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DATE: **29 March 2018**

TO: **File**

FROM: **Sabina Gold & Silver**

SUBJECT: **Back River Aquatic Monitoring Workshop Meeting Notes - March 14th, 2018**

Location: **Teleconference**

Attendees: Anne Wilson (ECCC)
Erik Allen (ECCC)
Merle Keefe (Sabina)
Katsky Venter (Sabina Consultant)
Colleen Prather (Sabina Consultant) (Golder)
Arman Ospan (Sabina Consultant) (Golder)
Elaine Irving (Sabina Consultant) (Golder)
Dionne Filiatrault (Sabina Consultant) (Golder)

These notes summarize the key points and conclusions of the workshop. The presentation reviewed during the workshop is attached at the end of these notes.

Key meeting points and conclusions:

Marine baseline program

- ECCC requested that there be a sampling location near the desalination effluent end of pipe. SBB agreed there would be.
- ECCC requested that SBB confirm the proposed reference location is unlikely to be influenced by Project activities, primarily shipping.
- ECCC sought clarity on next steps with respect to the Marine Program. SBB indicated that the baseline program would be carried out during 2018, after which a revised Marine Monitoring Program (MMP) would be submitted for review, based largely on the MMP submitted with the Type A Application and the sampling locations presented in this workshop.

Aquatic Effects Management Plan (AEMP)

- ECCC committed to doing a review of the proposed 2018 baseline program and AEMP revisions (as presented in the slides) and provide comments by March 26, 2018
- ECCC expressed concerns with BRP-33 (i.e., Goose Lake, mid-field area B, near southeast inflow) and potential indirect influence/exposure from pit operations during life-of-mine (e.g., dusting/blasting/runoff effects). This sampling area may need to be re-classified as near-field (although with notable different type of influence)
- ECCC questioned the need for slimy sculpin at two location in Propeller Lake, particularly at the BRP-36 (i.e., Propeller Lake, Far-field B) while noting that slimy sculpin sampling at BR-33 is recommended. SBB indicated it would evaluate the possibility of moving the slimy sculpin sampling location, with a review and consideration to any specific requests by others related to this sampling.
- ECCC raised the timing of biological monitoring and timing of discharge. SBB confirmed discharge will occur in 2019 and would reflect the end of the baseline data collection period. SSB indicated that a review of biological baseline data would be conducted prior to August 2018 sampling to confirm no additional biological data is needed.
- SBB noted that baseline 2017 sediment and benthos sampling at the shallow AEMP sampling locations (3-4 m depth) was problematic. SBB will evaluate whether moving some locations to deeper water is likely to provide more reliable monitoring results. SBB confirmed any deeper locations would remain in the effluent flow pathway and align with historically sampled locations. Sampling would continue to include a location within 250 m of the discharge point.
- AEMP revision tracking slide; ECCC to review and confirm complete by March 23rd.
- SBB outlined the proposed next steps for the AEMP (see slide numbered 17).

Aquatic Effects Monitoring Program Workshop

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Participants: ECCC and Sabina March 14, 2018

AEMP Workshop Agenda

- 2018 Marine Baseline Program
- 2018 AEMP Baseline Program
- Additional Topics
  - Slimy Sculpin Sampling
  - WQ Sampling frequency post dewatering
  - Sediment sampling procedures
- AEMP Revisions Tracking
- Next Steps

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Marine Baseline Program – historical data overview

- 2012 baseline sampling:
  - April – 4 mid-water stations for WQ (see black circles in figure)
  - August – 12 stations at a **different** MLA site (physical oceanography, WQ, SQ, infauna, mussel tissue at subset) + 11 stations at reference site 25 km south (physical oceanography, WQ, SQ, infauna, mussel tissue at subset) – see yellow pins in figure
- 2013 baseline sampling:
  - July – 8 stations at current MLA site (physical oceanography, WQ, SQ, infauna, mussel tissue at subset) + tides – see red pin in figure (no reference sampling conducted in 2013)
- 2017 baseline sampling:
  - August – WQ, SQ at current MLA site and reference site 25km south (see blue pins)
  - September – WQ only at current MLA site

Marine Baseline Program – proposed 2018 Program

- New Reference location
  - 4 km N of MLA
  - more reliably accessible and greater similarity in oceanographic conditions (similar freshwater influence)
- Comprehensive baseline sampling program
  - At both MLA and Reference
  - Collection of WQ, SQ, benthos and fish tissue and condition

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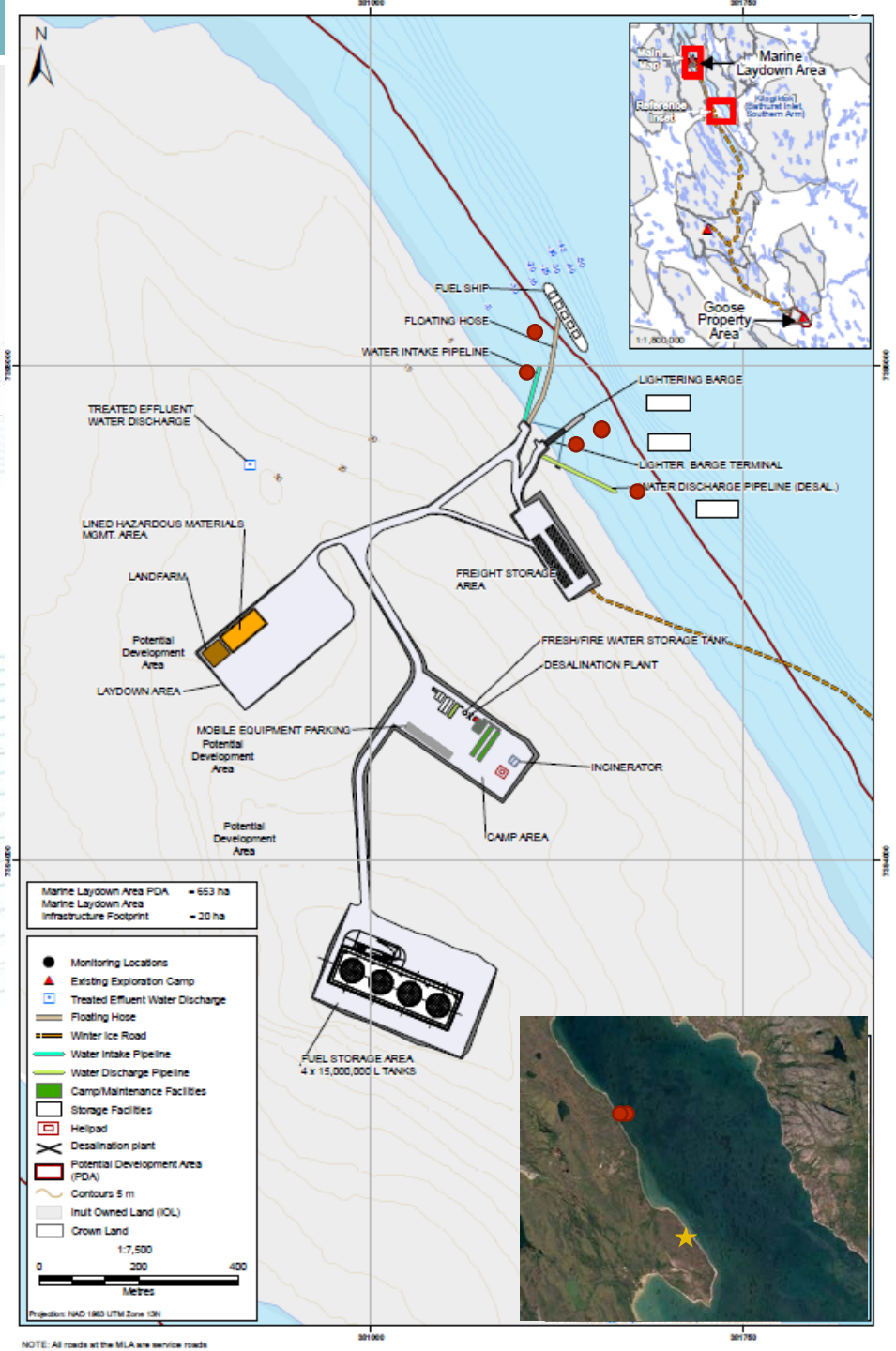
Marine Baseline Program – proposed 2018 Program



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Marine Baseline Program – proposed 2018 Program

Component	Monitoring Parameter	Number of Sampling Stations	Replication/station	Sampling Timing
Water Quality	Physical parameters (conductivity/salinity/ temperature profiles, dissolved oxygen), pH, turbidity, TSS, metals, nutrients, hydrocarbons	5 in MLA; 3 in Reference Area	1 replicate/sample @ 1 m below surface at shallow stations (<5 m); 2 replicates/samples (1 m depth and mid-depth) at deeper (> 5m); + 10% QA/QC replicates	April and August
Phytoplankton Biomass	Chlorophyll a	5 in MLA; 3 in Reference Area	3 replicates/station @ 1 m below surface	April and August
Sediment Quality	Particle size, nutrients, TOC, metals, hydrocarbons	3 in MLA; 2-3 in Reference Area	5 replicates per station	August
Infauna	Abundance and taxonomy	5 in MLA; 2-3 in Reference Area	3 replicates per station	August
Fish (Shellfish) Conditions	Whole wet weight, soft tissue weight, shell length	MLA and Reference Areas	20 shellfish/area	August
Fish (Shellfish) tissue (body burder)	Tissue metals (including Hg), hydrocarbons	MLA and Reference Areas	8 shellfish/area	August

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Thoughts on the 2018 Marine Baseline Program?

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AEMP Baseline Program – historical data overview

Table 1: Inventory of Water Quality Samples Collected from 2006 to 2017 by Month of Collection

Station Type	Station Description	List of Station Code or ID	Sep/2006	Jun/2007	Jul/2007	Aug/2007	Sep/2007	Aug/2010	Apr/2011	Jun/2011	Aug/2011	Sep/2011	Apr/2012	Jun/2012	Aug/2012	Sep/2012	Apr/2013	Jun/2013	Jul/2013	Aug/2015	Aug/2017	Sep/2017	Total WQ Samples
Lake	Goose Lake Near-field exposure area	BRP-31-01 to -05; GOONECK	-	-	-	-	-	-	1	-	1	-	1	-	1	-	1	-	1	-	5	5	16
Lake	Goose Lake Mid-field (A) exposure area	BRP-32-01 to -05; GOOCENT	-	-	-	1	1	-	2	-	1	-	1	-	1	-	1	-	1	-	5	-	14
Lake	Goose Lake Mid-field (B) exposure area	BRP-33-01 to -03; GOOSESTH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	-	4
Stream	Goose Outflow	BRP-34; GOOSEOF	1	1	1	1	-	-	-	1	1	1	-	1	1	1	-	1	1	-	1	-	13
Lake	Propeller Lake Far-field (A) area	PROLK; PRO LK	-	-	-	-	-	-	2	-	2	-	2	-	2	-	-	-	2	2	-	-	12
Lake	Propeller Lake Far-field (B) area	PRON LK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2
Stream	Propeller OF	PROOF;	-	-	-	-	-	-	-	1	1	1	-	1	1	1	-	1	1	-	-	-	8
Lake	Reference Lake B	BRP-38-01 to -05; REFBLK	-	-	-	-	-	2	2	-	1	-	-	-	-	-	1	-	1	-	5	5	17
Stream	Reference Lake B Outflow	BRP39; REFBOFWET; REFBOFFRY; REFBOFMID	-	-	-	-	-	-	-	1	1	1	-	1	1	1	-	2	1	-	1	-	10

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AEMP Baseline Program – historical data overview

Table 2: Inventory of Sediment Quality Samples Collected from 2006 to 2017 by Month of Collection

Station Description	Station IDs	Jun/2007	Jul/2007	Aug/2007	Sep/2007	Aug/2010	Apr/2011	Aug/2011	Apr/2012	Aug/2012	Apr/2013	Jul/2013	Aug/2015	Aug/2017	Sep/2017
Goose Lake Near-field exposure area	BRP-31-01 to -05; GOONECK	-	-	-	-	-	-	1	-	1	-	1	-	5	-
Goose Lake Mid-field (A) exposure area	BRP-32-01 to -05; GOOCENT	-	-	-	-	-	-	1	-	1	-	1	-	5	-
Goose Lake Mid-field (B) exposure area	BRP-33-01 to -03	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Goose Outflow	GOOSEOF	-	-	-	-	-	-	1	-	1	-	1	-	-	-
Propeller Lake Far-field (A) area	PROLK; PRO LK	-	-	-	-	-	-	1	-	1	-	1	-	-	-
Propeller Lake Far-field (B) area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Propeller Outflow	PROOF;	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Reference Lake B	BRP-38-01 to -05; REFBLK; REFBLKEAST	-	-	-	-	2	-	1	-	-	-	1	-	5	-
Reference Lake B Outflow	REFBOFWET; REFBOFFRY	-	-	-	-	-	-	1	-	1	-	1	-	-	-

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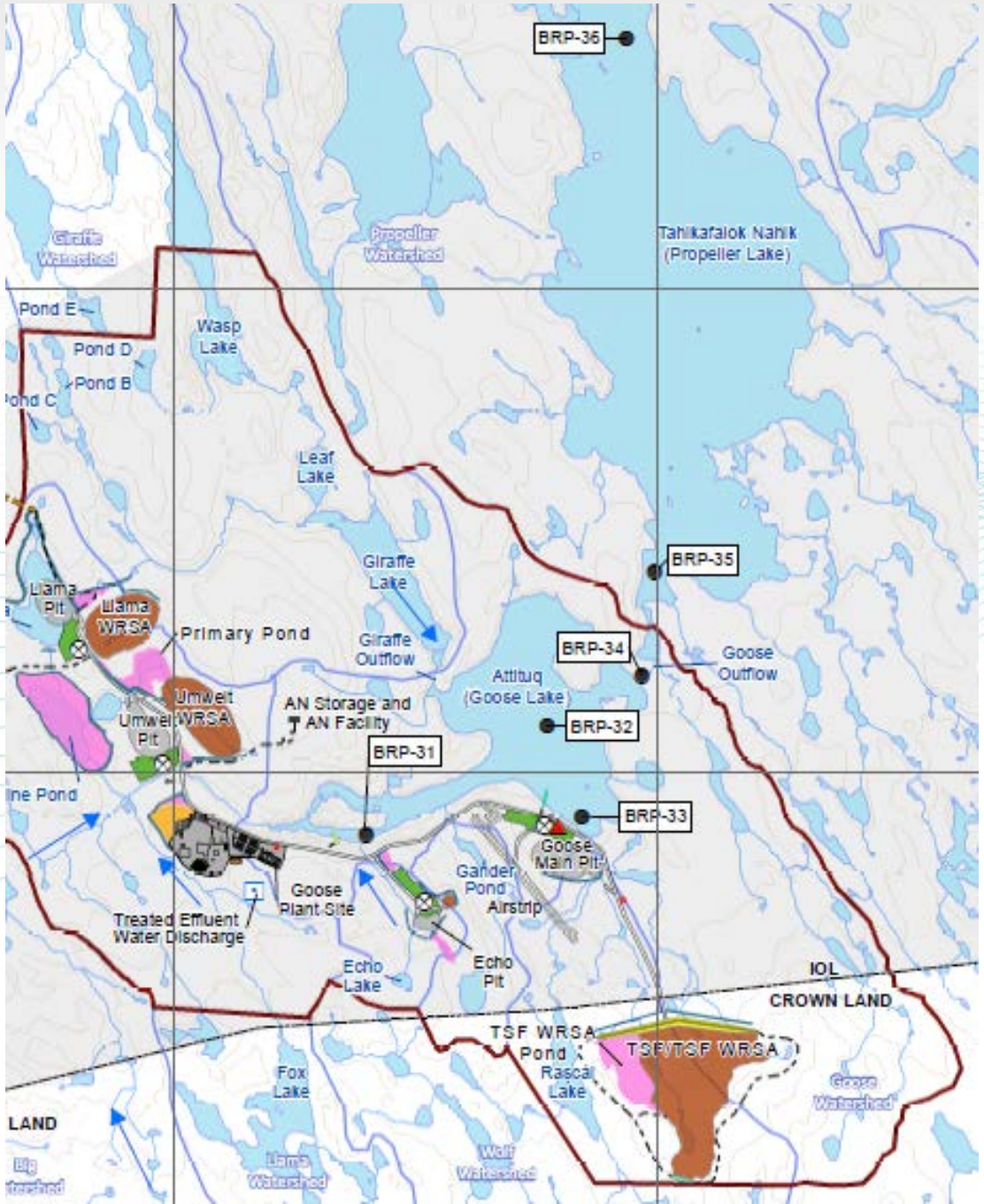
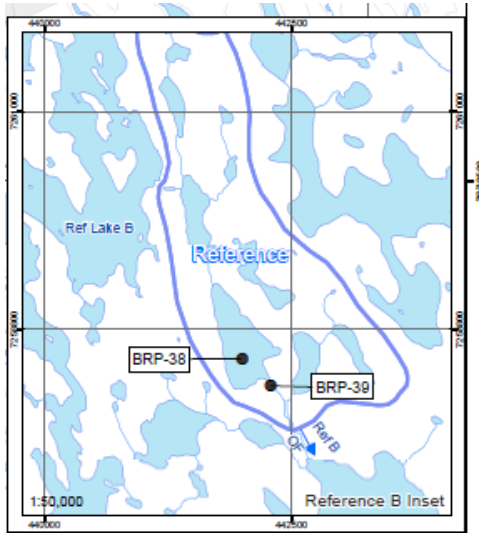
AEMP Framework





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AEMP Baseline Program – proposed 2018 Program

Station Area	April	June	July	August	September
Goose Lake Near-field and Reference Lake	WQ	-	WQ	WQ, SQ	WQ
Goose Lake Mid-field (A and B)	WQ	-	-	WQ, SQ	-
Propeller Lake Far-field (A and B)	-	-	-	WQ, SQ	-
Goose Outflow and Reference Outflow	-	WQ	WQ	WQ	WQ
Propeller Outflow	-	WQ	-	-	WQ

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Thoughts on the 2018 AEMP Baseline Program?

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Additional Topics – Fish Tissue Sampling

- Slimy Sculpin tissue sampling frequency
  - Unlikely to be triggered by effluent under MMER
  - Suggestion from ECCC that sampling frequency be reduced
  - Sabina is in agreement and will revise AEMP to indicate sampling every 6 years
- Additional Slimy Sculpin sampling locations (e.g. BRP-33)
  - Station area BRP-33 is in proximity to Goose Pit
  - Once Goose Pit is flooded and water quality meets discharge criteria, the berms will be breached and water will discharge to Goose Southeast Inflow (Water Management Plan, Figure A-08).
  - This is not scheduled to happen until Post-closure
  - As the Mine moves into Closure, the need for aquatic sampling near BRP-33 will be investigated

Additional Topics – Benchmarks and Sediment Sampling

- Timing and development of benchmarks
  - Following the completion of the 2018 baseline program, baseline data will be compiled and normal ranges generated
  - Sabina intends to consult with ECCC on proposed benchmarks based on these ranges and available guidelines in early 2019.
- Depth of sediment surface sampling (1-2 vs 2-5 cm)
  - Surficial lake sediments from the AEMP sampling areas have been collected in 2010, 2011, 2012, 2013, and 2017
  - All sampling programs have used an Ekman sampler and the top 2 cm have been analyzed (except in 2017)
  - This same methodology will be used going forward in the AEMP

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AEMP Revisions Tracking

- Correct the description of the trigger for EEM (ECCC-IR-8)
- More description of site water management and in particular effluent discharge form water and load balance (to be provided in First Study Design) (ECCC-IR-10)
- Clarification that that water quality, sediment quality, and benthic invertebrate samples will be collected from specific stations, while fish samples will be collected from broader areas.
- Indicate that subsample benthos variability will be characterized in one replicate per sampling area by not physically pooling the sub-samples for that replicate (ECCC-IR-21)
- Editorial updates to Tables 4.3-2 and 4.3-3 for consistency in lake trout sampling area (ECCC-IR-14)
- Include water quality analytical detection limit table – see response to ECCC-IR-15
- Update Table 5.1-1 to include field turbidity, laboratory pH, total dissolved solids (measured and calculated), and fluoride (ECCC-IR-17)
- Addition of Total Phosphorus in Sediment quality analyses (ECCC-IR-19)
- Identify of particle size methodology – see response to ECCC-IR-19; in 2017 the method used was Pipette removal OM & CO3 (Burt 2009). Historical data files do not have the laboratory certificate of analysis so unable to confirm historical method at this time. However, historical samples were analyzed at ALS and can be confirmed.
- Identify that sediment sampling be specific to top 1-2 cm of sediment

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Next Steps

- If further discussion warranted, Sabina to host a joint KIA-ECCC-Sabina AEMP workshop post TC submission (i.e. post Mar 26th)
- Revise AEMP, either prior to hearing (if significant changes beyond those listed are required), or alternately prior to construction
- Execution of 2018 baseline program
- Evaluation of 2018 data, development of normal ranges
- Consultation with relevant stakeholders on benchmarks and Action levels (early 2019)

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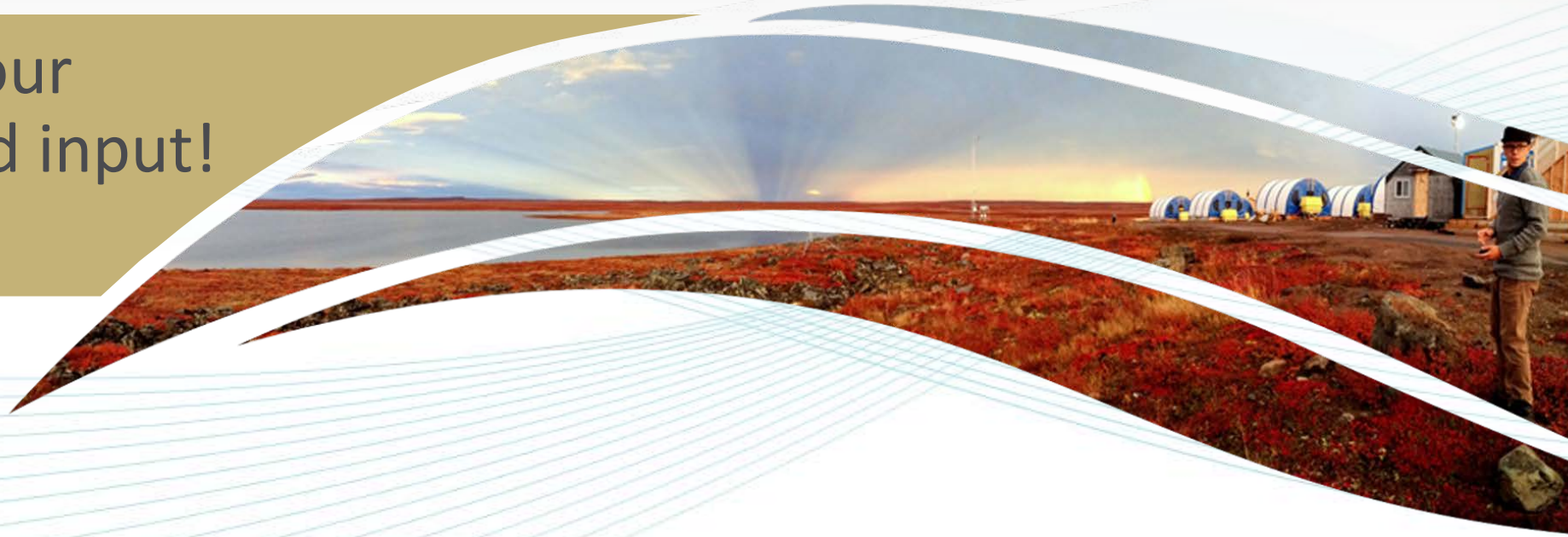
Thank you for your participation and input!



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