Final report for YMEP Focused Regional Project 21-063

THE SANDS OF TIME EXPLORATION PROJECT

GEOCHEMICAL REPORT

Cover image: collecting a bulk sample at site 21JM012B.

By and for Jack Milton, Ph.D.

31st January 2022

Dates of fieldwork 8th Sep to 13th Sep 2021

NTS 115J10; 115J11; 115J12; 115J13; 115J14; 115J15

Latitudes 62.641° to 62.771° N

Longitudes 138.922° to 139.409° W

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EXECUTIVE SUMMARY

Samples of stream sediments were taken in the area 8 km SW to 17 km W of the Casino deposit, Dawson Range, Yukon. Silt samples were analyzed for geochemistry, bulk stream sediment samples were collected for heavy mineral concentration, and a few soil samples were taken. Mineral concentrates were logged for porphyry indicator minerals, and zircon separates were produced. Zircons were analyzed by LA-ICP-MS for geochronology and geochemistry in an effort to detect Late Cretaceous zircons with fertile indicator geochemistry, associated with concealed and unmapped Casino suite intrusive rocks.

Casino Suite age zircons were detected in several bulk stream sediment samples that all occur in drainages with no known or mapped occurrences of Casino Suite intrusive rocks. The number of zircons detected suggest that a Casino Suite porphyry could be present in one drainage, with a significant footprint. Follow-up of these anomalous drainages with soil sampling, mapping and prospecting is recommended to try and trace these anomalous signatures back to bedrock sources that may potentially host Cu-Au-Mo mineralization related to Casino Suite rocks.

INTRODUCTION

A paucity of outcrop and deep oxidation has challenged the traditional methods of early-stage exploration for porphyry Cu-Au-Mo deposits in the Dawson Range, Yukon: stream sediment sampling, soil sampling and prospecting. A method here is proposed and tested within this project to detect Casino Suite intrusive rocks over large areas of the Dawson Range, at relatively low-cost, by dating zircons contained within stream sediments. The small volume ~78-72 Ma Casino Suite intrusive rocks are intimately associated with porphyry Cu-Au-Mo mineralization across the SW Yukon and these granitoids are difficult to distinguish from the granitoids of the Dawson Range Batholith, particularly given the lack of outcrop providing little control on regional geological maps. Late Cretaceous porphyry mineralization occurs in a belt parallel to the Big Creek fault, from Klaza to Casino. A conspicuous gap is present from Casino 150 km NW to the late Cretaceous Taurus and Bluff deposits in eastern Alaska, and within this gap are large areas of Dawson Range Batholith that have not seen much previous exploration activity, with no known late Cretaceous porphyry deposits.

Dating zircon grains in large numbers has until recently been prohibitively expensive, but with the advent of LA-ICP-MS, the cost of doing systematic large-n sampling has come down substantially to levels where it may be deemed feasible for use in mineral exploration (e.g., Lee et al., 2021). Trace element chemistry is measured during the LA-ICP-MS process in addition to the U-Pb dating at little additional expense. The trace element signatures of zircon have recently been linked to predicting porphyry fertility and provide another layer for exploration targeting (Dilles et al., 2015; Lee et al., 2020). Porphyry indicator minerals have been developed to detect porphyry deposits in nearby surficial sediments such as tills, stream sediments and sands (Averill, 2011; McClenaghan et al., 2020).

The Sands of Time project uses stream sediment zircon U-Pb geochronology, zircon trace element geochemistry, porphyry indicator mineralogy of stream sediments, and fine-fraction stream sediment geochemical sampling to explore for porphyry deposits at the headwaters of creeks in the Dawson Range, west of the Casino deposit. In April 2021, the SOT claims were staked on the results of the 2020 Sands of Time YMEP supported project. Follow-up stream sediment zircon, silt and soil sampling was carried out.

LOCATION

The Sands of Time project is located within the traditional territories of the Selkirk and Tr'ondëk Hwëch'in First Nations, on crown land. A 10 x 4 km area was investigated ~13 km south-west of the Casino deposit, 25 km south of the Coffee deposit and 25 km southeast of the Boulevard project. This project was conducted on the SOT claims under the authority of a Class 1 exploration notification in addition to some work off-claims, carried out as prospecting in order to locate claims.

ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

The Sands of Time project is located approximately 305 km NW of Whitehorse, and 150 km due south of Dawson City, Yukon, Canada. No year-round roads connect to the project area. Access is best achieved by helicopter from Dawson City or Whitehorse. Access could be possible by barge from the Yukon River, and then by 4x4 vehicle along exploration roads to the Casino property and adjoining Canadian Creek property. An old exploration trail crosses the project area, and an old airstrip, named Polaris, is located adjacent to the project area but is overgrown. There are airstrips nearby at Casino and Boulevard.

The project area covers part of the Dawson Range from elevations between 550 and 1500 metres. The Dawson Range is characterized by rounded rolling hills with sparse cover of scrubby vegetation in the alpine and more thickly vegetated and forested, moderately to steeply incised valleys. The Yukon River is 25 km to the north of the project where it flows to the west. The cold, long and dark winters of the Yukon make the most comfortable and practical season for exploration run from approximately June through to September.

HISTORY

The project area has a few scattered minfile locations based on the location of the DOYLE, CC, PRINCESS, DUCHESS, and GEP claims that were staked and explored around 1969-1975 immediately after the discovery of porphyry mineralization at Casino in 1969. Historic work includes geological outcrop and float mapping, stream sediment silt geochemistry, soil sampling for Cu-Mo, IP surveying and very limited reconnaissance drilling. A total of 4 vertical holes for a combined length of 600 m were drilled on the CC claims in the centre of the project area, and one 150 m hole was drilled just to the south of the project area on the DOYLE claims.

In 2011 Ryan Gold Corp. ran a ridge line of soils on the BAILEYS claims on the north side of the project area. In 2012, Canadian Dehua International Mines Group Inc. flew a magnetic-radiometric survey over a significant portion of the project area on the QUO and GROUT claims.

No significant mineralization has been located to date.

GEOLOGICAL SETTING

The project area is mostly underlain by Devonian-Permian metamorphic rocks of the Yukon-Tanana terrane; and intrusive and volcanic rocks, mostly of Cretaceous-Palaeogene ages (Fig. 1).

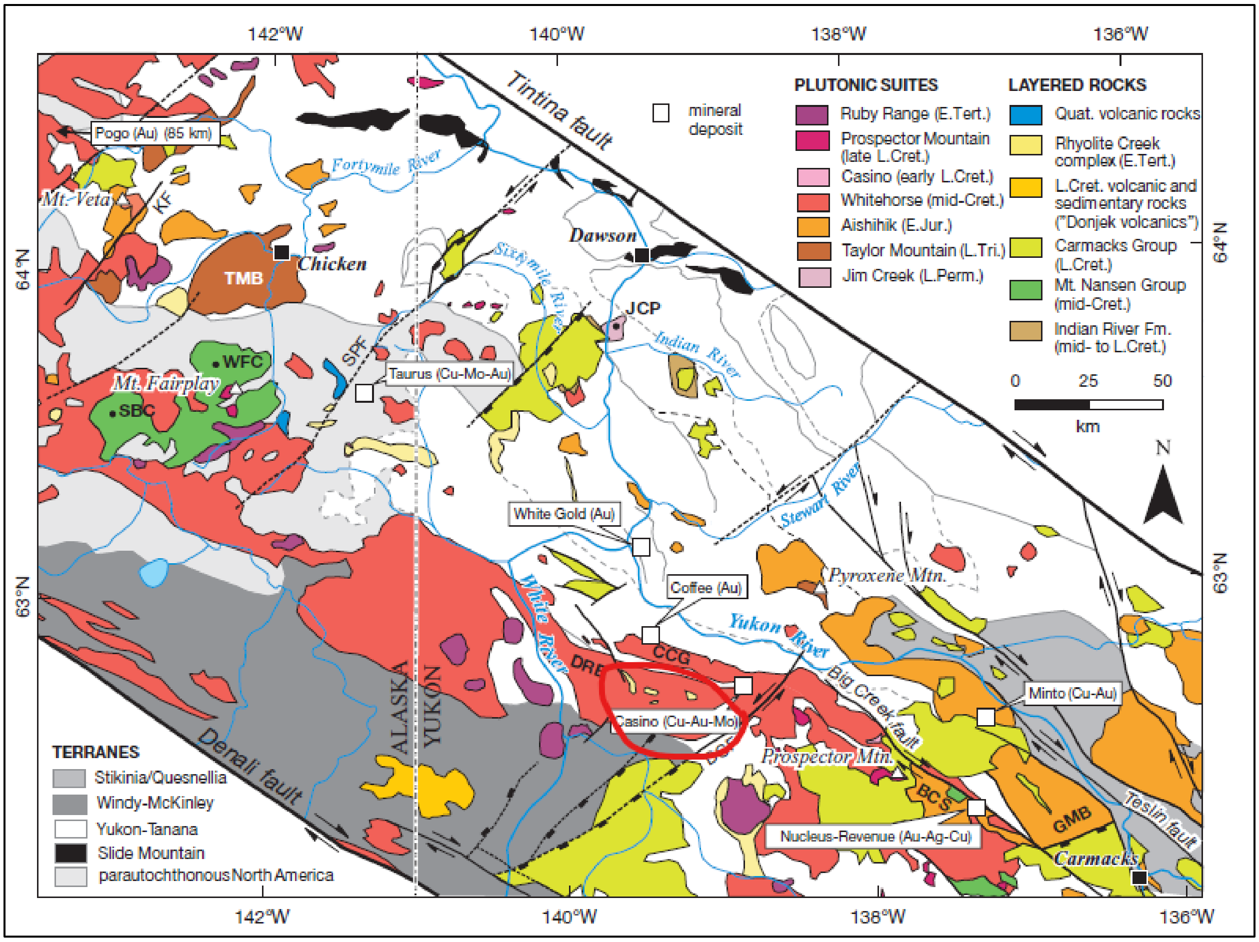

Figure 1 Regional Geology of project area, approximately outlined in red (from Allan et al., 2013).

The plutonic rocks of interest to this project include the Casino (early L. Cret.); Prospector Mountain (late L. Cret.); Whitehorse (mid-Cret.); Ruby Range (Palaeogene); Aishihik (E. Jur.); and Pyroxene Mountain (L.Tri) suites (Allan et al., 2013; Fig. 2). The volcanic rocks of interest include the Rhyolite Creek complex (Palaeogene); Carmacks Group (L. Cret); and Mt. Nansen Group (mid-Cret.) (Allan et al., 2013; Fig. 2). The ages of these intrusive suites are summarized in Figure 3 and a comprehensive update and review of Jurassic magmatism is given by Sack et al. (2020). The key ages relevant to this project are the Casino Suite (~72-79 Ma) (Allan et al., 2013), Prospector Mountain Suite and Carmacks Group (70-68 Ma) (Joyce et al., 2015; Yukon Geological Survey, 2020), Rhyolite Creek Assemblage (~64-54 Ma) (Yukon Geological Survey, 2020). The mid-Cretaceous Whitehorse Suite in this area occurs as: the Dawson Range Batholith (~107-100 Ma, Figure 1), which can show local evidence of deformation; and the undeformed, smoky-quartz bearing Coffee Creek granite (~100-99 Ma) (Godwin, 1975; Ryan et al., 2013; Allan et al., 2013).

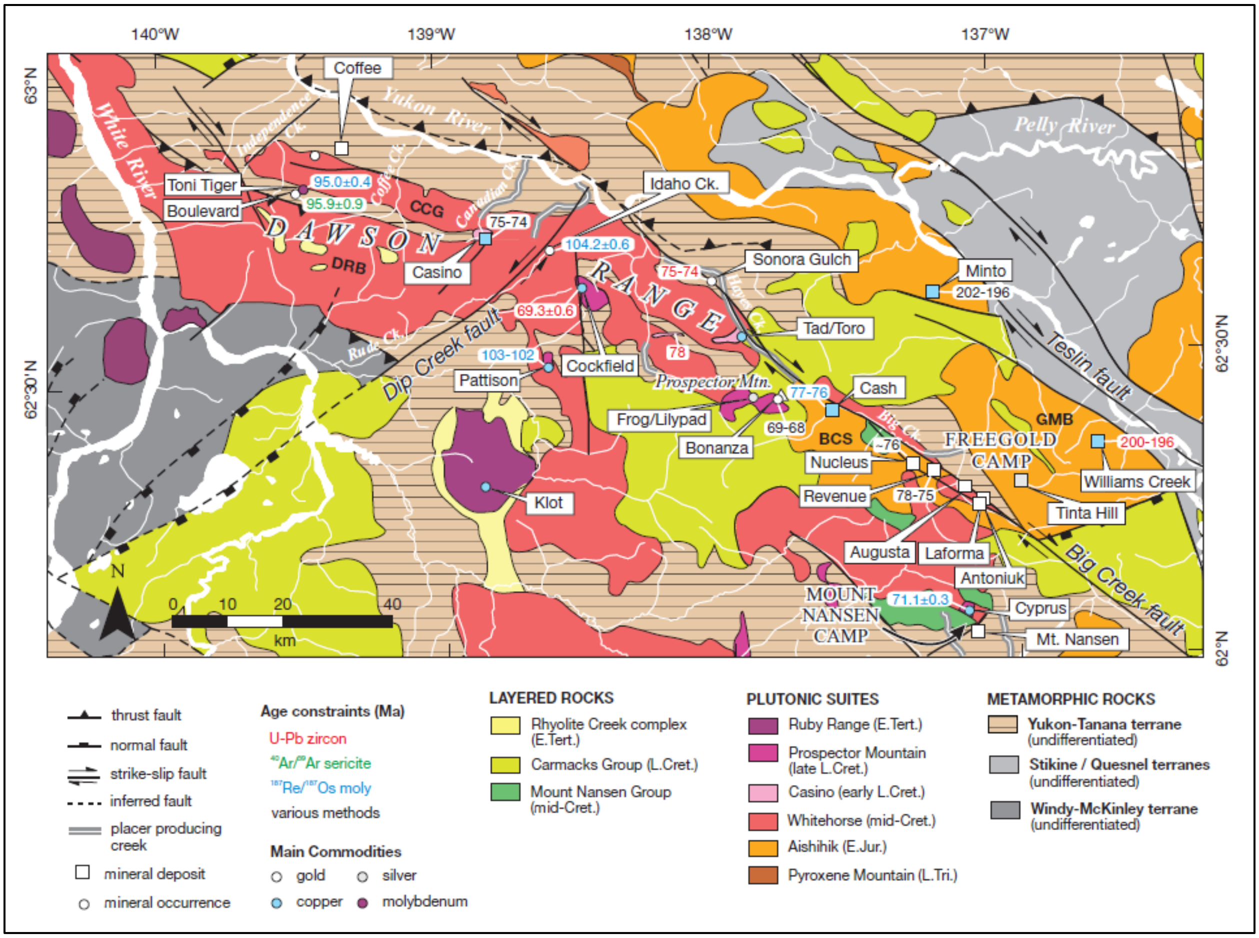

Figure 2 Volcanic and plutonic rocks of interest within the Dawson Range, significant mineral deposits and ages of mineralization (from Allan et al., 2013).

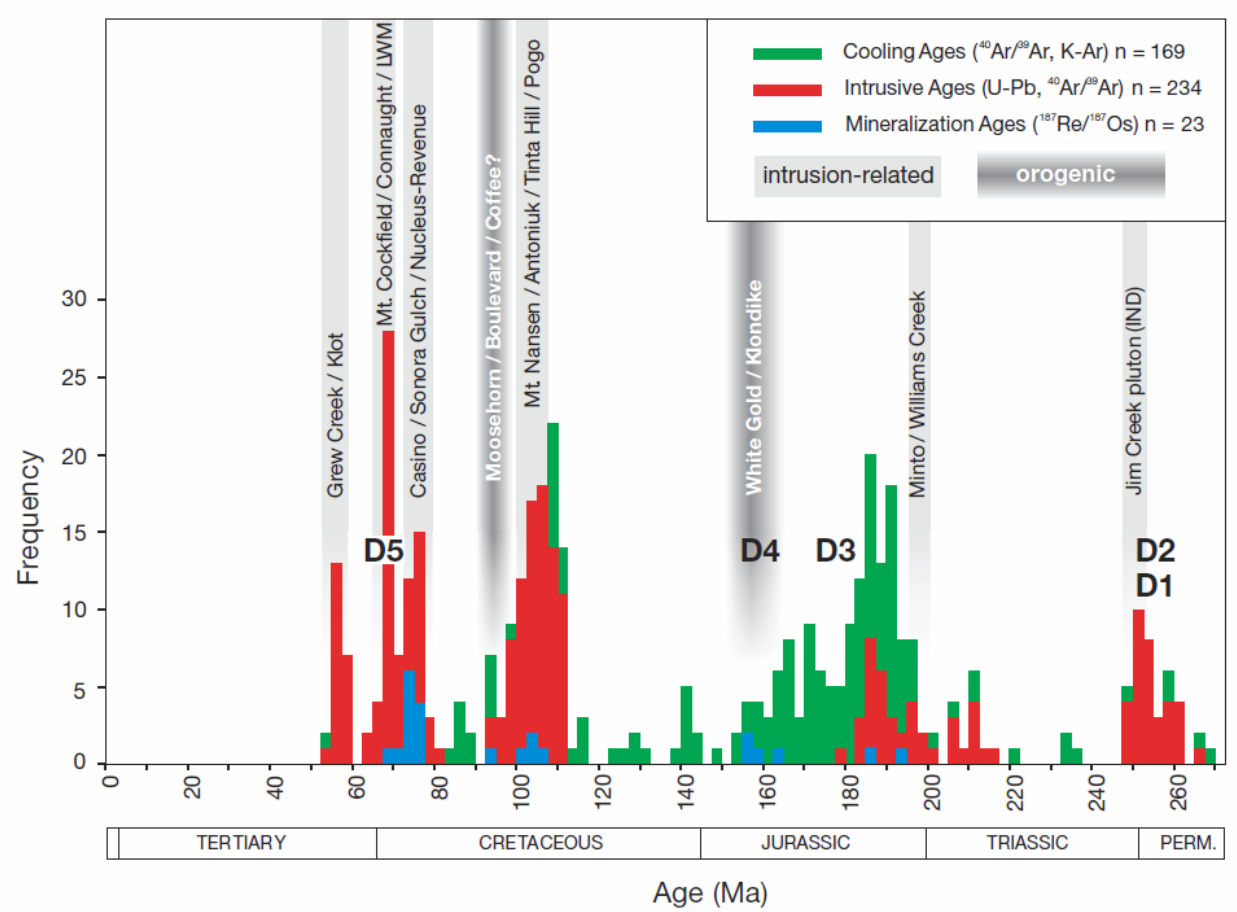

Figure 3 Age summary of intrusive events, mineralization, deformation and cooling ages of the Yukon-Tanana terrane from Allan et al. (2013).

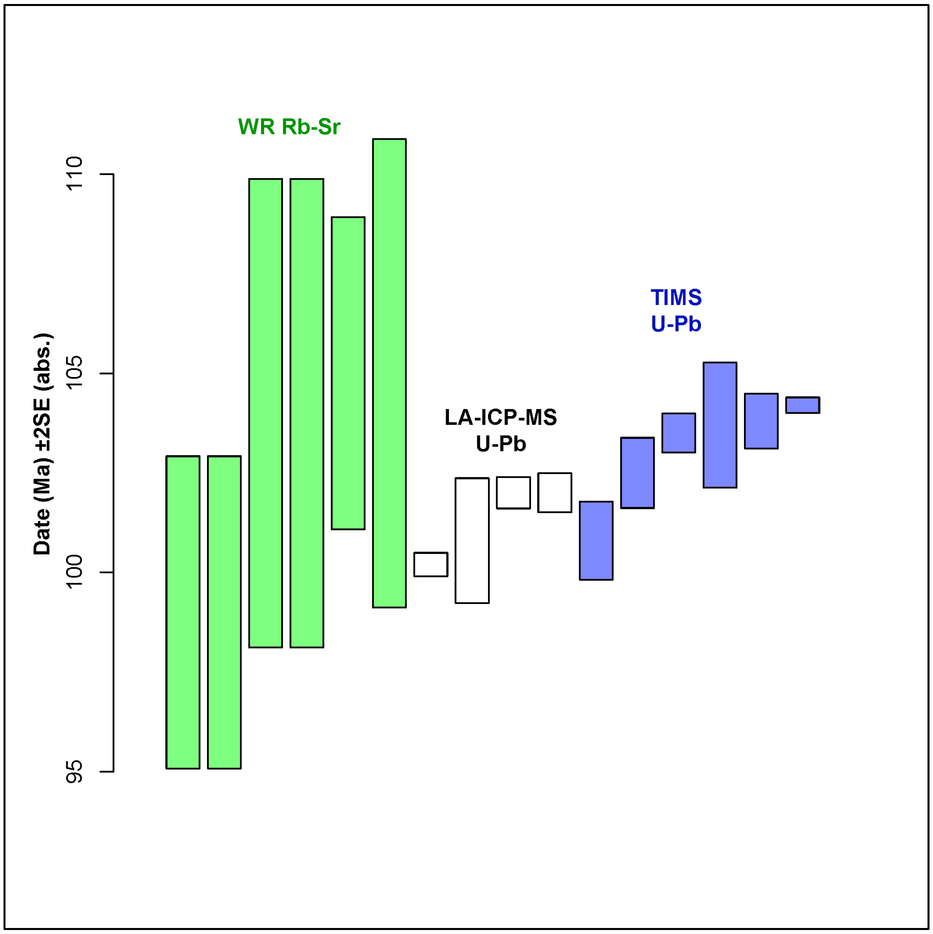

Figure 4 U-Pb zircon dates and whole rock Rb-Sr dates for the Dawson Range Batholith (data from Yukon Geological Survey, 2020).

DEPOSIT TYPES

The area is being targeted for early-Late Cretaceous porphyry Cu-Au-Mo-Ag mineralization associated with the ~78-72 Ma Casino Suite intrusive rocks such as that found nearby at the Casino deposit (Casselman and Brown, 2017).

The area is also prospective for gold mineralization similar to that found at the nearby Coffee deposit.

SAMPLING AND EQUIPMENT

Samples of 0.8 to 3.8 kg of fine sediment were collected from the banks of streams or in areas of slack water by hand and placed in pre-labelled hubco sentry bags, in locations where fine sediment was available for sampling.

Bulk samples were taken from the active channels of streams with a shovel and were screened with a 1/12" metal mesh sieve over a 5-gallon plastic bucket lined with a pre-numbered polyethylene sample bag (Figures 5 and 6; cover photo). Coarse material ranging from coarse sand through pebbles to cobbles was targeted from a selection of point locations at each site to ensure that the full range of grain sizes were sampled equally across different bedforms. Between 7.2 and 14.8 kg were collected in each sample (10 kg was targeted). A plastic gold pan was used to scoop water from the creeks to wet sieve the samples. Excess water was carefully tipped out of the buckets after a brief period of settling, ensuring that no silt to sand sized sediment was lost during the process. Sample locations were recorded using a hand-held GPS (Garmin GPSMAP 64s). Notes, and back-up sample locations were taken with an iPad using the FieldMove app and an external Bluetooth GPS (Garmin GLO). Sample collection procedures were broadly aligned with the GSC protocols for bulk sample collection established by Friske and Hornbrook (1991), described in Day et al. (2013) and implemented in a study of PIMS around the Casino deposit by McClenaghan et al. (2020).

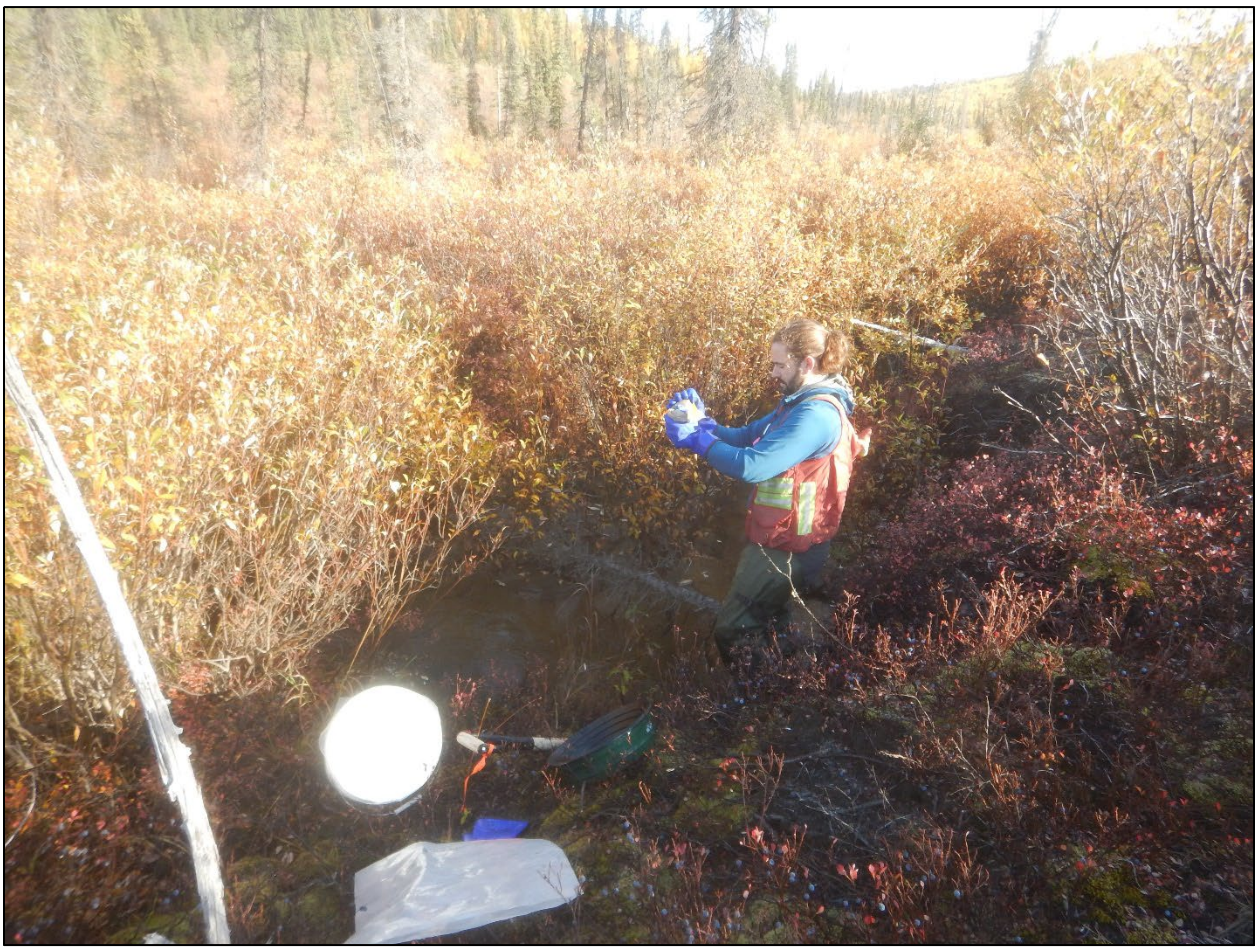

Figure 5 Sample site 21JM003 showing typical sampling environment and equipment.

Sampling was carried out by Jack Milton and Quintom Willms in September, 2021. Access to sampling locations was via Fireweed Helicopters MD520 to within ~200 metres of each sample site, then on foot to the sampling site.

Figure 6 Sampling site 21JM008 with sampling equipment.

Each sampling site was number using the scheme 21JM0XX where XX ranged from 02 to 12. All silt samples were suffixed by an 'S' and all bulk stream sediment samples were suffixed by a 'B'. One bulk and one silt sample were taken from each sample site, focusing on sandy versus silty sediment at each site, respectively.

Soil samples were numbered 21SXXX where XXX was as three-digit number.

All bulk/silt sample locations are shown on Figure 11 and can be found in digital appendix 1.

EXPLORATION METHODS

Silt Geochemistry

Silt samples were driven from Dawson City to Whitehorse and submitted to Bureau Veritas preparation laboratory. Samples were dried at 60°C and sieved to -230 mesh (grain size of less than 63 microns). Samples were digested in 1:1:1 aqua regia and analyzed by ultratrace ICP-MS (BV package AQ252).

Soil Sampling

Soil samples were taken using a hand-dug pit and targeted B-horizon soils. If no B horizon was present, a sample would be taken from the C horizon. Care was taken to avoid loess or volcanic ash contamination where possible. Samples were placed in Kraft paper bags and sent to BV for drying at 60C, sieving to -80 mesh, aqua regia digestion and ultratrace ICP-MS analysis (BV packages SS80 and AQ252).

Porphyry Indicator Mineralogy (PCIM)

Bulk samples were driven to Whitehorse, packed in to 5-gallon buckets and shipped via Manitoulin Transport to Overburden Drilling Management, Nepean, Ontario where the samples were processed for PCIMs, gold, and zircon (Figure 7). A ~300 g archival split is taken for each sample, then the sample is passed across shaking tables for gravity concentration and dry sieved to 0.25 mm. The heaviest fraction is micro-panned for gold, zircon and metallic grains. The table concentrate is passed through heavy liquids to separate a >2.8, g/cm^3 specific gravity fraction and the >2.8 SG material and the coarse fraction treated with an oxalic acid wash to aid picking and logging then dry sieved to 0.25 mm. The coarse fraction ferromagnetic grains are removed by magnetic separation and the non-ferromagnetic grains are further separated into SG 2.8-3.2 and >3.2 g/cm^3 fractions by heavy liquids. The remaining material is sieved to 0.25-0.5 mm, 0.5-1.0 mm and 1.0-1.7 mm size fractions. The SG >3.2 fraction is further separated into strongly, moderately and weakly paramagnetic fractions and nonparamagnetic fractions by currents of 0.6, 0.6-0.8, 0.8-1.0, and >1.0 amps, respectively. All fractions and splits are vialled and archived or used for picking PCIMS, metallic grains, zircon, and gold grains under a binocular microscope by an experienced picker. Grains of unknown or equivocal composition are checked using a scanning electron microscope (SEM). Representative grains are picked and vialled for PCIMs of interest, and all gold grains.

Only selected samples were run for PCIM. For the samples that were not run for PCIM, a zircon-rich separate was produced for geochronology by tabling and micropanning. This separate was examined for gold grains and gold grains were logged and identified, where present, for every sample.

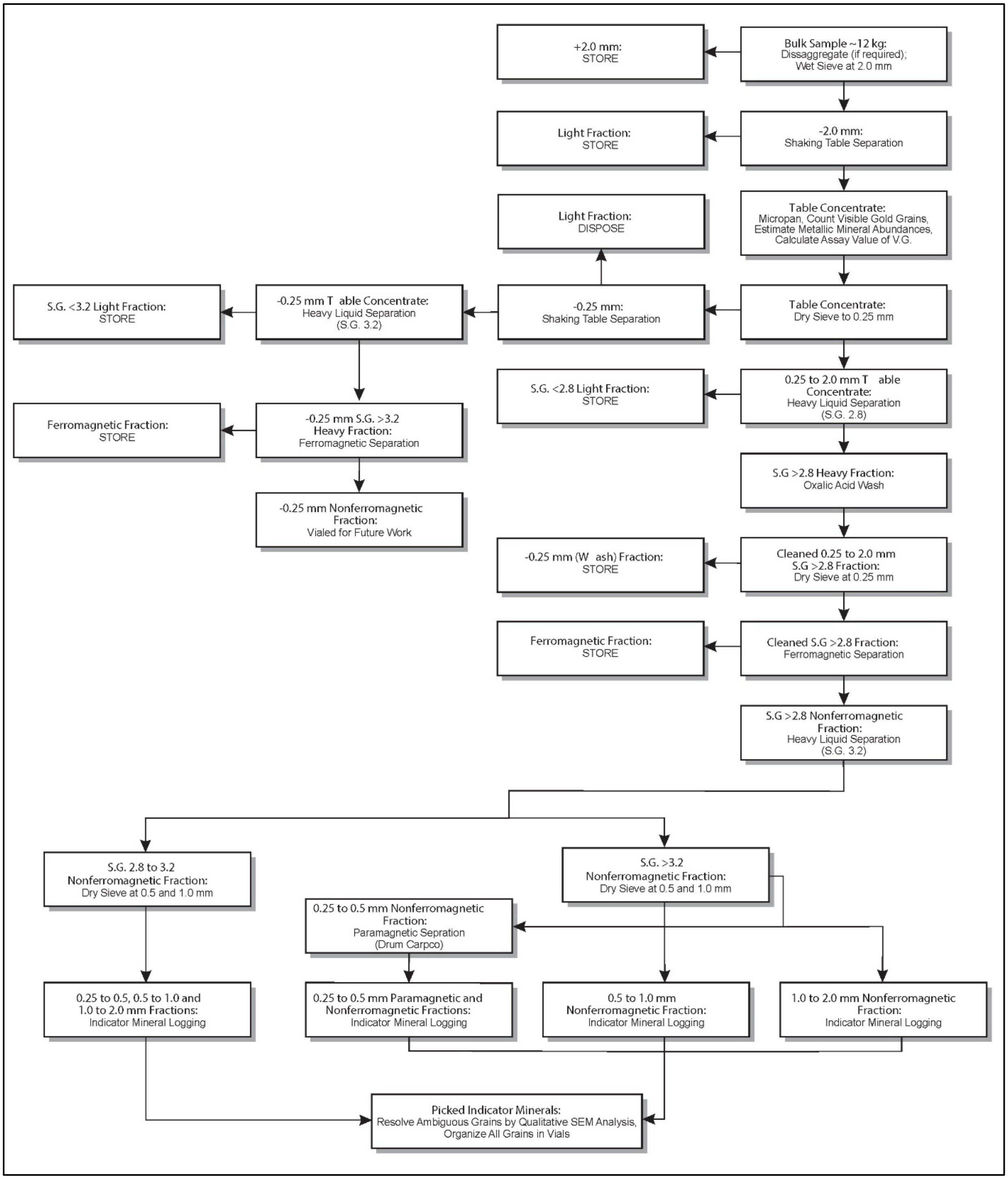

Figure 7 Processing methodology for heavy mineral concentration, gold, metallic and PCIM grain separation (from McClenaghan et al., 2020). Zircons were mostly recovered from the micropanned table concentrate in the <250 micron size fraction. Coarser zircons were recovered in the non-paramagnetic S.G.>3.2 fractions.

Zircon Texture

Zircon grains of interest were examined under the SEM and an electron microprobe mounted cathodoluminescence (CL) system. The CL imaging was employed in order to examine zircon textures, as this has been shown to correlate well with zircon fertility (Bouzari and Hart, 2019; Bouzari et al., 2020). The CL work was carried out at the University of British Columbia Okanagan campus at the Fipke Laboratory for Trace Element Research (FiLTER).

Zircon Geochronology and Chemistry

Zircon rich concentrates <~0.25 mm were sent from ODM to FiLTER UBCO for picking, mounting in epoxy pucks, and polishing. The zircon grains were then dated by LA-ICP-MS and simultaneously analyzed for trace element chemistry, including Ti, U, Th, Pb, REE, Ca, P, Zr, Ta, Hf, Y, and Nb. The spot size was 20 microns for regular runs and the instrument used was an Agilent 8900 triple quadrupole ICP-MS equipped with a NWR 193 laser with TV3 sample chamber. Some re-runs were conducted with a 30 micro spot size. Re-runs omitted Nb, Tb, Ho, Tm, and Ta in order to increase integration times on the LREE. Full instrument settings given in digital appendix 4. Standards were measured for trace elements (610 standard), U-Pb dating and trace elements (91500 standard) and U-Pb dating (Plesovice standard).

Additional grains were sampled from 2020 samples in order to provide more robust sampling statistics for the target areas. Re-runs on individual grains refer to grains of interest being re-visited for additional spots after the first round of analyses.

RESULTS

Silt Geochemistry

The gold content of the samples ranged from 2.1 to 11.3 ppb (Figure 8), generally low values. Molybdenum was anomalous in sample 21JM002S (2.15 ppm) and sample 21JM012S (1.61 ppm). No other elements were deemed anomalous including Cu, Ag, Pb, Zn, As, Bi and Sb. Full results listed in digital appendix 2.

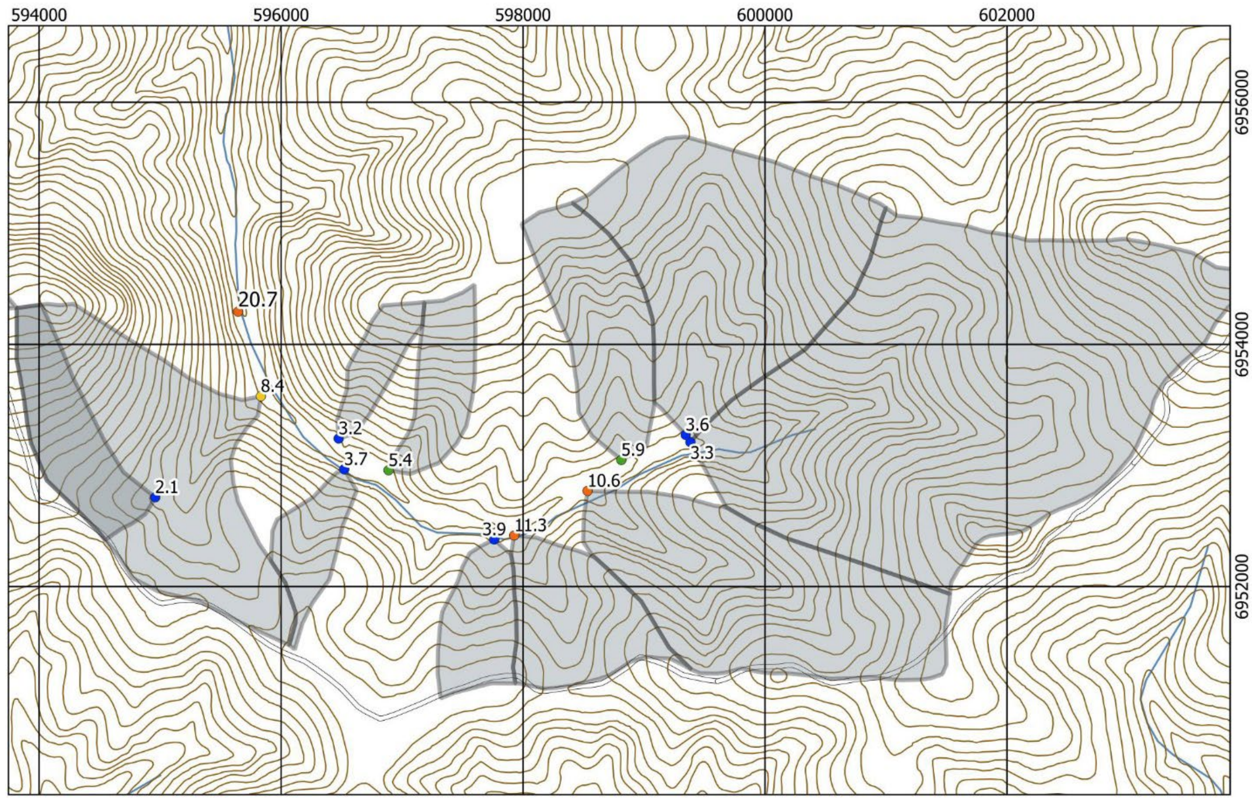

Figure 8 Fine fraction (less than 63 microns) stream sediment aqua regia ICP-MS gold results (ppb). Sample 20JM001S 20.7 ppb Au shown from 2020 program at head of the drainage. Drainages shown in grey. UTM7 2x2 km grid for scale. North is up the page.

Porphyry Indicator Mineralogy

Full data, weights, and picked minerals are listed in digital appendix 3.

All samples were examined for gold grains and at least a few gold grains were detected in all samples barring 21JM003B (Figure 9). The most strongly anomalous samples were nested in the same drainage, 21JM011B and 21JM012B, yielding 26 and 17 gold grains respectively, both including pristine shaped gold grains, inferred not to be affected by significant erosion and being located close to their bedrock source.

Zircons in the panned concentrated were abundant in all samples and ranged from an estimated 4,000 to 25,000 grains.

Porphyry copper indicator minerals were logged for 21JM002B, 21JM003B, 21JM011B and 21JM012B. Counts were generally low for all samples, however traces of chalcopyrite and supergene goethite were identified in 21JM002B and 21JM003B. Scheelite was also found in 21JM003B and 21JM011B. Scheelite is a favourable indicator, as tungsten minerals ferberite and scheelite are found in the Canadian Creek placer immediately below the Casino deposit (Bostock, 1959). Grossular was recovered in substantial quantities (100s to 1000s of grains) from samples 21JM003B, 21JM011B and 21JM012B; these high garnet concentrations are likely sourced from Yukon-Tanana schists and gneisses. Owing to the presence of these metamorphic rocks, garnet is not a useful indicator of porphyry mineralization in this district.

No mid density porphyry copper indicator minerals were found in any samples. The mid density particles consist mainly of coarse-grained hornblende and hornblende with attached plagioclase, epidote-altered plagioclase and minor goethite.

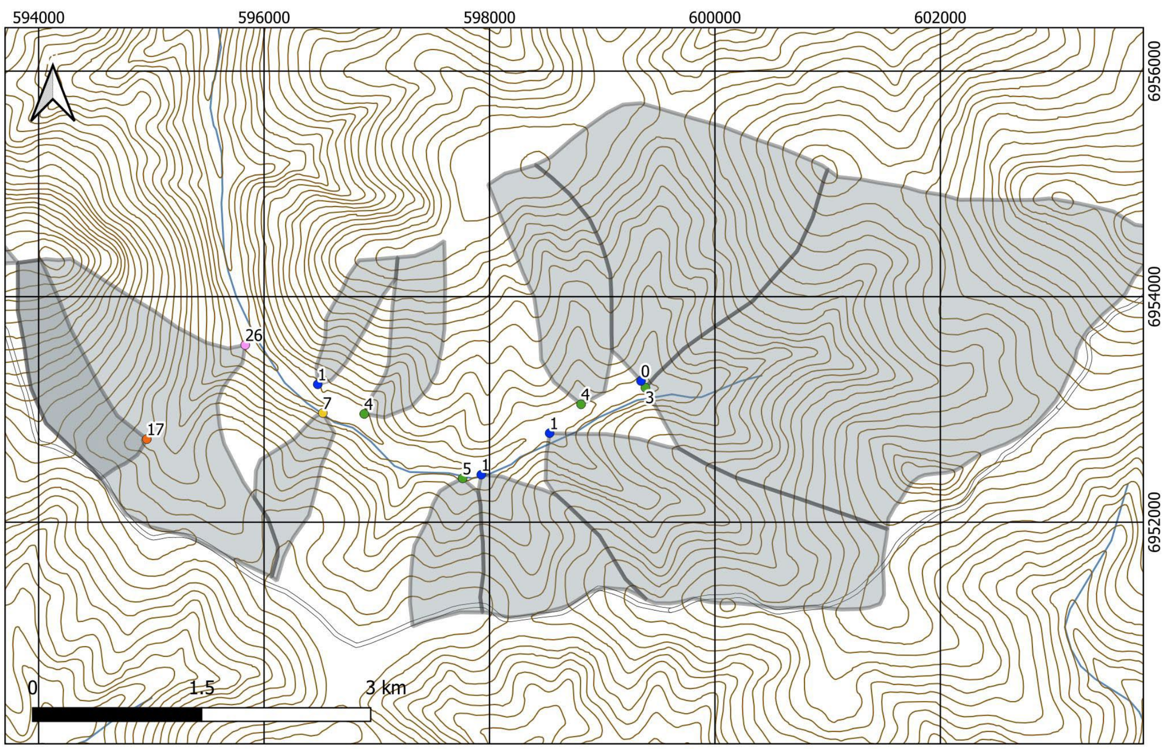

Figure 9 Total number of gold grains logged in bulk samples for each drainage (grey polygons).

Soil sampling

A total of 14 soil samples were taken opportunistically whilst prospecting. A single sample returned 237.8 ppm Cu and 11 ppm Mo at the site where the helicopter landed on the ridge. Here, soils were well developed, and good samples were taken. To the east on the tree covered slopes, a thin soil containing much grey silty loess was developed on top of pebble to cobble size rocky colluvium that may represent a buried talus slope. Samples taken in this material are likely strongly diluted by loess and do not represent the underlying bedrock if the soils are developed on top of a talus field. Deeper soil pits or hand trenches are recommended to determine the nature of this cover.

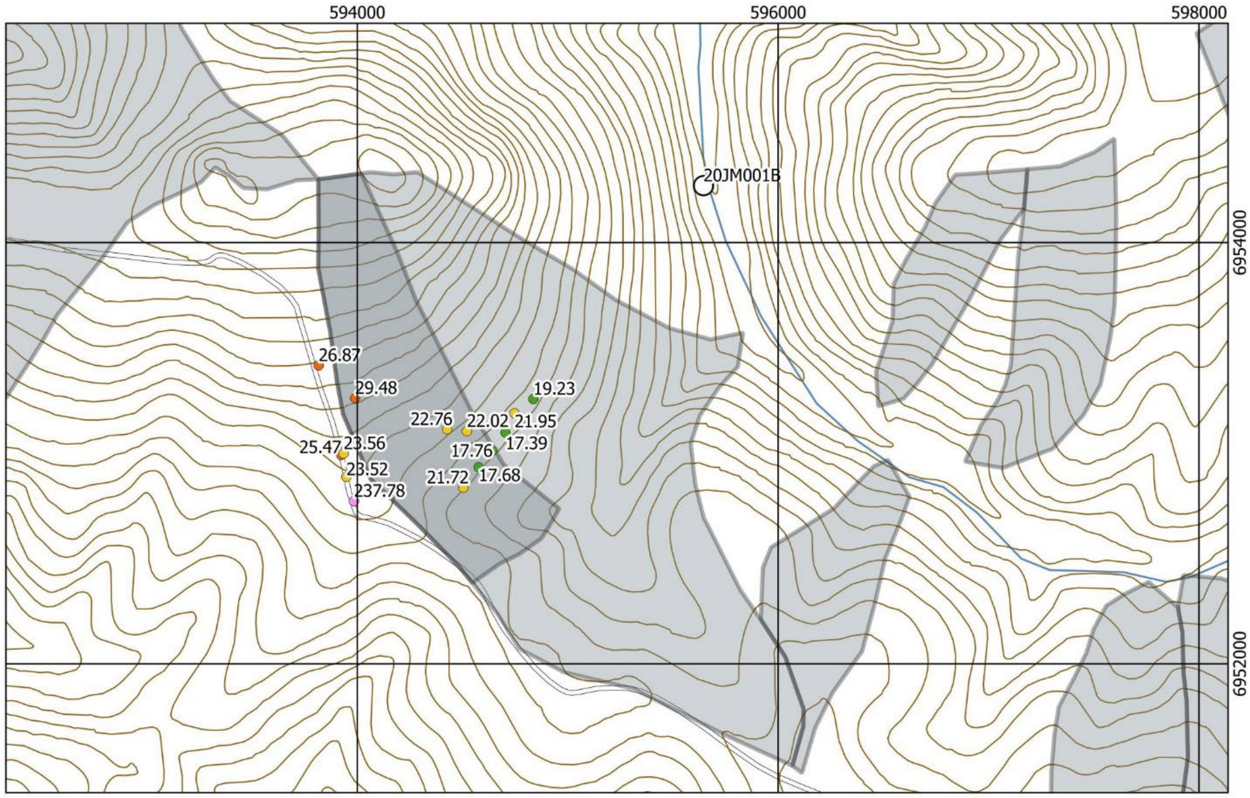

Figure 10 Copper in soil results (ppm aqua regia ICP-MS). 2x2 km UTM7 grid for scale. North is up.

Historic drill core

While prospecting, the location of some historic drill core in moderate to poor condition was noted at [593,936-6,952,984] (NAD83UTM7N). This likely correlates with hole CC-1 drilled by Amoco Petroleum in 1976. A few photographs were taken of the core and these are included in Digital Appendix 6. No further investigation was made of this core. More core was spotted from the air at approximately [594,200-6,952,697], likely hole CC-2.

Zircon Geochronology

Zircons were dated from each bulk sample. All dates reported in the text are $^{206}Pb/^{238}U$ dates corrected for common lead by the Stacey and Kramers method and errors are reported as absolute two standard errors of the mean dates. A total of 777 analyses were carried out, including single spots and multiple spots on each grain. Full sample data can be found in digital appendix 4. Unless otherwise stated, all spots were aimed at the centre of the zircon grain. Spot locations for re-analyses are shown in Appendix 4. Weighted mean ages are presented in Figures 12 to 22, however these do not represent crystallization ages of the rock suites from which they are derived. The intrusive suites and volcanic rocks considered are likely comprised of a range of different intrusions that may have crystallized throughout a prolonged span of magmatic or volcanic activity, and within each igneous phase there may be antecrystic or xenocrystic zircons that yield dates older than the age of magmatic crystallization or volcanic eruption. Detrital zircons in recent stream sediments are a mix of all zircon-bearing lithologies contained within the drainage, and therefore may represent a mix of different age igneous rocks. At best, the weighted means should be considered an average of the intrusive age of rocks within the considered fraction of the zircon sample population, but the precision is not meaningful. Weighted mean plots show ages included in the mean as green, outliers not included in the mean as blue or open boxes, and potential Casino Suite zircons in red. All ages are shown with 2SE and only zircons between 50 and 300 Ma are plotted for clarity. All zircon data can be found in Appendix 4.

Attempts are made to trace zircons back to bedrock sources within each drainage, by relating zircon dates to intrusive suites and other rock types that are well known across SW Yukon (for reviews see Allan et al., 2013; Sack et al., 2020). In many cases, suggestions are put forth for occurrences of unmapped units within each drainage, however it is recognized that any of the zircons could have a xenocrystic origin and may not indicate the presence of the suggested unmapped rock units in the drainage.

All bulk sample locations and the areas of drainages are shown on Figure 11.

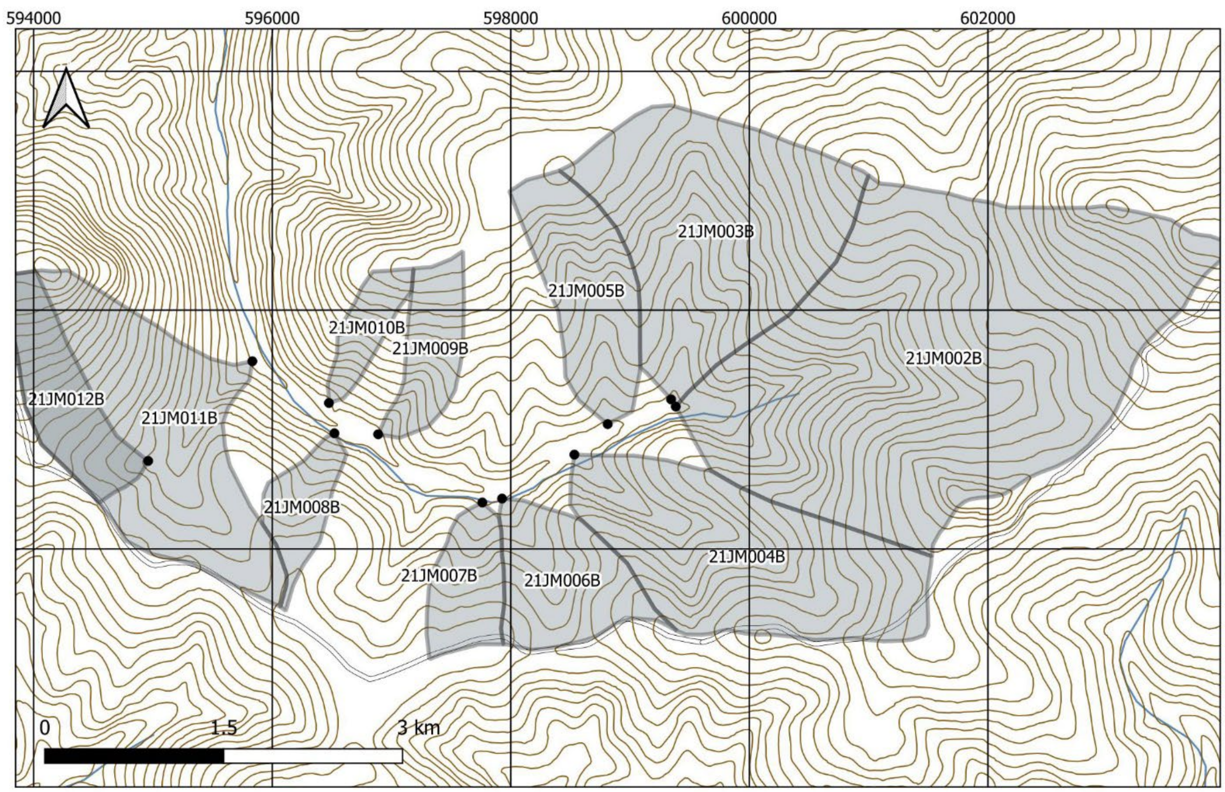

Figure 11 Locations of all bulk sample drainages and sample sites.

ADDITIONAL ANALYSIS OF 2020 SAMPLES

Prior to the 2021 field program, additional grains were analyzed from samples 20JM001B, 20JM003B and 20JM006B from the 2020 YMEP project 20-116, in order to confirm anomalous drainages with better sampling statistics. 64 grains were dated from 20JM001B and no additional Casino Suite zircons were identified. 61 grains were dated from 20JM003B yielding two grains at 66.7 Ma and 67.6 Ma with a re-analysis confirming dates of 61.8 and 66.9 Ma, respectively, showing a Prospector Mtn age. In addition, two grains from 20JM003B returned dates of 70.7 and 77.1 Ma with additional analyses confirming dates of 69.2 and 81.4 Ma, respectively, showing one grain of Prospector Mtn age and one of inconsistent but likely Casino Suite age. 124 grains were analyzed from 20JM006B with four grains of interest at 70.6, 73.8, 73.4 and 71.4 Ma re-analyzed at 68.7, no analysis, 71.9 and 69.6 Ma, respectively, showing Prospector Mtn age zircons in this drainage. All analyses listed in full in Appendix 4.

EXPLORATION BULK SAMPLE DETRITAL ZIRCON RESULTS

The vast majority of the zircons dated in this exploration project yielded ages associated with the Dawson Range Batholith ~110 Ma or Coffee Creek Granite ~100 Ma, as this is the dominant bedrock lithology in the area. Some zircons are older, particularly where zircons are being eroded from Yukon-Tanana metasedimentary rocks, and some older zircons may be inherited within igneous rocks. These ages are not further considered here, as they are not associated with the exploration target. Younger zircons (<~90 Ma) are considered, particularly those potentially derived from Casino Suite rocks (~80-70 Ma) and Prospector Mountain Suite rocks (~69-66 Ma) as either of these suites may be associated with porphyry Cu-Au-Mo mineralization. There is temporal overlap between Casino Suite and Prospector Mtn suite rocks. The Casino Suite is thought to be more highly prospective than the Prospector Mtn suite, so zircons yielding ages of ~80-72 Ma are considered better follow-up targets than those of a crossover, ~72-69 Ma age, or those from the Prospector Mtn suites ~69-66 Ma.

<u>21JM002B</u>

This drainage is 8.3 km^2 in area and 55 zircons were dated (Figure 12). One potential Casino Suite zircon was detected in this sample. The zircon was re-analyzed to show a ~76 Ma core with a ~69 Ma rim.

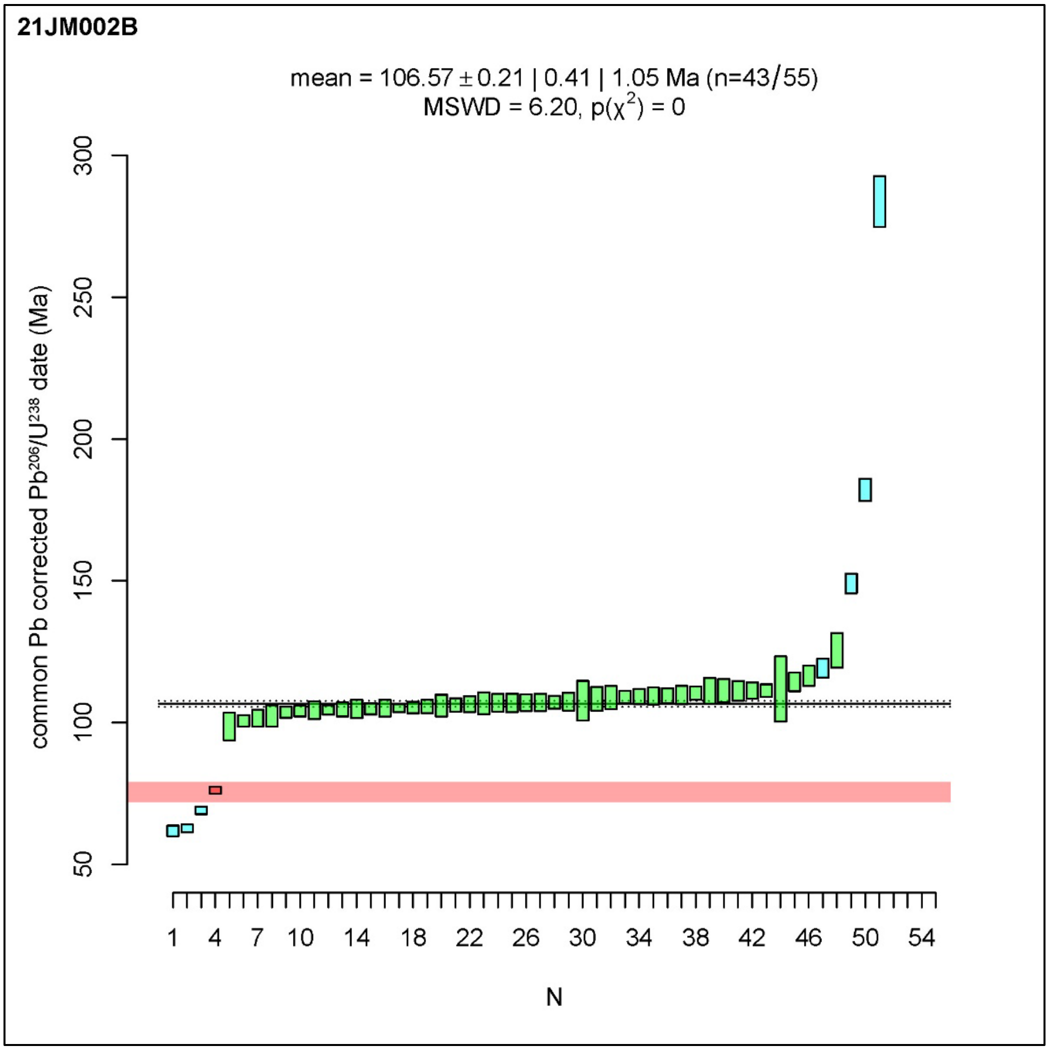

Figure 12 Weighted average age of Dawson Range batholith zircons detected in sample 21JM002B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM003B</u>

This drainage is 3.54 km^2 in area and 33 zircons were dated (Figure 13). No Casino Suite zircons detected.

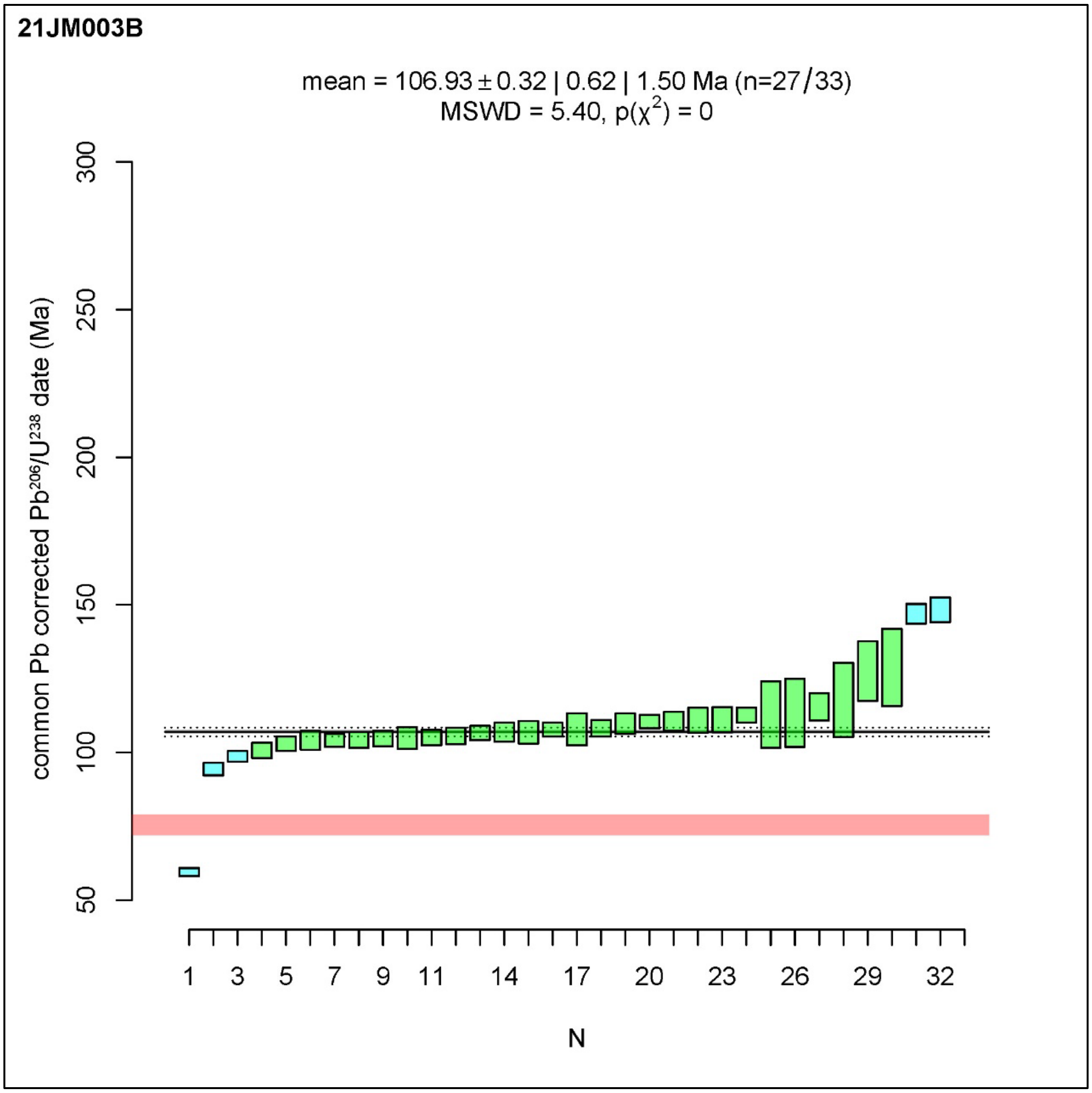

Figure 13 Weighted average age of Dawson Range batholith zircons detected in sample 21JM003B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM004B</u>

This drainage is 3.06 km^2 in area and 33 zircons were dated (Figure 14). One Casino Suite age zircon was dated and two follow up analyses on the same grain show a consistent Casino Suite age, yielding a weighted average date of 77.0 ±0.5 Ma. A single grain yielded a Palaeocene rim age of ~60 Ma.

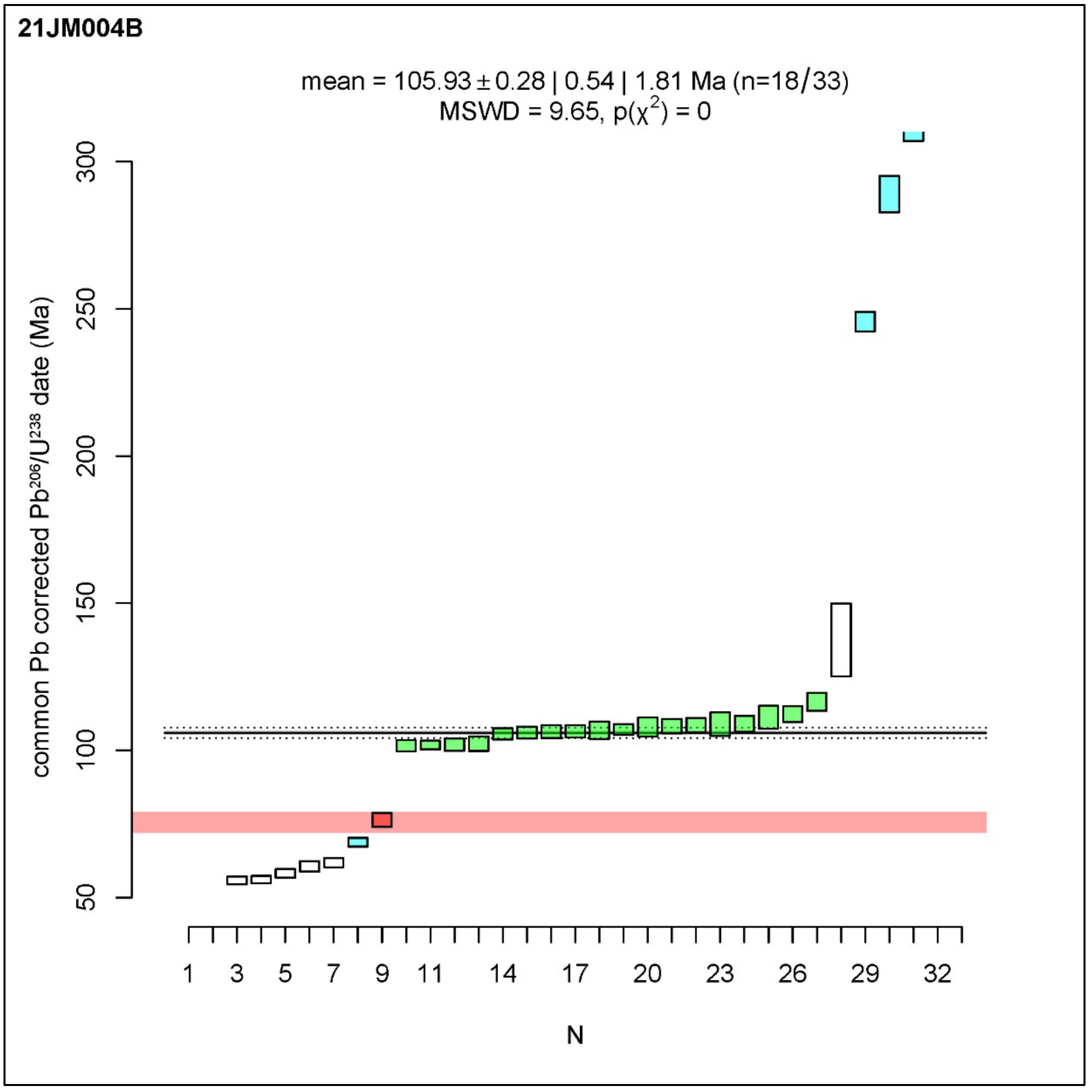

Figure 14 Weighted average age of Dawson Range batholith zircons detected in sample 21JM004B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM005B</u>

This drainage is 1.34 km^2 in area and 33 zircons were dated (Figure 15), a single crossover Casino/Prospector Mtn Suite grain was dated at ~70 Ma, but three additional analyses yielded ~105 Ma ages. The dates are concordant, so this may represent a lab mix up of samples, labels, or data between analytical sessions.

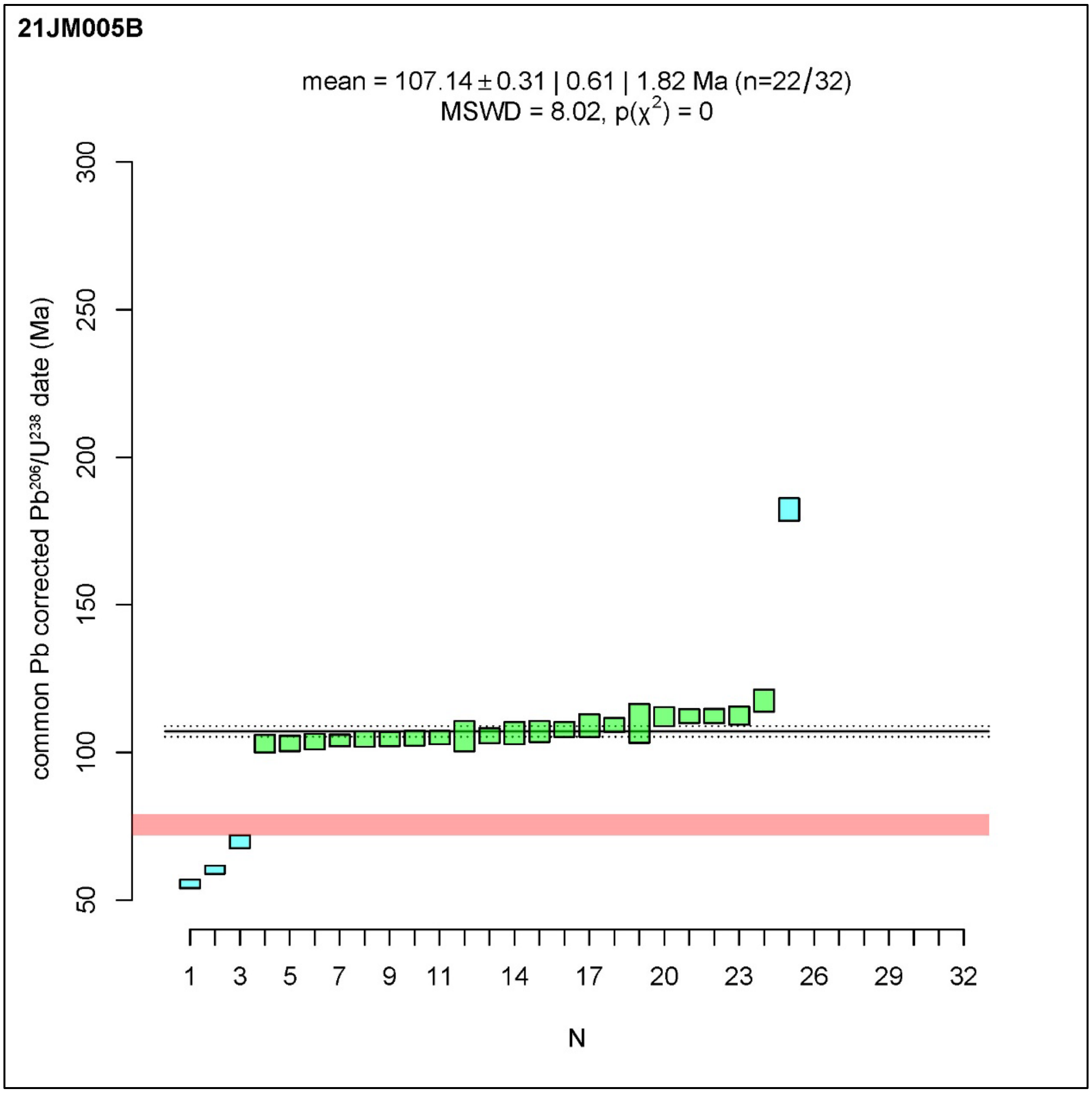

Figure 15 Weighted average age of Dawson Range batholith zircons detected in sample 21JM005B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM006B</u>

This drainage is 1.13 km^2 in area and 33 zircons were dated (Figure 16). A single zircon was dated with a total of four spots that returned an age of 68.3 ± 0.7 Ma, likely associated with Prospector Mountain Suite. One zircon returned a Palaeocene age.

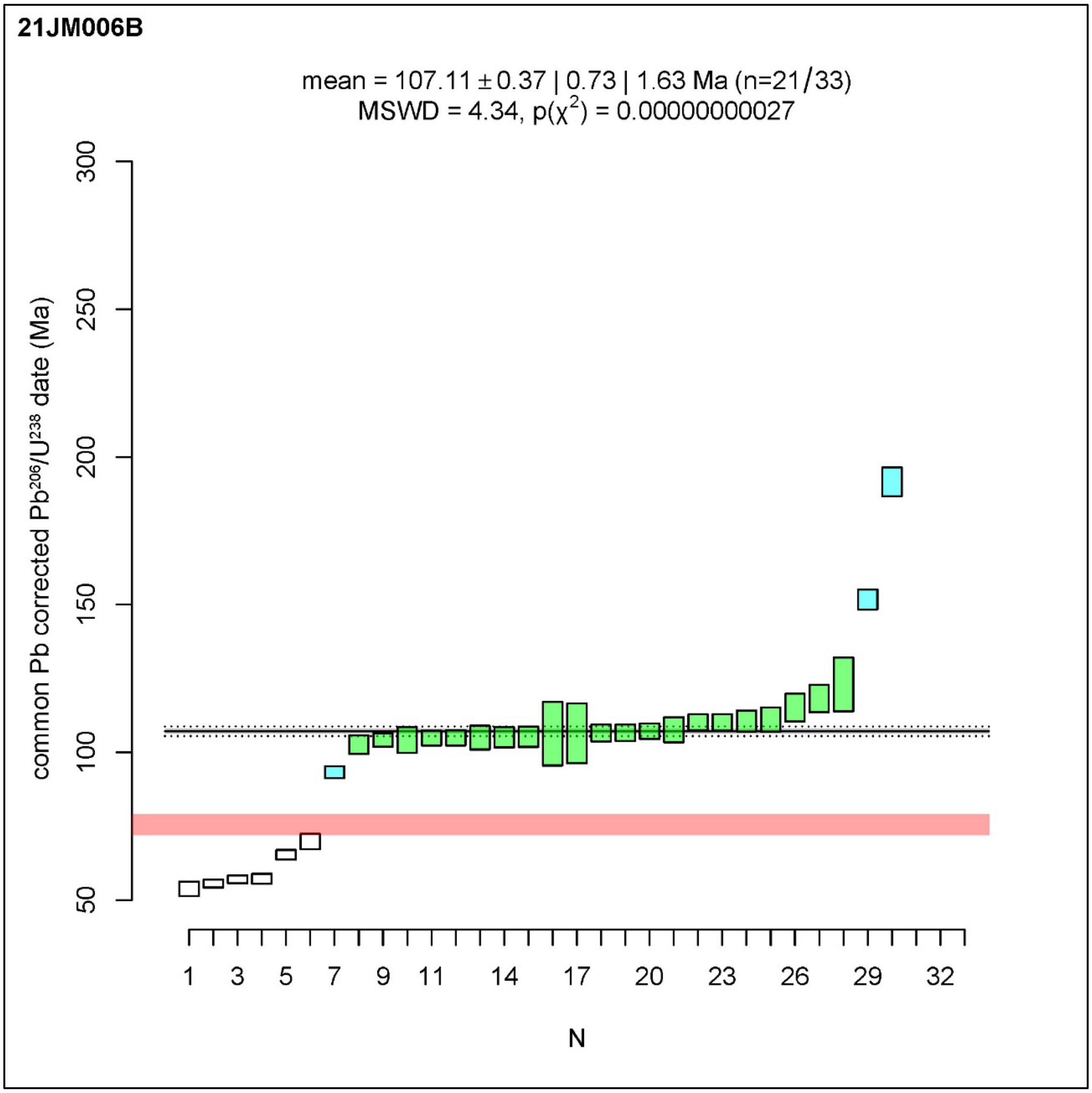

Figure 16 Weighted average age of Dawson Range batholith zircons detected in sample 21JM006B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

21JM007B

This drainage is 0.65 km^2 in area and 33 zircons were dated (Figure 17). No Casino Suite zircons were detected but some Palaeocene grains were dated.

21JM007B

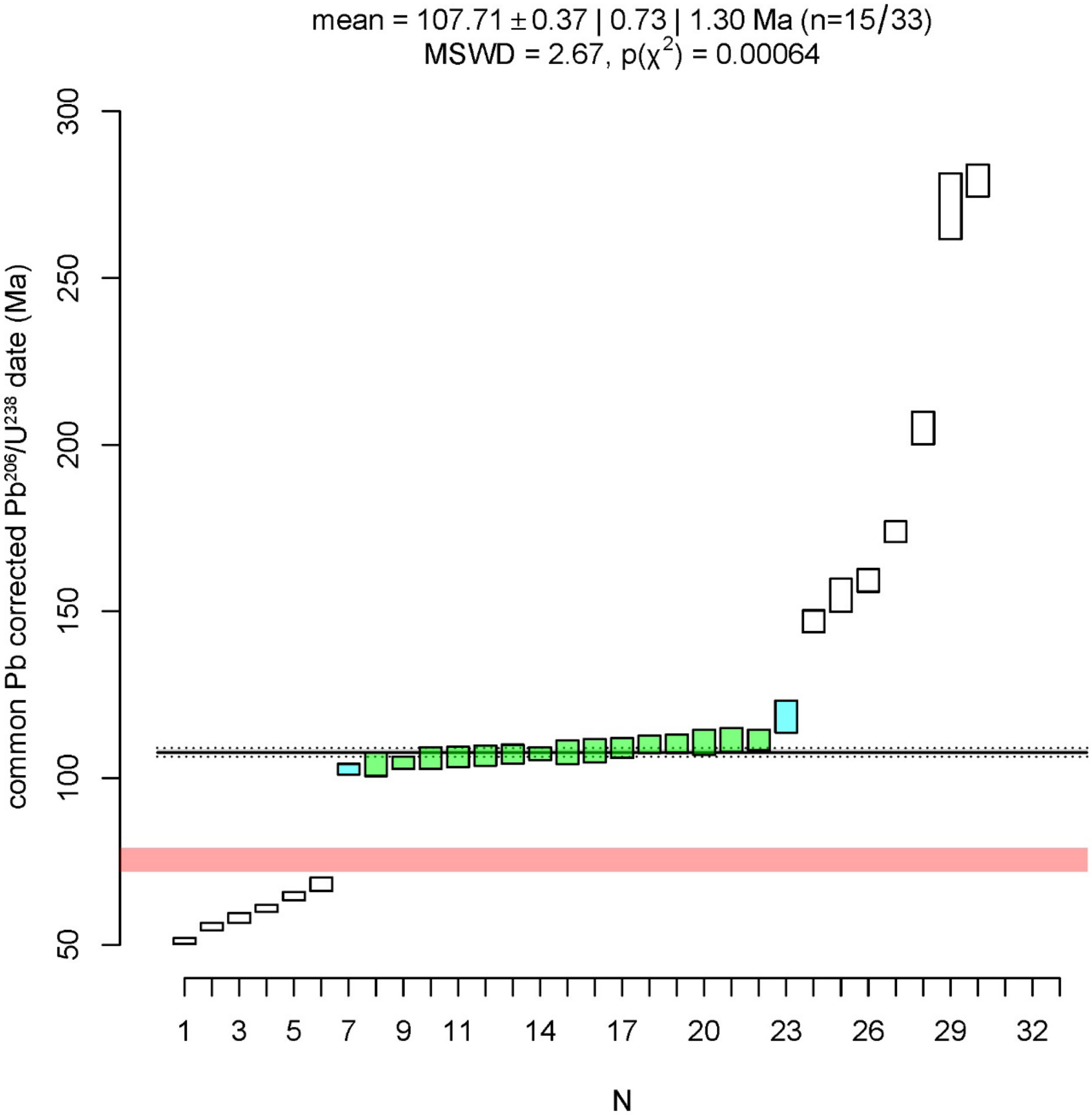

Figure 17 Weighted average age of Dawson Range batholith zircons detected in sample 21JM007B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM008B</u>

This drainage is 0.47 km^2 in area and 33 zircons were dated (Figure 18). One Casino Suite age zircon was detected at 71.5 ± 0.5 Ma and three Prospector Mtn age zircons yielded dates of ~69, ~67 and ~67 Ma. There is also a distinct population of 7 grains of late Jurassic age ~145-150 Ma.

21JM008B

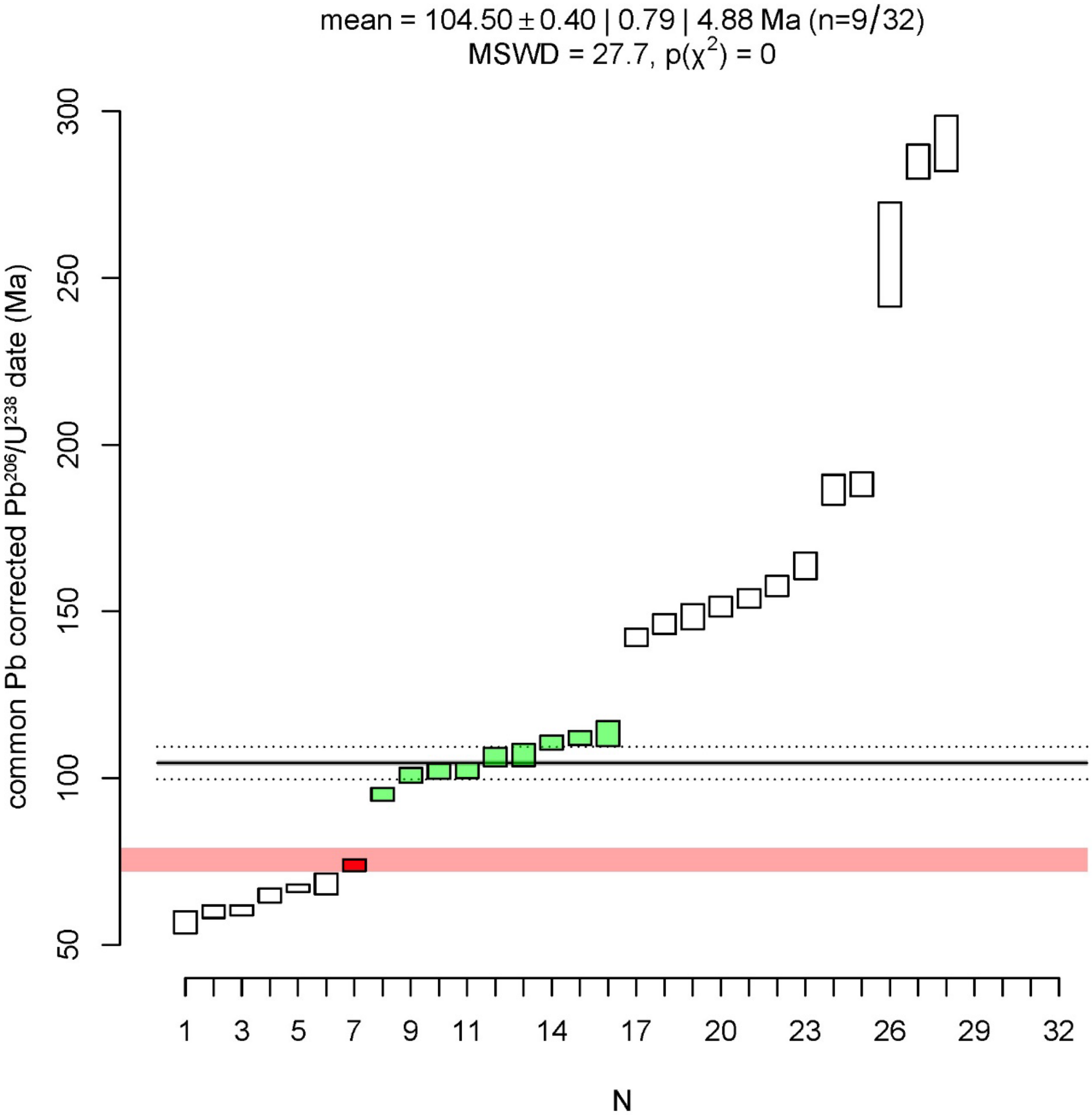

Figure 18 Weighted average age of Dawson Range batholith zircons detected in sample 21JM008B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM009B</u>

This drainage is 0.64 km^2 in area and 33 zircons were dated (Figure 19). One ~69 Ma Prospector Mtn age zircon was dated.

21JM009B

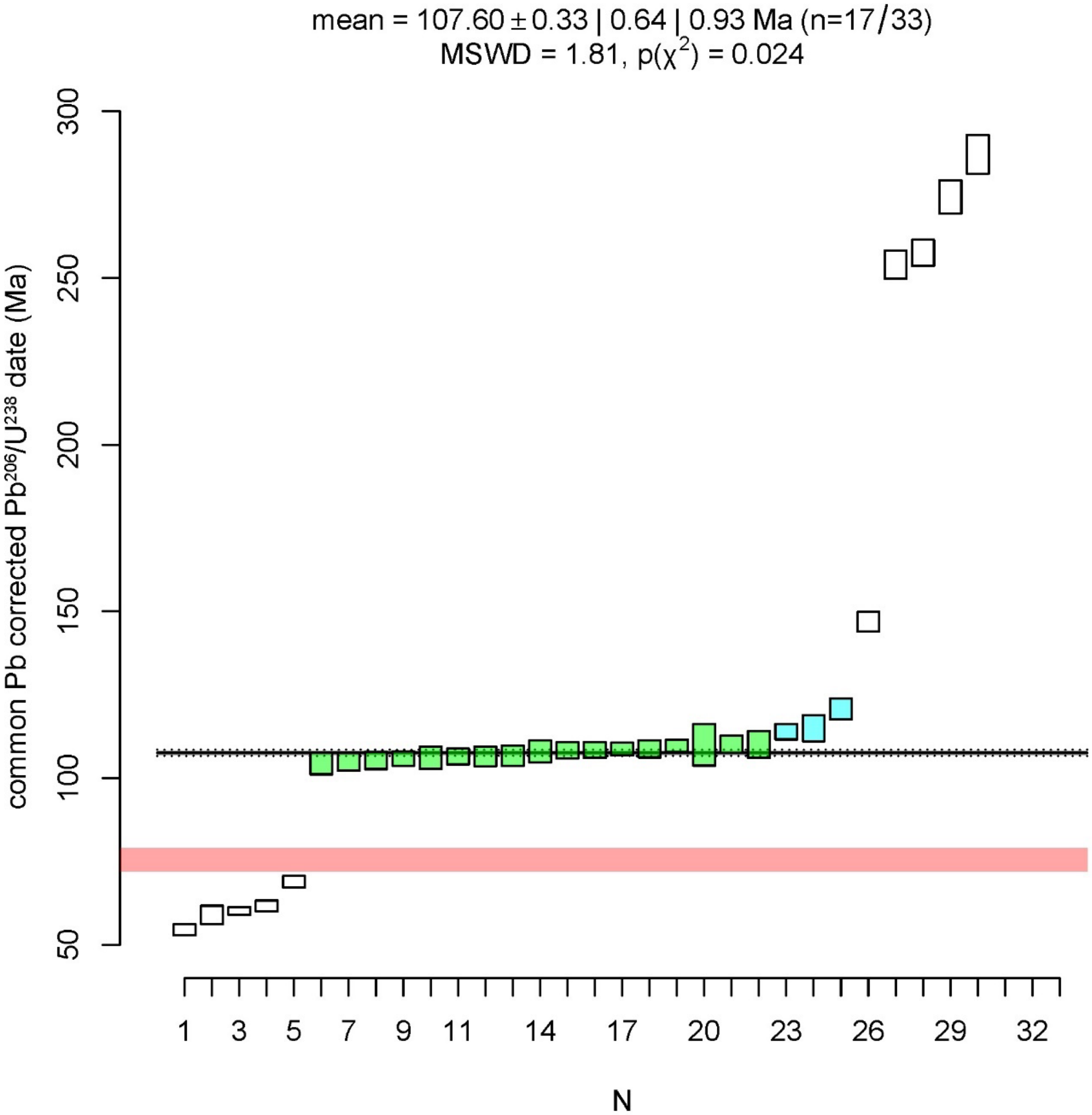

Figure 19 Weighted average age of Dawson Range batholith zircons detected in sample 21JM009B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM010B</u>

This drainage is 0.37 km^2 in area and 33 zircons were dated (Figure 20). Two Palaeocene zircons were detected.

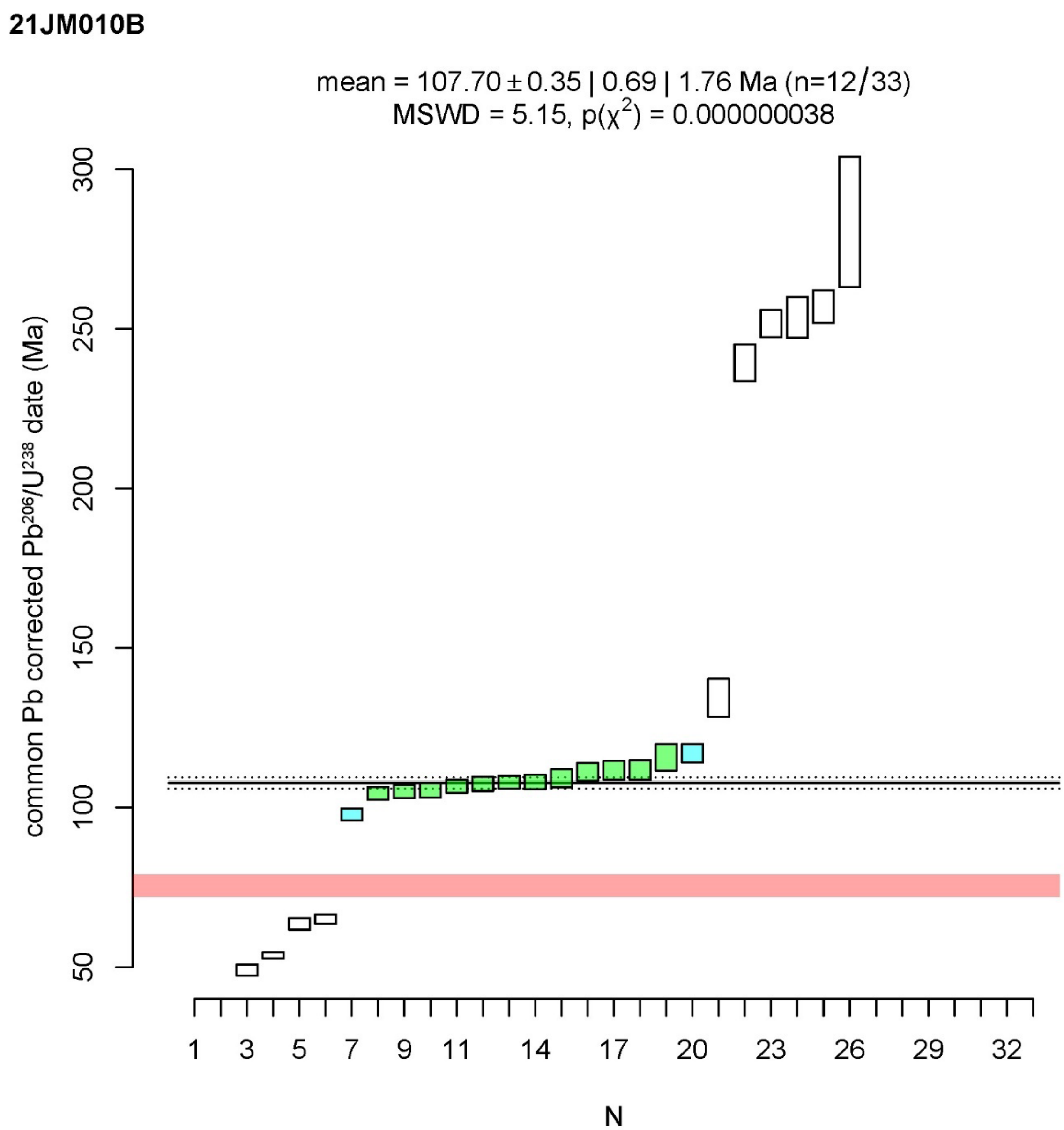

Figure 20 Weighted average age of Dawson Range batholith zircons detected in sample 21JM010B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM011B</u>

This drainage is 3.44 km^2 in area and 33 zircons were dated (Figure 21). One Casino Suite zircon was dated at ~74 Ma, one Prospector Mtn age zircon at ~69 Ma and one Palaeocene zircon.

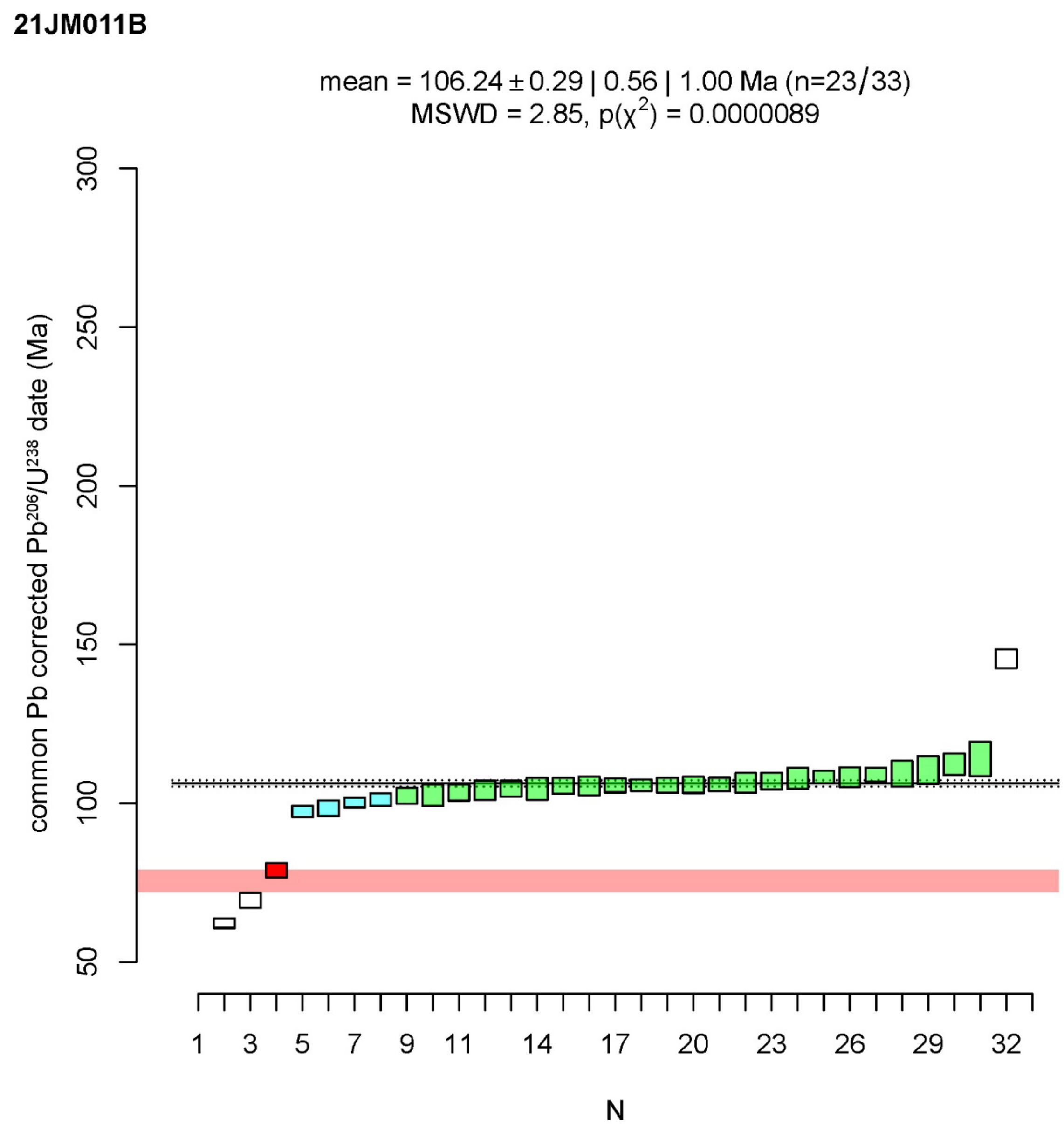

Figure 21 Weighted average age of Dawson Range batholith zircons detected in sample 21JM011B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

<u>21JM012B</u>

This drainage is 0.93 km^2 in area and 33 zircons were dated (Figure 22). No Casino or Prospector Mtn suite zircons were identified. There is a tight cluster of 7 ages in the Palaeocene that yield a weighted average mean date of 57.2 ± 0.3 Ma, strongly suggesting that there is a small intrusion here of this age.

21JM012B

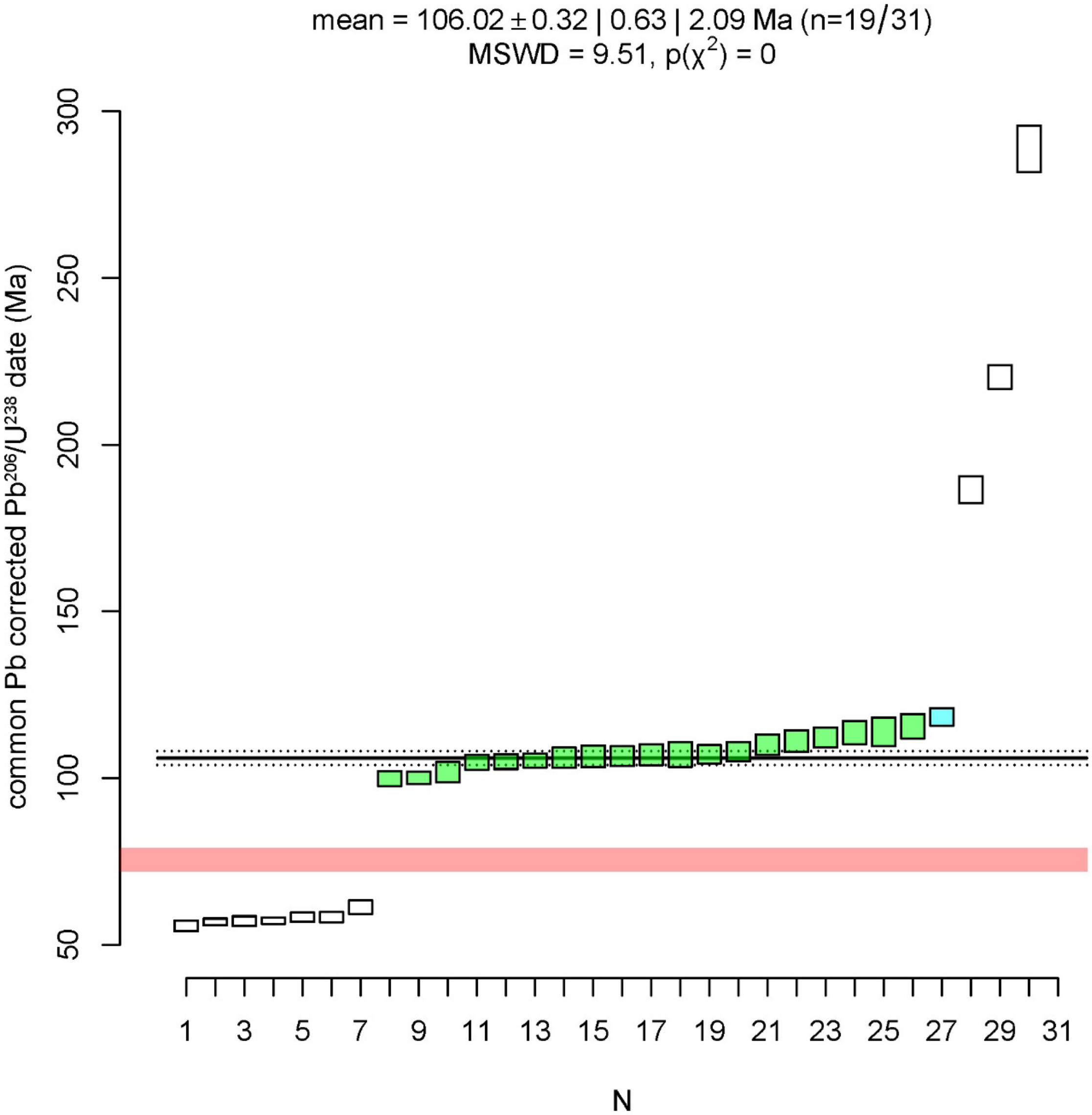

Figure 22 Weighted average age of Dawson Range batholith zircons detected in sample 21JM012B. Pink window 79-72 Ma represents Casino Suite as defined by Allan et al. (2013)

Sample 21JM001B was taken at a porphyry target in glaciated terrain (62.8031, -135.4501) in order to test the efficacy of the method in reproducing bedrock ages in glaciated terrain. Results were encouraging in reproducing a similar suite of ages as mapped in the nearby bedrock, perhaps including some unmapped Cretaceous lithologies or glacially transported grains.

Zircon Chemistry

Methodology outlined in Lee et al. (2020) was followed and zircons with Ca concentrations above detection (~>300 ppm Ca) and La > 1 ppm were excluded to avoid cases where apatite and melt inclusions may have been ablated. The REE concentrations were normalized to chondrite values (Anders and Grevesse, 1989), multiplied by 1.3596 (after Mazdab and Wooden, 2006). Normalized values (Ce_N, Nd_N, Sm_N, Gd_N) were used to calculate Ce/Ce_N^* ($Ce_N/((Nd_N)^2)/Sm_N$) using the method of Loader et al. (2017) and Eu/Eu_N^* ($Eu_N/(Sm_N*Nd_N)^{0.5}$) by the method of Dilles et al. (2015). An exponential power function was used to calculate Ce/Ce_C^* values using a new method that omits Ho, Tb and Tm from the calculation (but otherwise following methods in Zhong et al., 2019; Lee et al., 2020). Some calculations were hampered by a high detection limit for Nd (~0.1-1.0 ppm varying in each analytical session), Sm and Eu – particularly the routine first analysis of each grain in 2021. The re-runs were analyzed using increased integration times on the LREE in order to lower detection limits and make these calculations possible. Values of Eu, Nd and Sm below detection preclude the calculation of the Eu/Eu_N^* value – the best indicator of porphyry fertility in zircon chemistry. Values of Eu/Eu_N^* above 0.3 are considered fertile for porphyry mineralization. Only the chemistry of zircons from samples containing Casino Suite age zircons are discussed here but full data are in Appendix 4. Temperatures were calculated using the Ti in zircon geothermometer (Ferry and Watson, 2007). Zircons with Ti concentrations greater than 30 ppm were discarded from all temperature plots, to preclude the influence of Ti-bearing mineral inclusions such as rutile.

Europium anomalies

The Casino Suite zircons in samples from the 2020 orientation study from Canadian and Casino creeks produced Eu/Eu_N^* values of 0.38 to 1.08, well above the threshold value of 0.3 that is considered fertile for porphyry mineralization. This is a good indication that Eu/Eu_N^* can be used as an indicator of fertility in the Casino area. Results are summarized here for the promising samples, and full data can be found in the Appendix 4.

Prospector Mtn and Palaeocene age zircons in 21JM011B returned average Eu/Eu_N^* values of 0.41 and 0.31, respectively, which is above the threshold value of 0.3 to be considered fertile with respect to porphyry potential. Average Ce/Ce_C^* values for Prospector Mtn and Casino suite zircons were 105 and 185, respectively. In the neighbouring drainage, 21JM008B Prospector Mtn and Casino suite zircon Eu/Eu_N^* values were 0.51 and 0.43, respectively.

The re-runs of 2020 sample 20JM001B yielded Casino suite zircon average Eu/Eu_N^* values of 0.41 and an average Ce/Ce_C^* value of 306.

From the 2020 YMEP project, many zircons from the Dawson Range Batholith, Coffee Creek age rocks, and Prospector Mountain suite also displayed high Eu/Eu_N^* values, with mean values for each group all exceeding 0.3. This indicates that Eu/Eu_N^* values alone are not a good discrimination tool for fertile plutons in the Dawson Range, particularly with low-n sample sizes. The distinctive age of Casino Suite rocks is thought to be a much better indicator of potential mineralization, owing to the common association of Casino Suite rocks and Cu-Au-Mo mineralization across Yukon.

EXPLORATION SIGNIFICANCE AND INTERPRETATIONS

Exploration Potential of Anomalous Drainages

Although Casino Suite and Prospector Mtn age zircons were found in a number of drainages, three samples stand out as being the most highly anomalous in multiple datasets: 21JM011B, 21JM008B, and 21JM004B.

Sample site 21JM011B has 1 Prospector Mtn Suite age zircon, and 1 Casino Suite zircon, 9 grains of scheelite, and 26 gold grains (20 if recalculated to 10 kg sample). The presence of Casino Suite and Prospector Mtn age zircons in this sample and lack of glacial sediments in the area strongly suggests that there is an unmapped bedrock source of Casino Suite and Prospector Mtn age zircon-bearing rocks in the drainage. The absence of Casino/Prospector Mtn suite zircons in the nested drainage 21JM012B further constrains the source of the 21JM011B zircons to outside of the nested drainage. The high Eu/Eu_N* values of 0.41 in Prospector Mtn age zircons, and 0.31 in Casino Suite zircons suggests that both intrusive suites are fertile with respect to porphyry mineralization. The high soil sample of 237.8 ppm Cu and 11 ppm Mo at the head of this drainage is very encouraging.

Sample 21JM008B has 1 Casino Suite age zircon and 3 Prospector Mtn age zircon, 7 gold grains (9 on a recalculated basis), and Eu/Eu_N* values averaging 0.51 in the Prospector Mtn suite zircons and 0.43 in the Casino Suite zircon. This sample neighbours the 21JM011B drainage, so the source region of fertile Prospector Mtn/Casino Suite zircons may overlap both drainages.

Sample 21JM004B yielded a Prospector Mtn age zircon and a Casino Suite zircon. These numbers may be low, but considering the small number of zircons analyzed (33) and the modest size of the drainage (3.06 km^2), these zircons are likely related to a significant source area of rocks of these ages.

The intimate time and spatial association of Casino Suite age rocks with Cu-Au-Mo mineralization is apparent makes these drainages prime targets for follow-up work. The small volume Casino Suite intrusive rocks are almost always associated with at least some degree of mineralization all across the Yukon, e.g., Casino, Cash, Tad/Toro, Nucleus-Revenue, Klaza. Therefore, the discovery of Casino Suite age zircons in samples within this project is very significant and could lead to the discovery of Casino Suite intrusions in the area that may host associated Cu-Au-Mo mineralization. The increasing recognition of Prospector Mtn age mineralization in the Klaza district is also encouraging.

Predicting the size of the porphyry: sampling bias and statistics

Sampling theory according to a binomial distribution has driven the number of zircons chosen for dating from each sample. The probability of success for dating a zircon of Casino Suite age has been assumed to relate to the fraction of the area of Casino Suite rocks present in a drainage relative to drainage size. For example, a 1 km^2 Casino Suite intrusion in a 10 km^2 drainage has been assumed to have a total stream sediment zircon population of 10% Casino Suite age zircons. This assumes that there is no bias and fractionation in zircon distribution, formation, weathering, transport, deposition, sampling, concentration, picking, or dating – the "zircon bias". Now that there are data on the number of successful outcomes, i.e., number of Casino Suite zircons dated in each drainage, binomial probability theory can be used to calculate confidence limits on the sample population, and from this estimate the expected area of Casino Suite rocks in each drainage within confidence limits, assuming that there is no zircon bias.

For sample 21JM011B, n=33 (zircons sampled) and x=2 (Prospector Mtn and Casino Suite zircons detected). For this sample size, it can be predicted with 95% confidence that an area of combined Prospector Mtn and Casino Suite rocks of 0.06 to 0.351 km^2 is present within the drainage, assuming no zircon bias and a direct relationship between areal fraction of Prospector Mtn/Casino Suite rocks in the drainage and stream sediment zircon population.

For sample 21JM004B, n=33 (zircons sampled) and x=2 (Prospector Mtn and Casino Suite zircons detected). For this sample size, it can be predicted with 95% confidence that an area of combined Prospector Mtn and Casino Suite rocks of 0.058 to 0.312 km^2 is present within the drainage, assuming no zircon bias and a direct relationship between areal fraction of Prospector Mtn/Casino Suite rocks in the drainage and stream sediment zircon population.

CONCLUSIONS

- Several anomalous drainages have been identified that may host unmapped occurrences of Casino Suite or Prospector Mtn age rocks that may host associated Cu-Au-Mo mineralization.

RECOMMENDATIONS

Further sampling in the field would comprise prospecting within the drainages up-creek in order to trace the zircons back to a bedrock source. This should be combined with prospecting in the drainages for porphyritic rocks, intrusion or explosion breccias, veining, alteration and mineralization. Further soil sampling on a 200 x 200 m grid should be carried out in a 100 x 100 m grid around the 237 ppm Cu sample, with particular focus on any Au and Mo anomalies generated.

2021 EXPENDITURE STATEMENT

Expense	**TOTAL**
Staking materials	$ 1,360.16
ODM PCIM, gold grains and zircon separation	$ 3,921.13
BV stream sediment assays	$ 533.17
UBCO LA-ICP-MS zircon dating	$ 4,027.50
Helicopter	$ 8,249
Shipping samples	$ 160.69
Geologist sampler	$ 945.00
Zircon re-analysis	$ 1,840.00
Senior Geologist	$ 4,000.00
Daily field expenses	$ 1,000.00
BV Soil assays	$ 531.57
Staking flight	$ 7,141.37
Report	$ 3,333.00
Expediting	$ 258.88
GRAND TOTAL	**$ 37,301.49**

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STATEMENT OF QUALIFICATIONS

- I am a Professional Geologist registered with Engineers and Geoscientists of BC.
- I graduated with a Ph.D. in Geological Sciences from the University of British Columbia in 2015.
- I graduated with an M.Sc. in Mining Geology from the Camborne School of Mines, University of Exeter, 2009.
- I graduated with a first-class honours B.Sc. in Applied Geology from the Camborne School of Mines, University of Exeter, 2008.
- I have worked in mineral exploration continuously since graduation on projects in Yukon, N.W.T. and B.C.

Jack Milton
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DIGITAL APPENDICES

Appendix 1: Sample locations.

Appendix 2: Fine fraction stream sediment and soil aqua regia ICP-MS data.

Appendix 3: Heavy mineral concentrate and PCIM logging results.

Appendix 4: Zircon geochronology and geochemistry.

Appendix 5: High resolution figures from this report.

Appendix 6: Historic drill core