




# 2007 Baseline Studies Hackett River Project


*January 20, 2008*  
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*Project Manager*

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## 2007 Baseline Study Components

- Meteorology
- Active Layer Monitoring
- Surface Hydrology
- Lake Bathymetry
- Water Quality
- Sediment Quality
- Aquatic Biology
- Fish & Fish Habitat
- Metal Leaching & Site Drainage Chemistry
- Ecosystems, Vegetation, & Soils
- Terrestrial Wildlife
- Socio-Economics
- Public Consultation
- Land Use
- Traditional Knowledge
- Archaeology

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## 2007 Field Program Design



- 2007 Field Program was designed based on available engineering information
  - initially based on 'Wardrop' Site Layout
  - Expanded to include some 'Hatch' options
  - Modified further in August to include additional 'AMEC' options
- 2007 Field Program included areas potentially influenced by mining activities, as well as 2 reference areas well away from potential activities (~10 km away)

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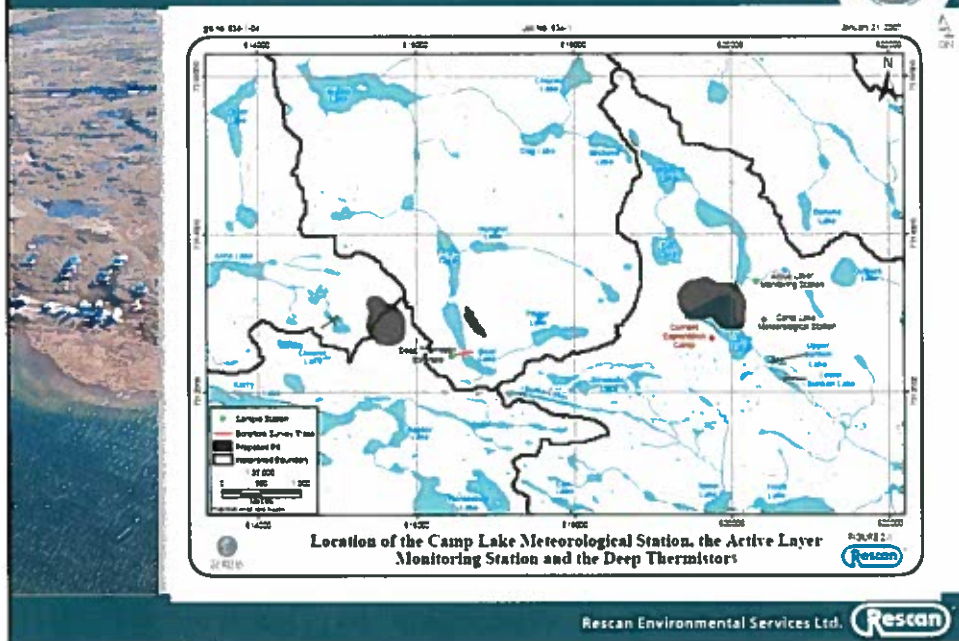
## Meteorology & Permafrost



- Met Station Installation  
*June 14-19; Kai Morgenstern, Ph.D.*
  - installed met station E of Camp Lake
  - refit met station at Port Site
- Active Layer Depth Survey  
*Aug 24-31; Kai Morgenstern, Ph.D.*
  - installed soil temperature thermocouple string NE of Camp Lake; depth of 1 m, sensors every 20 cm
- Permafrost
  - deep thermistor string in well just east of Boot Lake; ~ 575 m depth; installed in Sept. 2006 by BGC

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## Meteorology & Permafrost



## Hackett River Camp Met Station



## Hydrology and Bathymetry



### • Hydrology Station Installation

*June 18-29; Steve Guenther, M.Sc.*

*-installed 10 stations; train on-site personnel for flow measurements and data downloading*

### • Hydrology Station Re-Fit

*July 13-18; Steve Guenther, M.Sc.*

*-downloaded all data loggers*

*-installed new hydrology station in Dog Lake*

*-adjusted 2 stations to accommodate lower flow conditions*

*-installed 4 staff gauges in potential water source lakes*

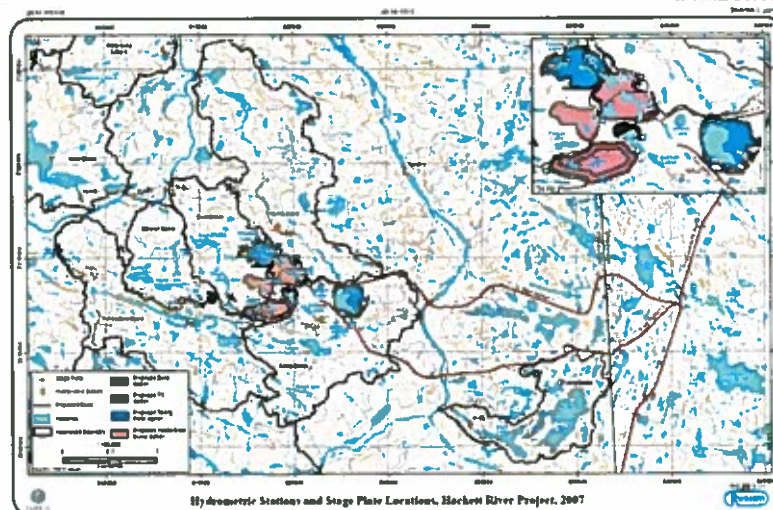
### • Lake Bathymetry

*July 24-Aug. 7; Steve Fifield, Steve Johnson*

*-maps of 22 lakes: Bat, Camp, Banana, Degaulle, Boot, Island, Chucku, Dog, Michelle, Joe, Kathy, Hood, Kerry, Anne, Ref Lake 2, Lake B, Thigh, Hungrat, Cleaver, Duck, D'Arcy, Lake D*

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## Locations of Hydrology Stations and Lake Gauges



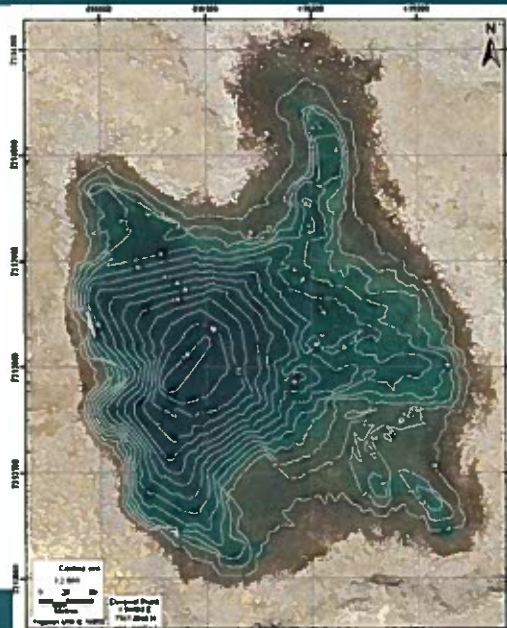
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## Hydrology Stations (Duck Outflow)



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## Lake Bathymetry-Bat Lake



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## Water Quality, Sediment Quality, & Aquatic Biology



- **Winter Lake Water Quality & DO/T**

May 1-8; Kris Viscotto, Ph.D., Dave Fauquier  
20 lakes were successfully sampled

- **Stream Freshet Water Quality**

June 22-26; Tonia Robb, Ph.D.  
collected samples from 21 stream sites

- **July Lake Water Quality & Limnology Survey**

July 10-24; Katsky Venter, M.Sc.  
-collected wq, chl a, & DO/T profiles from 28 lakes

### August Lake & Stream WQ, SQ, Aquatic Biology Survey

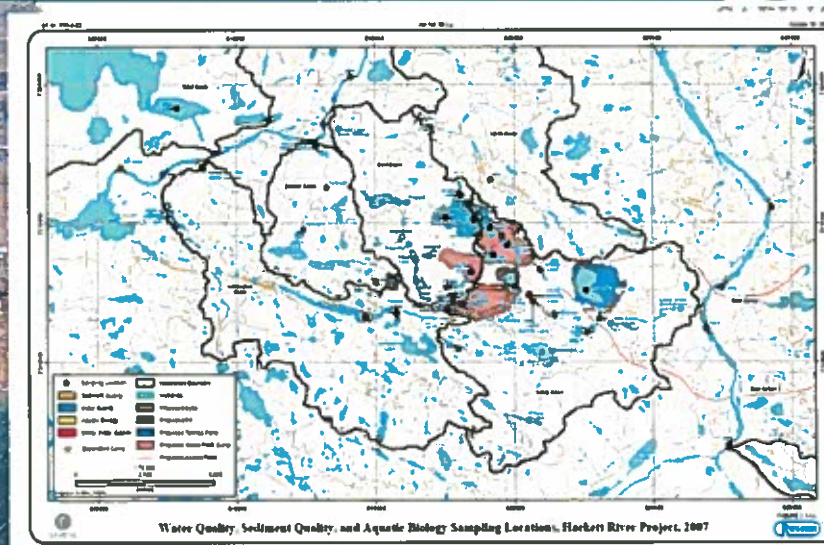
Aug 1-24; Katsky Venter, M.Sc., Kristrina Poitras, B.Sc.  
-collected wq, sq, DO/T, phyto., zoopl. benthos from 27 lakes  
-collected wq, sq (6), peri. install., benthos from 15 streams

- **September Lake & Stream Water Quality & Aquatic Biology Survey**

(K. Venter, M.Sc., C. James, M.Sc., Aug. 31-Sept. 11)  
-collected wq, chl a, & DO/T profiles from 28 lakes  
-collected wq, peri. retrieval from 15 streams

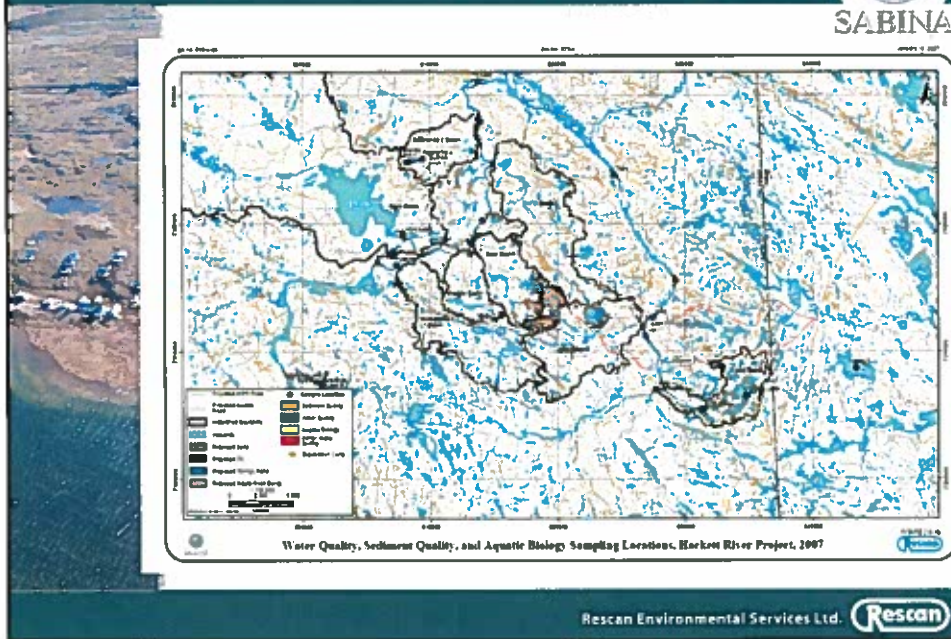
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## Water Quality, Sediment Quality, & Aquatic Biology

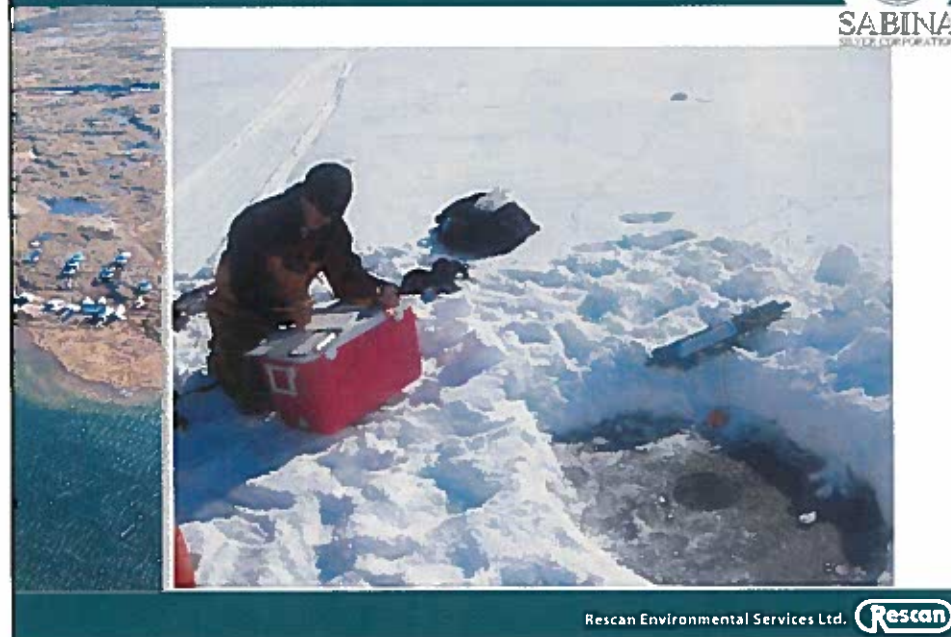


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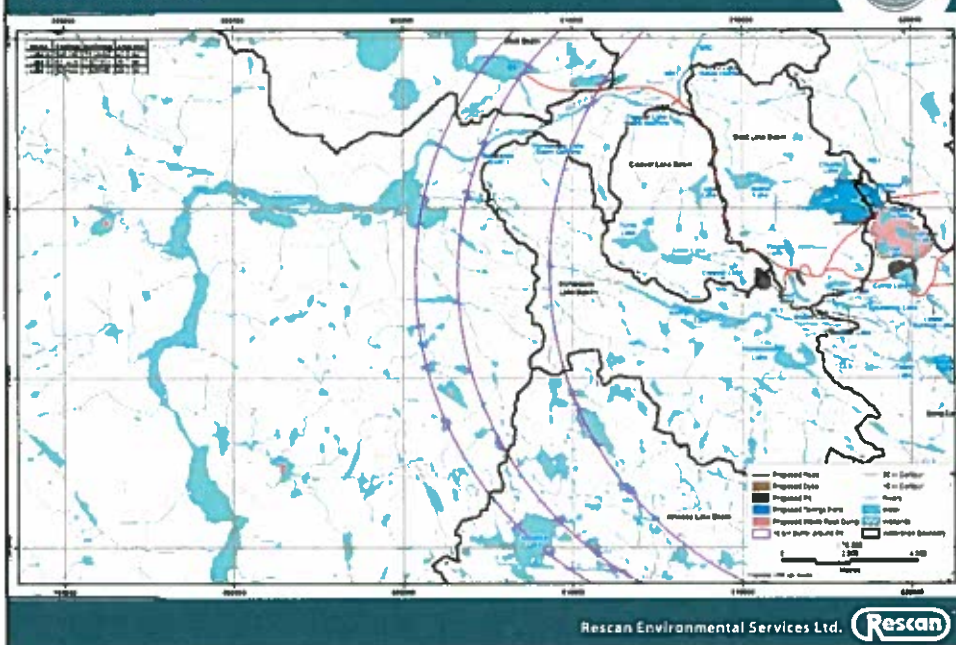
## Water Quality, Sediment Quality, & Aquatic Biology



## Winter Water Quality & DO/T (Kerry Lake)



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## Fish & Fish Habitat



### • Stream Fish Habitat Survey

-June 22-29; Andrew Harwood, Ph.D.  
-assessed 20 stream locations; flew both road options

### • Fish Communities and Habitat

July 20-Aug. 14; Andrew Harwood, Ph.D., Garrett Cooper, M.Sc., Kevin Esseltine, M.Sc.

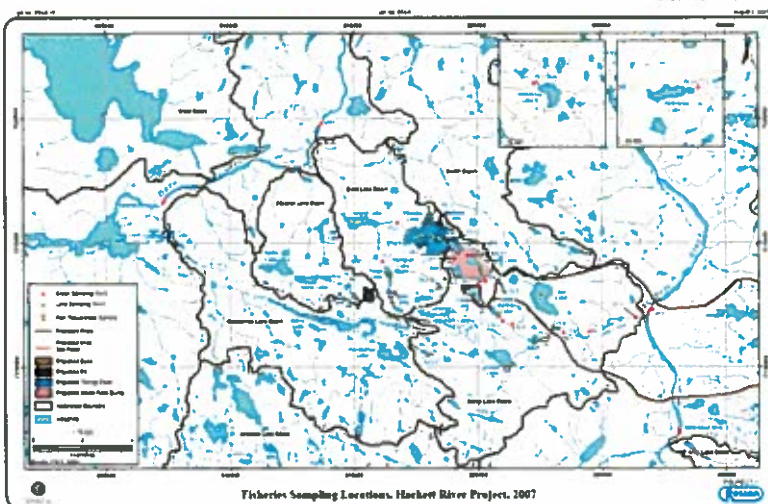
Aug. 21-31; Kevin Esseltine, M.Sc., Brett Van Portoon, M.Sc.  
-confirm no fish lakes; ponds in Dinosaur area, Mara & Hackett

- Surveyed 36 lakes and ponds
- Surveyed 18 stream and river sites
- Fish Present in ALL Lakes except Bat, Cleaver, and some small ponds
- Lakes are dominated by Single-Species: Lake Trout
- Arctic Grayling in Mara and Hackett Rivers
- So far, no Arctic Char have been found
- Other species include: burbot, ninespine stickleback, slimy sculpin (5 species in total)
- Muscle tissue collected for metal body burden

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## Fish Sampling Locations




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### Looking upstream at Island Outflow (Boot Basin)



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### Downstream of Kathy Lake (Camp Basin)



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## Arctic Grayling, Slimy Sculpin, Ninespine Stickleback



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## Lake Trout & Burbot



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## Marine Water Quality, Sediment Quality, Aquatic Biology



### • Marine Survey Near Proposed Port Site

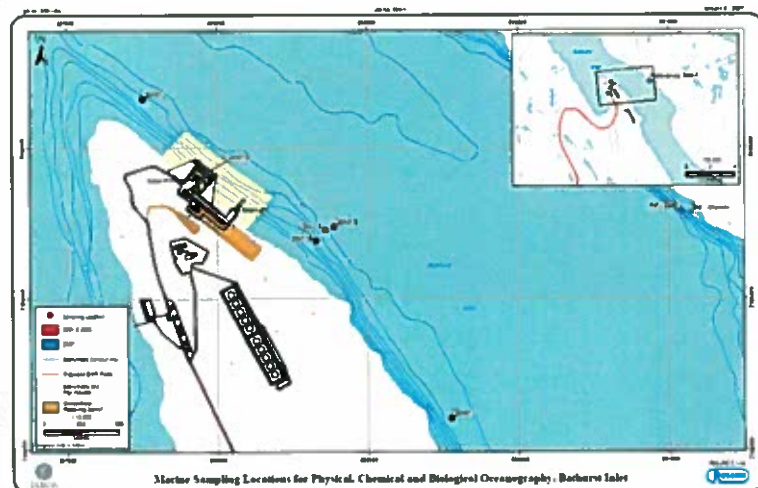
Aug 1-4; Katsky Venter M.Sc., Andrew Harwood, Ph.D., Allen Kapolak,  
with Kingaunmiut-provided boat, operator, assistant  
\*\*\*major weather delays

### • Components Included:

- CTD Profiling  
(water column structure)
- Bathymetry/Habitat  
(small area around potential dock)
- Water Quality  
(profiles; low-level seawater analyses)
- Sediment Quality  
(small area around potential dock)
- Marine Benthos  
(small area around potential dock)

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## Marine Water Quality, Sediment Quality, Aquatic Biology



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## ML/ARD; Site Drainage Chemistry



- **Environmental Geochemistry/ARD**  
*June 4-7; Kevin Morin, Ph.D., Nora Hutt  
Douglas Kim and Elizabeth Sherlock on site  
selection of core samples for analyses; ~ 600 samples*
- **Environmental Geochemistry at Port Site**  
*June 23; Kevin Morin, Ph.D., Nora Hutt  
-visually examined and collected samples of surficial rock within  
the proposed Concentrate Storage Area  
-7 samples collected*
- **ARD/ML: Construct Barrels for On-Site  
Testwork**  
*(N. Hutt; Sept 7-11)  
-Set up 230 L barrels; each barrel will contain ~ 400 kg of rock*

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## Ecosystems, Vegetation, & Soils



- **Vegetation, Soils, Ecosystem Mapping**  
*July 13-24; Tania Perzoff, M.Sc., Jace Standish, Damian Power,  
Page Burt on site 1 day (picked up at Bathurst)  
-characterized plots at various sites throughout the potential  
'Wardrop' mine footprint  
-partially covered road options to the east  
-ground-truthed mapping at Port Site*
- **Vegetation, Soils, Ecosystem Mapping**  
*Aug. 17-28; Tania Perzoff, M.Sc., Susan Ames, Ph.D., Damian  
Power, Cladio Bionchini  
-cover expanded site layout options; southern road option; airstrip  
-collected soil samples for background metal concentrations*

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## Vegetation, Soils, Ecosystem Mapping



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## Terrestrial Wildlife



- **Aerial Surveys**
  - Conducted surveys in coordination with Dundee Precious Metals (Back River Project)
  - Last surveys also included southern BIPR area
  - Conducted 5 surveys: May, June, mid-July, late-July, September
    - May: ~1200 caribou in NW Dundee Area
    - June: small groups of caribou on extreme W of Hackett River area
    - Mid-July: large numbers of caribou moved directly through camp around July 8 (post-calving migration)
    - Late-July: small groups observed around George Lake
    - September: small group NE of camp
- **Raptor Nest Survey, Carnivore Den Survey**

*June 11-15; Greg Sharam, Ph.D.*  
*-75 raptors were IDed and mapped*  
*2 fox, 2 wolf dens*  
*15 grizzly bears near camp; review camp waste management*

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## Terrestrial Wildlife



### • Breeding Bird Survey

June 19-26; Heather Bears, Ph.D., Rachel Brock, Ph.D., Carl Savignac, M.Sc., Sam Quinlan, Alyson McHugh

- 4 am to 12 pm surveys; highly synchronized nesting period
- survey timing was right on; conducted during short nesting period
- 47 species identified; 16 species confirmed breeding
- peregrine falcon & short-eared owl are species of special concern under SARA
- several species listed as sensitive by local NT rankings

### • Raptor Nest Productivity Survey, Waterfowl Survey, Carnivore Den Survey

July 31-Aug 3, Heather Bears, Ph.D.

- 14 waterfowl species identified (LSA); 18 dens found in RSA

### • Small Mammal Survey, Waterfowl # 2 Survey

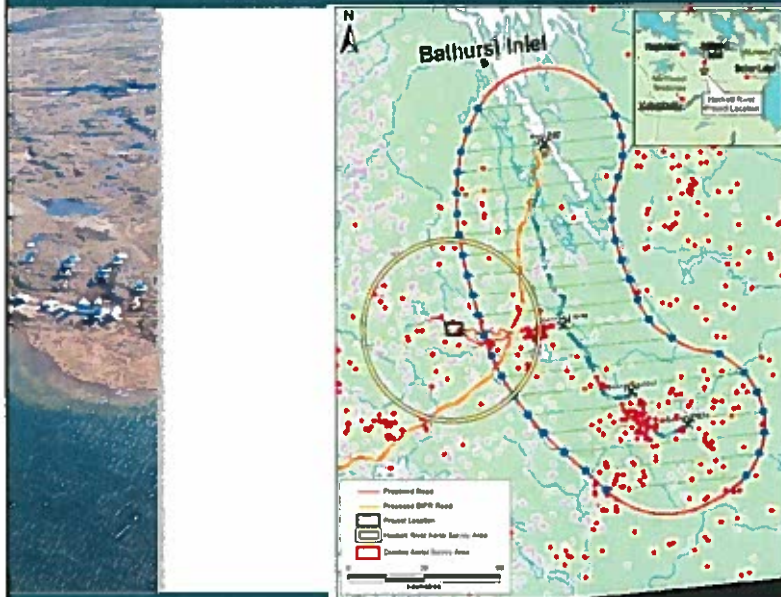
(H. Bears, Ph. D., C. Kent, M.Sc., Aug. 28-Sept. 4)

- red backed voles most common; 3 species captured; 3 waterfowl species with young observed

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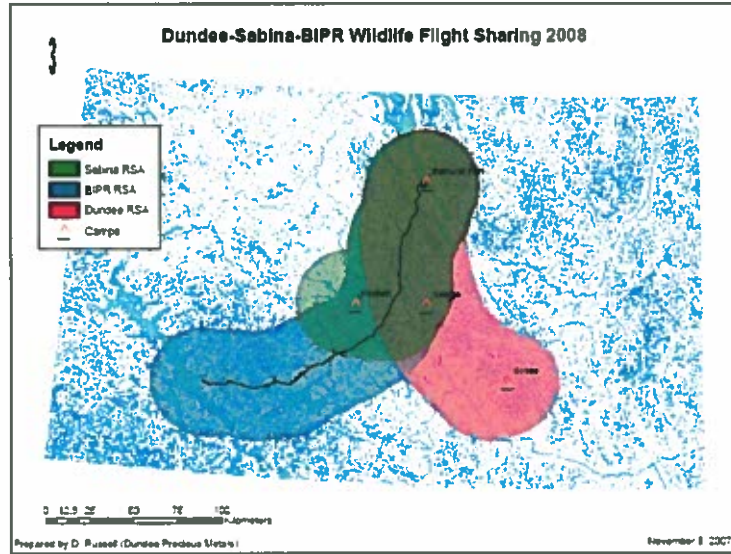
## 2007 Wildlife Aerial Survey Area



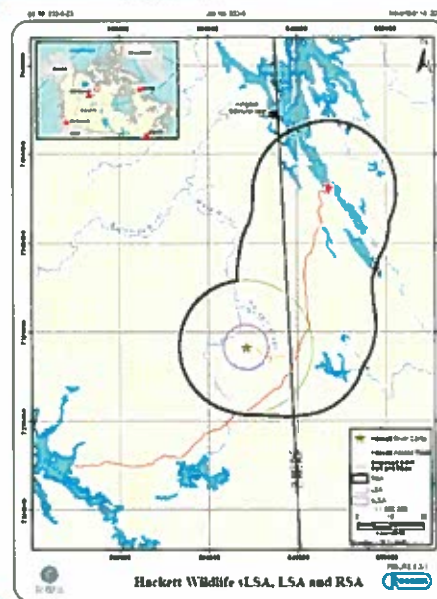
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## 2008 Survey Areas

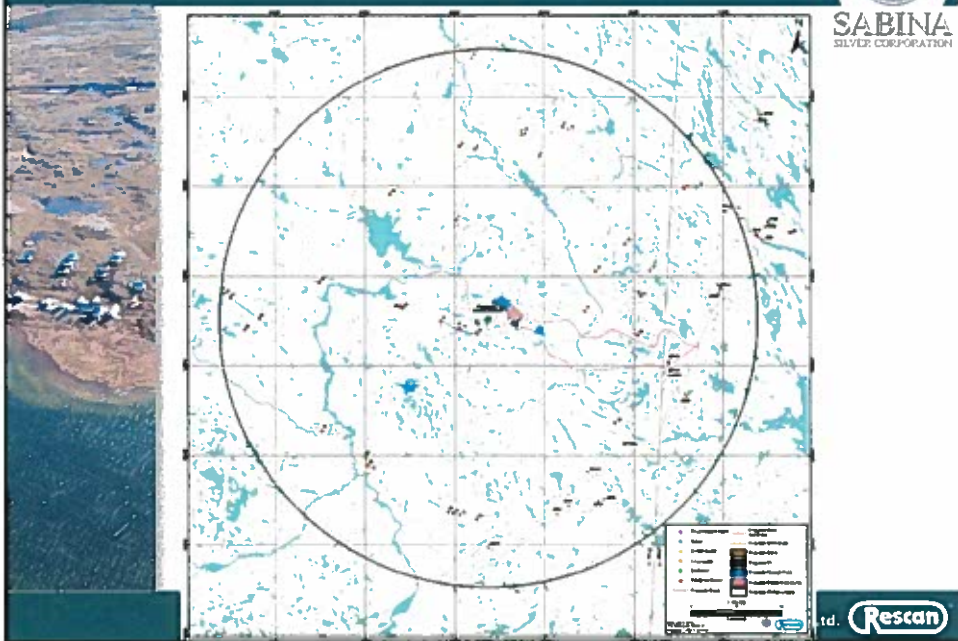


## Wildlife Study Areas



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## Raptor Nests

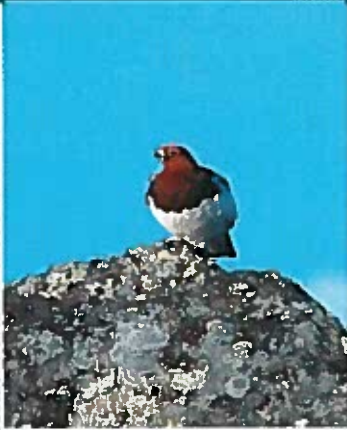


## Herring Gull Nest



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## Willow Ptarmigan, American Golden Plover



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## July Caribou Survey



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## Archaeology



- **Archaeology Survey**

*July 10-23; Lisa Seip, M.A., Kay Farquharson, John Breffitt, M.A., Susan Duxbury*

- assessed the 2 road options
- assessed the Main Pit, East Cleaver Pit, Crown Pit
- started assessment of western portion of Wardrop Plan tailings pond and waste rock dump

- **Archaeology Survey (2<sup>nd</sup> trip)**

*September 7-11; Lisa Seip, M.A., Kay Farquharson*

- cover expanded site layout options; southern road option; airstrip

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## 2007 Public Consultation-Community Trips



- **Community Consultation Trip: Gjoa Haven & Cambridge Bay**

*June 16-20; Gillian Davidson, Ph.D., Greg McKillop, Harvey Klatt (Sabina), Doris Keyok, Frank Ipokohak*

- Cambridge Bay Mayor and Council Presentation, NIRB, KIA, Open House, Dinner, Presentation
- Gjoa Haven Open House, NWB, Dinner, Presentation

- **Community Consultation Trip: Bathurst Inlet**

*July 24; Greg McKillop, Gillian Davidson, Ph.D., Harvey Klatt (VP Exploration, Sabina)*

- main concern was Port Site

- **Community Consultation Trip: Kugluktuk**

*October 17; Greg McKillop, Gillian Davidson, Ph.D., Harvey Klatt (VP Exploration, Sabina), Elizabeth Sherlock (Sabina)*

- Kugluktuk Mayor, KIA, Open House, Dinner, Presentation

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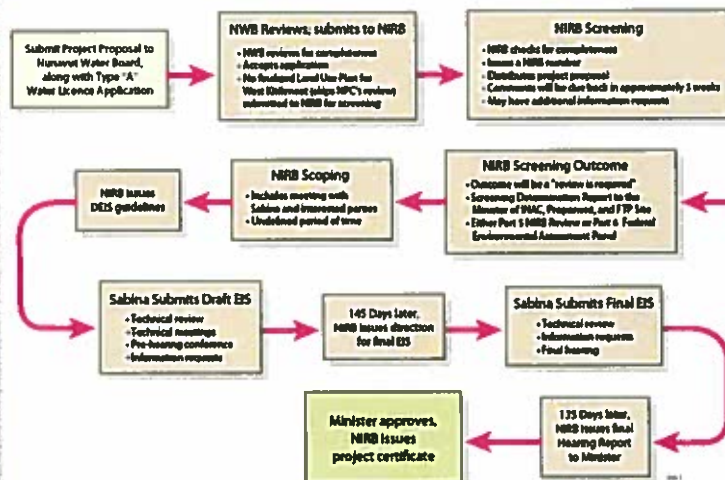
## 2007 Baseline Studies



- Baseline Reports for 2007:
  - 2007 Meteorology & Permafrost Baseline Report
  - 2007 Hydrology Baseline Report
  - 2007 Aquatic Baseline Report
  - 2007 Fisheries Baseline Report
  - 2007 Marine Baseline Report
  - 2007 Ecosystem Mapping & Vegetation Baseline Report
  - 2007 Soils Baseline Report
  - 2007 Wildlife Baseline Report
  - 2007 Archaeology Baseline Report

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## EIS Process in Nunavut



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## Arctic Hare



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