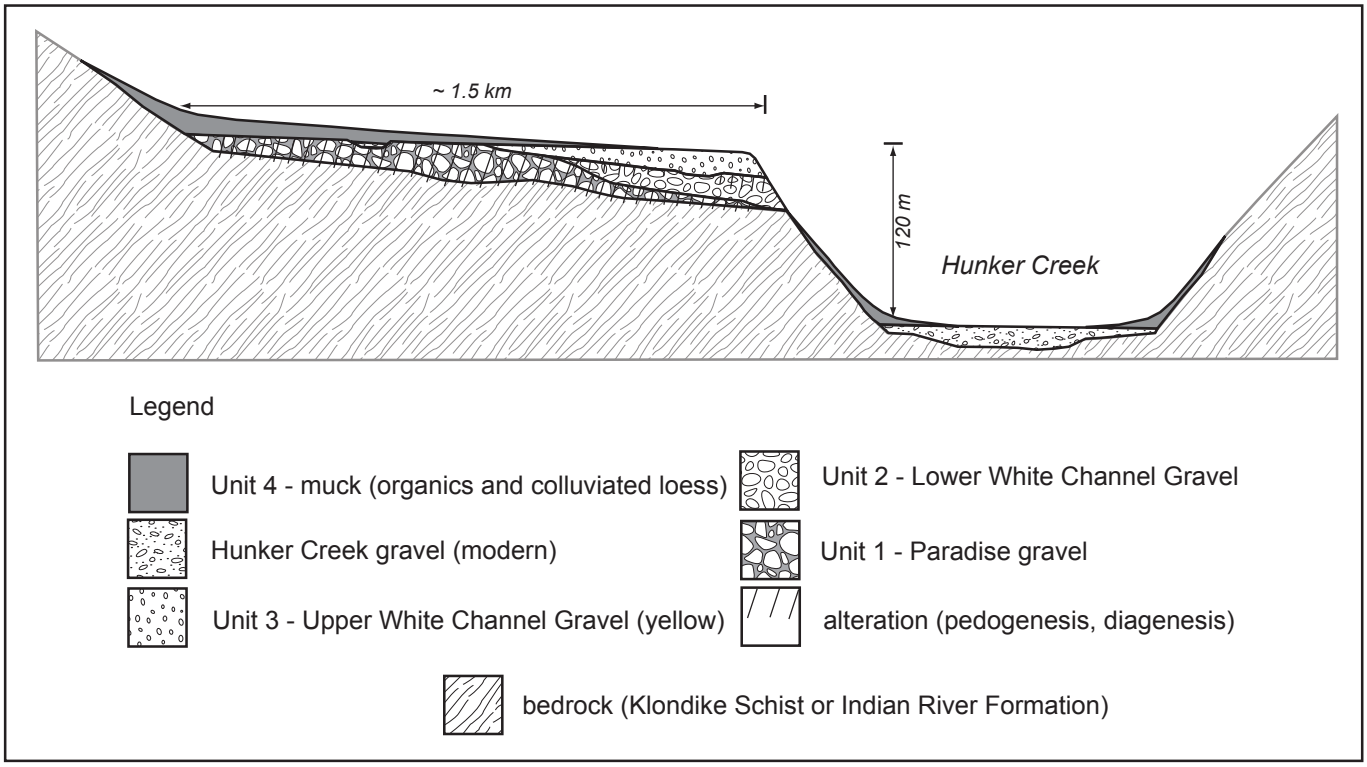

Figure 7. *Revised stratigraphic interpretation of Hunker creek surficial geology, showing the distribution of the Paradise gravel pay unit.*

Geohazard mapping in Old Crow

Kristen Kennedy continued community-based mapping as part of a multi-year collaboration with the Northern Climate ExChange at Yukon College. The mapping projects are underpinned by 1:20 000 scale surficial geology maps which identify potential geologic hazards (*e.g.*, landslides, degrading permafrost, floods, *etc.*) and assess their risk against climate change models.

This year's project focused in and around Old Crow in northern Yukon (Figs. 1 and 8). A surficial geology map, technical report summarizing landscape parameters (geology, hydrology, cryosphere, climate, *etc.*) and a weighted cumulative risk map will be released and presented to the community by spring 2016.

Holocene history of Llewellyn Glacier

Sarah Laxton continued to collaborate in 2015 with colleagues at Yukon College and Simon Fraser University on a study of the Holocene history of the Llewellyn Glacier south of Atlin Lake in northern British Columbia. The study, funded by Yukon Energy Corporation, is focused on ice volume estimates, as these have implications for potential future volumes of water that could flow through their hydro-electric facility at Whitehorse (Samolczyk *et al.*, 2016). The project is using models for climate warming coupled with Holocene ice advances/retreats to estimate melt rates.

GEOPHYSICAL AND GEOCHEMICAL SURVEYS

GEOPHYSICS PROJECTS

Seismic (earthquake) monitoring of the Liard sedimentary basin, southeast Yukon

YGS is in the process of acquiring four seismometers that will be deployed in and around the Liard sedimentary basin (Fig. 9), in southeastern Yukon, to monitor baseline seismic (earthquake) activity in the region. These instruments will be installed in spring 2016, along with an additional seismometer purchased by Natural Resources Canada (NRCan). Establishment of this earthquake monitoring network is in response to a recommendation by the Select Committee on the Risks and Benefits of Hydraulic Fracturing that baseline data on natural seismicity be collected ahead of potential development in the region.

The five new seismometers will add to an existing earthquake monitoring network in northeast British Columbia, operated by the BC Seismic Research Consortium (a collaboration between Geoscience BC, the BC Oil & Gas Commission, NRCan and the Canadian Association of Petroleum Producers). The objective of the Liard network is to monitor natural earthquakes with magnitude as low as 1-2 in order to identify potential active faults in the region. The current network of seismometers can only detect earthquakes with magnitude 3 or greater. The anticipated life of this monitoring network is 3-5 years, and is partially funded by SINED program resources.

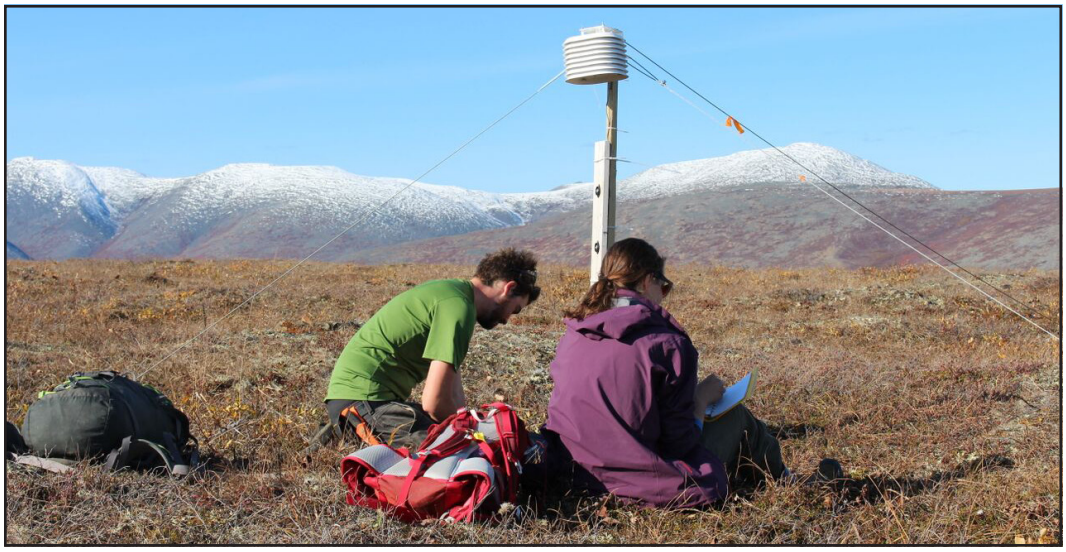

Figure 8. *Sarah Laxton and student setting up a weather monitoring station near Old Crow.*

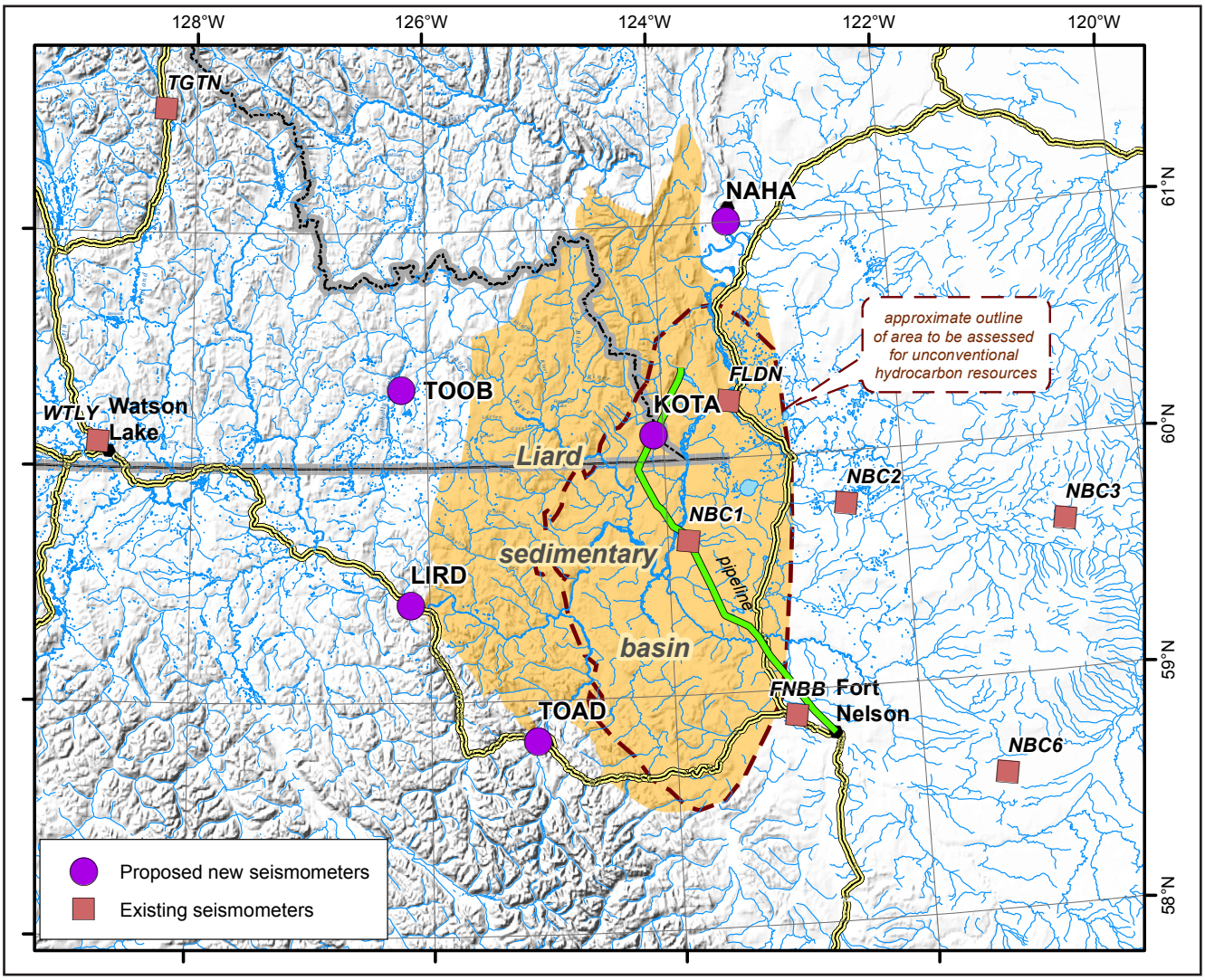

Figure 9. *Liard seismic network.*

Electromagnetic survey, Livingstone Creek area

As in previous years, YGS plans to invest SINED funds in a geophysical survey late in the fiscal year. This year, an airborne electromagnetic (EM) survey is planned over the Livingstone Creek area, where placer gold production indicates the presence of one or more bedrock lode sources for gold. The Livingstone camp is renowned for its coarse nuggets suggesting local sources. The area is underlain primarily by metasedimentary and meta-igneous rocks of the Yukon-Tanana terrane that were exhumed in the Jurassic (Nelson *et al.*, 2013). It is bounded by two Cretaceous strike-slip faults, the Big Salmon to the west and the d'Abbadie fault to the east, and dissected by a number of northeast-striking minor faults (Colpron, 2005). Gold mineralization is most likely derived from structurally-controlled vein systems. As rock exposures are locally hampered by a till veneer, an EM survey will help develop the structural framework of the area and provide exploration vectors.

Survey specifications are currently being developed. A request for proposals is anticipated by late January/early February, with the survey being flown in early March.

REGIONAL STREAM SEDIMENT GEOCHEMISTRY MAPS

Upgrading of Yukon's stream sediment geochemical (Regional Geochemical Survey – RGS) dataset has been ongoing for the past several years, funded primarily through SINED. Two different, but related sets of activities were carried out in 2015-16 (Fig. 10).

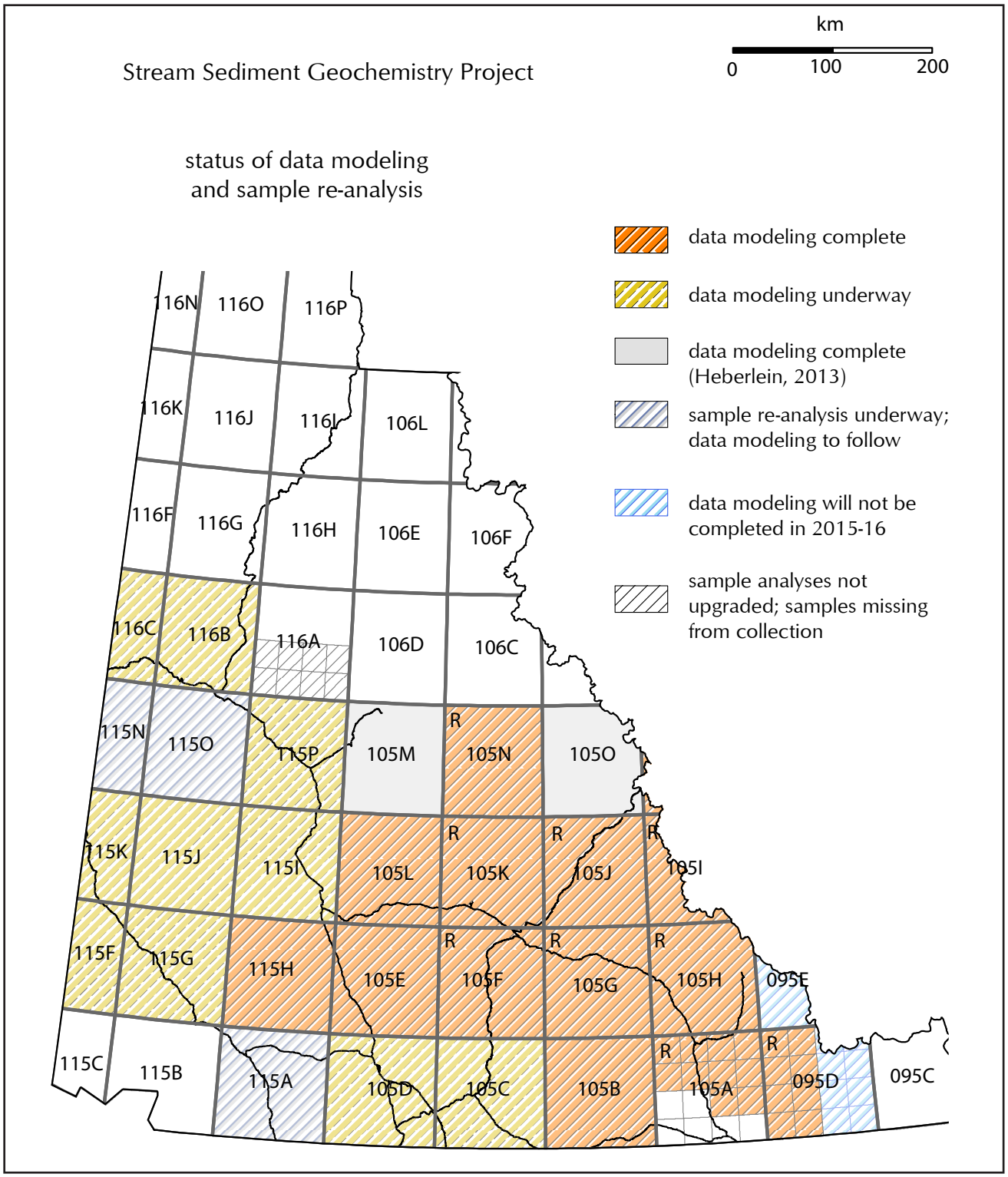

Figure 10. *Summary of stream sediment geochemistry projects underway, showing status of sample re-analysis (sample data for three maps sheets currently being upgraded) and data modeling (data for 12.5 map sheets completed; 10 map sheets underway). "R" indicates map sheets released to date (see Mackie et al., 2015 references)*

The first RGS-related activity was the re-analysis of samples archived in Ottawa with the Geological Survey of Canada's collection. Wayne Jackaman (Noble Exploration) is recovering up to 2691 samples from six areas (095D, 105A, 105I, 115A, 115N and 115O) and analyzing them for 53 elements via inductively coupled plasma mass spectrometry (ICP-MS). This work, anticipated for completion by March 2016, will complete the upgrading of all available Yukon stream sediment samples collected south of 65°N to modern standards[1].

The second RGS activity involved the modelling of raw RGS data to add value for end-users. This work has two components: the creation of catchment areas for each sample, and the modelling of the sample composition to reflect a probability value for different mineral deposit types.

Significant effort was put into the generation of catchment basins; particularly with the verification of sample locations, as many samples on the original maps did not plot on an existing stream. The catchment area layer is a critical base layer for the modelling step, as catchment areas represent the source area for each sample and the integration of background geology is heavily influenced by the delineated catchment. Additionally, catchment size provides insights into the dilution factor of anomalies, and the exercise of generating the basins highlights drainages that were never sampled by the original survey.

CSA Global was awarded a contract in December 2014 to undertake the RGS modelling work. The contract wraps up in March 2016, and in that time they will have modelled a total of 26 map areas (095D, 105A, B, C, D, E, F, G, H, I, J, K, L, N, 115A; F, G, H, I, J, K, N, O, P; 116B, C). The initial stages of the work involve attributing bedrock and surficial geology to each catchment area, assessing dilution (based on catchment size) and normalizing the sample data (*e.g.*, levelling to reflect dominant lithology(ies)). Principal component analysis is then undertaken on the sample data to "filter" bedrock influence on sample chemistry and enhance anomalies. Weighted sums, which assigns rankings to selected elements based on the mineralogical and chemical characteristics of various target deposit types, is then undertaken to further enhance anomalies.

Multiple weighted sums maps are generated for each map area, based on the mineral deposit types likely to occur in that area (determined by bedrock geology).

The modeling technique is described in more detail in Mackie *et al.* (2015a). To date, weighted sums maps for seven map areas have been published (Fig. 10; Mackie *et al.*, 2015b-h).

AEROCHEM STREAM SEDIMENT SAMPLING

This SINED-funded case study was undertaken to assess the effectiveness of Aurora Geoscience Ltd.'s Aerochem sampling bucket as a potential tool for collecting stream sediment samples. The sampling bucket, suspended on a long line from a helicopter, allows stream sediment samples to be collected without the use of ground-based field crews. This allows creek valleys with thick vegetation to be more easily accessed (to access on foot, personnel must be dropped some distance from the sample site and hike in). Initial testing of the system by Aurora indicated that samples can be collected faster, reducing field costs.

The Aerochem bucket has obvious applications for property-scale exploration. YGS' interest in the bucket is its potential as a cost-effective tool for infilling gaps in Yukon's regional RGS dataset. The generation of catchment basin polygons for existing RGS samples has revealed a number of drainages that were not sampled in the original surveys, as well as a number of catchment basins that are significantly larger than average, meaning samples with diluted geochemical signatures. A field campaign to systematically collect samples to level sampling density would be extremely costly and is unlikely to be a priority with current resources. However, the Aerochem bucket could be means to strategically fill targeted gaps to better image documented anomalies.

To compare the quality of Aerochem samples with those collected by hand, field crews collected two samples per site: one using the bucket and one by hand following the Geological Survey of Canada's sampling protocol. The analytical results from the two sampling techniques will be compared to assess whether the material collected with the bucket matches that collected by hand, and therefore whether Aerochem sampling is a viable technique for RGS infill. A final report will be submitted before the end of March and will be published shortly thereafter.

[1] *53-element ICP-MS analyses of all archived stream sediment samples in Yukon south of 65°N will exist, with the exception of samples from map sheets 116A, 106D and western 106C (archived samples do not exist) and 095C (RGS samples have never been collected for this map sheet).*

GEOSCIENCE OUTREACH

Sarah Laxton delivers and/or coordinates YGS' public outreach and education activities. This past year, public events included a variety of interpretive hikes in the Whitehorse area (Miles Canyon, Whitehorse waterfront, Fish Lake; Fig. 11), Tombstone Park (as part of a "Tombstone Rocks" weekend), the Yukon Wildlife Preserve and along the Alsek River.

Sarah also visited a number of schools, providing hands-on educational geoscience activities for students in Whitehorse, Haines Junction, Mayo and Dawson City. She also coordinated with other organizations (e.g., Yukon Department of Education, Environment, Yukon College, the Chamber of Mines) to deliver sessions under programs such as Rural Experiential Model, Canada Water Week, "Scientists Visiting Classrooms", Mining Week and the Yukon Geoscience Forum. The facilities at the Core Library are regularly used to teach geology and hold teacher workshops, and YGS was represented at the annual Career Expo and Lions Trade Show.

In addition to the above, Sarah collaborated with a colleague at the University of Toronto (Dr. Charly Bank) to deliver an undergraduate field course in near-surface geophysics. The course focused on the application of ground penetrating radar to exploration for aggregate and placer resources, and carried out a case study of the Moosehide slide north of Dawson City.

A geological highway map of Yukon is currently being developed by Sarah Laxton and Charlie Roots. Its release is planned to coincide with the Whitehorse 2016 GAC-MAC conference in June.

Other outreach activities in which YGS staff were involved were related to public concerns over potential impacts of oil and gas development. Matt Hutchison attended a number of public meetings, including an open house organized by the Yukon Environmental and Socio-economic Assessment District Office in Dawson, to provide information to the public on a proposed drilling project in Eagle Plain.

Finally, YGS has plans to deliver a series of public lectures on Yukon geology at the Beringia Interpretive Centre in winter 2016.

UNIVERSITY COLLABORATIONS

YGS provided logistical and/or financial support for a number of university projects this year. Interim results from a number of these projects were presented at the Yukon Geoscience Forum in November, and overviews of some of the projects are included in this year's YEG volume. Locations of these projects are illustrated in Figure 12.

Figure 11. *Jeff Bond explaining the glacial history of the Whitehorse area to hikers during the 2015 Fish Lake Rock Walk.*

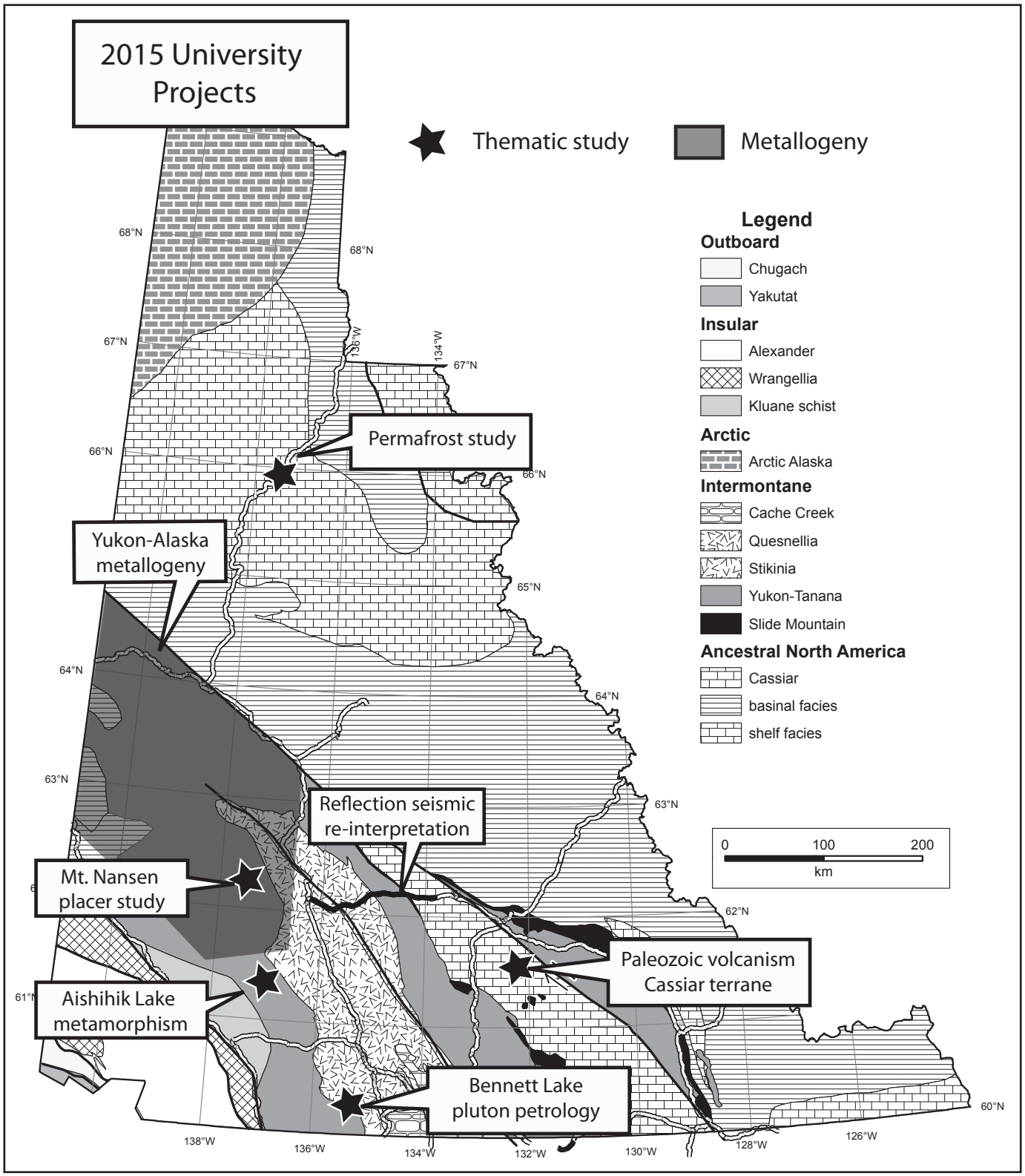

Figure 12. *Locations of 2015 field projects carried out by university researchers with support from YGS. See text for project descriptions.*

RE-INTERPRETATION OF SEISMIC REFLECTION DATA NEAR CARMACKS

In 2004, YGS and the Geological Survey of Canada undertook a reflection seismic survey across the northern Whitehorse trough (along the Robert Campbell and North Klondike highways) in order to improve understanding of the trough's subsurface architecture. Since the data were originally processed and interpreted (White *et al.*, 2006, 2012; Colpron *et al.*, 2007), new techniques have emerged for analyzing seismic data, allowing greater resolution of features.

This research project, supervised by Dr. Andy Calvert at Simon Fraser University, will generate 3D velocity models by using tomographic inversion in order to refine interpretation of the seismic reflection data. This should improve the resolution of the stratigraphic and structural interpretations for the northern Whitehorse trough and assist in assessing its prospect for hydrocarbon resources.

YUKON-ALASKA METALLOGENY PROJECT

The Yukon-Alaska Metallogeny project, initiated in August 2014, is being led by Murray Allan, Craig Hart and Jim Mortensen at the University of British Columbia's MDRU. The project is a joint university-industry-government partnership that is focused on defining gold metallotects in southwestern Yukon and eastern Alaska. The project comprises a number of integrated studies that are examining local and regional structural and magmatic controls on gold mineralization. YGS is supporting the project through the contribution of SINED funds, and through related studies focused on Jurassic magmatic suites and their metallogenetic significance (*see* papers by Bartlett *et al.*, 2016; Joyce *et al.*, 2016 and Sack *et al.*, 2016).

TECTONO-METAMORPHISM AT AISHIHIK LAKE

Andy Clark is undertaking an MSc study of Paleozoic and Mesozoic metamorphism of rocks of the Yukon-Tanana terrane between Aishihik and Sekelmun lakes in southwest Yukon under the supervision of Dan Gibson at Simon Fraser University. The project builds on regional mapping of the area by Israel and Westberg (2011) and Israel and Borch (2015), and aims to document metamorphic assemblages and structural fabrics, and link thermal and tectonic events in a time-temperature-pressure framework using in-situ monazite dating and conventional geothermobarometry. The constraints on the timing and conditions of metamorphism and deformation in this area will add to previous studies regionally in the Yukon-Tanana terrane (Staples *et al.*, 2013, 2014) and help better constrain crustal evolution of southwestern Yukon.

PERMAFROST MONITORING, EAGLE PLAIN

Pascale Roy-Léveillée at Laurentian University is establishing permafrost-monitoring infrastructure in the eastern Eagle Plain area to enhance existing baseline data on the distribution, thickness and nature of permafrost in the region. This area is currently the target of oil and gas exploration, and these data will assist with regulating activities such as road building and determining well casing requirements to protect permafrost. The data gathered will contribute to the Canadian Cryospheric Information Network, and be linked to Yukon's online Permafrost network.

MOUNT NANSEN QUATERNARY STRATIGRAPHY

Patrick Englehardt is in his second year of a MSc project at Simon Fraser University, under the supervision of Brent Ward. His thesis examines placer deposits in Back Creek in the Mount Nansen area (southwestern Yukon). Specifically, he is looking at the effect of Pleistocene glaciation on placer deposits, including the impact of late Pleistocene sands on stream sediment geochemistry. Preliminary results for this study are presented by Englehardt *et al.* (2016).

PALEOZOIC STRATIGRAPHY, TECTONICS AND METALLOGENY, PELLY MOUNTAINS

Luke Beranek and Steve Piercey of Memorial University are supervising two MSc students studying two stratigraphically distinct volcanic successions in the Pelly Mountains of Quiet Lake and Finlayson Lake areas (Cassiar terrane). The older succession of Cambrian to Ordovician mafic volcanic and clastic sedimentary rocks was deposited in a marine extensional environment and is host to a number of SEDEX lead-zinc-silver deposits. The younger succession comprises Devonian-Mississippian felsic volcanic and clastic sedimentary rocks correlated with Earn Group. They formed in a volcanic rift basin and are associated with VMS base metal occurrences (including the MM prospect, Yukon MINFILE 105F 012, and Wolf deposit, Yukon MINFILE 105G 008).

Field observations coupled with trace element geochemical and Nd-Hf isotope analyses are being used to further characterize the setting and metallogeny of the two volcanic successions, and to link them to the broader tectonic setting. Descriptions of the stratigraphic units and preliminary interpretations are presented in this volume (Beranek *et al.*, 2016). This study relates regionally with mapping by Cobbett (2016) in Tay River and Glenlyon map areas to the north.

STUDY OF THE BENNETT LAKE PLUTON

As a contribution to the Late Triassic-Jurassic pluton metallogeny project in south-central Yukon, Josh Pilsbury collected samples from the Bennett Lake pluton and is examining its age, petrology, and emplacement depth. The study is the subject of his BSc Honours thesis at UBC under the supervision of Murray Allan.

ONGOING YGS ACTIVITIES

INDUSTRY LIAISON

Lara Lewis, Patrick Sack and Derek Torgerson, from YGS' Minerals Geology unit, visited 11 mineral exploration properties in 2015 to monitor exploration results and they participated in the annual media tour, which visited seven exploration properties. Highlights of hard rock exploration projects were presented at the Yukon Geoscience Forum and are included in this volume (Lewis *et al.*, 2016).

Surficial geology staff, Jeff Bond and Sydney van Loon, visited placer mines throughout Yukon, documenting information on stratigraphy, gold distribution and character, and work activity. This information was presented at the Yukon Placer Forum and is compiled here (Bond and van Loon, 2016); it will also be included in the next Placer Industry Report in 2017.

In addition to tracking industry activities, YGS staff responded to a variety of information requests from clients and Yukon government departments.

PERMAFROST MONITORING

YGS continued its program of permafrost monitoring in Yukon communities in 2015. Sarah Laxton collected data on active layer thickness and ground temperature from stations in Whitehorse, Destruction Bay, Carmacks, Faro, Beaver Creek, and Dawson City. The information collected contributes to The Yukon Permafrost Network, can be accessed at http://permafrost.gov.yk.ca.

INFORMATION MANAGEMENT

PUBLICATIONS

YGS released thirty-two Open Files, two Miscellaneous Reports, one Bulletin, three Annual Reports and one brochure in 2015. The 2015 Yukon Exploration & Geology Annual Report and an Open File version of the recently-completed digital bedrock geology compilation are scheduled for release early in 2016. Scanned industry documents, while not technically YGS publications, are searchable via YGS' search tool and can be downloaded from the YGS website. In December, YGS staff travelled to Ottawa to identify a batch of YCGC files for scanning; once scanned, this will complete the YCGC scanning project.

NEW BEDROCK GEOLOGY COMPILATION MAP

The update of the Yukon digital bedrock geology map, which was in progress for the past few years, is now complete. The new GIS dataset is now available for download from either the YGS website (http://www.geology.gov.yk.ca/update_yukon_bedrock_geology_map.html) or Geomatics Yukon (ftp://ftp.geomaticsyukon.ca/GeoYukon//Geological/Bedrock_Geology), and through online map services: MapMaker Online (http://mapservices.gov.yk.ca/YGS/SL/) or GeoYukon (http://mapservices.gov.yk.ca/GeoYukon/SL/).

This update of the Yukon bedrock geology map builds upon the previous compilation by Gordey and Makepeace (1999, 2001). It includes new, detailed bedrock geology maps and regional compilations that have been published by the Yukon Geological Survey and the Geological Survey of Canada between 1999 and 2014, as well as some recent thesis works. The new GIS dataset includes an expanded attribute structure (compared to the 1999 dataset) that facilitates searching of the geodatabase. In addition, future maps produced by YGS will be quickly integrated into the digital compilation and regular updates of the GIS dataset will be made available through the various online access points. Finally, a new 1:1 000 000-scale wall map with legend is planned for release in early 2016 (Colpron *et al.*, in press).

DATA MINING YCGC FILES

Canada's National Archives retains historic placer mining records from Yukon Consolidated Gold Corporation (YCGC); the Klondike Placer Miners' Association has long advocated for access to these records. In response to

this demand, YGS began scanning YCGC files in 2014. To date, over 500 maps and 400 documents have been scanned and made available.

As a means to assess the value of the information contained in the YCGC files, Sydney van Loon undertook a pilot data-mining project over the summer (*see* van Loon, 2016). Focusing on a nine-kilometre section of Dominion Creek, which was a significant gold producer in the early 1900s, she geo-referenced old maps, integrating data on gold grades, material thickness, depth to bedrock from drill logs and dredging records from 1936. By rasterizing and contouring the data different ways, she was able to model the bedrock surface and a number of benches, highlighting areas where pay gravels were likely missed by the dredge. The map generated significant interest among attendees at the 2015 Placer Forum, and YGS was encouraged to undertake more compilations of this type.

WEB SERVICES

The technical services team is working on various web mapping applications that will allow users to explore our data in new ways. For example, MINFILE records, currently served via http://data.geology.gov.yk.ca and through GeoYukon, will soon be accessible with a new application on the YGS website that allows spatial (map-based) searches of records. In addition, a new interactive web map has been created that allows the user to explore the updated bedrock geology dataset.

A beta version of a form called 'Yukon Mining Assessment Report Submittal Form' has been created to enable clients to enter key metadata for their assessment reports, accelerating the capture of reference information. This form will be incorporated into the Enterprise database and made available for client use over the next year.

MINFILE DATA

Entry of data into MINFILE focused on Selwyn basin, where an upgraded regional mineral potential map is being generated to support land management planning. A total of thirteen new occurrences were added and numerous other occurrences were updated.

H.S. BOSTOCK CORE LIBRARY

Since opening the new building in November, 2011, client use of the facilities has increased steadily. Over the summer, the move of drill core for the old core library to the new facility was completed. Some core remains at the old facility, to allow room for growth of the collection.

The next phase of the drill core project will involve linking drill core records to MINFILE so clients can discover which mineral occurrences have drill core available for viewing and sampling. In the meantime, queries about the core collection can be directed to Lara Lewis (lara.lewis@gov.yk.ca) or Patrick Sack (patrick.sack@gov.yk.ca).

WHITEHORSE 2016: GAC-MAC CONFERENCE

In partnership with Yukon College, YGS has agreed to host the 2016 Geological Association of Canada – Mineralogical Association of Canada annual conference. The meeting, to be held June 1-3, will include technical sessions and workshops at the College, as well as a variety of field trips. Session themes range from Cordilleran tectonics, metallogeny, Beringia, geo-archeology, mine remediation and geo-education.

Abstracts for sessions will be accepted until the end of January, and registration will open in March. Information on the conference can be found at http://whitehorse2016.ca.

SUMMARY

2015 was another busy year for YGS. The Bedrock Geology unit was fully staffed and completed field work on eight projects. The Minerals Geology unit wrapped up the field component of a multi-year metallogeny study and started work to upgrade Yukon's mineral potential maps. They also invested some time in 2015 to evaluate internal capacities and client needs and will shortly be staffing two positions (Economic Geologist and Core Library manager). In addition to ongoing work on a number of thematic studies, the Surficial Geology unit is becoming increasingly recognized by the placer industry as a valuable resource.

Following the fall meeting of the Technical Liaison Committee YGS has committed to hold a workshop to get input on MINFILE priorities; this will be planned for late winter/early spring, and will likely include a broader discussion of client information needs.

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Yukon Hard Rock Mining, Development and Exploration Overview 2015

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Lewis, L.L., Casselman, S., Deklerk, R., Sack, P.J. and Torgerson, D., 2016. Yukon Hard Rock Mining, Development and Exploration Overview 2015. *In:* Yukon Exploration and Geology 2015, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 23-43.

INTRODUCTION

Junior exploration companies working in Yukon continue to brace themselves in unfriendly equity markets. The 2015 season experienced modest exploration as companies sought to preserve capital. Of the 85 hard rock exploration projects in Yukon in 2015, only 16 included drill programs (Figs. 1 and 2) and only 11 projects spent more than one million dollars. Exploration spending decreased from $80 million in 2014 to $65 million in 2015 (Fig. 3). The spending decrease is largely due to a revised budget for Selwyn-Chihong Mining Ltd.'s Selwyn project, which saw exploration expenditures drop substantially from $32 million in 2014 to $7.4 million in 2015. The largest exploration programs, in terms of estimated expenditures, continue to have success despite the economic headwinds. Examples of these include Kaminak Gold Corp. on the Coffee Project, Selwyn-Chihong Ltd. on the Selwyn Project, Rockhaven Resources Ltd. at the Klaza Project and Atac Resources at the Rackla Gold Project. A welcome re-addition to the Yukon exploration scene is the Kudz Ze Kayah Project, acquired early in 2015 by BMC Minerals; the company explored with a sizeable 2015 program that included reviewing historic work as well as substantial new drilling. Across Yukon, almost 60% of exploration programs were exploring for gold, while the remainder explored for lead, zinc, copper, nickel, silver, platinum group metals or jade.

Levels of funding for the well-subscribed Yukon Mineral Exploration Program (YMEP) remained at $1.4 million. The funds were distributed to 62 placer and hard rock exploration projects and used to offset exploration costs. Details are included in the YMEP overview paper in this volume.

Claim staking continued to be at a diminished level in 2015. Only 2190 claims were staked, although the number of claims in good standing remains high at 195 280 claims (Fig. 4), partly due to assessment relief administered in temporarily withdrawn areas and a double assessment credit government initiative for work done in 2015.

The activities and results presented in this report are a summary rather than a comprehensive list of Yukon exploration, development and mining projects. Some results are still pending at the publication deadline of this volume. Summary statistics and analytical results are based on technical reports and news releases by companies and personal communication with company representatives.

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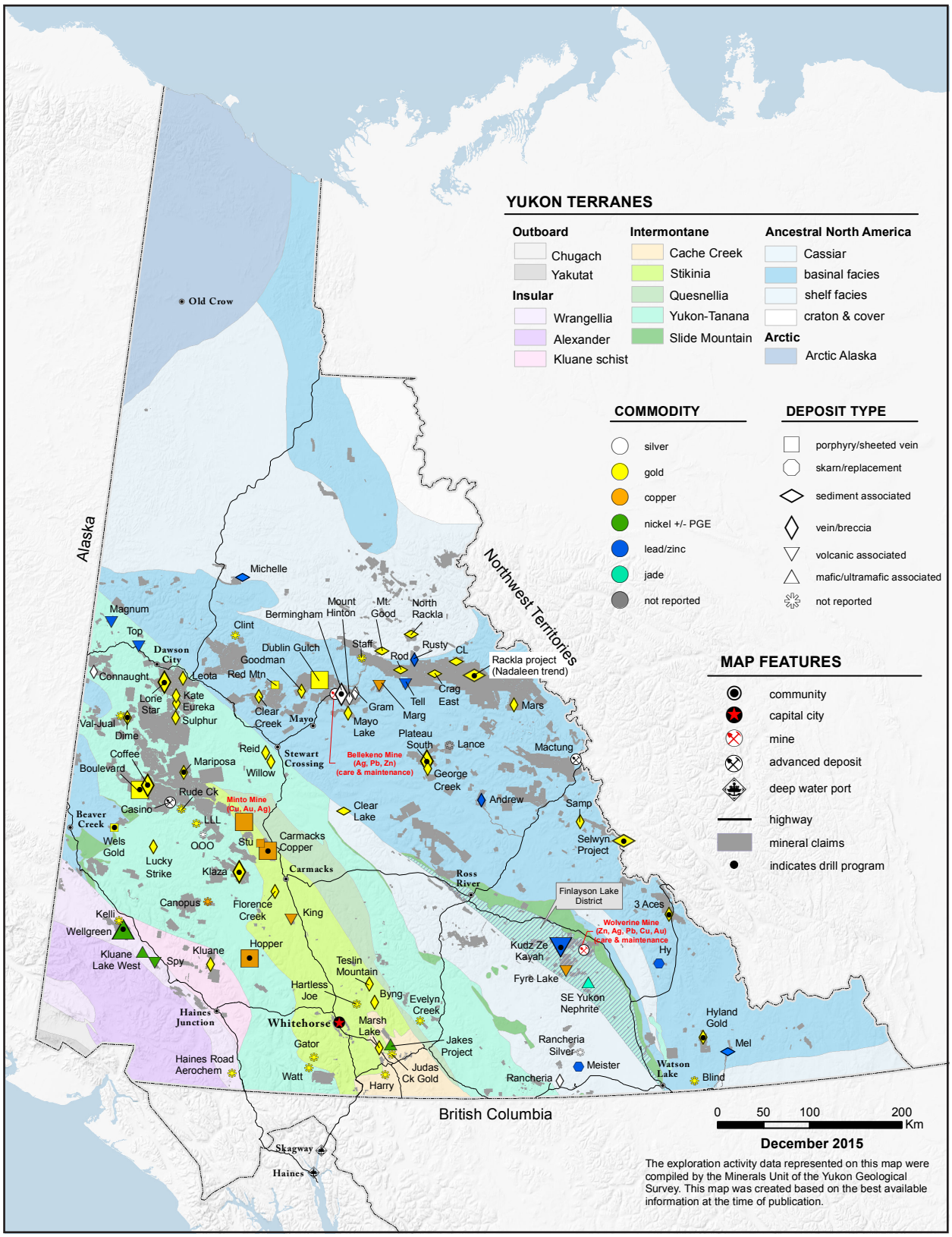


Figure 1. *Yukon exploration projects, 2015. Large symbols represent projects with estimated expenditures ≥$500 000, small symbols with <$500 000. Black dot in the centre of a symbol indicates that drilling constituted part of the exploration activities.*

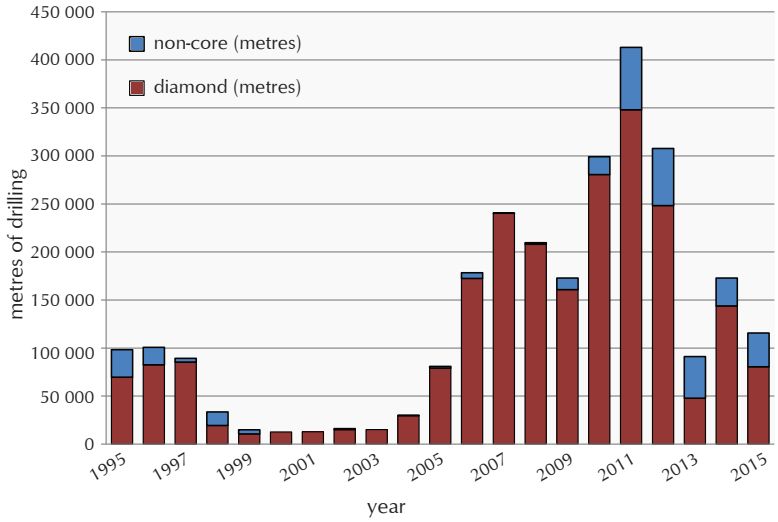


Figure 2. *Diamond drilling and non-core (reverse-circulation or rotary air blast) drilling between 1995 and 2015.*

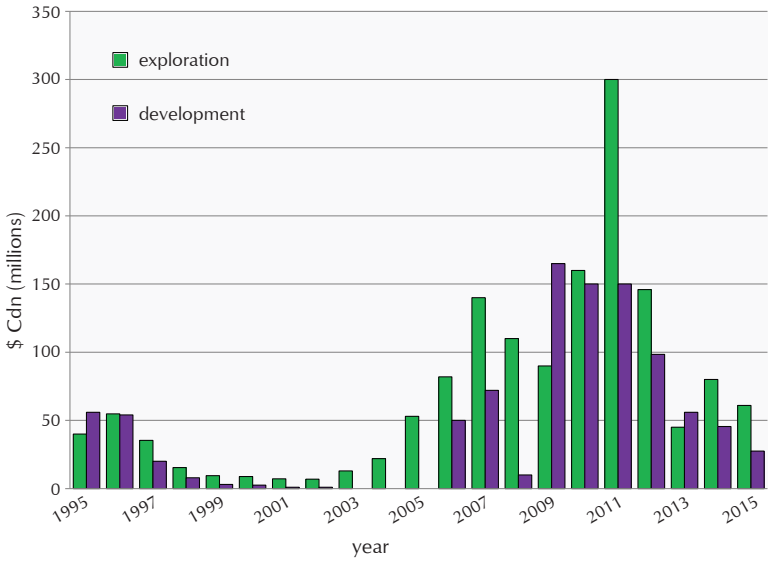


Figure 3. *Estimated exploration and development expenditures on Yukon projects, 1995-2015.*

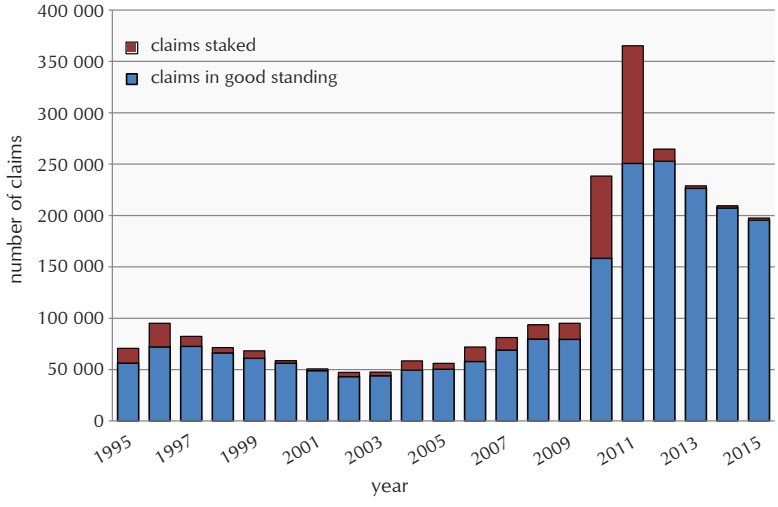


Figure 4. *Hard rock claims staked and in good standing between 1995 and 2015.*

MINING

The territory currently has one operating hard rock mine, Capstone Mining Corp.'s (www.capstonemining.com) Minto copper-gold-silver mine (Yukon MINFILE 115I021, 115I022; Fig. 5). Capstone maintained full production in 2015 at Minto, producing 12 065 t Cu, 11,794 oz Au, and 118,000 oz Ag in the first three quarters of the year. Mill throughput for this period was 3828 tonnes/day at an average head grade of 1.36% Cu, 5 g/t Ag and 0.49 g/t Au. The company received an amendment to its Water Use Licence in August 2015, which allowed for stripping of a new high-grade zone to be open-pit mined: the Minto North deposit.

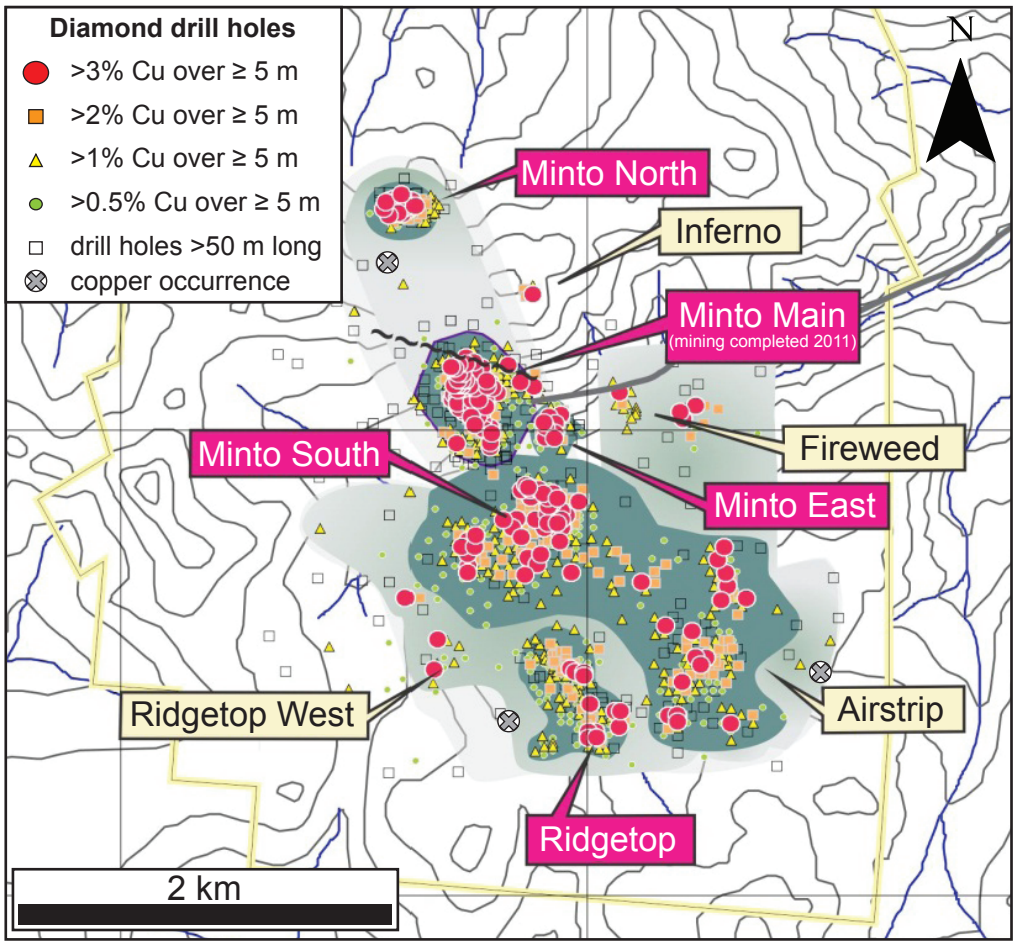


Figure 5. *Deposits and exploration targets at Capstone Mining Corp.'s Minto property. Dark green area represents known deposits; pink labels are ore bodies that have defined resources or reserves, yellow labels do not. Pale green shows area of significant prospectivity, and light grey the exploration corridor between Minto Main and Minto North. (Modified from Mercer and Sagman, 2012 - PFS Phase VI).*

The polymetallic Wolverine Mine (Yukon MINFILE 105G 072) owned by Yukon Zinc Corp. (www.yukonzinc.com), a private company, announced closure in January 2015. The company went into creditor protection in March 2015 with the majority of its debt owed to the parent company Jinduicheng Canada Resources Corporation Ltd. A vote on a restructuring plan took place in September 2015 and was passed by a majority of shareholders. The Wolverine mine is currently under care and maintenance.

MINE DEVELOPMENT

Overall development expenditures in Yukon in 2015 totalled $28 million; the majority of expenditures were from work on three properties, Capstone Mining's Minto property, Alexo Resource Corp.'s Keno Hill deposits and Selwyn Chihong Mining Ltd.'s (www.selwynchihong.com) Selwyn property (Yukon MINFILE 105I 012, 032, 036, 037, 042, 045, 053, 066, 067, 068, 069) near the Yukon-Northwest Territories border. Selwyn-Chihong completed geotechnical, metallurgical, definition and exploration drilling (10 000 m in 64 drill holes) at its Selwyn lead-zinc sedimentary exhalative property. The company carried out engineering work and metallurgical test work for a pre-feasibility study expected by the end of 2015. The company also dedicated substantial resources toward heritage studies and community consultation. The company recently completed a socio-economic participation agreement with the Kaska First Nation, on whose territory the property lies. The First Nation members will vote in early 2016 on whether to accept the agreement.

ADVANCED PROJECTS

Victoria Gold Corp.'s (www.vitgoldcorp.com) Eagle gold deposit in central Yukon is permitted for construction. The company received its water licence in December 2015 and is looking at financing options. Recent exploration attention on the property has focused on the Olive zone, 2 km northeast of the Eagle deposit (Dublin Gulch; Yukon MINFILE 106D 025). The Olive zone lies on the intrusive-sediment contact of a broad northeasterly mineralized trend on the property (Fig. 6). Metallurgical testing completed in 2015 on drill core from this zone demonstrated favourable heap leach recoveries. The company plans to calculate an initial resource estimate at Olive to be later incorporated into an updated feasibility study.

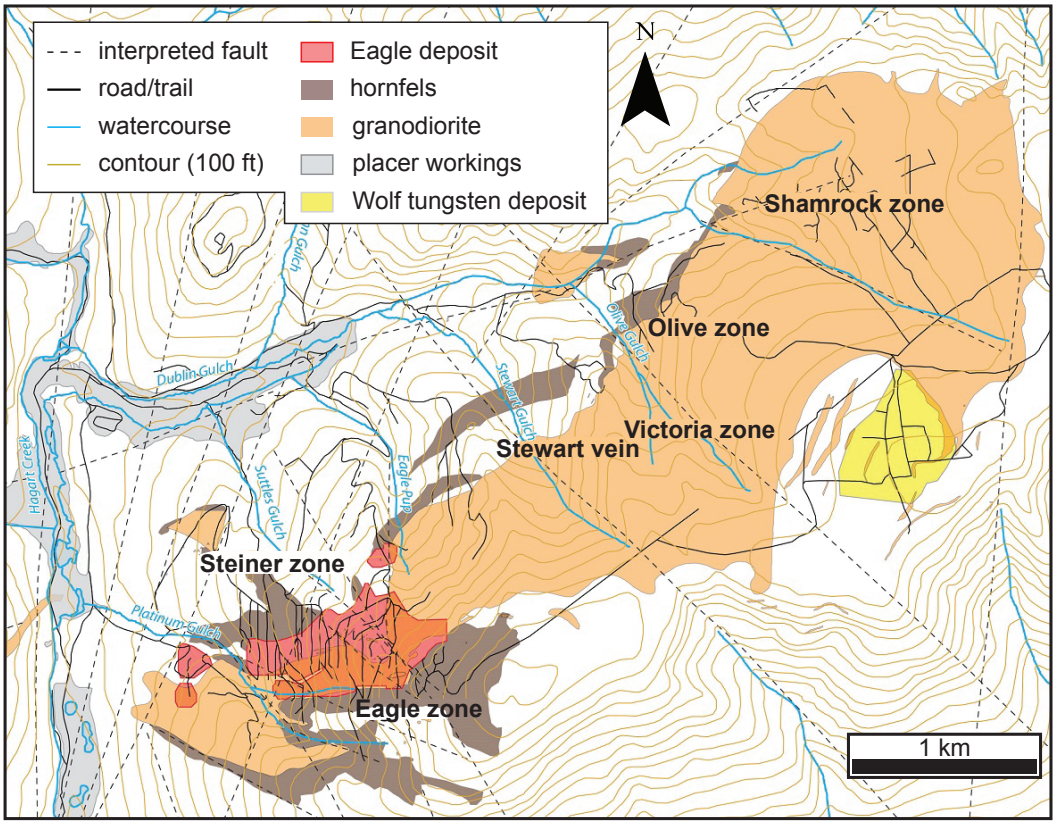


Figure 6. *Geology and zones at the Eagle Gold Project (modified from www.vitgoldcorp.com/s/olive_zone, downloaded December 4, 2015).*

Western Copper and Gold Corp.'s (www.westerncopperandgold.com) Casino copper-gold porphyry deposit (Yukon MINFILE 115J 028) in western Yukon is currently in the adequacy review stage of the assessment process. This is the largest project ever submitted to the Yukon Environmental and Socioeconomic Assessment Board (YESAB).

North American Tungsten's (www.natungsten.com) Mactung tungsten skarn deposit (Yukon MINFILE 105O 002) is located near the NWT border at MacMillan Pass. The company filed for creditor protection in June 2015, and the Government of the Northwest Territories purchased the Mactung property after no acceptable bids for the property were received. In a related deal, the recently closed Cantung mine, 215 km north of Watson Lake, and just across the border into the Northwest Territories, will be transferred as an abandoned mine site to the Government of Canada as part of the Northwest Territories' recent devolution agreement.

PRECIOUS METALS EXPLORATION – GOLD

SEDIMENT ASSOCIATED

ATAC Resources (www.atacresources.com) was active on the Nadaleen trend (Yukon MINFILE numbers pending) of its Rackla Gold Project (Fig. 7) along the northern margin of Selwyn basin. Within the Carlin-style Nadaleen trend, a rotary air blast drill (RAB) program (31 drill holes; 1289 m) at the Anubis Cluster resulted in the discovery of the Orion target: ARB-15-026 intersected 47.24 m of 3.79 g/t Au (August 25, 2015 News Release). Orion is hosted in pyritic siltstone, a regionally extensive unit. A single 480 m diamond drill hole (OS-15-231) at the Conrad zone, within the Osiris Cluster, was designed to test continuity of mineralization between the lower, middle and upper Conrad zones. The hole was lost before hitting the lower zone target; but it hit several mineralized intersections, the most impressive being 3.02 g/t Au over 124.96 m beginning at 357.5 m depth (August 25, 2015 News Release). Within the Rau trend on the west end of the Rackla Gold Project, trenching, drilling and optimization work was conducted on the carbonate replacement-style Tiger deposit (Yukon MINFILE 106D 098; Fig. 7). The 2015 program was designed to advance the project towards pre-feasibility, and included

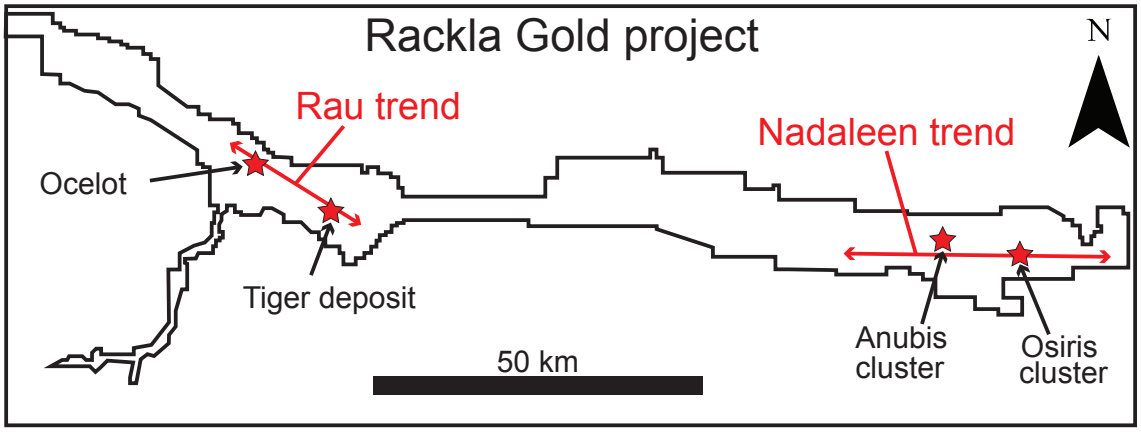


Figure 7. *Rackla Gold Project regional property map (modified from* http://www.atacresources.com/projects/rackla*).*

geotechnical drilling as well as infill and expansion diamond drilling (18 holes; 1418 m). Eight trenches (400 m) were dug in order to better define the near-surface portion of the gold deposit. The company also collected a small bulk sample to be used in future for metallurgical and processing studies.

Anthill Resources Ltd. (www.anthillresources.com), a private company, undertook a small program on its Einarson claims (Yukon MINFILE number pending) in east-central Yukon; the program was partially funded through the YMEP. The company carried out magnetic, VLF and IP surveys on the Mars zone at the south end of the claim block. The most compelling target is a north-south coincident VLF and resistivity-IP target that is coincident with gold-arsenic anomalies in soil and mineralized quartz veins. Subsequent infill grid soil sampling, mapping and prospecting were carried out. At Mars Northeast, prospecting uncovered brecciated quartz float boulders strewn over a length of 200 m at the newly named Callisto zone. Grab samples from this zone assayed up to 8.56 g/t Au.

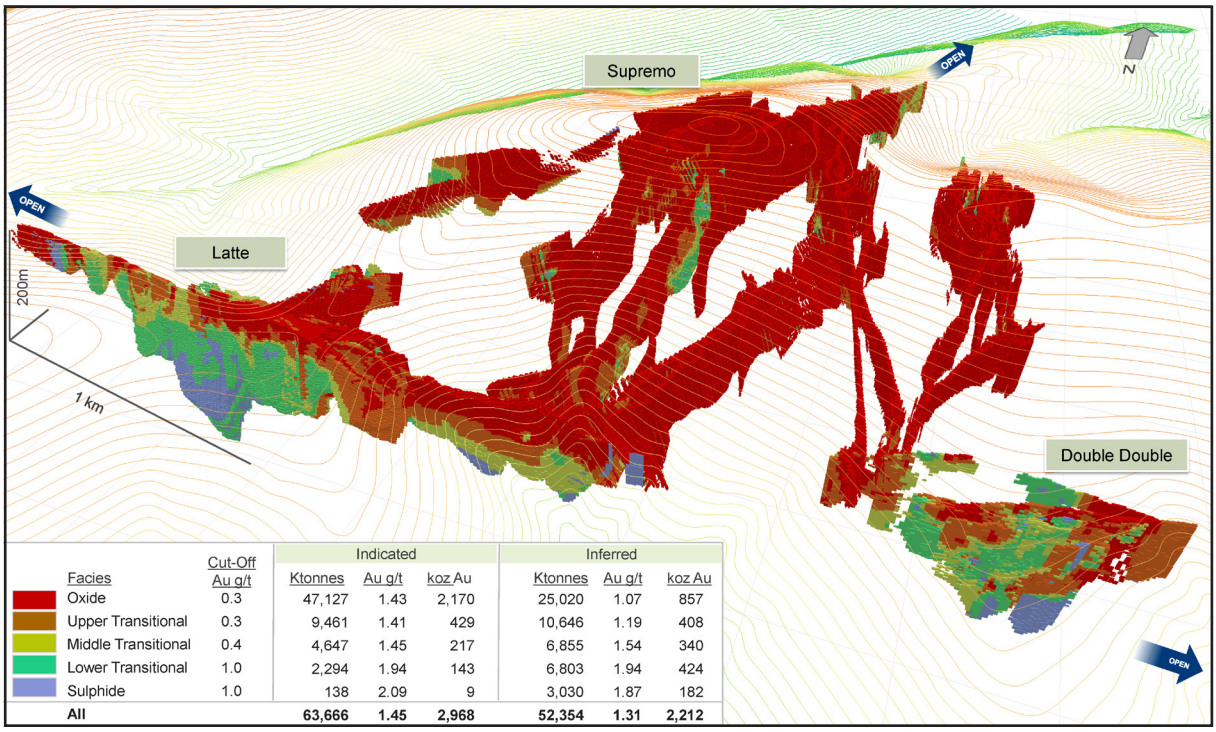
VEIN/BRECCIA (OROGENIC GOLD)

Kaminak Gold Corp. (www.kaminak.com) undertook the largest exploration project in the territory on its Coffee Gold Project (Yukon MINFILE 115J 053, 058, 062, 065, 066, 067, 068, 110, 111) in west-central Yukon. The company continues to work toward a feasibility study (expected Q1 2016), completing more than 40 000 m of core, reverse circulation (RC) and RAB drilling on the property in 2015. Exploration drilling targeted oxidized gold-bearing structures within the Kona North zone, step-outs on the Supremo T3 trend, and targets within the Cappuccino zone and other gold-in-soil anomalies near the current resource. Kaminak also continued environmental and heritage baseline studies, and began a study to determine the optimal route and design of an access road to the property (September 2, 2015 News Release). A new mineral resource estimate has bumped the resource up to almost 5 million ounces of gold (Table 1). The new estimate upgraded a substantial portion of the inferred resource into the indicated category. Deposits remain open along strike and at depth (Fig. 8), and there is potential to increase the near-surface oxide resource (Fig. 9).

Table 1. *Updated mineral resource for Coffee (modified from September 23, 2015 News Release).*

Deposit	Classification	Ore Type	Tonnes (Mt)	Au (g/t)	Contained ounces
Coffee	Indicated	oxide + transitional + sulphide	63.666	1.45	2,968,000
	Inferred	oxide + transitional + sulphide	52.354	1.31	2,212,000

Indicated and inferred resources 2015 at projected Feasibility Study resource cut-off grades.
Cut-off grades of 0.3 g/t Au for oxide & upper transitional zones, 0.4 g/t Au for middle transitional zone and 1.0 g/t for lower transitional and sulphide zones.



Facies	Cut-Off Au g/t	Indicated Ktonnes	Indicated Au g/t	Indicated koz Au	Inferred Ktonnes	Inferred Au g/t	Inferred koz Au
Oxide	0.3	47,127	1.43	2,170	25,020	1.07	857
Upper Transitional	0.3	9,461	1.41	429	10,646	1.19	408
Middle Transitional	0.4	4,647	1.45	217	6,855	1.54	340
Lower Transitional	1.0	2,294	1.94	143	6,803	1.94	424
Sulphide	1.0	138	2.09	9	3,030	1.87	182
All		**63,666**	**1.45**	**2,968**	**52,354**	**1.31**	**2,212**

Figure 8. *Coffee Gold property - Block model of deposits at projected feasibility study resource cut-off grade. From Kaminak Corporate presentation, Coffee Gold project, November 2015.*

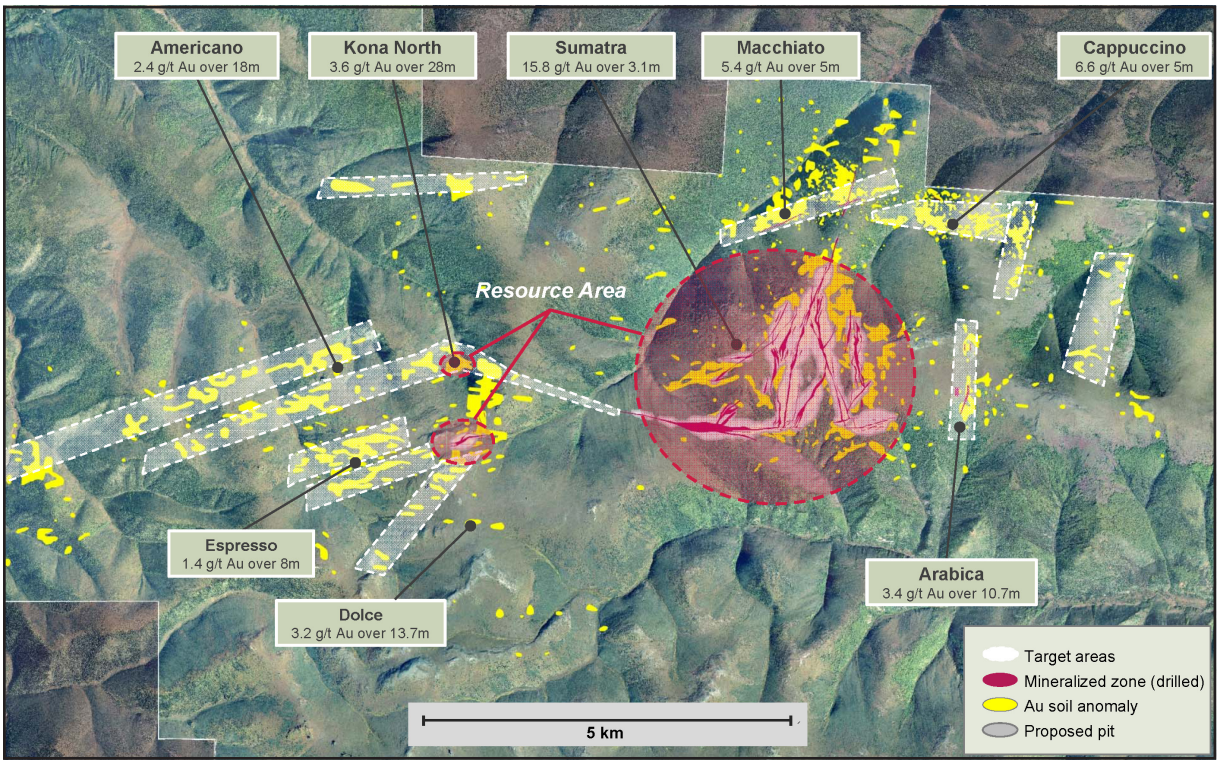


Figure 9. *Plan view of resource area and potential for expansion of the resource on the Coffee property. From Kaminak Corporate presentation, Coffee Gold project, November 2015.*

The Boulevard gold property (Yukon MINFILE 115J 050) in west-central Yukon saw renewed activity by Independence Gold Corp. (www.ingold.com). The company carried out a ground magnetic survey, geological mapping and drilling on the property. A reverse circulation drill program (1746 m; 13 holes) tested geochemical soil anomalies with coincident magnetic lows, resulting in two new discoveries on the property. The best intersections include 7.23 g/t Au over 12.2 m at the new Sunrise zone and 4.25 g/t Au over 6.10 m at the Denali zone. (August 24, 2015 News Release). Follow-up drilling later in the season at the Sunrise zone resulted in two additional intercepts; 15.00 g/t Au over 3.05 m and 0.94 g/t Au over 22.86 m (drill holes BV15-40 and BV15-35, respectively).

Golden Predator Mining Corp. (www.goldenpredator.com) completed a small rotary air blast drill RAB program in advance of a bulk sample on its 3 Aces property (Yukon MINFILE 105H 066) in southeast Yukon. Thirteen shallow holes (totalling 45.73 m) covering an irregular grid of roughly 15 by 6 m were drilled on the Sleeping Giant vein. Visible gold was encountered in all holes. The highest grade intersection occurred in hole 3ARAB15-13 which assayed 159 g/t Au within the top 2.25 m of the hole (September 14, 2015 News Release). The results of the RAB drilling will be used to plan a 500 tonne bulk sample for metallurgical testing.

The Lone Star property (Yukon MINFILE 115O 072) of Klondike Gold Corp. (www.klondikegoldcorp.com) was explored with diamond drilling (19 holes; 1374 m) on surface targets containing visible gold in quartz veins. Drill hole EC15-10 intersected 75.6 g/t Au over 2.8 m (October 26, 2015 News Release). The company also carried out a drone orthophoto survey, 1000 line metres of induced polarization, and remediated historically disturbed areas on the property, which is located in the Klondike goldfields south of Dawson City.

SHEETED VEIN (INTRUSION-RELATED)

The recently discovered Wels gold property (Yukon MINFILE 115J 039) of Gorilla Minerals Corp. (www.gorillaminerals.com) is located 50 km west of Beaver Creek. In 2015, the company diamond drilled based on positive trenching in 2014 on the Saddle zone. The five-hole diamond drill program tested mineralization under the 2014 trenches which exposed strongly weathered biotite granite. The first diamond drill hole on the property, Wels15-01, assayed 1.1 g/t Au over 97.5 m. Xenoliths in the drill core have been interpreted as indicating proximity to the pluton cupola, and a favourable sign for mineralization. The company also completed further trenching in 2015 (Fig. 10).

Figure 10. *Geologist Al Doherty standing next to trench TR-15-01 at the Wels gold property*

VEIN/BRECCIA

Rockhaven Resources Ltd. (www.rockhavenresources.com) spent more than $4 million exploring its Klaza epithermal gold-silver property (Yukon MINFILE 115I 067), located 50 km west of Carmacks. In January 2015, Rockhaven released a first resource calculation on the property of nearly 1 million ounces of contained gold. An updated resource in December increased the resource by 503,000 oz gold (Table 2). The 2015 exploration program included 13 738 m (56 holes) of diamond drilling within and below the current resource on the high-grade western BRX, Klaza and BYG zones. The company also conducted substantial environmental and engineering studies in support of future permitting applications. The Klaza property currently hosts nine mineralized zones, which have a cumulative mineralized strike length of 9.4 km, and occur in a 1.8 km-wide structural corridor that crosscuts a mid-Cretaceous granite. Individual zones range from 1 to 75 m in width and consist of quartz-sulphide veins, breccia and fracture networks that are spatially associated with unmineralized quartz-feldspar porphyry dikes. They exhibit exceptional lateral and down-dip continuity, and all zones remain open for extension along strike and depth.

Table 2. *Updated NI 43-101 mineral resource estimate for Rockhaven Resources' Klaza property. Cut-off grades are 1.3 g/t Au EQ for pit-constrained resource and 2.75 g/t Au EQ for underground resource (modified from December 9, 2015 News Release).*

Deposit	Classification	Type	Tonnes (Mt)	Au (g/t)	Ag (g/t)	Pb (%)	Zn (%)
Klaza	Inferred	pit-constrained	2.366	5.12	94.51	0.93	1.18
	Inferred	underground	7.054	4.27	87.18	0.69	0.88
	Inferred	total	9.421	4.48	89.02	0.75	0.95

Goldstrike Resources Ltd. (www.goldstrikeresources.com) continued work at its Plateau South property (Yukon MINFILE 105N 034, 035, 036) in central Selwyn basin. The company explored the property with shallow drilling (11 holes; 924.1 m) targeting the Gold Dome and Goldstack prospects. At Goldstack, a 30 m step-out drill hole (PSGS15-01) from the discovery hole assayed 13.5 g/t Au over 17.5 m (from 22.0-39.5 m). At Gold Dome, 17 km east of Goldstack, eight exploratory holes were drilled, with one testing a geophysical anomaly and returning 9.09 g/t Au over 1.5 m near surface and 12.65 g/t Au over 0.5 m at a depth of 117 m (drill hole PSVG15-06).

Banyan Gold Corp. (www.banyangold.com) performed a modest program at its Hyland Gold project (Yukon MINFILE 095D 011) in southeast Yukon. Soil grids were extended, trenching was performed at the Montrose target, and 740 m of drilling was completed in three diamond drill holes at the Camp zone (Fig. 11). Trench results include 6.0 m of 4.4 g/t Au in MT-15-01, and drill results include 76.34 m of 0.32 g/t Au from 75.56 to 151.90 m in HY-15-46 (September 17, 2015 News Release). Results from 2015 identified carbonate replacement-style gold, lead, zinc and copper mineralization hosted within the north-trending Quartz Lake structural corridor. This style of mineralization appears similar to that found at the Tiger deposit (Yukon MINFILE 106D 098).

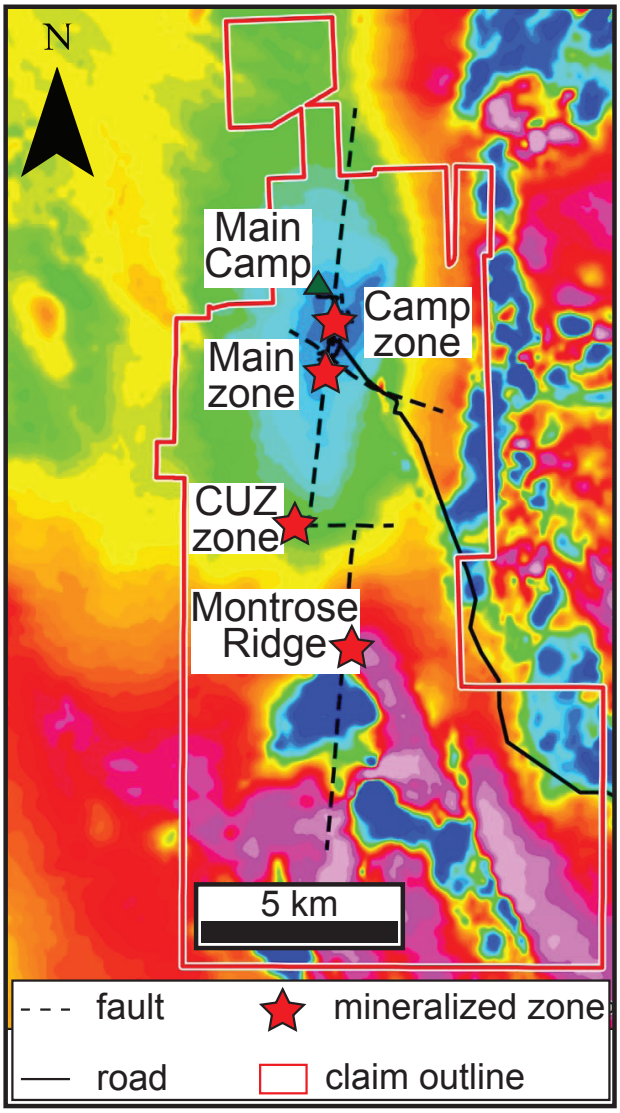


Figure 11. *Regional magnetic map covering the Banyan Gold's Hyland property (modified from January 2015 corporate presentation).*

Pacific Ridge Exploration (www.pacificridgeexploration.com) revisited its Mariposa gold project (Yukon MINFILE 115O 075) in the White Gold District of west-central Yukon; and completed a 12-hole, 655.3 m RAB drill program (Fig. 12). Drilling intercepted two gold-bearing structures within the northeast-trending Skookum Main zone and demonstrated continuity between mineralized structures within the zone over a strike length of 125 m. DDH 15MPR-07 intercepted 28.96 m of 0.841 g/t Au starting at a depth of 30.5 m and hit another mineralized intersection at 51.8 m depth assaying 1.217 g/t Au over 7.62 m (November 12, 2015 News Release).

A small program of reclamation, prospecting, geochemical sampling and trenching was undertaken at the Lucky Strike property (Yukon MINFILE number pending) in southwest Yukon by Goldstrike Resources Ltd. (www.goldstrikeresources.com). A new 40 by 50 m gold anomaly in bedrock, discovered through hand-pitting, returned assays up to 4.26 g/t Au. Results from grid soil sampling 5 km to the northwest outlined a 1200 by 250 m anomaly with values up to 1989 ppb Au. Both new discoveries coincide with northwest-trending magnetic anomalies and remain open along strike (September 28, 2015 News Release).

Strategic Metals Ltd. (www.strategicmetalsltd.com) discovered new high-grade gold mineralization at its Hartless Joe property (Yukon MINFILE number pending), 28 km east-northeast of Whitehorse. The discovery is within a 500 by 250 m area of strong gold and copper soil anomalies with sporadically mineralized talus. A continuous chip sample across the discovery outcrop from a quartz-rich band, either a vein or an exhalite horizon, graded 60 g/t Au, 554 g/t Ag, 5.01% Pb and 0.35% Cu over 1.2 m (September 30, 2015 News Release).

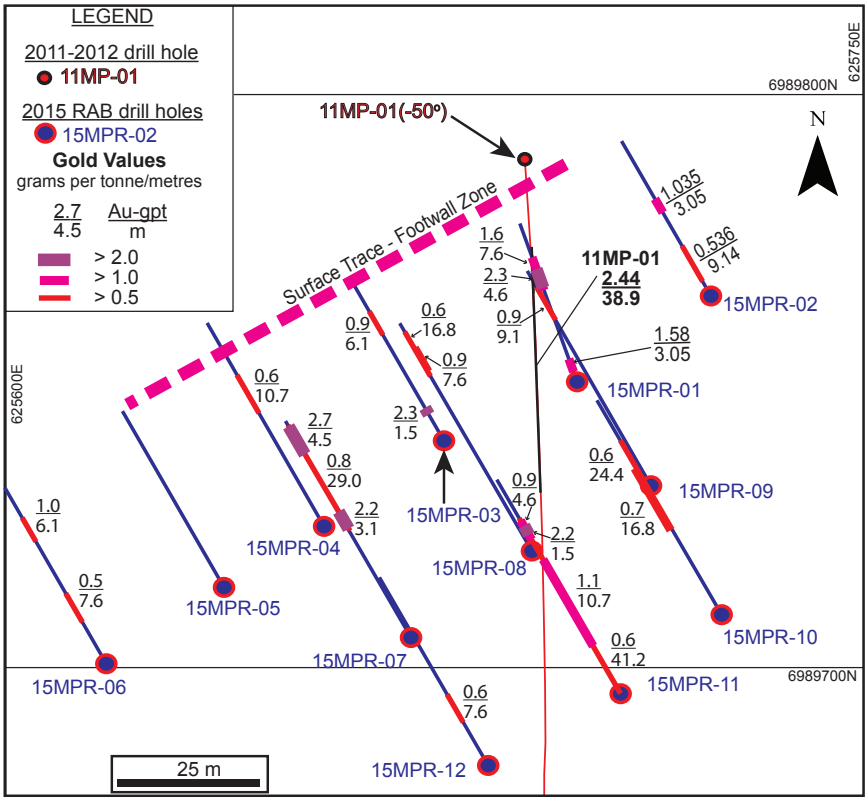


Figure 12. *Plan view map of 2015 RAB holes with 2015 assay highlights. 2011 discovery hole intersection in bold (modified from www.pacificridgeexploration.com/s/mariposa, accessed December 7, 2015).*

PRECIOUS METALS EXPLORATION– SILVER

Alexco Resource Corp. (www.alexcoresource.com) temporarily suspended its mining operation at the Bellekeno (Yukon MINFILE 105M 082) silver-lead-zinc mine in September 2013 due to low silver prices and high operating costs. Permitting is underway for development and production of the Flame & Moth deposit, discovered in 2010, 3.5 km west of Bellekeno mine (Fig. 13). Alexco Resources Ltd.'s 2015 exploration program focused on drill-definition of the Bermingham (Yukon MINFILE 105M 086) silver-lead-zinc deposit (Fig. 13). The company completed 2595 m of diamond drilling in eight holes. Drill hole K-15-0580 intersected an impressive 7462 g/t Ag over 4.98 m (true thickness). Updated resource estimates were released in April 2015 for Bermingham (6.0 million oz indicated and inferred) and Flame & Moth (30.7 million oz silver – indicated and inferred; Table 3). This constitutes a 10% increase in the silver resource at the Keno Hill property.

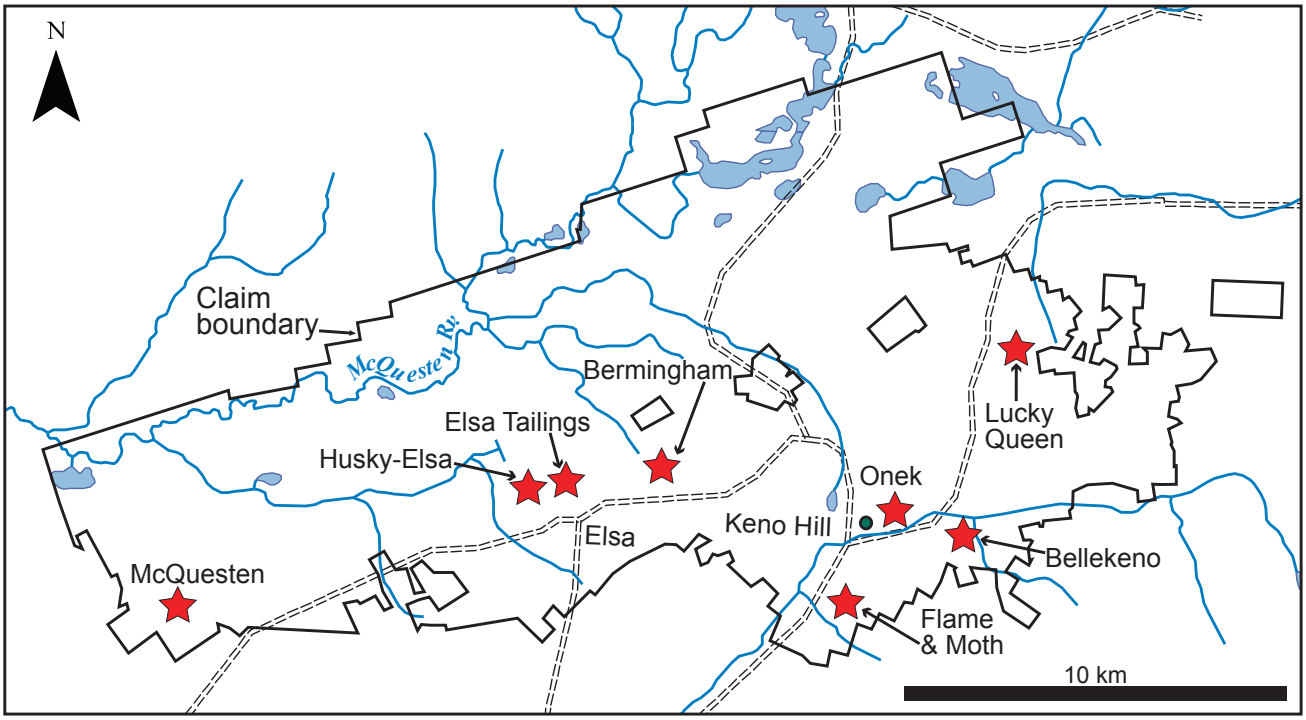


Figure 13. *Map of the Keno Hill District outlining locations of exploration and development projects.*

Table 3. *Bermingham and Flame & Moth deposits resource estimates. Reported at a contained metal value cut-off grade of $185 per tonne (modified from April 29, 2015 News Release).*

Deposit	Classification	Tonnes (000)	Ag (g/t)	Au (g/t)	Pb (%)	Zn (%)
Flame & Moth	Indicated	1638	506	0.43	1.89	5.4
	Inferred	348	366	0.26	0.47	4.37
Bermingham	Indicated	377	430	0.07	1.59	1.74
	Inferred	52	477	0.12	1.22	1.88

BASE METALS EXPLORATION – COPPER

PORPHYRY/SHEETED VEIN

Copper North Mining Corp. (www.coppernorthmining.com) undertook a phased diamond drilling program at its Carmacks Copper project (Yukon MINFILE 115I008) in west-central Yukon, in support of a pre-feasibility study. Total drilling was 3270 m in 34 holes. Phase 1 infill drilling targeted Zone 2000S and Zone 13 (Fig. 14), and demonstrated continuity of mineralization between the zones. Highlights of the Phase I drilling include an estimated true width of 18.32 m of oxide mineralization grading 0.72% total copper (0.47% soluble copper) in drill hole CN15-02, and an estimated true width of 24.01 m of sulphide mineralization grading 1.01% total copper from drill hole CN15-07 (September 8, 2015 News Release). Phase 2 of the program involved drilling oxide mineralization in Zone 12 in order to provide more data for an updated resource estimate. The company also undertook trenching and ground geophysics and it continues to work on optimizing the economics of the project.

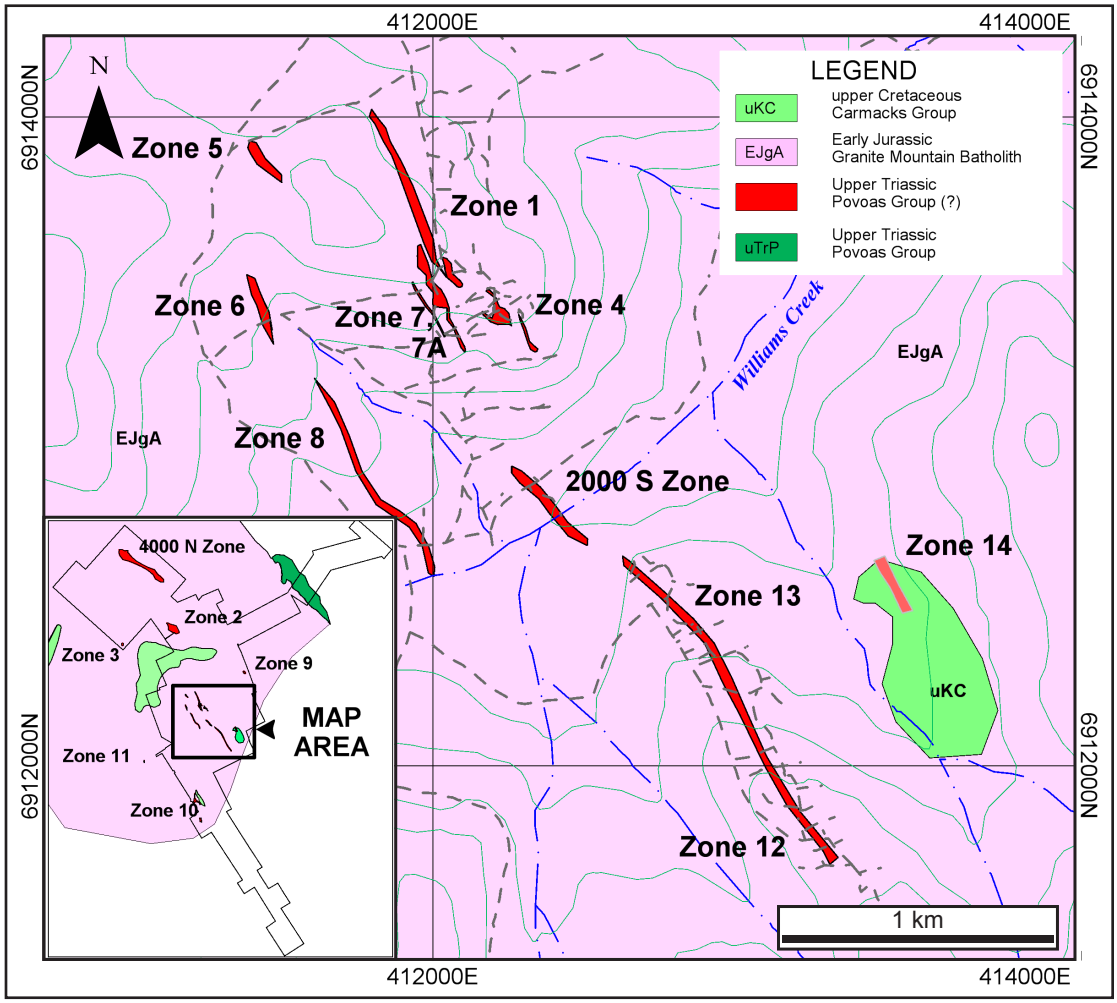


Figure 14. *Mineralized zones at the Carmacks Copper property. Bottom left inset shows location of main map. Deposits are shown in red and are interpreted as belonging to the Upper Triassic Povoas Formation (modified from* www.coppernorthmining.com/s/Carmacks*, accessed December 7, 2015).*

Strategic Metals Ltd. (www.strategicmetalsltd.com) explored its road-accessible Hopper gold-copper-porphyry/skarn property (Yukon MINFILE 115H 019, 034) in southwest Yukon with a nine-hole, 3270 m diamond drill program. Historic drilling on the property consisted of short drill holes, and much of the drill core wasn't analyzed for gold. In 2015, newly discovered horizons of shallowly dipping copper-rich skarn were intersected at deeper levels than in previous drilling, substantially expanding known mineralization. The best intersections were in DDH 15-01 which assayed 12.15 g/t Au and 0.95% Cu over 2.65 m (true width) 300 m north-northwest of historic drilling (August 6, 2015 News Release), and in DDH 15-08 which intersected 43.6 g/t Au over 1.0 m (September 15, 2015 News Release). Perhaps most interesting is the alteration, possibly porphyry-related, that appears to increase with depth in the 2015 diamond drill holes.

Midnight Mining Services Ltd., a private company, explored the Stu project (Yukon MINFILE 115I 011) approximately 10 km northwest of the Carmacks Copper deposit. The 2015 program, in part supported by the YMEP, consisted of mechanized and hand trenching, road and trail clearing, camp construction, trench sampling, collection of XRF data on trenches, and reconnaissance mapping and sampling. In addition, a core rehabilitation project extracted, reboxed and restacked the historic core stored on the property in racks that were collapsing (Fig. 15). Approximately 80% of the core was recovered, including the boxes with the best intersection on the property (3.51% Cu, 2.5 g/t Au and 18.4 g/t Ag over 13.5 m in historic diamond drill hole 80-14; Tempelman-Kluit, 1981). In conjunction with 2015 exploration, the Yukon Geological Survey conducted a small deposit study at Stu, the results for which, including a simple 3D geologic model, are published in the 2015 Yukon Exploration and Geology volume (Sack *et al.*, 2016).

Figure 15. *YGS geologist Scott Casselman examines historic core at the Stu during the core rehabilitation project that Midnight Mining Ltd. conducted in 2015.*

BASE METALS EXPLORATION – LEAD+ZINC

VOLCANIC ASSOCIATED (VOLCANOGENIC MASSIVE SULPHIDE)

BMC Minerals Ltd. (www.bmcminerals.com) acquired the Kudz Ze Kayah (Yukon MINFILE 105G 117) volcanogenic massive sulphide property in the Finlayson Lake District in early 2015 from Teck Resources Ltd. The property consists of two deposits, the ABM and GP4F, which are 6 km apart. Both deposits are hosted in Mississippian felsic metavolcanic rocks of the Kudz Ze Kayah unit. Early season work included relogging 19 000 m of historic drill core (Fig. 16), 75 line km of ground gravity, and a VTEM survey over the property. Subsequently, the company completed approximately 23 000 m of diamond drilling on the ABM and GP4F deposits, both infill drilling and exploratory step-out holes. The overall focus is to advance the project through pre-feasibility in 2016.

Figure 16. *Historic core stored near the ABM deposit at the Kudz Ze Kayah property.*

Minquest Ltd. (www.minquest.com.au) released an updated mineral resource estimate (Table 4) for the volcanogenic massive sulphide (VMS) Kona deposit on the Fyre Lake property (Yukon MINFILE 105G 034) in the Finlayson Lake District. The Kona resource increased by over 40% with the new calculation due to a more systematic geological interpretation. The Kona deposit is hosted in the Devonian Fire Lake metavolcanic unit, which is stratigraphically overlain by the Kudz Ze Kayah felsic metavolcanic unit. The Kona deposit consists of two parallel lenses (Kona East and Kona West) separated by a step fault (Fig. 17). Additional step-faults bound the deposit to the east and west, beyond which several geophysical anomalies have been interpreted as prospective sulphide horizons. Though very limited drilling has occurred to date, these untested areas have electromagnetic and magnetic anomalies similar to those directly associated with the known Kona deposits.

Table 4. *NI 43-101 compliant mineral resource estimate for Minquest Ltd.'s Fyre Lake property at a cut-off grade of 1.0 g/t Au (modified from January 22, 2015 News Release).*

Deposit	Classification	Tonnes (Mt)	Au (g/t)	Cu (%)	Co (%)	Zn (%)
Kona	Indicated	3.5	0.63	1.55	0.10	0.31
	Inferred	9.1	0.63	1.56	0.09	0.30

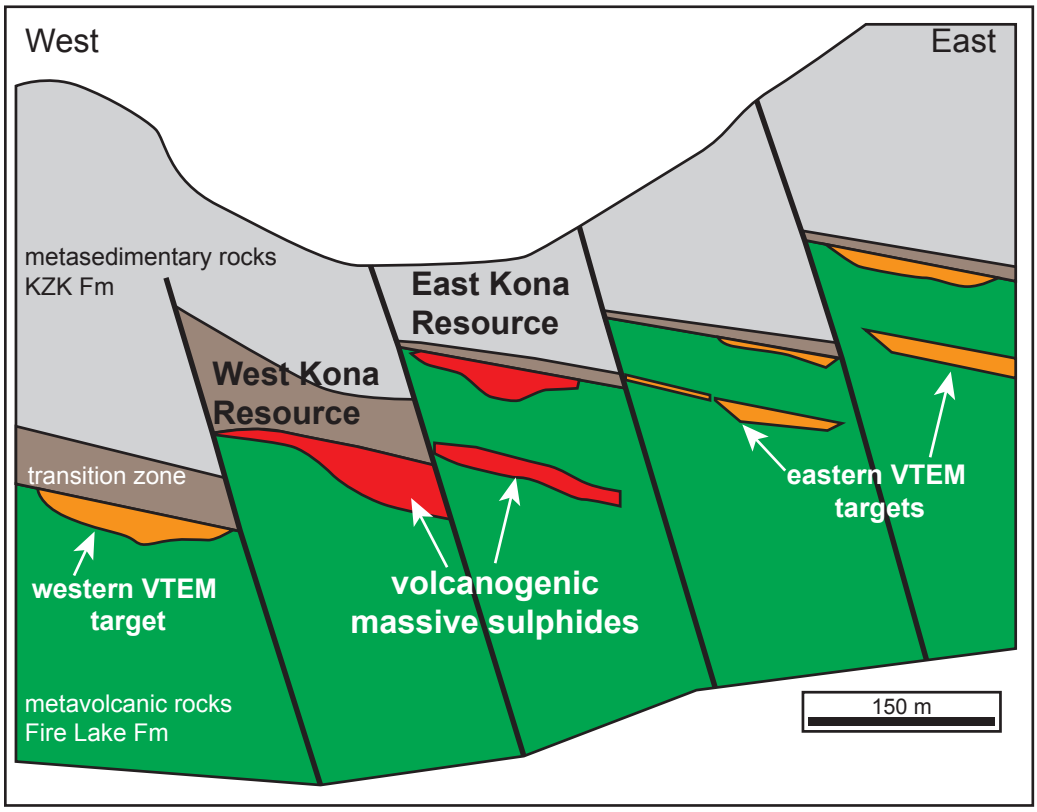


Figure 17. *Schematic cross section through the Fire Lake deposit (modified from* www.minquest.com.au/projects/fyre-lake/maps*, accessed December 7, 2015). Fm = Formation, VTEM = Versatile Time Domain Electromagnetic system.*

Minquest Ltd. (www.minquest.com.au) optioned the volcanogenic massive sulphide Marg property (Yukon MINFILE 106D 009; Fig. 18) in central Yukon from Golden Predator Mining Corp. in March 2015. A new scoping study released in November 2015 assessed the Marg project as a 1.25 million tonne per year underground operation capable of producing 241 400 t of zinc, 81 400 t of copper, 97 300 t of lead, 8.69 million oz of silver and 104,000 oz of gold over a seven-year period. A base case net present value was calculated at US$113 million with an internal rate of return of 29%. Capital expenditures are estimated at $174 million (November 25, 2015 ASX News Release). The scoping study was based on the updated mineral resource (Table 5). MinQuest plans to start a pre-feasibility study on the project during the spring of 2016.

Figure 18. *Camp and exploration roads at the Marg volcanogenic massive sulphide property. Photo: Minquest Ltd.*

Table 5. *NI 43-101 compliant mineral resource estimate for Minquest Ltd.'s Marg property at a cut-off grade of 0.5 g/t Au (modified from October 6, 2015 ASX News Release).*

Deposit	Classification	Tonnes (Mt)	Cu (%)	Zn (%)	Pb (%)	Au (g/t)	Au (g/t)
Marg	Indicated	3.7	1.5	3.8	2.0	48	0.76
	Inferred	6.1	1.2	3.4	1.7	44	0.74

BASE METALS – NICKEL+PLATINUM GROUP METALS (PGM)

Wellgreen Platinum Ltd. (www.wellgreenplatinum.com) continued to advance its platinum group metals (PGM)–nickel-copper Wellgreen deposit (Yukon MINFILE 115G 024) in southwest Yukon. Work for the 2015 program was outlined in the March 2015 Preliminary Economic Assessment (PEA) for the project. Diamond drilling included infill and offset drilling to upgrade and bring unclassified material into the mineral resource estimate, testing new targets identified by mapping and geophysics, and drilling to collect samples for metallurgical testing. The 2015 PEA characterized the project as an open pit operation yielding 208,800 oz PGM+gold and 128 million pounds Ni+Cu in concentrate annually over the first 16 years at a million rate of 25 000 tonnes per day for the first five years. Conventional sulphide flotation would be used to produce concentrates for shipping via a port in southern Alaska. Initial capital expenditures are calculated at $586 million, including $100 million for contingency, for a 25 year base case mine life. Ongoing work includes pre-feasibility-level metallurgical work and winter drilling at the property.

REFERENCES

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APPENDIX 1: 2015 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit type
PRECIOUS METALS - GOLD						
3 Aces	Golden Predator Mining Corp.		105H/09	BS, NC	Gold	vein/breccia
Big Salmon - Evelyn Creek	Sid McKewon		105C/14	P, G	Gold	not reported
Blind	Strategic Metals Ltd.		105A/1	SGC	Gold	not reported
Boulevard	Independence Gold Corp.	115J 050	115J/13	G, GGP, NC	Gold	porphyry/ sheeted vein
Byng	Strategic Metals Ltd.	105D 184	105D/16	RS	Gold	vein/breccia
CL	Carlincore Resources Ltd.		106C/7	P, G, SGC, RGC	Gold	sediment associated
Clear Creek	StrataGold Corp.		115P/14	P, G, SGC, RGC	Gold	vein/breccia
Clear Lake	Bernie Kreft	105L 045	105L/14		Gold	sediment associated
Clint	Strategic Metals Ltd.		116A/5	SGC	Gold	not reported
Coffee Project	Kaminak Gold Corp.	115J 110	115J/14	DD, NC, ES	Gold	vein/breccia
Crag East	Strategic Metals Ltd.		106C/3	SGC	Gold	sediment associated
Dime	Ryan, Shawn		115O/12	GGP, SGC, NC	Gold	vein/breccia
Eagle (Dublin Gulch)	Victoria Gold Corp.	106D 025	106D/4	MD	Gold	porphyry/ sheeted vein
Eureka	Strategic Metals Ltd.	115O 057	115O/10	SGC, G, P, RGC	Gold	vein/breccia
Florence Creek	Cathro Resources Corp.		115H/16	P, RGC	Gold	vein/breccia
Gator	Strategic Metals Ltd.	105D 160	105D/5	P	Gold	not reported
George Creek	Clayton Jones		105N/3		Gold	vein/breccia
Goodman	Nevada Zinc Corp.		115P/16	P, G, SGC, RGC, T	Gold	vein/breccia
Haines Road Aerochem	Panarc Resources Ltd.		115A/3	SGC	Gold	not reported
Harry	Strategic Metals Ltd.	105D 157	105D/1	P, SGC, RGC, T	Gold	not reported
Hartless Joe	Strategic Metals Ltd.	105D 203	105D/15	SGC, RGC, RS	Gold	not reported
Hyland Gold	Banyan Gold Corp.	095D 011	095D/12	SGC, T, DD	Gold	vein/breccia
Judas Ck Gold	39627 Yukon Inc.		105C/5	P, SGC	Gold	not reported

Abbreviations

G – geology
AGP – airborne geophysics
BS – bulk sampling
CR – road construction
CS – claim staking
DD – diamond drilling
ES – economic studies
NC – non-core drilling
GGP – ground geophysics
MD – mine development
P – prospecting
RS – remote sensing
RGC – rock geochemistry
SGC – soil/silt geochemistry
T – trenching

Appendix 1 (continued): 2015 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit type
Kate	44984 Yukon Inc.		115O/15	CS, P, G, SGC, RGC	Gold	vein/breccia
Kelli Claim	Gordon Gutrath	115G 102	115G/12	P, G, SGC, RGC	Gold	not reported
Klaza	Rockhaven Resources Ltd.	115I067	115I/3	DD	Gold	vein/breccia
Kluane	Strategic Metals Ltd.		115H/4	P, G, SGC, RGC	Gold	vein/breccia
Leota	Goldbank Mining Corp.		115O/15	SGC, RGC, T	Gold	vein/breccia
LLL	Strategic Metals Ltd.	1115J015	115J/9	AGP, G, P, RGC, SGC	Gold	not reported
Lone Star	Klondike Gold Corp.	115O072	115O/14	P, G, GGP, SGC, T, DD	Gold	vein/breccia
Lucky Strike	Goldstrike Resources Ltd.		115O/3	P, SGC, T	Gold	vein/breccia
Mariposa	Pacific Ridge Exploration	115O075	115O/1, 2; 115J/15, 16	NC	Gold	vein/breccia
Mars Project	Anthill Resources		105O/14	P, G, SGC, RGC	Gold	vein/breccia
Marsh Lake	Joseph Clarke		105D/8	P, G, RGC, T	Gold	vein/breccia
Mayo Lake	Mayo Lake Minerals		115M/11	P, G, SGC, RGC	Gold	vein/breccia
Mt. Good	Cantex Mine Development Corp.		106D/8	RGC	Gold	sediment associated
Nadaleen Trend	ATAC Resources Ltd.	New	106C/1	DD, NC	Gold	sediment associated
North Rackla	Cantex Mine Development Corp.		106C/12	RGC	Gold	sediment associated
Plateau South	Goldstrike Resources Ltd.		105N/6	GGP, SGC, RGC, NC	Gold	vein/breccia
Red Mountain	Am Gold Corp.	115P006	115P/15	CS, P, G, SGC, RGC	Gold	porphyry/ sheeted vein
Reid	Mieras, Jeff		115P/7	P, G, RGC	Gold	vein/breccia
Rod	Strategic Metals Ltd.		106D/1	SGC, G, P, RGC, T	Gold	sediment associated
Rude Creek Gold	0890763 BC Ltd.	115J022	115J/10	P, G, SGC, RGC, T	Gold	not reported
Samp	Polar Star Explorations Inc.		105J/9	P, G, RGC	Gold	vein/breccia
Staff	Strategic Metals Ltd.		106D/7	SGC	Gold	not reported
Sulphur (White Gold)	Taku Gold Corp.	New	115O/10	P, G, GGP	Gold	vein/breccia

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NC – non-core drilling
RS – remote sensing

Appendix 1 (continued): 2015 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit type
Teslin Mountain	Heon, Daniele		105E/1	P, G, RGC	Gold	vein/breccia
Val-Jual	Kreft, Bernie		115N/9	P, RGC	Gold	not reported
Watt	Strategic Metals Ltd.	105D 165	105D/5	SGC, RGC	Gold	not reported
Wels Gold	Gorilla Minerals Corp.		115J/5	DD	Gold	porphyry/ sheeted vein
Willow	Richards, Gord		115P/2	P, G, RGC	Gold	vein/breccia
PRECIOUS METALS - SILVER						
Connaught	ATAC Resources Ltd.		115N/15	CS, P, G, SGC, T	Silver	vein/breccia
Gram	Rockhaven Resources Ltd.	105M 057	105M/15		Silver	vein/breccia
Keno Hill	Alexco Resource Corp.	105M 001	105M/14	DD	Silver	vein/breccia
Mount Hinton	Strategic Metals Ltd.	105M 052	105M/14	P, G, SGC, RGC, T	Silver	vein/breccia
OOO	Strategic Metals Ltd.	115J 005	115J/8	AGP, P, RGC, SGC	Silver	not reported
Rancheria	Travis, Adam		105B/2		Silver	vein/breccia
Rancheria silver	Strategic Metals Ltd.	105B 107	105B/8	SGC, RGC	Silver	not reported
BASE METALS - COPPER						
Canopus	Sumac Mines Ltd.	new	115H/13	SGC	Copper	not reported
Carmacks Copper	Copper North Mining Corp.		115I/7	GGP, T, DD	Copper	porphyry/ sheeted vein
Fyre Lake	Minquest Ltd.	105G 034	105G/2		Copper	volcanic associated
Hopper	Strategic Metals Ltd.	115H 019	115H/7	DD	Copper	porphyry/ sheeted vein
King	Strategic Metals Ltd.	115H 004	115H/9	SGC, G, P, RGC	Copper	volcanic associated
Marg	Minquest Ltd.	106D 009	106D/1	ES	Copper	volcanic associated
Minto	Capstone Mining Corp.	115I 021	115I/11	MD	Copper	porphyry/ sheeted vein
Stu	Harris, Bill		115I/7	P, G, SGC, RGC, T, CR	Copper	porphyry/ sheeted vein

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RS – remote sensing

Appendix 1 (continued): 2015 EXPLORATION PROJECTS

Project	Optioner/Owner	Occurrence	NTS	Work type	Commodity	Deposit type
BASE METALS - LEAD, ZINC						
Hy	Strategic Metals Ltd.	105H 10	105H/7	SGC, G, P, RGC	Zinc-Lead	skarn/ replacement
Kudz Ze Kayah	BMC Minerals	105G 117	105G/7	GGP, DD	Zinc-Lead	volcanic associated
Magnum	Strategic Metals Ltd.	116C 118	116C/7	SGC	Zinc-Lead	volcanic associated
Meister	Strategic Metals Ltd.	105B 114	105B/8	G, P, RGC	Zinc-Lead	skarn/ replacement
Mel	Silver Range Resources Ltd.	095D 005	95D/6		Zinc-Lead	sediment associated
Michelle	Silver Range Resources Ltd.	116A 016	116A/13	P, RGC	Zinc-Lead	sediment associated
Rusty	Strategic Metals Ltd.	105C 085	105C/5	SGC, G, P, RGC, T	Zinc-Lead	vein/breccia
Selwyn Project	Selwyn-Chihong	105I 037	105I/6	DD, ES	Zinc-Lead	sediment associated
Tell	Manson Creek Resources Ltd.	106C 118	106C/4	P, G, SGC, RGC	Zinc-Lead	volcanic associated
Top	Strategic Metals Ltd.	116B 041	116B/4	SGC, RGC	Zinc-Lead	volcanic associated
Yukon Base Metal Project (Andrew)	Overland Resources	105K 089	105K/16	SGC	Zinc-Lead	vein/breccia
BASE METALS - NICKEL, PGEs						
Jakes Project	Nicolai Goeppel		105D/9	CS, P, G, RGC	Nickel-PGE	mafic/ultramafic associated
Kluane Lake West	Kluane Mineral Services		115G/6	P, G, AGP, RGC	Nickel-PGE	mafic/ultramafic associated
Spy	Group Ten Metals Inc.		115G/2	P, G, RGC	Nickel-PGE	volcanic associated
Wellgreen	Wellgreen Platinum Ltd.	115G 024	115G/5	G, DD, ES	Nickel-PGE	mafic/ultramafic associated
GEMSTONES						
SE Yukon Nephrite	Van Kirchbaum, Everett		105G/1	P	Jade	mafic/ultramafic associated
UNKNOWN						
Lance	Strategic Metals Ltd.	105N 009	105N/7	AGP	Unknown	not reported

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BS – bulk sampling
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P – prospecting
T – trenching
CR – road construction
NC – non-core drilling
RS – remote sensing

APPENDIX 2: 2015 DRILLING STATISTICS

Property	Optioner/Owner	# of metres
DIAMOND DRILLING		
Carmacks Copper	Copper North Mining Corp.	3270
Coffee Project	Kaminak Gold Corp.	15 840
Hopper	Strategic Metals Ltd.	3227
Hyland Gold	Banyan Gold Corp.	740
Keno Hill	Alexco Resource Corp.	2595
Klaza	Rockhaven Resources Ltd.	13 738
Kudz Ze Kayah	BMC Minerals	25 966
Lone Star	Klondike Gold Corp.	1374
Nadaleen Trend	ATAC Resources Ltd.	483
Selwyn Project	Selwyn-Chihong	10 003
Wellgreen	Wellgreen Platinum Ltd.	2800
Wels Gold	Gorilla Minerals Corp.	443
NON-CORE DRILLING		
3 Aces	Golden Predator Mining Corp.	46
Boulevard	Independence Gold Corp.	2839
Coffee Project	Kaminak Gold Corp.	25 900
Mariposa	Pacific Ridge Exploration	655
Nadaleen Trend	ATAC Resources Ltd.	1289
Plateau South	Goldstrike Resources Ltd.	924
Wellgreen	Wellgreen Platinum Ltd.	3500

Yukon Placer Mining Exploration and Development Overview 2015

Jeffrey Bond*[1] *and Sydney van Loon
Yukon Geological Survey

Bond, J. and van Loon, S., 2016. Yukon Placer Mining 2015 Exploration and Development Overview. *In:* Yukon Exploration and Geology Overview 2015, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 47-57.

INTRODUCTION

Placer gold development across all of Yukon's placer districts remained healthy in 2015. The decline in the price of gold had little effect on the industry due to the offset of a lower Canadian dollar and a lower diesel price. The Canada-US exchange rate added 25% for an ounce of gold in Canadian dollars; whereas bulk fuel prices were 20-30% lower than in 2014. This is a significant saving since fuel consumption accounts for approximately 30% of mining costs.

Placer exploration was vibrant in all districts. Fifteen projects received funding through the Yukon Mining Exploration Program (YMEP). YMEP investment into placer in 2015 totalled $417 000 and leveraged an estimated $1.25 million dollars in spending in Yukon communities.

CLIMATE FOR MINING

The 2015 mining season got an early start with unseasonably warm weather. In Dawson City, the average maximum daily temperature during May was 21.6°C and the average minimum temperature was 2.6°C. The average maximum temperature remained unchanged through June and July for Dawson City. Late season sluicing near Dawson City got off to a cold start with temperatures dropping below -7°C during the first week of October. Fortunately, minimum temperatures improved between October 9th and 26th with the average low equalling -1°C. Early season snow and cold had a greater effect on higher elevation mines located in Kluane and Keno City.

Precipitation was in short supply at the start of the season due to the warm temperatures. This primarily impacted mines drawing from small catchments. For the months of May and June a total of 15 mm of precipitation was measured in Carmacks, which severely limited stream flows in the Nansen district and limited early season production. Precipitation increased in all districts during the month of July.

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GOLD PRODUCTION SUMMARY

Yukon placer gold production for the reporting period of May 1st to December 15th, 2015 was 59,830 crude ounces for a value of CDN $70.3 million (Fig. 1). This is the highest reported number of ounces recovered in the last 8 years, and when adjusted for inflation, the highest value since 1989. The total number of active operations in 2015 was 163; down slightly from 171 operations in 2014.

REGIONAL PRODUCTION SUMMARIES

The regional summaries provide a production overview (Fig. 2) from the various drainages and districts throughout Yukon. Production is reported in crude ounces from royalty figures from May 1st to December 15th, 2015.

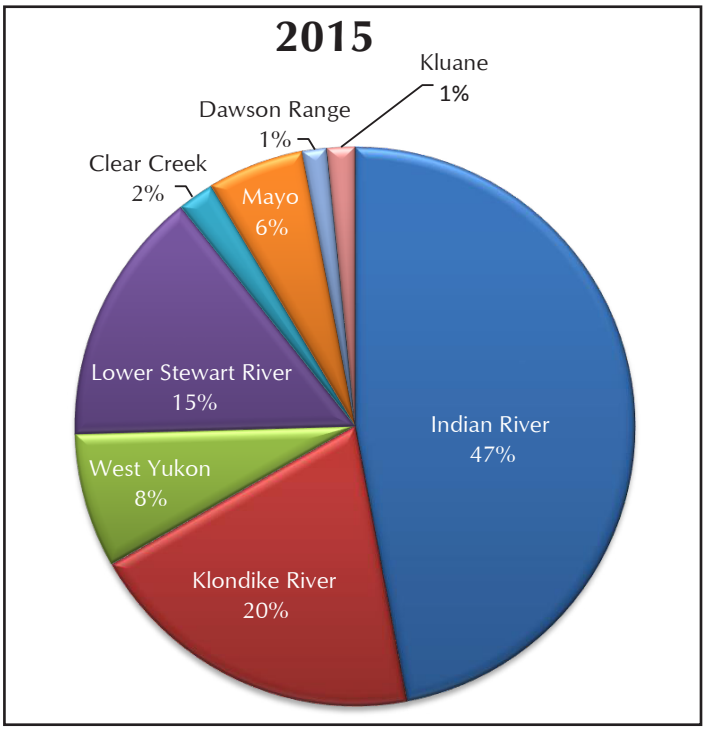

Figure 2. *A pie chart illustrating production from the various regional placer districts in Yukon. Unglaciated districts account for 90% of the placer gold production and include Indian River, Klondike River, West Yukon and Lower Stewart River.*

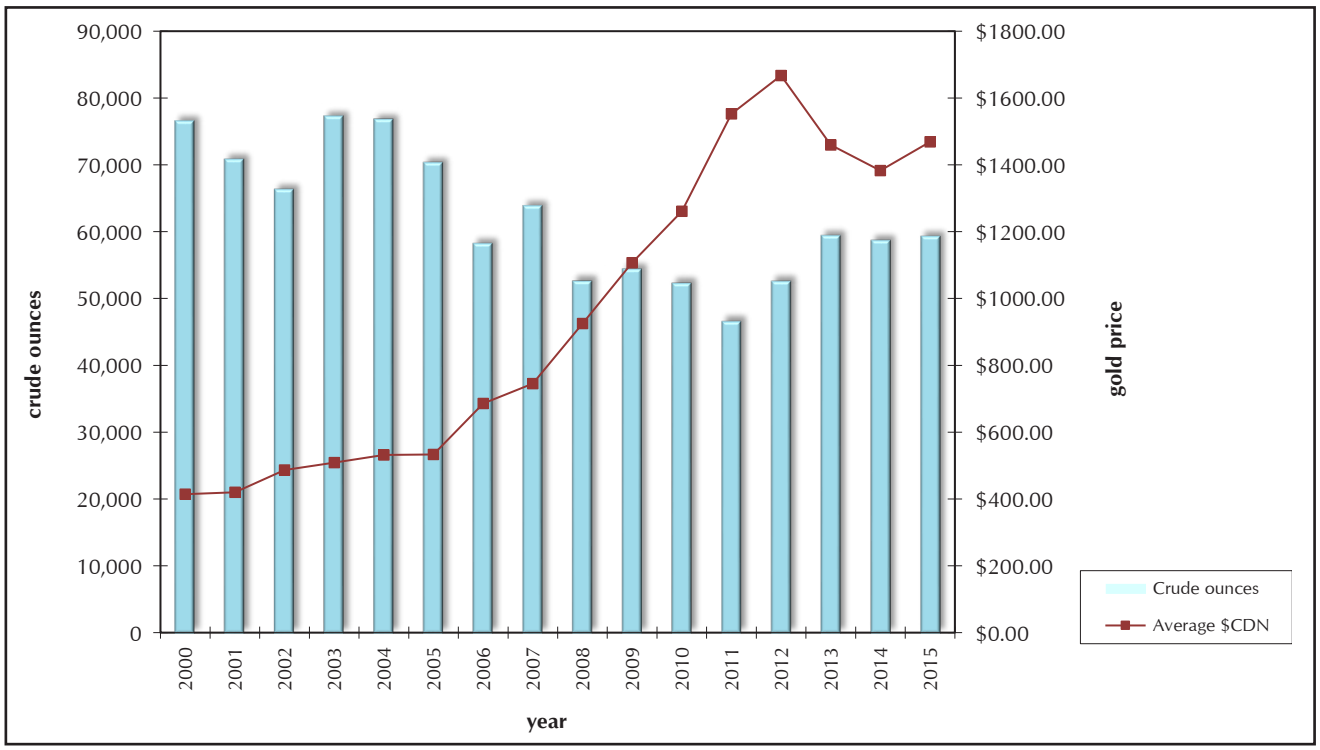

Figure 1. *A chart illustrating both Yukon placer gold production and gold price in Canadian dollars for the past 15 years. The recent upswing in the gold price is attributed to the decline in the Canadian dollar relative to the US dollar. Production in 2015 is expected to exceed 60,000 crude ounces as the winter royalty reporting season continues.*

INDIAN RIVER

Production of placer gold from the Indian River drainage totalled 26,129 ounces in 2015 and accounted for 47% of the total production in Yukon (Fig. 2). Increase in production occurred in the Indian River and Eureka Creek, whereas production decreases were noted from Quartz and Gold Run creeks. More than 10,000 ounces was produced from the Indian River (excluding tributaries), which was the highest production value for all Yukon placer streams in 2015.

Fine Gold Resources claimed the honour of having the highest production from a single property in 2015. Their operation on Eureka Creek exploited numerous targets including confluence zones with the Indian River, right-limit valley bottom side pay, gulch-like settings at the headwaters of Eureka Creek and a left limit bench deposit. Two large cuts were mined on the left limit bench, confirming geophysical interpretations of a 5 km-long buried channel deposit (Fig. 3). This deposit represents one of the largest unmined targets in the Klondike.

The renewal of dredging operations by Tamarack Inc. on the Indian River was a significant highlight in 2015 (Fig. 4). The dredge operated on the Indian River below Eureka Creek and processed 100 cubic yards for every 10 gallons of fuel per hour, making it one of the most efficient placer operations in Yukon.

An unusual deposit was exploited on Gold Run Creek in 2015. T.D. Oilfield mined a floodplain deposit under a rockslide of unknown age. Old timers had previously mined underground to access the deposit and an estimated 70% of the gold had been recovered. The landslide toe was mined by stripping off the weathered rock overburden to reach the buried floodplain. The placer gold grains were reported to be more round and smooth in the buried floodplain deposit compared to the modern active channel.

Production began on June 1st at M2 Gold's property located on the incised meanders of the lower Indian River. Out-of-stream mining occurs on modern point bars and paleo-point bars preserved as terraces. The first strip mined along the edge of the point bar in 2015 measured 46 by 1219 m (150 by 4000 ft).

Figure 3. *View of Fine Gold Resources 2015 pit on the left limit bench channel of Eureka Creek. The cut consists of 16.5 m (54 ft) of gravel overlain by 9 m (30 ft) of silt (loess). Both units are frozen. The bedrock surface continues to dip into the face and the full width of the channel has not been exposed.*

Figure 4. *An aerial view of the former Queenstake dredge now operating on the Indian River by Tamarack Inc. Dredging is regarded as one of the more environmentally friendly mining methods, specifically pertaining to fuel consumption, sediment discharge and on-going reclamation.*

KLONDIKE RIVER

Production from the Klondike River drainage dropped slightly from 12,184 crude ounces in 2014 to 10,988 crude ounces in 2015. Klondike River production accounted for 20% of the total Yukon production (Fig. 2). The top producing drainage from the Klondike River was Last Chance Creek where 2,850 crude ounces was reported. This included contributions from a variety of geological settings such a left limit intermediate-level terrace, colluvial deposits on the rim of Dago Hill and valley bottom deposits. Bonanza Creek had the second highest production with 2,165 crude ounces produced from 18 separate mines. Production from Adams Gulch was reported separately and totalled more than 500 ounces, which is twice the production from 2014. Production from Hunker Creek was strong and more than 2,000 ounces were produced from high-level bench deposits and 1,500 ounces produced from valley bottom claims (Fig. 5). This included Tatra Ventures operation near the mouth of Last Chance Creek that successfully demonstrated the potential of re-mining dredged ground (Fig. 6).

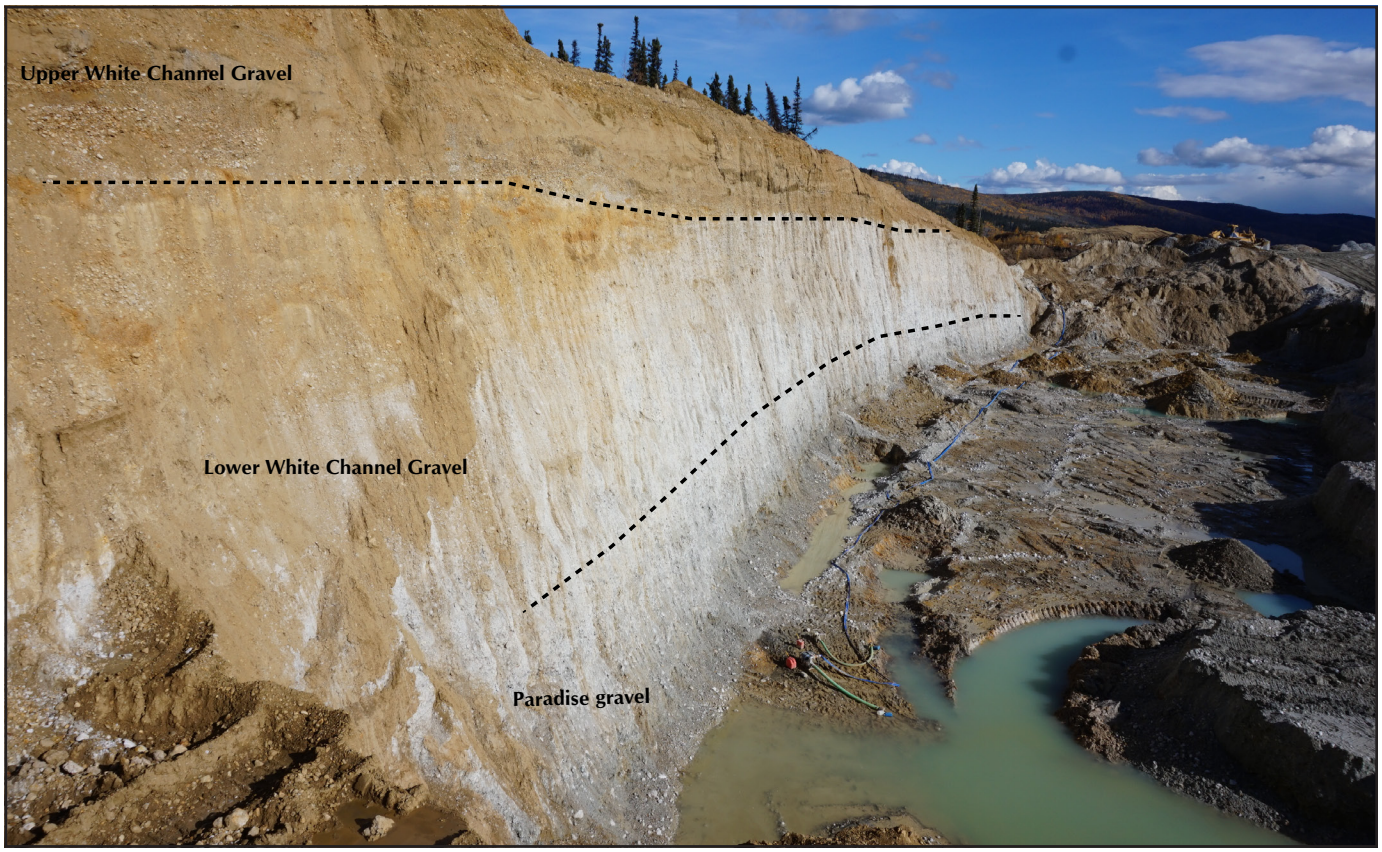

Figure 5. *A view to the east of the bench gravel deposit on Preido Hill that is mined by Moonlight Mining. The section measures 21 m (69 ft) in height. The general stratigraphy consists of Paradise Gravel at the base that is overlain by lower White Channel and upper White Channel gravel. Only the Paradise Gravel and top of bedrock is processed for placer gold.*

Figure 6. *A view of virgin Hunker creek gravel preserved under the tailings stacker of Dredge 11 at the mouth of Last Chance Creek. Tatra Ventures was successful in discovering significant areas of virgin gravel on bedrock in an area that appeared to have been mined out. Their program highlights the potential of working within the dredge limits elsewhere in the Klondike.*

LOWER STEWART RIVER

Mining operations in the vicinity of the lower Stewart River produced 8,195 crude ounces in 2015, for a total of 15% of the Yukon production (Fig. 2); this is up by 1,600 crude ounces from 2014. Black Hills Creek continued to produce the most gold in the area with a total of 2,460 crude ounces reported from 6 operations. Production also increased in Henderson Creek, Maisey May and Scroggie creeks, whereas production decreased slightly from Kirkman and Thistle creeks. Schmidt Mining wrapped up work on Thistle Creek in 2015 and in mid-season moved their operation over to Barker Creek near the Dixie Bench (Fig. 7).

Figure 7. *An aerial view of Schmidt Mining's operation on Barker Creek near the mouth of Dixie Creek. Their 2015 cut is located upstream of the old-timer workings on Dixie Bench. The processing plant is located between the mine cut and settling pond.*

WEST YUKON-FORTY MILE, SIXTY MILE AND MOOSEHORN

Gold production from placer operations west of the Yukon River increased slightly in 2015 to 4,318 crude ounces for a total of 8% of Yukon production. This remains below the 2010 to 2013 values that ranged between 5,500 and 7,000 crude ounces. Most of the production occurred from low terraces on the Sixty Mile River where Hawk Mining was active. Consistent production was noted from the Miller Creek left limit bench (Miller Creek Mining) and Kate and Kenyon creeks in the Moosehorn Range (Moosehorn Exploration). Production decreases were noted from Matson Creek where the operation shut down and on Ten Mile Creek. Mining on Cheryl Creek, a tributary to 50 Mile Creek, moved past the exploration stage and into development (Fig. 8).

CLEAR CREEK AND MAYO

Placer gold production from the Clear Creek area was consistent with previous years at 1,170 crude ounces reported in 2015. A highlight from Clear Creek was the re-opening of the Barlow Creek mine after a two year hiatus in production.

Placer mining in the Mayo district increased by 30% in 2015 to 3,109 crude ounces and accounted for 6% of the total production in Yukon. This is the highest production value since 1998. A large part of the boost in production is attributed to a new discovery on Granite Creek in the Gustavus Range southeast of Keno City. In this alpine setting, gold is mined from a re-concentrated McConnell end moraine (Fig. 9). Production was also strong from Davidson Creek where Coulee Resources continued to mine above the bedrock canyon. Mining resumed on Seattle Creek, a tributary to the south McQuesten River, after the property changed hands and miners formerly operating in the Caribou District of BC re-established camp, cleaned up the site and initiated production.

Figure 8. *An aerial view to the southeast over P. Joseph's operation on Cheryl Creek. The placer gold is contained within a boulder-rich gravel containing magnetite. In general, the right-limit of the creek contains more gold than the left-limit in this area of the valley.*

Figure 9. *An aerial view to the west of Granite Creek in the Gustavus Range near Keno City. Mining is focused immediately downstream of an end moraine deposited from an alpine glacier during the McConnell glaciation (dashed line marks the base of the moraine ridge). The deposit consists of outwash gravel derived from reworking the end moraine and recessional moraines farther up-valley. Photo courtesy of William Leary.*

DAWSON RANGE

Dawson Range activity includes mines in the Freegold Mountain, Mount Nansen and Casino areas. Production from this area decreased by nearly 50% in 2015. This is mainly attributed to a decrease from Guder Creek, Nansen Creek and Klaza River. After following up on a 2014 auger drilling program A-1 Cats did significant development work on Back Creek. The focus of the 2015 project was to test for a pre-glacial target under the Pleistocene morainal sediment. Remnants of the pre-glacial channel were intersected; however, production focused on a younger, post-glacial gravel (Fig. 10). Activity on Canadian Creek has been reinitiated by L. Olynyk and is expected to be in production for 2016.

KLUANE

Placer Gold production increased from the Kluane district largely due to reinitiated production on Gladstone Creek. In 2015, 880 crude ounces of placer gold is reported to have been mined from the district, which is up by 300 crude ounces from 2014. Mining on Gladstone Creek by Tic Exploration focused on left-limit side pay where a coarse boulder-rich gravel overlies a false-bedrock of consolidated till.

Figure 10. *A view to the east over Back Creek in the Mount Nansen mining district. Initial excavations by A-1 Cats in 2015 focused on the left limit searching for a pre-glacial gravel on bedrock under a layer of early Pleistocene till. Remnants of the pre-glacial gravel were discovered closer to the valley center-line and a post-glacial gravel became the mining focus later in the season.*

EXPLORATION HIGHLIGHTS

DOMINION CREEK - GIMLEX

Gimlex completed an auger drilling program on Dominion Creek near Granville in 2015. Utilizing an 8-inch diameter auger, a total of 65 holes were drilled on the left limit of Dominion Creek near the south edge of the miners ditch. Drilling successfully outlined a placer gold deposit measuring 79 by 762 m (260 by 2500 ft), which could be mined over 2 to 3 seasons. Depth to bedrock ranges from 7.5 to 16 m (25-52 ft) and averages about 9 m (30 ft). Gravel thickness ranges from 3.6 to 12 m (12-40 ft) and averages about 6 m (20 ft). Gold recovered is mainly fine-grained but several small nuggets were found. Additional drilling is planned to further understand the distribution of gold in the gravel section and to potentially increase the mineable area. This program was supported through YMEP.

AUSTRALIA CREEK – BILL HARRIS

Exploration continued in 2015 in Australia Creek, a tributary to Indian River. This large property consists of 60 creek claims, two 5-mile creek leases and two 5-mile bench leases. Well-defined benches border the left limit of the creek and these together with the valley bottom floodplain were the focus of exploration (Fig. 11). Following a drill program in 2014, exploration during the 2015 season focused on excavator trenching and mini-bulk sampling on the left limit near a bedrock exposure. Additional exploration trenching is planned for the 2015-2016 winter season.

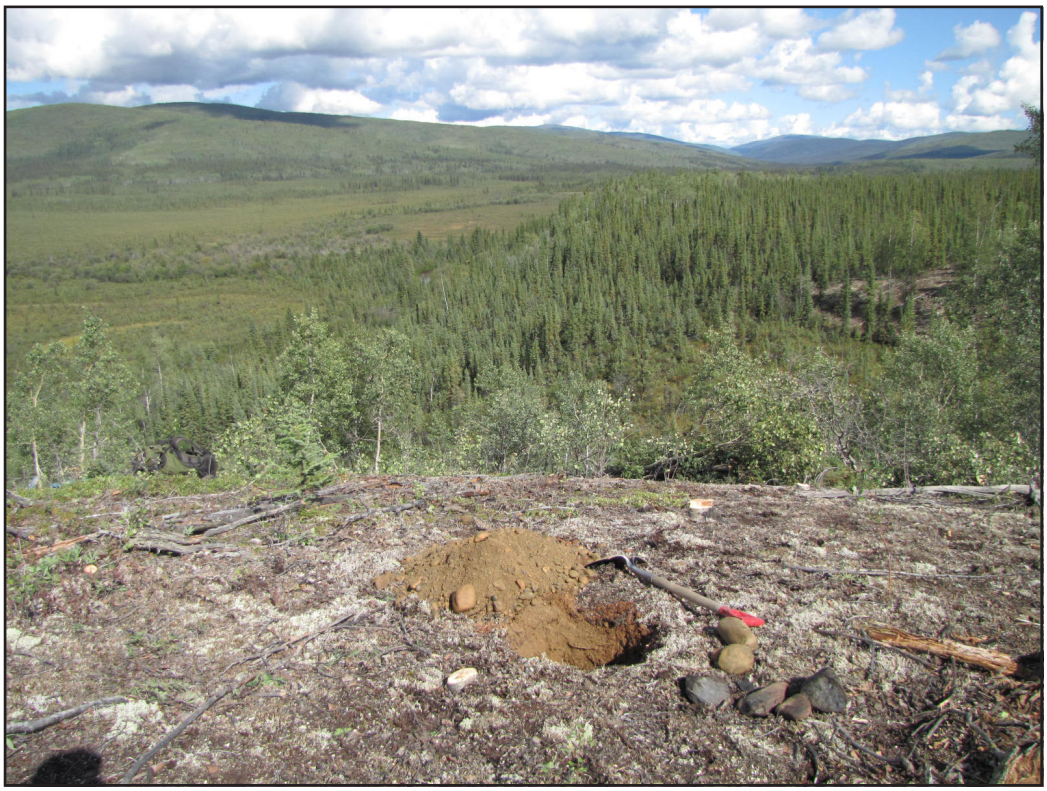

Figure 11. *A view looking east up Australia Creek from an intermediate level terrace. The valley bottom is visible in the distance. Thawed outwash gravel is present on the surface of the terrace. This coarse gravel was deposited when runoff from the early Pleistocene Cordilleran Ice Sheet flowed into the drainage from the Stewart River. During this process the outwash reworked pre-glacial gravel. It represents one of many placer targets in this broad valley.*

BIG ALEX BENCH – WOLFHEAD MINING AND DISCOVERY

Wolfhead Mining and Discovery continued exploring the Big Alex Bench near the Klondike Highway and Clear Creek (Fig. 12). This program was the largest placer exploration program in Yukon and included sonic drilling, resistivity geophysics, road construction and staking of 119 hardrock claims. Mud Bay Drilling, using a Boart-Longyear tracked sonic drill, completed 914 m (3000 ft) of reconnaissance drilling in 17 holes ranging in depth from 12 to 107 m (40 to 350 ft). The geological interpretation and sampling were overseen by W. LeBarge of Geoplacer Exploration.

Figure 12. *Dave Johnson, Bill LeBarge and Rod Hunt (L to R) of Wolfhead Mining and Discovery sample and describe the stratigraphic units contained within their sonic drill core.*

LOWER CLEAR CREEK – YUKON EXPLORATION GREEN GOLD INC.

Exploration on lower Clear Creek focused on investigating both high-level and valley bottom targets (Fig. 13). The 2015 project consisted of excavator test pitting, auger drilling and sampling above the Clear Creek bridge. This program was funded with assistance from YMEP.

TRIBUTARIES TO 60 MILE RIVER – YUKON EXPLORATION GREEN GOLD INC.

Exploration on California Creek and an unnamed left limit tributary to the Sixty Mile River consisted of test pitting and drilling. Coarse gold was recovered on both properties and as a result initiated work to submit water license applications.

SEYMOUR CREEK – DEREK DODGE

Derek Dodge shifted his focus from Guder Creek to Seymour Creek in 2015 with the purpose of mining a relatively shallow right-limit cut and exploring for the deep channel. A refurbished Bucyrus-Erie cable tool rig was used to drill a series of holes testing a resistivity target (Fig. 14). The location of the channel was verified at a depth between 27 and 30 m (90-100 ft) and the cable tool rig allowed for accurate sampling of the pay interval. Additional drilling, using a Boart-Longyear sonic drill, is planned for 2016. This program was supported by YMEP.

Figure 13. *Sandro Frizzi of Yukon Exploration Green Gold Inc. surveys lower Clear Creek from high benches bordering the valley.*

STEAMBOAT BAR – GARY LEE

A program of shallow shafting and sample processing was completed on Steamboat Bar, Stewart River. The property encompasses ground that was previously dredged (Fig. 15) in the early 1900's by William Ogilvie. Evidence of old-timer shafting and a drain, possibly dating to the late 1800s, are also present on the property.

Figure 14. *A view of Derek Dodge's refurbished 1950s-vintage cable tool rig on Seymour Creek. Drilling the 6" cased holes was slow (5-7 days per hole), but was able to accurately delineate a channel at approximately 27 m (90 ft) depth. The rig was also able to sample the pay zone in 30 cm (1 ft) intervals helping to define the gold distribution.*

Figure 15. *Gary Lee surveys William Ogilvie's dredge tailings on Steamboat bar on the Stewart River. Investigations suggest two different dredges operated on the margin of the point bar in the early 1900s following successful hand-mining in the late 1800s. One of the dredges was later moved to Highet Creek in the Mayo District in 1919.*

Yukon Mineral Exploration Program Update 2015-2016

Derek Torgerson[1]
Yukon Geological Survey

Torgerson, D., 2016. Yukon Mineral Exploration Program Update 2015-16. *In:* Yukon Exploration and Geology Overview 2015, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 59-64.

PROGRAM SUMMARY

The Yukon Mineral Exploration Program (YMEP) is a funding program designed to support individual prospectors, partnerships and companies by providing a portion of the risk capital required to locate, explore and develop mineral occurrences in Yukon. YMEP funding has consistently demonstrated its impact as an effective economic incentive by supporting exploration work that has led to numerous discoveries, which in turn, have provided significant long term economic benefits to the territory.

YMEP funding supports placer and hardrock exploration projects by reimbursing a percentage of approved exploration expenditures. Funding is merit-based; a panel of geologists evaluate submissions using a ranking system designed to score a range of criteria, quantifying the quality of the target, the proposal, the work plan and the applicant's previous YMEP performance. This scoring system is available on our website at http://www.geology.gov.yk.ca/ymep.html. The program comprises three different modules of varying reimbursement rates and maximum allowable funding (Table 1 and Fig. 1).

Table 1. *YMEP 2015 funding.*

2015 Funding Levels	Grassroots	Focused Regional	Target Evaluation
maximum funding	$15 000	$25 000	$40 000
reimbursement rate	up to 100% of eligible expenses	up to 75% of eligible expenses	up to 50% of eligible expenses
no. of approved placer applications	2	0	13
no. of approved hardrock applications	1	12	34

[1]*derek.torgerson@gov.yk.ca*

YMEP 2015 At A Glance			
	Grassroots	**Focused Regional**	**Target Evaluation**
Funding	max $15 000	max $25 000	max $40 000
Reimbursement rate	up to 100% of eligible expenses	up to 75% of eligible expenses	up to 50% of eligible expenses
Scope of work	to generate new targets and advance existing ones	to generate new targets	to evaluate and advance already known targets
Who is it for	individual prospectors only (no companies nor anyone working on behalf of a company)	prospectors, companies, partnerships	prospectors, companies, partnerships; projects with total exploration expenditures less than $300 000
Work to proceed on	on claims, leases, or crown land	on claims, leases, or crown land	on claims, leases, coal exploration licenses, or quarry leases, not crown land
Advance of funds	no advance	no advance	no advance
Field time requirements	minimum 30 person-days in field, daily log and final technical report	no constraints on time in field, final technical report	no constraints on time in field, final technical report
Holdback/reports	15% of funds will be held back until submission of final reporting requirements		
Reporting deadlines	Project proposal: March 31, Status Report: September 30, Final Financial Report and Final Summary/Technical report, release of funds: January 31 of following calendar year		
Confidentiality	reports will be kept confidential for 5 years	reports will be kept confidential for 2 years	
Module-specific eligible expenses	applicant cannot draw wages but wages for one assistant are eligible		road building costs up to <25% of YMEP contribution if pre-approved, drilling
Eligible expenses	conventional exploration work, travel within Yukon (truck, helicopter, *etc.*), assays, shipping, wages (applicant not eligible in grassroots module), WCB, contracts, equipment rental, daily field expenses, fuel, claim staking, reclamation, limited physical work		
Staking	staking costs up to 20% of eligible contribution		
Travel	travel within Yukon (truck, helicopter, *etc.*) up to 25% of eligible contribution		
Reimbursement rate guidelines	Expenses reimbursed according to YG guidelines. Private and commercial rates are provided. Private rates for heavy equipment are 75% of commercial rate as approved by YG.		
Eligible use of machinery	use of light equipment (<5 tons)		use of light or heavy equipment
Non-eligible expenses	GST, recording fees, management fees, costs of applying for permits or licenses, project planning and compilation, legal fees, promotional expenses, transportation outside Yukon, underground work, preparation for mining, mining, acquisitions, repairs		
Compliance	applicants must ensure that proper permitting is in place and that their work programs satisfy existing laws and regulations		

Figure 1. *A summary of the YMEP program guidelines. Please reference the YMEP guidebook or* http://www.geology.gov.yk.ca/ymep.html *for more detailed information.*

UPDATE FOR 2015

The program was oversubscribed again in 2015, with 103 applicants competing for $1.4M in funding. The Government of Yukon recognized the capital crisis in the mining markets and maintained the enhanced funding of $1.4M in 2015. This enhanced funding is intended to support the exploration industry through these challenging times. In light of the current financial challenges facing the exploration industry, YMEP funding was highly successful in pushing projects forward, and has resulted in several potentially significant hard rock and placer discoveries in 2015. The funding level for the YMEP was recently announced at the Yukon Geoscience Forum and will remain unchanged at $1.4M for 2016.

The competition for YMEP funding was very tight in 2015 and many quality projects were unable to be funded due to budget constraints. Challenges to secure equity financing, especially amongst the junior mining applicants, led multiple applicants to withdraw their applications. Table 2 outlines historical funding levels for the past six years.

A total of 62 applications were offered funding. The amount available under the grassroots module was unaltered from 2014 at $15 000. The Focused Regional module remained at $25 000 and the Target Evaluation module decreased by $10 000 to a maximum of $40 000. The funding levels for 2015 were determined from suggestion received in last year's online survey. The majority of respondents indicated that funding more projects at a reduced dollar value was a preferable approach. Of the 62 successful applicants 3 projects were in the Grassroots module, 12 in the Focused Regional module and 47 in the Target Evaluation module. This year, most applications were funded at the maximum allowable based upon the proposed budget.

Of the 62 applications that were offered funding in 2015, hardrock projects account for 72% of the successful applications and placer projects account for the remaining 28%. Individual prospectors and private companies secured approximately 66% of available funds while public junior mining/exploration companies received approximately 34% of the funds. The breakdown between the different modules and the demographics of the applicants over the past three years is outlined in Table 3.

In 2015, the bulk of placer projects were centered in the Klondike placer district, three projects were in the south west Yukon area and two in the McQuesten area. Hardrock projects were fairly evenly distributed throughout the territory. Gold appeared to be the most sought after commodity again this year and some clustering of projects occurred around exciting recent discoveries in the Klondike/White Gold area, with the majority of projects south of the Tintina trench. Other successful applications were located in south and central Yukon (Fig. 2). Forty-nine projects targeted gold as the primary commodity (placer, structurally controlled, epithermal, Carlin style, intrusion related and orogenic deposit types), three projects identified vein hosted

Table 2. *YMEP historical funding, fiscal years 2010-11 through 2015-16.*

Historical funding	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
available funding	$1.67M	$570 000	$570 000	$1.17M	$1.4M	$1.4M
no. of applications	165	83	79	81	111	103
approved projects	83	34	29	55	51	62
max funding level grassroots	$15 000	$15 000	$15 000	$15 000	$15 000	$15 000
max funding level focussed regional	$25 000	$15 000	$15 000	$15 000	$25 000	$25 000
max funding level target evaluation	$50 000	$25 000	$25 000	$35 000	$50 000	$40 000

Table 3. *YMEP funding statistics for fiscal years 2013-14 through 2015-16.*

	2013-14		2014-15		2015-16	
Approved projects	**# of approved projects**	**% of approved funding**	**# of approved projects**	**% of approved funding**	**# of approved projects**	**% of approved funding**
approved placer	7	15%	14	22%	15	28%
approved hardrock	48	85%	37	78%	47	72%
total projects approved	55		55		62	
prospectors/ individuals	28	36%	20	30%	24	34%
private companies	16	33%	12	29%	21	32%
public companies	13	31%	19	41%	17	34%

silver as the target, three projects explored for porphyry copper potential, two for VMS style mineralization, two jade projects, one aggregate project, and two proposal looked at magmatic massive sulphide copper/nickel/PGE prospects.

YMEP's aim is to keep a variety of projects at various stages of advancement operating in Yukon. Of the 2015 approved projects, 30 of the projects indicated that soil/silt sampling and prospecting/geological mapping would be the primary focus of the program, 11 programs completed various ground and airborne based geophysical surveys, 19 of the project proposals were for drilling and/or trenching and 2 projects proposed hand shafting.

The success of the program can be measured by a number of indicators such as dollars leveraged, new discoveries and option agreements entered. In 2015, ~$4.2M was proposed to be leveraged from YMEP funding. It was a very challenging year across the board for option agreements, as many options were returned to the vendors. However, a couple of very encouraging YMEP discoveries were made in 2015 which will stimulate exploration expenditures in the years ahead (Table 4). In 2015, YMEP funding contributed to the discovery of twelve new potentially significant occurrences. One junior explorer was able to option their property to another junior explorer and three prospectors were able to option their placer prospects to major Yukon based placer miners. Several other applicants have been in discussions regarding the optioning or sale of their YMEP funded projects. Benefits of the program can span several years: follow-up property option and/or exploration work may occur several years after the initial YMEP funding. A number of significant properties including Coffee, Red Mountain and Mariposa have benefited from YMEP funding in the past which has led to additional exploration expenditures and various property agreements.

Program materials will be updated and posted on the YMEP website prior to the application deadline. New versions of the application form, scoring criteria, and the program's guidelines will be available for download.

YMEP is designed to meet the needs of the users of the program and to act as an engine for stimulating economic development; therefore, the program is continually evolving to meet these goals. Any additional changes to the program's guidelines and maximum funding levels will be announced upon completion of the yearly program review. Funding for 2016 was announced at the Yukon Geoscience Forum and will remain at $1.4M.

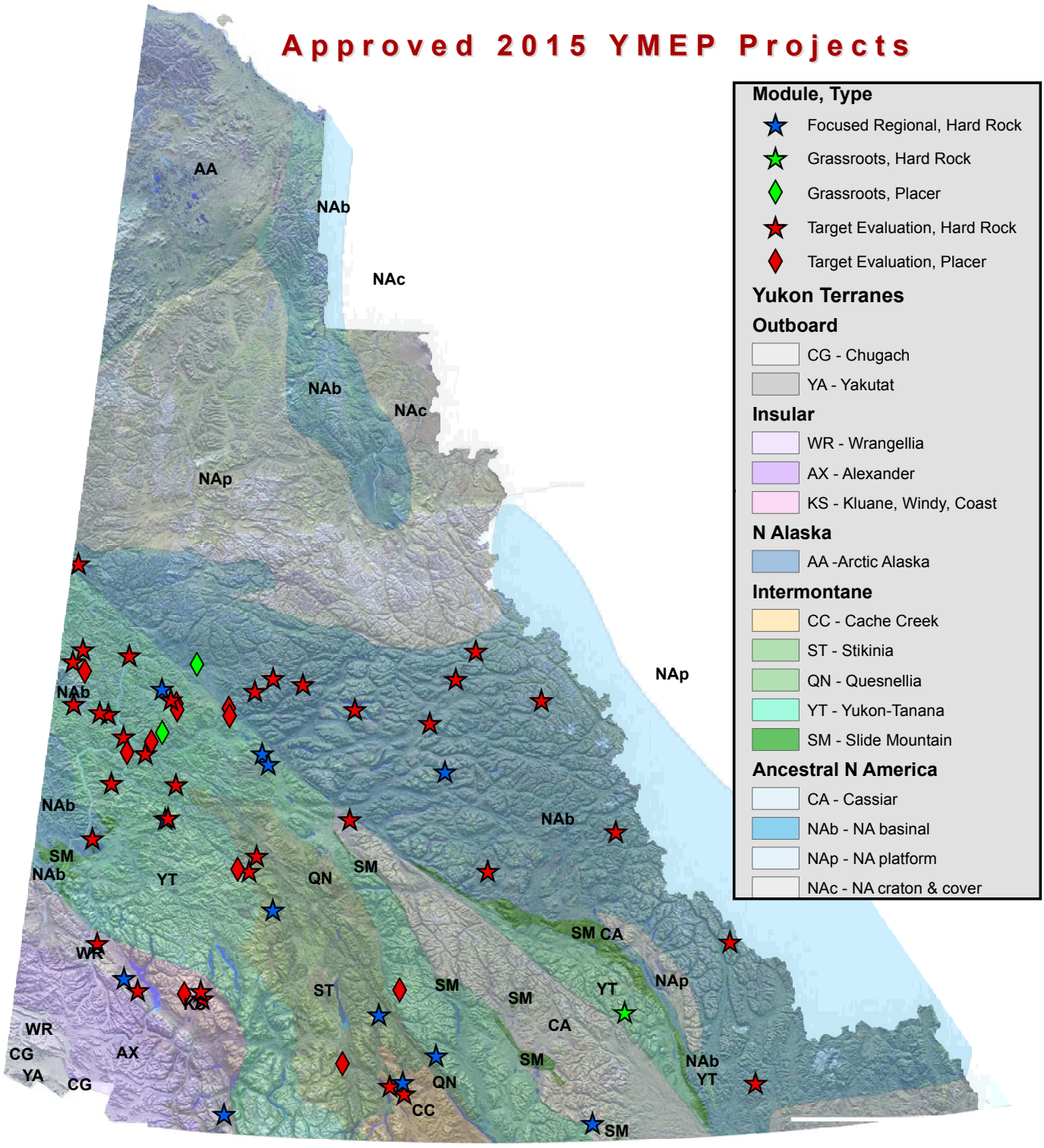

Figure 2. *Yukon map of approved 2015 YMEP projects.*

Table 4. *YMEP successful options 2000-2015.*

YMEP Successful Options (2000-2015)				
YMEP#	**Property Name**	**Total YMEP Contribution(s)**	**Optioned by**	**Company investment or work commitment**
01-011 and 15-030	Ice/Red Mountain	$52 500	AM Gold	~$7.6M
03-079	White Gold	$10 000	Underworld/Kinross	~$33.2M
04-072 and 05-043	Blende	$30 000	Blind Creek Resources	>$5M
05-058	Andrew	$14 400	Overland Resources	~$6.5M
06-054	Antimony Creek	$10 000	Logan Resources/ Golden Predator	~$0.35M
04-041 and 07-043	Coffee	$35 000	Kaminak Gold Corp.	~$97M
07-056, 08-012 and 09-112	Toni/Sixty Mile	$33 000	Radius Gold	~$4.5M
03-023, 06-033 and 09-137	Scheelite/Gold Dome	$75 000	Golden Predator	~$1.4M
09-015	Clear Creek	$10 450	Golden Predator	~$4.1M
09-016 and 017	Ten Mile Creek	$25 600	Radius Gold	~$0.63M
09-158	Prospector Mountain	$30 750	Silverquest Resources	~$3.85M
09-116	Cynthia	$15 350	Golden Predator	~$1.7M
09-173	Shark/True Blue	$21 354	Great Western Minerals	~$1M
10-097	Portland	$14 320	Taku Gold	~$1.25M
00-069, 06-005, 06-006 and 15-014	Mariposa	$76 000	Pacific Ridge	~$4.9M

Robert E. Leckie Awards

Judy St. Amand[1]
Mining Lands, Energy, Mines and Resources

St. Amand, J., 2016. Robert E. Leckie Awards. *In:* Yukon Exploration and Geology Overview 2015, K.E. MacFarlane and M.G. Nordling (eds.), Yukon Geological Survey, p. 65-66.

EXCELLENCE IN ENVIRONMENTAL STEWARDSHIP IN PLACER MINING: CAW MINING LTD.

CAW Mining has owned and mined claims on Barlow Creek, in the Mayo district, since the 1970s. An organized, thoughtful and structured annual mining plan has resulted in lower operating costs with professional final reclamation. Initial site cleanup from previous activity and an insightful initial operation placement has created a property for future development and systematic mining and allowed for outstanding reclamation of the initial settling ponds and waste piles.

The fish habitat features created for Barlow Creek have enhanced the quality and quantity of habitat available for a wide range of species in the wetlands.

Reclamation at CAW Mining, along Barlow Creek.

[1]*judy.stamand@gov.yk.ca*

EXCELLENCE IN ENVIRONMENTAL STEWARDSHIP IN QUARTZ MINING: KAMINAK GOLD CORPORATION

Kaminak Gold Corp.'s Coffee property is located approximately 120 km south of Dawson City, Yukon, in the Whitehorse mining district.

Kaminak takes a proactive approach to incorporating environmental and social responsibility with adaptive planning and innovative responses to challenges at the Coffee property. They have repeatedly demonstrated exemplary practices and innovation in their ongoing efforts towards progressive reclamation while building capacity and advancing cooperative relationships with local communities and First Nations.

RESPONSIBLE AND INNOVATIVE EXPLORATION MINING PRACTICES IN QUARTZ MINING: CAPSTONE MINING CORPORATION

Minto mine is located within Selkirk First Nation Category A Settlement Land and is approximately 240 km northwest of Whitehorse, Yukon.

Capstone has demonstrated innovative and responsible management through the construction of a three storey camp to reduce their overall footprint. They have reclaimed their original land treatment facility and have replaced it with a new facility to increase environmental protection, installed HDPE liners at maintenance shops and in areas where equipment is staged to reduce the risk of hydrocarbon contamination, created a designated area for chemical storage to reduce haul distance as well as constructed a lined wash pad with an oil/water separator to clean heavy equipment on site. All of these measures reduce the potential for impact while maintaining or reducing the overall footprint of the site.

Yukon Exploration and Geology 2015 Abstracts

The following abstracts are from the Yukon Exploration and Geology 2015 volume. Full versions of the individual papers are available at the Yukon Geological Survey website, www.geology.gov.yk.ca.

FIELD INVESTIGATIONS OF THE SUGAR GOLD PROSPECT, DAWSON RANGE, YUKON (NTS 115J/14 AND 15)

S.E. BARTLETT, M.M. ALLAN, E.N. BUITENHUIS, T.R. SMITH AND C.J.R. HART

The Sugar gold prospect, located 20 km southeast of the Coffee gold deposits in Yukon, is hosted in the mid-Cretaceous Dawson Range batholith, of which three mappable sub-units are recognized: (1) biotite hornblende quartz monzodiorite; (2) K-feldspar phyric hornblende biotite syenogranite; and (3) biotite hornblende diorite. Plutonic rocks are cut by steep, west to northwest-striking andesite dikes of uncertain age. Alteration and mineralized zones are coincident with fault-fracture zones that are parallel and proximal to dikes and their margins. Alteration is characterized by an early phase of calc-sodic (albite-amphibole) and potassic (pervasive biotite and fracture-controlled K-feldspar) and a later phase of silica flooding and sericite alteration. Gold mineralization is associated both with disseminated sulphides in zones of silica flooding, and with variably sheared veins of quartz-carbonate-arsenopyrite ± pyrite ± stibnite ± sphalerite. Late chalcedonic quartz-carbonate and ferroan carbonate veins mark the collapse of the hydrothermal system.

PALEOZOIC STRATIGRAPHY, TECTONICS AND METALLOGENY OF THE PELLY MOUNTAINS, QUIET LAKE AND FINLAYSON LAKE MAP AREAS (NTS 105F AND G), CENTRAL YUKON: PROJECT OUTLINE AND PRELIMINARY FIELD RESULTS

L.P. BERANEK, S.J. PIERCEY, R. CAMPBELL AND P. WAWRZONKOWSKI

Paleozoic rocks of the Pelly Mountains, central Yukon, preserve greater than 150 my of sedimentation, magmatism and base-metal mineralization. To identify secular trends in regional tectonics and metallogeny, a multi-year project on the stratigraphy of the Pelly Mountains in the Quiet Lake (105F) and Finlayson Lake (105G) map areas was initiated. Field studies during summer 2015 focused on two stratigraphic intervals: (1) mafic volcanic, volcaniclastic and clastic rock successions assigned to the Cambrian-Ordovician Cloutier and Groundhog formations (Kechika group); and (2) felsic volcanic, volcaniclastic and clastic rock successions assigned to the Devonian-Mississippian Black Slate and Felsic Volcanic formations (Seagull group). Cambrian-Ordovician strata were deposited in a marine environment characterized by episodic mafic volcanism and extensional tectonism. Devonian-Mississippian strata record the transition from an extensional turbidite basin to a metalliferous volcanic rift basin, and resemble key rock assemblages of the Selwyn basin (Earn Group) and Yukon-Tanana terrane (Grass Lakes and Wolverine Lake groups).

THE PARADISE GRAVEL: EVIDENCE FOR A PRE-WHITE CHANNEL GRAVEL IN THE KLONDIKE

J.D. BOND

New stratigraphic interpretations for exposures at Dago, Preido and Paradise hills on lower Hunker Creek suggest a more complex stratigraphic framework for the development of high-level bench gravel in the Klondike than has been previously put forward. A highly-altered gravel has formerly been interpreted to be part of the lower White Channel Gravel sequence and its degree of alteration attributed to enhanced groundwater diagenesis near the bedrock contact. New mining exposures indicate this altered gravel, here informally termed 'Paradise gravel', is laterally extensive and the alteration is not restricted to the bedrock interface. Furthermore, a cross-section reconstruction shows the White Channel Gravel is stratigraphically inset into the Paradise gravel. Alteration of the Paradise gravel is possibly a function of pedogenesis, suggesting a period of landscape stability followed its deposition. This pattern of sedimentation and potential stability was repeated within the lower White Channel Gravel and recorded by a zone of clay alteration and iron oxidation.

Economically, the Paradise gravel is significant. At each locality investigated, the primary pay streak occurs in the Paradise gravel. Conversely, the White Channel Gravel is only economic where it sufficiently erodes and reworks the Paradise gravel. In nearby drainages, including upper Hunker Creek, the White Channel Gravel more completely reworks Paradise gravel to bedrock and becomes the pay unit. Preservation of the Paradise gravel documented in lower Hunker Creek may be due to its broad valley morphology. Future studies are recommended on the sedimentology of the Paradise gravel to understand gold distribution both vertically and within the pay channel(s). In addition, research into the pedogenic alteration could provide information on past climates during the Neogene.

PRELIMINARY RESULTS ON THE MIDDLE TRIASSIC TO MIDDLE JURASSIC STRATIGRAPHY AND STRUCTURE OF THE TESLIN MOUNTAIN AREA, SOUTHERN YUKON

E. BORDET

Stratigraphic and structural relationships within Stikinia, and overlap assemblages of the Whitehorse trough, are investigated in the Teslin Mountain area, southern Yukon. The Middle Triassic Joe Mountain Formation is dominated by a thick sequence of aphyric basalt produced by subaqueous volcanism. The Upper Triassic Lewes River Group displays complex lateral and vertical lithological and facies changes. It illustrates synvolcanic terrane exhumation, with erosion of the volcanic upland leading to deposition of thick volcaniclastic sequences, in parallel with ongoing clastic and carbonate sedimentation in marginal basins. Unravelling the Lewes River Group stratigraphy is critical in understanding the latest stages of Stikinia arc volcanism and the onset of Whitehorse trough marine sedimentation in the Early-Middle Jurassic. Further mapping and analytical work will focus on characterizing the Joe Mountain Formation and Lewes River Group, to determine how Stikinia evolved prior to final amalgamation of the Intermontane terranes with North America.

PLACER-LODE GOLD RELATIONSHIPS IN THE NANSEN PLACER DISTRICT, YUKON

R. CHAPMAN, M. COOK, M. GRIMSHAW AND S. MYLES

Compositional studies have been undertaken on gold particles recovered from hypogene ore, eluvial material and placer samples in and around the Klaza property. These data have been correlated with previous descriptions of *in situ* mineralization to elucidate placer-lode relationships and systematic change in gold compositions between porphyry and epithermal environments.

Gold alloy from the porphyry environment is Ag poor with respect to Au formed in later stage veins. Silver, and to a lesser extent Cu, have been the main discriminants for inferring the source of Au within the placers, and in general, vein mineralization is a more important source type than porphyry mineralization.

The signature of Pb-Bi-Te previously identified in the inclusion suites of Au grains from Nucleus/Revenue, Casino, and Sonora Gulch has also been identified at Klaza, demonstrating that generic compositional signatures can underpin a robust exploration methodology. The relative sizes of porphyry and epithermal footprints of detrital Au together with their respective compositions are important considerations when targeting Cu-Au systems.

PRELIMINARY OBSERVATIONS ON THE GEOLOGY OF TAY MOUNTAIN AREA (PARTS OF NTS 105K/12 AND 13, 105L/9 AND 16), CENTRAL YUKON

R. COBBETT

Regional mapping north and west of Faro is aimed at improving knowledge of the geologic history of the area and at elucidating the host stratigraphy and structures of both precious and base-metal occurrences. The southern part of the Tay Mountain area is underlain by metamorphosed lower Cambrian to Silurian Selwyn basin strata. These are thrust northward over Silurian to Triassic clastic, carbonate and volcanic rocks. The entire succession is intruded by mid-Cretaceous granitic rocks of the Tay River plutonic suite. The area is deformed by folding and north-verging thrust faults and by both east-west and north-south oriented normal faults. There is evidence that north-verging thrust faults are reactivated Devonian normal faults that formed in response to regional extension and controlled the deposition of the Earn Group.

Selwyn basin strata, which are age-equivalent to the Anvil Mine host stratigraphy, crops out extensively south of the Twopete thrust fault. The end of a northwest-trending belt of silver-bearing occurrences is located at Mount Menzie. Folded chert in proximity to calcareous rocks and granitic intrusions are common features of silver showings in the area.

PROTOPICEOXYLON YUKONENSE SPEC. NOV. – A REMARKABLE EXTINCT CONIFER FROM THE NORTHERN YUKON AND NORTHWESTERN MACKENZIE DELTA AREA

M. DOLEZYCH AND L. REINHARDT

A fossil wood remain of parautochthonous origin was found in Paleocene sedimentary rocks of the Moose Channel Formation in the Big Fish River area close to the Yukon and Northwest Territories border during the CASE 15 expedition. The fossil wood was recovered from overall medium to coarse sandstone of inferred fluvial-deltaic origin. This contribution summarizes the current knowledge primarily on the taxonomy and paleoecology of the protopiceaceous wood specimen. The fossil wood specimen turned out to be without a relationship to extant taxa: *Protopiceoxylon yukonense* spec. nov. as a taxon of the fossil wood genus *Protopiceoxylon* (Gothan, 1907) belongs to the extinct genus of Protopinaceae (Kraeusel, 1949). The holo and paratypes of the generotypus *Protopiceoxylon extinctum* from the King Charles Land (Gothan, 1907) as well as from Green Harbour/Spitsbergen (Gothan, 1910), found in the Natural Historical Museum at Berlin, were available for this investigation. The fossil conifer wood *Protopiceoxylon* is characterized by extinct major anatomical differences that are intermediate between the *Protopiceoxylon* and the *Piceoxylon* manifest within the radial bordered pits, which are protopinoid in the first mentioned taxon and abietoid in the other discussed taxon. Most other features demonstrate a close relationship between both fossil taxa.

EARLY PLEISTOCENE GLACIATIONS AND IMPLICATIONS FOR PLACER GOLD DEPOSITS IN BACK CREEK, MOUNT NANSEN AREA, YUKON

P. ENGLEHARDT, B. WARD, J. BOND AND M. COLEMAN

Yukon has more than a century of placer mining history, predominately in unglaciated regions. However, as these targets are exploited, focus turns to more complex landscapes where glaciation has buried, eroded and incorporated placer gold. This study examines how Early Pleistocene glaciation in the Mount Nansen area, central Yukon, has affected placer gold deposits. Detailed stratigraphic analysis and sample collection has focused on Back Creek, where placer mining has exposed a 22 m section containing several gold bearing units. In the section, sediments from two glacial advances cap sporadically preserved pre-glacial gravel. The section is variably dissected by younger placer gold bearing fluvial gravel with enrichment related to intersection of inter-glacial or pre-glacial placer gold deposits. Analysis at Back Creek reveals the potential for deeply buried placer gold deposits in other glaciated regions of Yukon.

NEW U-PB ZIRCON DATES FROM THE AISHIHIK BATHOLITH, SOUTHERN YUKON

N.L. JOYCE, M. COLPRON, M.M. ALLAN, P.J. SACK, J.L. CROWLEY AND J.B. CHAPMAN

New U-Pb zircon dates (SHRIMP and LA-ICPMS) from granitoid rocks of the Aishihik batholith indicate a range of *ca.* 190-180 Ma for the Long Lake plutonic suite, as previously indicated by less precise, multi-grain TIMS dates. None of the phases in the Aishihik batholith are as old as the Minto suite to the north, therefore limiting the potential for Minto-style Cu-Au-Ag mineralization in the batholith. However, local occurrences of apparently shallow-level intrusions suggest that parts of the Aishihik batholith may present suitable targets for more typical porphyry Cu-Au mineralization. LA-ICPMS U-Pb zircon dating of two orthogneiss samples from the western margin of the Aishihik batholith yielded Early Mississippian protolith ages akin to the Simpson Range plutonic suite (Yukon-Tanana terrane), and Jurassic overgrowths consistent with partial melting related to the intrusion of the Aishihik batholith.

A-TYPE GRANITE AND TIN SKARN IN SOUTHEAST YUKON: MINDY PROSPECT AND SURROUNDING GRANITE OF 105C/9

T. LIVERTON

In the southeast Yukon, immediately southwest of the mid-Cretaceous Cassiar suite plutons, is a northwest-trending suite of anorogenic single-mica granite called the Seagull suite. This suite comprises the Seagull and Hake batholiths, Ork and Thirtymile stocks and an un-named intrusion to the northwest. These B and F enriched granite units are associated with various forms of tin mineralization, including skarn. The Mindy prospect in the Thirtymile Range contains a variety of metasomatic silicate and borate and fluoride minerals. Tin (Sn) mineralization is found as cassiterite and borate mineral phases. Mapping has shown that faulting active during metamorphism-metsomatism controlled the distribution of the skarn mineralization. Both mineral chemistry and structural control of mineralization have a significant effect on the economic potential of the Mindy prospect.

U-PB ZIRCON AGE AND PB ISOTOPIC CONSTRAINTS ON THE AGE AND ORIGIN OF PORPHYRY AND EPITHERMAL VEIN MINERALIZATION IN THE EASTERN DAWSON RANGE, YUKON

J.K. MORTENSEN, C.J.R. HART, J. TARSWELL AND M.M. ALLAN

Six dikes that are intimately associated with the Klaza epithermal vein system in the Mt. Nansen district yielded early Late Cretaceous U-Pb zircon ages (78.2-76.3 Ma), which is similar to that obtained from the porphyry stock that hosts the Cyprus Cu-Mo-Au porphyry occurrence immediately to the southeast. These results support the interpretation that epithermal veins in the Mt. Nansen district are likely genetically related to subvolcanic magmatism. Granodiorite of the Dawson Range batholith, that underlies most of the Klaza property, gives a U-Pb zircon age of 107.9±0.3 Ma. These dates overlap with previously reported mid-Cretaceous U-Pb zircon ages for felsic dikes associated with the Brown-McDade occurrence and related vein and breccia deposits in the Mt. Nansen mine. The new results, together with regional dating and Pb isotopic data from western Yukon, emphasize the metallogenic importance of the "early Late Cretaceous" magmatic-hydrothermal event in this region.

PRELIMINARY STRATIGRAPHIC AND STRUCTURAL INTERPRETATION OF THE UPPER HYLAND RIVER AREA (PARTS OF 105H/8 AND 9), SOUTHEAST YUKON

D. MOYNIHAN

The upper Hyland River area of southeast Yukon is mostly underlain by rocks of the Neoproterozoic-Cambrian Hyland Group. The Yusezyu Formation, which forms the lower part of the Hyland Group, was previously undivided; however good exposure in the upper Hyland River area facilitates the identification of marker horizons, including marble/limestone layers and thick units of quartz granule-pebble conglomerate. A new 1:50 000-scale map of part of the area includes ten stratigraphic subdivisions in rocks previously assigned to the Yusezyu Formation. From NE to SW, the structure of the area is characterized by: 1) a SW-vergent fold and thrust belt; 2) a central region characterised by upright, NW-SE-trending folds; and 3) a highly deformed region characterized by tight-isoclinal folding, in which folds and stretching lineations are at a high angle to the trend of the orogen. A steeply-dipping fault with long strike-length is coincident with the upper Hyland River valley.

COPPER-GOLD ± SILVER MINERALIZATION AT THE STU OCCURRENCE, CENTRAL YUKON (YUKON MINFILE 115I 011)

P.J. SACK, S. CASSELMAN, D. JAMES AND B. HARRIS

The Stu copper-gold ± silver occurrence (Yukon MINFILE 115I 011) is located midway between the Minto and Carmacks Copper deposits in the Minto suite part of the eastern Granite Mountain batholith. The best known mineralization at Stu is in Zone A, where at least four foliated and mineralized bodies strike northwest and dip moderately to steeply to the northeast. These bodies grade 0.2 to 0.6% total Cu, though the best historic diamond drill intersection contains 3.5% Cu over 13.5 m. In plan and cross section view, the foliated and mineralized granodioritic bodies are dominantly gneiss which pinches and swells, appearing as lenses surrounded by unfoliated K-feldspar porphyritic granodiorite. Copper mineralization occurs as fine-grained hypogene bornite and chalcopyrite, and supergene malachite, azurite, tenorite and chrysocolla. This study suggests that Stu mineralization is similar to that at the Carmacks Copper and Minto deposits as it is primarily hosted in multiple, discrete bodies of foliated granodioritic rock. In terms of ore body orientation, the moderate to steeply dipping nature at Stu is more reminiscent of Carmacks Copper than Minto, which likely explains the presence of significant supergene copper mineralization.

LATE HOLOCENE FLUCTUATIONS OF THE NORTH LOBE OF LLEWELLYN GLACIER, UPPER YUKON RIVER BASIN

M. SAMOLCZYK, S. LAXTON AND J.J. CLAGUE

Llewellyn Glacier contributes glacial meltwater to runoff entering the Yukon River, which flows through the hydroelectric power dam in Whitehorse, Yukon. An examination of lateral moraine stratigraphy, and radiocarbon and dendrochronological dating of *in situ* and detrital subfossil wood provide a record of fluctuations of Llewellyn Glacier over the past two millennia. Our data indicate the north lobe advanced sometime between AD 260 and AD 505, and reached within 70 m of its Little Ice Age maximum limit as early as the 17th century. The main lobe advanced as early as AD 1035, possibly between the First Millennium and Little Ice Age advances of the last two millennia, when glaciers have traditionally been considered more restricted. Results provide new information on the timing and frequency of fluctuations of Llewellyn Glacier, and can be used to assist with modelling the future impacts of climate change on glacial meltwater contributions to rivers and hydroelectric security in Yukon.

CRUSTAL DEPTH OF EMPLACEMENT OF THE EARLY JURASSIC AISHIHIK AND TATCHUN BATHOLITHS, WEST-CENTRAL YUKON

M.J. TOPHAM, M.M. ALLAN, J.K. MORTENSEN, C.J.R. HART, M. COLPRON AND P.J. SACK

Early Jurassic plutons in west-central Yukon were emplaced during accretion of the Intermontane terranes onto the western North American margin, and their exhumation is recorded in the sedimentalogical and geochronological record. Here the aluminum-in-hornblende geobarometer is applied to the 200-197 Ma Tatchun batholith and the 188-180 Ma Aishihik batholith, to estimate crystallization depths and exhumation rates. The Tatchun batholith crystallized at 6.4-7.2 kbar (23-26 km), whereas the Aishihik batholith was emplaced at 3.4-4.2 kbar (12-15 km). The Tatchun batholith exhumed at a rate of ~1 mm/a after crystallization, and was likely exposed at surface by the Middle Jurassic. Although subvolcanic equivalents of the Tatchun batholith have been lost to erosion, it could be prospective for deformed copper deposits such as Minto and Carmacks Copper. Hypabyssal and water-saturated phases of the Aishihik batholith suggest that portions of the batholith could be at, or just below, an appropriate crustal level for magmatic-hydrothermal mineralization.

DIGITIZING AND SPATIALLY ANALYZING HISTORIC PLACER EXPLORATION DATA FROM DOMINION CREEK: A PILOT PROJECT

S. VAN LOON

Compilation of historic geologic data can help identify deposits of unmined gold-bearing gravel and promote further exploration on under-explored ground. Archival documents of the Yukon Consolidated Gold Corporation (YCGC) contain detailed, accurate prospecting data, and can be used to identify dredge localities and production values. With dredge inefficiencies and crude mining techniques, areas heavily worked in the past may contain both technogenic and remnant *in situ* gold-bearing gravel. These types of placer deposits have been the target for many miners on previously worked ground, but with the aid of historic data, these deposits can be identified and evaluated for their potential prior to any ground work. Although there are some limitations and challenges associated with the historic documents, the data contained within the YCGC archives can significantly support placer exploration in both mined and unmined areas of Yukon.

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