EBA Engineering Consultants Ltd.

October 31, 2001 EBA File: 0701-01-15302

Echo Bay Mines Ltd.
Lupin Operation
9818 Edmonton International Airport
Edmonton, Alberta
T5J 2T2

ᐅᕗᖓ ᑐᖀᑦᑐᑦ: Mr. Hugh Ducasse, CMSP
ᐊᐅᓚᑦᓯᔨ, ᒪᐅᖓᑐᐃᓐᓈᑎᑦᓯᑕᐃᓕᓂᕐᒥᒃ ᐊᒻᒪᓗ ᐊᕙᑎᓕᕆᓂᕐᒥᒃ

ᐅᕗᖓ Mr. Ducasse:

ᐅᓄᓂᖓ ᐱᔾᔪᑎᖏᑦ: ᓴᓇᔾᔪᑎᓂᒃ ᕿᒥᕐᕈᔩᑦ, ᕿᒻᒪᑯᓂᒃ, ᐅᑎᖅᑎᑦᑕᐅᔪᓐᓇᖅᑐᑦ ᐸᕐᓇᑕᐅᔾᔪᑎᖏᑦ, ᓘᐸᓐᓂᒥ, ᑲᓐᑐᐊᐃᑐ ᑕᓯᖓᓂ, ᓄᓇᕗᑦᒥ

ᖁᔭᓕᑐᐃᓐᓇᖅᑐᒍᑦ ᐃᓕᑦᓯᓐᓂᒃ ᐱᑎᑦᓯᒐᑦᑕ ᐱᖓᓃᓕᖓᓪᓗᑎᒃ ᐅᑯᐊ ᖁᓛᓃᑦᑐᑦ ᑐᓴᒃᓴᓕᐊᕕᓂᕐᓂᒃ ᐊᒻᒪᓗ ᐅᖃᐅᓯᒃᓴᖃᕽᐱᕆᓪᓗᕆᑦ. ᑕᒪᓐᓇ ᑐᓴᒃᓴᖅ ᓴᖅᑭᐅᒪᓂᓕᒃ ᕿᒥᕐᕈᔪᔭᑦᑎᓐᓂᒃ ᐱᕆᐊᕐᑕᐅᓚᐅᖅᓯᒪᔪᒥᒃ ᐅᑲᓂ August 2001-ᒥ, ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᖁᑎᑦᓯᓐᓂ, ᐊᒻᒪᓗ ᓴᖅᑭᔪᔪᑦ ᑖᒃᑯᐊ ᑲᑐᑎᓪᓗᓂᔾᔪ ᐱᓕᕆᐊᕕ-ᖓᑦ ᐱᓕᕇᐅᔪᑦ EBA Engineering Consultants Ltd. ᐄᐊᓗᓐᓇᐃᒥ, ᓄᓇᑦᓯᐊᕐᒥ Edmonton Alberta-ᒥ ᐊᒻᒪᓗ ᐅᑯᐊ Robinson Geo Consultants of Vancouver, B.C.-ᒥ.

ᐅᒃᐱᕈᓱᒃᐳᒍᑦ ᐅᑯᐊ ᑐᓴᐅᑎᕆᔪᓐᓇᕐᓂᐊᕐᑕᑎᑦ ᖃᓄᑐᐃᓐᓇᖅ ᐊᑑᓂᖃᓐᓂᐊᕐᒪᑕ ᐃᓕᑦᓯᓐᓄᑦ. ᖃᖓᓕᒫᖅ ᐊᐱᕆᑕᐃᓕᖏᓪᓗᓯ ᐅᕙᓪᓗᑭᐊᖅ ᑐᑭᓯᕆᐊᒃᑲᓐᓂᕈᒪᒍᑦᓯ ᖃᓄᑐᐃᓐᓇᖅ.

ᐅᑯᓈᖓᖅᑐᑦ,
EBA ENGINEERING CONSULTANTS LTD.

R. B. Murphy, M.Sc., P. Geol.
ᓴᓇᔭᒃᓴᒥᒃ ᓯᕗᒨᒃᑎᑦᓯᔨ, ᓄᓇᑦᓯᐊᕐᒥ/ᓄᓇᕗᑦᒥ

RBM/…
cc: Mr. Dave Hohnstein, Echo Bay Mines Ltd.
Ms. Shannon Shaw, Robertson GeoConsultants Inc.

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ᓴᓇᔾᔪᑎᑦ ᕿᒥᕐᕈᔭᐅᓂᖏᑦ
ᕿᒻᒪᑯᑦ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑕᐅᔾᔪᑎᖏᑦ
CONTWOYTO LAKE, NUNAVUT

ᐱᓕᕆᐊᖑᓂᐊᑕ ᓈᓴᐅᑖ No. 0701-01-15302

October, 2001

ᓴᓇᔾᔪᑎᑦ ᕿᒥᕐᕈᔭᐅᓂᖕᒋᑦ
ᕿᒻᒪᑯᑦ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑕᐅᔾᔪᑎᖕᒋᑦ
LUPIN MINE, CONTWOYTO LAKE, NUNAVUT

ᐅᑯᐊ ᐋᕿᒃᓱᖅᑕᖕᒋᑦ:

EBA ENGINEERING CONSULTANTS LTD.
ᔭᐊᓗᓐᓇᐃ, ᓄᓇᑦᓯᐊᖅ

ᑐᓂᔭᐅᔪᑦ ᐅᑯᓄᖕᒐ:

ECHO BAY MINES LTD
EDMONTON, ALBERTA

Project No. 0701-01-15302

October, 2001

P.O. Box 2244, #201, 4916 – 49 Street, Yellowknife, Northwest Territories X1A 2P7
Tel: (867) 920-2287 - Fax: (867) 873-3324 Internet: yellowknife@eba.ca - Web Site: http/www.eba.ca

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ᓈᓴᐅᑎᑎᒍᑦ

ᓈᓴᐅᑖ 1 Lupin-ᒥ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ ᓱᕈᒃᑎᕆᔪᓐᓇᖅᑐᖅᑕᓕᒃ ᓄᓇᒥ - 2001 12

ᖃᓄᖅ ᐱᒋᐊᖓᐅᑎᒥᓃᑦ ᑕᒪᒃᑯᓄᖓ

ᐅᑯᐊ ᐱᓕᕆᕕᐊᓐᓂ EBA Engineering Consultants Ltd. ᐅᑯᐊ EBA-ᑯᑦ ᐱᓕᕆᑎᑕᐅᓚᐅᕐᒪᑕ Echo Bay-ᑯᑦ ᐅᔾᕿᓵᖅᓯᐅᖅᑎᖏᑦ ᓕᒥᑎᑦ. ᑖᒃᑯᐊ (Echo Bay)-ᑯᑦ ᐱᒋᐊᖅᑎᑕᐅᕐᑯᔭᐅᓪᓗᑎᒃ ᓴᓇᕿᑎᓂᒃ ᕿᒥᕐᕈᕐᑯᔭᐅᓪᓗᑎᒃ ᑐᒃᓯᕋᐅᒻᒥᒃ ᐅᑎᖅᑎᑦᓯᒍᑕᐅᒐᔭᖅᑐᒥᒃ ᐱᐅᓯᖓᓄᑦ ᓄᓇᐅᑉ ᐊᐅᓚᔾᔪᑕ-ᐅᓇᔭᖅᑐᓂᒃ ᑕᐃᑲᓂ ᓘᑉᐱᓐ ᐅᔾᕿᓵᖅᓯᐅᖅᐱᐊᓂ. ᑕᒪᓐᓇ ᕿᒥᕐᕈᔾᔪᑕᐅᔪᖅ ᐱᒋᐊᕈᑕᐅᓂᖃᒪᑦ ᑐᒃᓯᕋᐅᑎᑎᒍᑦ ᐊᔾᔨᒌᖕᒋᑦᑐᓂᒃ ᐱᓕᕆᐊᒃᓴᐅᓂᒃ ᐋᕿᒃᓱᖅᓯᒪᔪᓂᒃ ᐊᑐᐃᓐᓇᐅᓂᐊᕐᑐᓂᒃ ᐃᖕᒥᑯᐊᕐᓗᑎᒃ ᖃᓄᐃᑦᑐᑐᐃᓐᓇᐃᑦ ᕿᒥᕐᕈᒍᑎᑦ ᐱᔾᔪᑕᐅᑎᓪᓗᒍ ᐃᓘᓐᓇᓂ ᐅᑎᖅᑎᑕᐅᓂᕆᐊᓕᖓ ᓄᓇᐅᑉ ᐱᐅᓯᕐᒍᑦ ᐅᔾᕿᓵᖅᓯᐅᖅᐱᖓᒥ. ᑕᒪᓐᓇ ᕿᒥᕐᕈᓂᖅ ᑐᒃᓯᖅᑕᐅᔪᖓᒪᑦ ᓇᓗᓇᐃᔭᖅᑕᐅᑦᓯᐊᕐᑯᔭᐅᓪᓗᓂ ᓯᕗᖓᒍᑦ ᐊᑑᑎᓂᕆᒐᔭᖅᑕᖕᒋᓐᓂᒃ ᒫᓐᓇ ᓴᖅᑭᐅᒪᔫᑉ ᐅᑎᖅᑎᒍᑕᐅᔪᒫᕐᓂᐊᖅᓯᐅᑎᐅᑉ ᐱᐅᓯᖓᓄᑦ ᐸᕐᓇᑕᐅᔾᔪᑦ ᐅᔾᕿᓵᖅᓯᐅᖅᐱᖓᒥ (ᑕᐃᑲᓂ ᐱᓗᐊᖅᑐᒥᒃ ᐊᖅᑯᑎᖏᓐᓂ ᓴᓇᔾᔪᑎᑦ ᐅᔾᖃᓂᒃ ᓱᕈᒃᑎᕆᔪᓐᓇᖅᑐᓂᒃ) ᐱᒋᐊᖅᑎᑕᐅᓗᓂᓗ ᐱᓕᕆᔾᔪᑎᑦ ᖃᓄᖅ ᐊᐅᓚᑕᐅᔾᔪᑎᖏᓐᓂᒃ ᐊᑐᑎᓂᖃᕿᔭᖅᑐᑦ ᐅᑎᖅᑎᑦᓯᓂᕐᒥᒃ ᐱᐅᓯᕙᓂᖓᓄᑦ ᓄᓇᐅᑉ.

ᐅᕙᑦᓯᐊᕈᓕ ᖃᐅᔨᓴᕈᑕᐅᖃᑦᑕᖅᓯᒪᔪᔪᑦ ᓱᖅᑯᐃᔭᖅᑕᐅᓯᒪᖓᒪᑕ ᐆᑎᕐᓇᖅᑑᓕᑦ ᓴᓇᔾᔪᑏᑦ ᐅᔾᕿᓵᓂᒃ ᐃᓂᖏᑦ. ᒫᓐᓇᓕ ᐊᑑᑎᑲᐃᓐᓇᖅᑐᑦ ᕿᒻᒪᑯᓕᕆᔾᔪᑎᑦ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑦᓯᔾᔪᑎᑦ ᐋᕿᒃᓱᖅᓯᒪᔾᔪᑎᖏᑦ (Echo Bay, 2001c) ᐃᓚᖃᒻᒪᑦ ᒪᕿᓐᓂᒃ ᖃᓄᖅᑑᕈᑎᒃᓴᓂᒃ ᐊᑑᑕᐅᓇᔭᖅᑑᖕᓂᒃ ᐋᕿᒃᓱᐃᒍᒻᒥᒃ ᐊᒻᒪᓗ ᐸᓚᕈᑎᒋᔫᓐᓇᖅᑕᖏᓐᓂᒃ ᓱᕈᒃᑎᕆᔫᓐᓇᖅᑐᑦ (ᐆᒃᑑᑎᒋᓗᒋᑦ ᐊᐅᒍᓐᓇᖅᑐᑦ ᓴᕕᕿᔭᒃᓴᑦ) ᐊᑦᑕᒎ-ᓕᖅᑐᓄᑦ (ᐆᒃᑑᑎᒋᓗᒋᑦ ᓱᓪᓗᓖᑦ ᐊᖅᑯᑕᐅᔫᑦ ᓯᑎᕚᑎᑦ) ᒫᓐᓇ ᐊᑐᖅᑐᑦ ᑕᐃᑲᓂ. ᒪᑯᐊ ᐃᓚᖏᑦ:

- ᐃᒪᖃᓗᐊᖅᑐᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᓯᒪᔪᑦ ᐃᒪᒃᑯᕕᐅᓪᓗᑎᒃ ᐊᒻᒪᓗ ᐊᒃᐸᓯᒃᑐᒦᑦᑐᑦ ᐊᖅᑯᑎᑦ ᑯᕕᔭ-ᐅᕙᒃᑐᓄᑦ (ᐃᒪᓕᒃ ᐃᒪᐃᓪᓗᐊᖅᑐᓂᒃ ᖁᕝᕙᓯᖕᓂᖃᖅᓱᓂ 484.5 m-ᓂᒃ); ᐊᒻᒪᓗ
- ᐅᓕᒃᓯᒪᔭᐅᔪᑦ ᐃᒪᐃᓪᓗᐊᕐᑐᓅᖓᔪᑦ 1.75 m ᕿᖓᐅᔭᖅᑕᓖᑦ ᖂᖓᓂ ᖁᕝᕙᓯᒃᑐᒥ ᐃᓂᒋᔭᑦ ᐃᓗᓕᓖᑦ ᐊᖅᑯᑎᑦ ᖁᐊᕿᓐᓇᕋᓱᐊᕿᑎᓂᒃ ᐊᖅᑯᑎᓅᖓᔪᑦ ᐅᕝᕙᓗᑭᐊᖅ ᐃᓗᓕᓖᑦ ᑕᒪᒃᑯᓄᖓ ᐊᖅᑯᑎᕕᓂᕐᓄᑦ ᓱᓪᓗᓕᖕᓄᑦ ᐊᒻᒪᓗ ᐸᓚᕿᑕᐅᓇᓱᐊᖅᑐᓄᑦ ᓱᕕᓈᒃᑯᑎᓂᒃ ᐊᖏᖅᑕᐅᓯᒪᔪᑎᒍᑦ ᐊᑑᑎᒐᔭᒃᑐᑎᒍᑦ.

ᐅᓇ ᕿᒥᕐᕈᔭᐅᔪᖅ ᖃᐅᔨᓴᖅᑕᐅᔾᔪᑎᖃᔪᖓᒪᑦ ᓄᐊᑕᐅᓪᓗᑎᒃ ᑐᓴᒐᒃᓴᑦ ᐃᒃᑯᐊ Echo Bay-ᑯᑦ ᐊᓪᓚᒃᓯᒪᔪᕐᑯᑎᖏᓐᓂᒃ ᐅᑯᐊ EBA-ᑯᑦ ᑕᐃᑲᓃᑦᑎᓪᓗᒋᑦ ᓘᑉᐱᓐᒧᑦ ᑕᑯᔭᖅᑐᖅᓯᒪᓪᓗᑎᒃ ᐅᕙᓂ August 27 - 29, 2001-ᒥ. ᒪᑯᓂᖓ ᐃᓚᖃᔪᔪᑦ ᐊᓪᓚᒃᓯᒪᔪᓂᒃ ᓴᖅᑭᔪᔪᓂᒃ:

- ᓄᓇ ᓴᓇᔭᐅᓂᑯ ᐋᕿᒃᓯᒪᔭᐅᓪᓗᓂ ᐊᕙᓗᓕᐅᖅᓯᒪᔪᑦ ᐃᒪᖃᕿᒫᕐᓂᐊᖅᑐᓄᑦ;
- ᖃᐅᔨᓴᖅᑕᐅᕙᒃᓱᑎᒃ ᕿᓪᓖᖕᒋᒃᑲᓗᐊᕐᒪᖔᑕ ᐃᑎᖅᓴᓕᐅᕐᓯᒪᔪᑦ ᐊᕙᓗᓖᑦ, ᒫᓐᓇ ᐊᑏᑎᔪᑦ ᐊᒻᒪᓗ ᐊᑏᑎᑐᓐᓃᕐᓂᑯᐃᑦ, ᐊᒻᒪᓗ ᓄᓇ ᐊᑐᖅᑕᐅᓯᒪᖕᒋᑦᑐᖅ ᕿᒥᐊᕐᔪᐃᑦ/ᕿᖓᐅᔭᑦ;
- ᓄᓇᒦᑦᑐᖅ ᐱᓕᕆᔾᔪᑎᕕᓂᖅ ᐆᑎᕆᔾᔭᓐᓇᖅᑐᖅ ᓱᓪᓗᓕᖕᓂᒃ ᐊᖅᑯᑎᕕᓂᕐᓂᒃ ᐱᔪᖅ, ᕿᒥᐊᕐᔪᖕᓂᒃ ᓯᐅᕋᓐᓂᒃ ᐊᒻᒪᓗ ᑐᐊᕙᖕᓂᒃ, ᐊᒻᒪᓗ ᖃᑯᖅᑖᖑᐊᓂᒃ ᐅᔾᕋᓐᓂᒃ
- ᓱᓪᓗᓖᑦ ᐊᖅᑯᑎᖏᓐᓂᒃ ᐱᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᕐᓂᖏᑦ ᐱᓕᕆᕕᐊᓐᓂᒃ ᑯᕕᔪᑦ; ᐊᒻᒪᓗ
- ᐊᓪᓚᒃᓯᒪᔪᑦ ᑐᓴᒐᒃᓴᑦ ᐅᓂᒃᑳᓖᑦ ᑭᓪᓕᓕᖕᓂᒃ ᐊᕙᑎᓅᖓᔪᑦ, ᖃᓄᐃᓕᖓᓂᖏᑦ ᓘᑉᐱᓐ ᐱᓕᕆᐊᖑᓚᐅᖅᑎᓐᓇᒍ ᖃᓄᐃᑦᑑᓂᒥᓂᖓ ᓄᓇᐅᑉ.

ᐅᑯᐊ ᐱᓕᕆᕕᐊᑦ Robertson GeoConsultants Inc. Vancouver, B.C.-ᒥᒃ ᑲᑐᔾᔭᐅᓪᓗᑎᒃ ᐱᓕᕆ ᐊᖑᔪᖓᑕ ᑲᓐᑐᕋᒃᑎᑦᓯᓪᓗᑎᒃ EBA-ᑯᑦ ᖃᐅᔨᓴᖅᑎᑦᓯᓪᓗᑎᒃ ᐊᑐᐃᓐᓇᐅᔪᓂᒃ ᑐᓴᒐᒃᓴᓂᒃ ᐱᔾᔪᑎᓕᖕᓂᒃ ᐃᒥᕐᒥᒃ ᑯᕕᔪᖃᓐᓂᖅᐸᑦ ᒪᐅᖓᑐᐃᓐᓇᖅ ᓱᕈᒃᑎᕆᔪᓐᓇᖅᑐᒥᒃ ᐊᒻᒪᓗ ᓄᓇᓕᕆᓂᕐᒥᒃ ᓱᕈᓐᓇᕐᑐᓕᖕᒥᒃ ᐊᖅᑯᑎᖏᓐᓂ ᓴᓇᔾᔪᑎᑦ ᓱᓪᓗᓖᑦ.

2.0 ᕿᒥᕐᕈᓂᖅ ᓄᓇᒨᖓᔪᓂᒃ ᓯᓚᐱᐊᒃᓴᓂᒃ ᒪᐅᖓᑐᐃᓐᓈᓃᒃᑯ ᑐᓴᒐᒃᓴᑦ

2.1 ᖃᓄᐃᓐᓇᖅ ᐱᔾᔪᑕᐅᔪᑦ

ᐊᖅᑯᑎᑦ ᐱᓕᕆᔾᔪᑎᓄᑦ ᓱᓪᓗᓖᑦ ᐊᒻᒪᓗ ᐱᓕᕆᔾᔪᑎᑦ ᐃᒦᑦ ᕿᒪᑯᖅᑖᖃᑦᑕᕐᒪᑕ ᑕᐃᒪᓐᓇᐃᓱᖑᒻᒪᑕ ᑭᓱᑐᐃᓐᓇᐃᑦ ᕿᒪᑯᖃᓕᓲᖑᒻᒪᑕ ᐊᒻᒪᓗ ᖃᓄᐃᓐᓇᖅ ᐋᕿᒃᓯᒪᔾᔪᑦ ᐃᒪᓐᓇᐃᓕᖓᕐᑯᔭᕕᓃᑦ ᓯᕗᓐᖓᒍᑦ ᖃᓄᖅᑑᖅᑎᓄᑦ ᓈᓴᐅᑎᑎᒍᑦ.

ᒫᓐᓇ ᐃᒪᓐᓇᐃᓕᖓᓂᖓᓂᒃ, ᖁᐊᑦ ᓱᓪᓗᓖᑦ, ᑐᒃᓯᕐᑮᓇᓯᒪᔭᖏᑦ Echo Bay-ᑯᑦ, ᐊᑑᑎᓂᖃᕈᓐᓇᑐᐃᓐ-ᓇᕆᐊᓕᒃ ᓄᓇᓕᕆᓂᕐᒧᑦ ᐊᑯᓂ:

- ᓯᓚᑖᓅᖓᔪᖅ ᐃᒥᖅ ᐊᕙᓗᓕᐅᖅᓯᒪᔫᑉ ᑕᐃᒪᐃᖏᓐᓇᓂᐊᖅᑐᖅ ᐃᒪᖅ ᑕᑕᐅᑎᓕᖅᐸᑦ ᓯᓚᑖᓄᑦ;
- ᐃᔾᔪᓂᖓ ᕿᒥᐊᖅᔪᔭᑦ ᓯᐅᕋᖅ ᐊᒻᒪᓗ ᑐᐊᐸᒃ ᓴᐅᓯᒪᔾᔪᑎᑦ ᓱᓪᓗᓕᖕᓂᒃ ᓈᒻᒪᑐᐃᓐᓇᓂᐊᕐᑐᖅ ᕿᒪᑯᑕᓕᖕᓂᒃ ᖁᐊᖑᓪᓗᑎᒃ; ᐊᒻᒪᓗ,
- ᐊᒃᐸᓯᖕᓂᖅᓴᑦ ᐃᒪᕐᒥᒃ ᐊᓰᓐᓈᓅᖅᐸᑦ ᐊᐅᒃᑎᓯᔾᔭᖏᑦᑐᖅ ᖁᐊᕐᓂᒃ ᓱᓪᓗᓕᖕᓂᒃ ᑕᕝᕗᖓᖓᔪᑦ.

ᑕᒪᒃᑯᐊ ᐱᓕᕆᓂᓕᖕᒧᑦ ᓄᓇᐅᑉ ᐃᓗᐊᓂ ᐊᖅᑯᑎᕕᓂᕐᓂᒃ ᓱᕈᒃᑎᕆᔪᓐᓇᖅᑐᖅᑕᓕᖕᓂ, ᓱᕐᕋᒃᑕᐅᓯᒪ-ᔪᓄᑦ ᓯᓚᒧᑦ, ᖃᓄᐃᓪᓗᐊᕐᓂᖏᑦ ᑕᓲᑦ, ᓱᕐᕋᑦᑕᐃᓕᔾᔪᑎᓖᑦ ᖁᐊᖑᐃᓐᓇᕐᑐᒨᖓᔪᑦ ᐃᓂᖏᑦ, ᐃᑎᖅ-ᓴᓕᐅᖅᓯᒪᔪᑦ, ᓱᓪᓗᓖᑦ ᐊᖅᑯᑎᑦ, ᐊᒻᒪᓗ ᓴᐅᓯᒍᑎᒃᓴᑦ.

ᐅᓇ ᓇᐃᓈᖅᓯᒪᔪᖅ ᐊᓪᓚᒃᓯᒪᔪᖅ ᐊᑐᐃᓐᓇᖅ ᑐᓴᒐᒃᓴᖅ ᐱᔾᔪᑎᓕᒃ ᓯᓚᒦᑦᑐᓂᒃ ᐊᒻᒪᓗ ᓄᓇᒥᒃ ᖁᐊᖑᐃᓐᓇᖅᑐᒥᒃ ᑕᐃᑲᓂ Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ ᐊᒪᑦᑕᐅᖅ ᓱᓕ ᓇᐃᓈᖅᓯᒪᖕᒥᔪᖅ ᐱᔾᔪᑎᓕᒃ ᓄᓇᓕᕆᔾᔪᒻᒥᒃ ᐊᒻᒪᓗ ᓯᓚᐱᐊᒃᓴᑦ ᓱᓪᓗᓕᖕᓄᑦ ᓱᕈᒃᑎᕆᔪᓐᓇᖅᑐᖅᑕᓕᖕᓄᑦ.

2.2 ᓯᓚᖓ Contwoyto Lake/Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓐᓂ

ᑕᐃᑲᓂ ᓯᓚᖓ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ Lupin ᐅᑭᐅᖅᑕᖅᑐᒨᖓᓪᓚᕆᒻᒪᑦ ᐊᒻᒪᓗ ᐅᓇᖅᑐᐸᓗᒃᓱᓂ ᖃᐅᓯᕐᓇᖅᑐᒥ ᐊᕐᕌᒍᖅ ᒪᖅᑯᑉᐸᒃᑐᖅ ᐃᒫᑎᑭ 129 mm, ᐊᕐᕌᒍᑕᒫᕐᓗ ᖃᓐᓂᐸᒃᑐᒃ ᐃᒫᑎᑭ 118 cm ᐊᒻᒪᓗ ᖃᐅᓯᕐᓇᖃᖃᑦᑕᖅᑐᒥ ᐃᒫᑎᑭ 247 mm (ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᐅᖃᐅᓯᖏᑦ, 1993-ᒥ).

ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᖃᐅᔨᓴᖃᑦᑕᖅᓯᒪᖕᒪᑕ ᓯᓚᐅᑉ ᓱᕐᕌᓂᖓᓂᒃ ᑕᐃᑲᓂ Lupin-ᒥ ᑕᐃᒪᖓᓂᒃ 1959-ᖑᔪᖕᒪᕐ. ᓯᓚᓐᓂᐊᖅᐲᑦ ᖃᐅᔨᖃᑦᑕᖅᓯᒪᖕᒪᑕ Contwoyto Lake-ᒥ ᐊᒻᒪᓗ ᐊᑎᖃᑦᑎᑕᐅᓪᓗᓂ ᓯᓚᓐᓂᐊᖅᕕᐊ Contwoyto Lake. 1982-ᖑᑎᓪᓗᒍ, ᓯᓚᓐᓂᐊᖅᕕᒃ ᐊᓯᔾᔨᔪᖕᒪᑦ Lupin-ᒨᖓᔪᖅ, ᖁᑦᓯᓂᖅᓴᒦᑦᑐᕐᓕ ᑲᓇᖕᓇᖓᓂ, ᐅᐊᓕᓂᐊᓄᑦ ᑎᑭᐅᑎᓯᒪᔪᖅ Contwoyto Lake. ᐊᓪᓚᓯᒪᔪᑦ

ᓂᒡᓕᓇᕐᓂᖓ -11.5°C ᐊᒻᒪ ᖅᑯᐊᖅᑦᑕᕐᓂᖏᑦ ᐅᕗᖓᖓᔪᑦ 4990 °C-ᐅᓪᓗᐃᑦ ᐊᒻᒪ 820 °C-ᐅᓪᓗᐃᑦ, ᑕᐃᒪᓐᓇᐃᓕᖓᔪᑦ.

ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᑎᒍᑦ ᒥᒃᓴᐅᓴᒃᑐᖅ ᐊᕐᕌᒍᑕᒫᑦ ᐃᒪᐃᓪᓗᐊᖅᑐᒥᒃ ᖃᐅᓯᕈᔪᒃᑐᖅ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᖕᒥ ᖃᓂᒋᔮᓂ 247 mm. ᐊᕐᒎᑕᒫᑦ ᑕᓯᖓᓂ Lupin ᒥᒃᓴᐅᓴᒃᑐᖅ ᐃᒪᐃᓪᓗᐊᖅᑐᒥᒃ 275 mm.

2.3 ᖁᐊᖑᐃᓐᓇᖅᑑᑉ ᓄᓇᐅᑉ ᐃᓗᐊᓂ ᖃᓄᐃᓐᓂᖏᑦ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ Lupin

ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ Lupin ᖁᐊᖑᐃᓐᓇᖅᑐᖅ ᓄᓇᐅᑉ ᐃᓗᐊ ᐊᒻᒪ ᐊᖏᓈᖅᓯᒪᓪᓗᓂ; ᐅᖓᑖᓄᑦ 500 m ᓄᓇᐅᑉ ᐃᓗᐊ ᖁᐊᖅ ᑕᐃᒪᐃᑎᓪᓗᒍ ᐱᓕᕆᐊᖑᕕᐅᓯᒪᔪᖅ ᐋᕿᒃᓱᖅᑕᐅᑎᓪᓗᒋᑦ ᐅᔭᕋᒃᓯᐅᖅ-ᕕᒃ ᐱᓕᕆᔾᔪᑎᓄᑦ ᐃᑲᓂ (Lafleche et al., 1988). ᓄᓇ ᑲᓇᖕᓇᖓᓃᑦᑐᖅ ᕿᔪᖃᓗᐊᖏᑦᑐᖅ ᓇᐹᖅᑐᖃᓗᐊᖏᑦᑐᖅ ᐱᐅᓯᖅᓱᕋᒥ ᖅᑭᒻᒎᓚᒥ. ᓄᓇᓗ ᐱᕈᖅᑐᖃᓗᐊᕋᓂ, ᐃᔾᔪᐃᓐᓇᐸᓗᒃ, ᐅᔭᖃᓂ ᓄᓇᔭᐅᖕᒥᓃᓚᓗᐊᑦ, ᐊᒻᒪ ᐃᕕᑦᓱᑲᖄᔾᔪᒃᑐᖅ ᑕᑯᒃᓴᐅᔪᓂᒃ (ᖃᐃᖅᑑᓪᓗᓂ) (Geocon, 1980b).

ᓂᒡᓕᓇᕐᓂᖓ ᓄᓇᐅᑉ ᖃᓂᒋᔮᓃᑦᑐᖅ -6°C ᐅᕗᖓ -8°C. ᓱᕐᕌᖅ ᓄᓇ (ᐊᕐᖀᒍᕋᐃᒻᒪᑦ ᐊᐅᒃᐸᒃᑐᖅ) ᑕᐃᑲᓂ Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ ᐊᔾᔨᒌᖏᑦᑐᒥᒃ ᓱᕐᕋᖃᑦᑕᖅᑐᖅ 1.0 m ᓄᓇᐅᑉ ᐊᑐᖅᑕᐅᓯᒪᖏᓐᓂᐊ ᐊᖏᓂᓕᒃ 4.0 m ᓴᖅᑭᐅᒪᔪᒃᑯᑦ ᐅᔭᖃᓂᒃ ᖃᐅᔨᓴᖅᑕᒥᓂᖅ ᐅᑯᓂ (Geocon, 1990).

2.4 ᒫᓐᓇ ᐊᐅᓚᔪᑦ ᐊᒻᒪ ᐅᑎᖅᑎᑕᐅᔾᔪᓐᓇᖅᑐᖅ ᐊᖅᑯᑎᑦ ᐱᓕᕆᔾᔪᑎᓄᑦ ᐆᓇᕐᓂᖓ

ᐅᑯᐊ ᐱᔭᐅᔪᕕᓃᑦ ᕿᒥᕐᕈᔭᐅᓂᑯᑦ ᐊᑐᐃᓐᓇᐅᔪᑦ ᓄᓇᓕᓐᓂᕐᒧᑦ ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᒃ ᖃᐅᔨ-ᒪᔾᔪᑎᑦ ᐃᑲᖓᑦ ᐊᑐᐃᓐᓇᐅᖓᒪᑕ Echo Bay-ᒥᒃ ᑐᓴᒃᓴᓕᐊᕆᓯᒪᔭᖏᓐᓂᒃ, ᓇᓗᓇᐃᔭᑦᓯᐊᖅᓯᒪᔪᑦ, ᑕᑭᓈᖅᓯᒪᓪᓗᑎᒃ, ᐊᑑᑎᓂᖃᑦᓯᐊᕈᓐᓇᖅᓱᑎᒡᓗ ᐊᑐᐃᓐᓇᐅᓂᖏᑦᑎᒍᑦ ᑕᐃᒪᖓᓂᑦᑕᑦ ᐊᑑᑕᐅᕙᒃᑐᕕᓂᕐᓂᒃ ᓄᓇᐅᑉ ᐃᓗᐊᓅᖓᔪᓄᑦ ᒫᓐᓇ ᐊᑐᖅᑐᑦ ᐊᒻᒪ ᐊᑑᑎᖏᑦᑐᑦ ᐱᓕᕆᔾᔪᑎᓄᑦ.

ᑕᐃᑦᓱᒪᓂ ᐆᓇᕐᓂᖓᓂᒃ ᓱᖅᑯᐃᔭᐃᒍᑎᑦ ᓄᓇ ᐅᑎᖅᑎᑕᐅᑎᓪᓗᒍ ᖃᓄᑎᒋ ᐃᔾᔨᓂᖏᑦ ᕿᒥᐊᕐᔭᐃᑦ ᓯᐅᕋᑦ ᐊᒻᒪ ᑐᐊᐸᑦ ᓴᐅᓯᒍᑕᐅᕙᒃᓱᑎᒃ ᐃᒪᐃᓪᓗᐊᕐᑐᑦ (0.5 m ᐅᕗᖓ 1.5 m ᐃᔾᔨᓂᓕᒃ), ᐊᖅᑯᑎᑦ ᐱᓕᕆᔾᔪᑎᓄᑦ ᐃᒥᕐᒧᑦ ᐊᕐᕌᒍᓕᒫᖅ ᖁᐊᕕᓃᑦ, ᑭᓯᐊᓂ ᐊᐅᒃᐸᒃᓱᑎᒃ ᐊᐅᔭᐅᓕᕋᐃᒻᒪᑦ, ᖃᓕᐊᓈᑦ ᐃᔾᔨᓂᓖᑦ ᐃᒪᐃᓪᓗᐊᕐᑐᓂᒃ 1.5 m ᐅᕗᖓ 2.0 m. ᓄᓇᒨᖓᓂᖃᕋᔪᒃᓱᑎᒃ ᐃᒪᐃᓪᓗᐊᕐᑐᒥᒃ 1.0 m ᐃᓂᖏᓐᓄᑦ ᓱᓪᓗᓃᑦ, ᐊᖏᓂᖃᖅᓱᑎᒃ ᐃᒫᒃ ᑎᑭᐅᑎᓯᒪᔪᒥᒃ 10.0 m ᐃᔾᔨᓂᖃᖅᓱᑎᒃ ᐃᖕᒥᒍᑦ. ᐊᐅᓚᖏᑦᑐᑦ ᓂᒡᓕᓇᕐᓂᖃᖅᓱᑎᒃ ᐃᒫᒃ -3.5°C ᑎᑭᑦᓱᒍ -7.5°C (Klohn-Crippen, 1997, Geocon 1990) ᐅᑯᐊ ᖃᐅᔨᓴᕐᑕᒥᓂᖏᑦ.

3.0 ᓄᓇᐅᑉ ᐃᓗᐊᓃᑦᑐᓂᒃ ᓴᓇᔾᔪᑎᓂᒃ ᕿᒥᕐᕈᓂᖅ

3.1 ᐊᑕᖏᑦᑎᓪᓗᒋᑦ ᐅᓂᒃᑳᑦ

ᐊᔪᓇᖏᔾᔪᑎᒋᕙᔭᖅᑕᖓ ᒫᓐᓇ ᐱᔾᔪᑕᐅᔪᒃᑯᑦ ᑐᒃᓯᕌᖑᓯᒪᔪᖅ Echo Bay-ᑯᓐᓄᑦ ᐊᒻᒪᓗ ᐊᓯᖏᓐᓄᑦ ᓯᕗᓂᒃᓴᑎᓐᓂ ᐊᑑᑕᐅᒍᒪᕙᔭᕐᒥᔪᓄᑦ ᑕᒪᒃᑯᓄᖓᑦᑕᐅᖅ ᖃᐅᔨᔪᒪᔪᖃᕐᐸᑦ ᓄᓇᓕᐅᓂᕐᒧᑦ ᑕᒪᒃᑯᓂᖓ ᐊᖅᑯᑎᖏᓐᓅᖓᔪᓂᒃ ᓱᓪᓗᓖᑦ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᖕᒥ ᐊᒻᒪᓗ ᓇᓪᓕᐊᒃ ᓈᒻᒪᖏᓐᓂᖅᓴᐅᓇᔭᖅᑐᖅ ᐊᑑᑎᓗᒍ ᓱᕈᒃᑎᓇᓂᐅᓴᕙᔭᖅᑐᓘᓐᓃᑦ ᓄᓇᒨᖓᔪᒧᑦ ᐃᒪᕐᒧᑦ ᐊᒻᒪᓗ ᖄᖓᓄᑦ ᐃᒪᐅᑉ.

ᒪᑐᒪᓗ ᐃᓚᖓᓂᒃ ᐱᔾᔪᑎᖃᒻᒪᑕ ᓇᐃᓈᖅᓯᒪᔪᒥᒃ ᑐᓴᕋᒃᓴᒥᒃ ᐊᑐᐃᓐᓇᐅᔪᒥᒃ ᑐᓴᕋᒃᓴᐅᓪᓗᓂ ᐱᔾᔪᑎᓕᒃ ᐃᒫᓂᒃ ᖃᓄᐃᑦᑑᓂᖓᓂᒃ ᐊᒻᒪᓗ ᐅᔭᕋᒃᓴᓕᕐᔾᔪᑎᑦ ᓄᓇᒥ ᓱᕈᒃᑎᓇᔾᔪᑎᒍᑦ ᐊᖅᑯᑎ-ᓄᑦ ᐊᒃᑐᐊᔪᓂᒃ, ᐃᓚᖃᖅᓱᑎᒃ ᑕᒪᒃᑯᓂᖓ ᐊᖅᑯᑎᒃᓴᓂᒃ ᓯᑎᔪᓂᒃ, ᐊᒻᒪᓗ ᕿᒥᐊᕐᔪᔭᐃᑦ ᓴᐅᓯᒍᑕ-ᐅᕙᒃᑐᑦ ᐅᔭᖃᑦ ᐊᑦᑕᓇᕐᓂᐅᓴᔪᖅᑕᓕᖓᓄᑦ ᒪᐅᖓᑐᐃᓐᓈᕐᑯᓇᒋᑦ. ᓯᕗᓐᖓᒍᑦ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᕐᓯᒪᔪᑦ ᐆᑎᓇᔪᓐᓇᖅᑐᑦ ᓱᓪᓗᓕᖕᓂᒃ, ᐱᓗᐊᖅᑐᒥᒃ ᐱᔪᑦ ᕿᒪᑯᓂᒃ, ᐅᑎᖅᑎᑕᐅᔪᒫᕐᓂᐊᕐᑐᓂᒃ ᐱᐅᓯᖏᓐᓄᑦ.

3.2 ᓯᕗᓪᓕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᖅᑕᐅᔪᑦ ARD ᓱᕈᒃᑎᓇᒌᓪᓚᒍᓐᓇᕐᓂᖏᑦ ᐊᖅᑯᑎᓕᐊᓂᓯᒪᔪᓂ (ᐃᒪᖃᑦᑕᐅᖅ ᓴᐅᔭᐅᒋᐊᖃᑦᑐᖃᓕᕐᐸᑦ ᓴᐅᓯᒍᑎᒃᓴᑦ)

ᑕᒪᓐᓇ ᖃᐅᔨᓴᖅᑕᐅᔪᔪᖅ ᕿᒥᕐᕈᔭᐅᒃᑲᓂᖅᓯᒪᔪᖅ ᓇᓗᓇᐃᔭᖅᑕᐅᑦᓯᐊᖅᓱᓂ ᒪᑯᓄᖓᖓᔪᑦ ᐊᖅᑯᑎᓄᑦ ᓱᓪᓗᓕᖕᓄᑦ ᓱᕈᒃᑎᓇᔪᓐᓇᖅᑐᑦ ᕿᒪᑯᐃᑦ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑕᐅᔪᓐᓇᖅᑐᑦ ᐱᐅᓯᖓᓄᑦ ᐸᕐᓇᐃᒍᑎᑦ. ᕿᒥᕐᕈᒍᑦ ᐃᓚᓕᒃ ᒫᓐᓇᒨᖓᔪᓂᒃ ᐊᒻᒪᓗ ᓯᕗᓂᒃᓴᒧᑦ ᑕᒪᒃᑯᐊ ᐆᑎᓇᔪᓐᓇᖅᑐᑦ ᓱᕐᖂᐸᑕ ᐊᖅᑯᑎᖏᑦ ᐊᒻᒪᓗ ᐃᒥᕐᒧᑦ ᐊᒃᑐᐊᔪᑦ/ᐊᑦᑕᓈᕿᑐᐃᓐᓇᓇᐋᑦ ᐊᒻᒪᓗ ᐱᓗᐊᕐᑐᒥᒃ ᖃᓄᖅ ᓯᕗᓐᖓᓂ ᖃᐅᔨᓴᖅᑕ-ᒥᓂᐅᓚᓗᐊᕐᓗᑎᒃ ᐅᔭᕋᒃᓴᖅᓯᐅᕈᑎᑦ ᖃᓄᐃᑦᑑᓂᖏᑦᑎᒍᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᑦ ᐊᒃᑐᐊᓂᖃᕈᓐᓇᕐᒪᑕ ᖃᐅᓯᓕᕐ-ᓂᕈᑎᒃ, ᖁᐊᓐᓂᕈᑎᒃ ᐅᐸᓗᑭᐊᖅ ᓱᐱᖅᑑᖏᓐᓇᖃᑦᑕᖅᐸᑕ ᐊᒻᒪᓗ ᐃᒪᕐᑰᖓᓐᓂᖅᐸᑕ.

ARD ᕿᒪᑰᒪᑦ ᖃᒃᑯᖅᓯᓂᖅ ᑕᓇᐅᖑᔭᖅ ᐅᓇᖅᑑᔭᖅ ᐊᒻᒪᓗ ᑕᒪᓐᓇ ᓱᕐᖃᑎᑦᓯᔪᓐᓇᕐᒪᑦ ᐱᐅᓯᖓ-ᓂᒃ ᐆᑎᕐᑎᑦᓯᕙᓪᓕᐊᒍᓐᓇᕐᒪᑦ ᓴᕕᖃᔭᖓᓂᒃ ᓱᓪᓗᓕᖓᓂᒃ ᐅᐸᓗᑭᐊᖅ ᐱᒥᑎᓇᔪᓐᓇᕐᒪᑦ ᐃᒥᕐᒥᒃ. ᐳᓪᓚᐅᔭᖅ ᐅᔭᕋᒃᓴᖅᑕᓕᒃᓴᖅ ᑕᐃᑲᓂ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᖕᒥ Lupin-ᒥ ᐊᖅᑯᑎᖏᓐᓂ ᓱᓪᓗᓖᑦ ᐃᓚᖃ-ᒻᒪᑕ ᒪᑯᓂᖓ arsenopyrite (FeAsS), pyrrhotite ($Fe_{1-x}S$), pyrite (FeS_2), and chalcopyrite ($CuFeS_2$). ᑕᓇᐅᖑᔭᑦ ᐳᓪᓚᕐᓗᐃᑦ ᖁᖅᓱᕈᔪᒃᑐᓂᒃ ᐱᑕᓖᑦ ᐃᒪᐃᓪᓗᐊᕐᑐᓂᒃ 3 ᐊᒻᒪᓗ 4 ᐳᕐᓴᓅᖓᔪᑦ ᐅᖃᐅᓯᐅᓯᒪᖓᒪᑕ ᐊᓪᓚᒃᓯᒪᔪᑎᒍᑦ ᑐᓴᒃᓴᓂ ᐊᒥᓱᐊᖅᑎᖅᓱᑎᒃ. ᑕᒪᓇᓗ ᖁᑦᓯᖕᓂᖃᒻᒪᑦ ᐱᑕᓕᒃ, ᐊᒻᒪᓗ ᐊᒃᐸᓯᒃᑑᓪᓗᓂ ᓱᕐᖁᓂᖓ ᐊᓪᓚᒃᓯᒪᔪᖅ ᐃᒪᐃᓪᓗᐊᕐᑐᑦ (<50 kg $CaCO_3$/t equiv.), ᓂᓇᐅᖕ-ᓇᖁᔪᖅᐳᖅ, ᖃᖓᑭᐊᖅ, ᑕᒪᒃᑯᐊ ᑯᕕᕚᑦ ᐊᖅᑯᑎᖏᑦ ᐅᔭᕋᒃᓴᖅᓯᐅᕈᑎᑦ ᐆᑎᓐᓇᖅᑐᓄᑦ ᓱᕐᖁᓚᔪᕐᒪᑕ ᐊᒻᒪᓗ ᓴᕕᒃᓴᑦ (ᓴᕕᖁᔪᑦ) ᐃᓱᓖᓪᓗᖓᖁᔪᖅᑐᑦ ᐃᓚᖃᖅᓱᑎᒃ ᒪᑯᓂᖓ, Fe, ᐊᒻᒪᓗ ᐃᓱᓖᓪᓗᖓᕐᑐᑦ ᒪᑯᐊ Cu ᐊᒻᒪᓗ Zn.

ᑕᒪᒃᑯᐊ ᐱᔾᔪᑕᐅᑎᓪᓗᒋᑦ ᓄᓇᒨᖓᔪᑦ ᐃᓚᒍᑕᓖᑦ ᐋᓪᓚᓂᒃ, ᒪᕿᒃ ᐊᐱᖅᑯᑎᒋᔪᒥᓇᓗᐊᕐᑑᒃ ᑭᐅᔭᐅᔪᓐᓇᖏᑦᑑᒃ ᒫᓐᓇ ᓴᖅᑭᐅᒪᔪᑎᒍᑦ ᑐᓴᒃᓴᖅᑎᒍᑦ ᐅᑯᐊ:

(1) ᐃᓱᒪᒋᓪᓗᒋᑦ ᐃᒃᐱᖕᓇᕈᓐᓇᖅᑐᑦ ᑕᒪᒃᑯᐊ ᑭᓯᐊᓂ ᓱᕐᖁᑕᐅᒐᐃᑉᐸᑕ ᓯᓚᒧᑦ ᖃᓕᐊᓈᑦ ᖁᓛᓃᑦᑐᑦ ᐊᖅᑯᑎᑦ ᓱᓪᓗᓈᑦ ᓴᓇᔾᔪᑎᓄᑦ ᖁᒻᒧᑦ ᑎᑭᐅᑎᓯᒪᔭᑦ 1.5m (ᐃᒪᖃᖅᓱᑎᒃ 1.75m ᐅᔭᖃᓂᒃ ᕿᒥᐊᕐᔪᔭᓂᒃ ᖄᖓᓂ), ᓛᓐᓇᒨᖓᔪᑦ ᐊᒻᒪ ᕿᓪᓛᖅᑐᖃᓕᕐᓂᕐᐸᑦ ᐃᒥᕐᒥᒃ ᐱᔪᒥᒃ ᓱᓪᓗᓕᖕᓂᒃ ᓴᓇᕕᖕᒥ ᒫᓐᓇ?

(2) ᑕᒪᓐᓇ ᐃᓱᒪᒋᓗᒍ, ᖃᐅᖅ ᐱᔪᖅᑲᕋᔭᕐᐸ ᐱᔪᓂᒃ ᒫᓐᓇ ᐊᒻᒪ ᐅᕙᑦᓯᐊᕈᔪᒫᕐᑐᖅ ᐊᒃᑐᐊᓂᓪᓛᑦ ᑕᒪᒃᑯᐊ ᕿᓪᓛᑐᐃᓐᓇᓄᐊᓪᓛᑦ ᐃᒦᑦ ᐃᒫᓄᑦ (ᑕᓯᖅ 1, ᑕᓯᖅ 2 ᐊᓯᐊᒍᓪᓗ ᕿᓪᓛᖅᑐᖃᑉᐸᑦ)?

4.0 ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑎᑦ ᖃᐅᖅᑑᕐᑕᐅᓂᖏᑦ ᐅᑎᖅᑎᑦᓯᓂᖅ ᓇᓪᓕᐊᒃᑯᑐᐃᓐᓇᖅ ᐊᑑᑕᐅᔪᓐᓇᕐᑐᑦ

ᒫᓐᓇᓯᐅᑦ ᓴᖅᑭᐅᒪᓂᓈᑦ ᑐᑭᖏᑦ -- ᐃᒪᕐᒧᑦ ᖄᒥᒍᒫᖕᓂᐊᕈᑎᑦ ᒫᓐᓇ ᐃᒪᖃᑉᐸᖕᒪᑕ ᐊᒻᒪ ᐅᔭᖃᓅᖅᐸᒃᓱᓂ ᓴᐅᓯᒪᒍᑕᐅᔭᓄᑦ ᖁᑦᓯᓂᖅᓴᒦᑦᑐᓄᑦ ᐊᖅᑯᑕᐅᔭᓄᑦ ᖅᑯᐊᕐᓂᖅᓴᐅᒐᔭᕐᒪᑦ ᐊᒃᑐᐊᒍᑎᖕᒋ-ᓂᖅᓴᐅᓕᖃᔭᕐᒪᑕᓗ ᐊᖅᑯᑎᖕᒋᑦ ᖁᐊᑉᐸᑦ -- ᑕᒪᓐᓇᓗ ᐊᑑᑕᐅᓇᓱᐊᖃᑦᑕᕐᒪᑦ ᐱᓕᕆᔭᓄᑦ ᖃᐅᔨᒪᔭᖅ ᐸᓚᕈᑕᐅᒍᓐᓇᕐᒪᑦ ᐆᑎᕐᓇᖅᑐᖃᑦᑕᐃᓕᑎᑦᓯᓗᓂ ᑕᒪᒃᑯᓄᖓᖓᔪᓂᒃ ᐊᖅᑯᑎᓄᑦ ᓱᓪᓗᓕᖕᓄᑦ ᓱᕙᖅᑎᑕ-ᐅᑕᐃᓕᒐᓱᐊᖅᓱᑎᒃ ᐊᒻᒪ ᑕᓇᐅᖕᒍᔭᖅ ᐃᓗ ᓱᕐᖁᓗᐊᕐᑯᓇᒍ ᐳᓪᓚᕐᓗᒃ ᐊᒃᑕᑯ ᐅᔭᖃᒃᓴᖅᓯᐅᕈᑎᕙᓂᖅ ᐅᑯᑎᒎᓇ ᓇᓗᓇᐃᔭᖅᓯᒪᔭᑦ (Geocon, 1993; Payant ᐅᒻᒪᓗ Yanful, 1995; Dawson ᐊᒻᒪᓗ Morin, 1996).

ᑐᒃᓯᕐᖑᓯᒪᔪᑎᒍᑦ ᕿᖕᒐᐅᔭᑦ/ᕿᒥᐊᕐᔪᐃᑦ ᐅᔭᖃᑦ ᓴᐅᓯᒍᑕᐅᔪᓐᓇᕐᓂᖏᑦ ᐊᑑᑕᐅᓗᐊᕐᓂᐊᖏᒻᒪᑕ, ᑕᐃᒪᖓᓕᒫᖑᖏᑦᑐᖏᓛᖅ ᐃᓗᒻᒧᐊᒦᒃᑯᑕᐅᓗᓂ ᓱᕕᖁᓇᒍ ᐃᓘᒻᒧᑦ ᐃᓗᐱᐊᖏᑦ ᓱᕐᖂᖁᓇᒋᑦ. ᖃᐅ-ᔨᓴᖅᑕᐅᖃᑦᑕᖅᓯᒪᔭᑦ ᓴᓂᐊᓃᑦᑐᑦ ᓂᓪᓕᓇᕐᓂᖓᓄᑦ 0°C, ᑕᒪᓐᓇ ᐃᓚᒋᓕᐅᑎᓯᒪᔭᖅ ᓱᕕᕈᓐᓇᕐᑐᖅ ᐃᒫᒃ ᐱᕙᓪᓕᐊᓂᖃᕈᓐᓇᖅᓱᓂ ᖃᓂᒋᔸᓂᒃ 15 ᐳᕐᓴᓐ ᑎᑭᐅᑎᓯᒪᓪᓗᓂ ᐊᑑᑎᓂᓇᒐᔭᕐᑖ 25°C (Knapp, 1987). ᓱᖅᑯᐃᔭᐃᕕᖕᒥ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᖅᓯᒪᔭᑦ ᐆᒃᑐᖁᖅᑕᐅᓪᓗᑎᒃ ᐅᑯᓄᖓ Meldrum ᑲᑐᔾᔭᐅᓪᓗᓂ (2001)-ᒥ ᓱᖅᑯᐃᖅᑕᐅᓐᓂᖏᑦᑐᑦ ᖃᐅᔨᖅᑕᑦ ᐆᒃᑑᑎᒋᔭᓪᓗ ᖃᐅᖅ ᓱᕐᖂᓂᖓ ᓱᕕᕐᓂᖏᑦᑕ ᐃᒫᒃ -10°C ᐊᒻᒪᓗ ᐸᓚᕐᓯᒍᑎᒋᔭᓐᓇᕐᑕᖓᓅᖓᔭᖅ ᑎᑭᐅᑎᓯᒪᓪᓗᓂ ᐅᕙᖓ -2°C; ᑕᒪᓐᓇᓗ ᓱᖅᑯᐃᖅᑕᓚᐅᕐᓯᒪᖕᒪᑦ ᖃᐅᔨᖅᑕᐅᓪᓗᓂ ᖁᐊᖑᓐᖏᓗᐊᕐᑐᖅ ᐃᒪᖅ ᐃᓗᐊᓃᑦᑐᑦ ᓱᓪᓗᓈᑦ ᓱᖅᑯᐃᔭᕈᑎᑦ ᐆᒃᑑᑕᐅᓯᓐᓈᑦ ᖅᑯᐊᖅᑎᑕᐅᕙᒃᓱᓂ ᖃᐅᖅ ᐸᓚᕈᑎᒋᔭᓐᓇᕐᑕᕐᖏᓐᓂᒃ ᕿᓪᓛᕐᓂᐅᓴᔭᑦ ᐃᒫᓂᒃ ᐱᔪᒥᒃ ᑕᓇᐅᕐᒥᒃ ᐊᒻᒪ ᐊᐅᒃᑎᑕᐅᕙᒃᓱᑎᒃ ᓯᑎᔭᑦ. ᖃᐅᔨᖅᑕᐅᖃᑦᑕᕐᓯᒪᖕᒥᔭᑦ ᐊᓯᖏᑦ ᐆᑎᕐᓇᖅᑐᑦ ᐊᖅᑯᑎᖏᓐᓃᑦᑐᑦ ᑯᑉᕕᕖᑦ ᓱᓪᓗᓈᑦ ᐅᔭᖃᒃᓴᖅᓯᐅᖅᕕᖕᒥ ᖁᐊᖑᐃᓐᓇᖅᑐᖅ ᖃᐅᐃᒐᔭᕐᒪᖕᒪᖅ ᓄᓇᐅᑉ ᐊᕙᑖᓂ ᑕᒪᓐᓇᓗ ᓱᖅᑯᐃᖅᑕᐅᑦᓱᓂ ᓱᕐᖁᐃᓗᐊᕐᖁᔭᖏᒋᐊᖓᓂ ᐆᑎᕐᓇᖅᑐᓂᒃ ᖃᐅᔨᕐᑕᖅ ᐅᑯᓄᖓ (Dave ᑲᑐᔾᔭᐅᓪᓗᓂ., 1996; Dawson ᐊᒻᒪᓗ Morin, 1996). ᓱᓕᓗ, ᖃᐅᔨᕐᑕᐅᓪᓗᑎᒃ ᐳᓪᓚᕐᓗᐃᑦ ᓱᕕᕐᑐᓃᑦᑐᑦ ᓱᓕ ᖁᐊᖑᖏᑦᑐᒧᑦ ᐃᒥᕐᒧᑦ ᖁᐊᕐᓇᐅᑎᓪᓗᒍ ᓯᓚ, ᖃᐅᔨᓴᕈᑕᐅᓪᓗᑎᒃ ᐱᓕᕆᔾᔭᑎᑦ ᐃᓚᓐᓈᑦ ᓱᓪᓗᓈᑦ ᐊᖅᑯᑎᖏᑎᒍᑦ ᕿᓪᓛᕈᓐᓇᕐᒪᖓᑕ ᐃᒥᕐᒥᒃ ᖁᐊᕈᓐᓇᖏᑦᑐᖅ ᐃᒥᖅ ᓱᖁᐃᔭᕐᑕᒥᓂᐊᑦ ᐅᑯᐊ (Dawson ᐊᒻᒪᓗ Morin, 1996).

ᑐᒃᓯᕐᖑᓯᒪᔪᑎᒍᑦ ᕿᖕᒐᐅᔭᑦ/ᕿᒥᐊᕐᔪᐃᑦ ᐊᔭᖃᑦ ᓴᐅᓯᒍᑕᐅᔪᓐᓇᖅᑐᑦ ᐸᓚᖅᑎᓯᓗᐊᕈᓐᓇᖏᑦᑐᑦ ᐊᐅᒃᑎᑦᓯᑦᑕᐃᓕᓂᕐᒥᒃ ᓯᓚᐱᐊᖏᓐᓂᒃ ᓱᓪᓗᓈᑦ ᐊᖅᑯᑏᑦ ᐅᔭᖃᒃᓴᓕᐅᕈᑎᕙᓂᕐᓄᑦ. ᖃᐅᔨᕐᑕᐅᔪᒥᓃᑦ ᐊᑖᒎᖓᔭᑦ ᑐᒃᓯᕐᑎᒍᑦ ᐃᒪᐃᓪᓗᐊᕐᑐᑦ 1.75 m ᐅᔭᖃᑦ ᓴᐅᓯᒍᑕᐅᕙᒃᑐᑦ, ᐃᓂᒋᕙᒃᑕᖏᑦ ᐊᖅᑯᑎᑦ ᖃᓂᒋᔸᓅᖓᔭᑦ 0.5 ᑎᑭᐅᑎᓪᓗᓂ 1.5 m ᐃᔾᔭᓂᓕᒃ. ᐊᓯᐊᒍᓪᓗ ᐊᑑᑕᐅᔪᓐᓇᕐᑐᖅ, ᐃᔾᔭᓗᐊᖏᑦᑐᒥᒃ ᓯᓚᐱᐊᖑᔭᓐᓇᕐᑐᒥᒃ ᑕᒪᒃᑯᓄᖓ ᖃᐅᖅ ᓱᕐᖂᒐᔭᕐᒪᖕᒪᖅ. ᓯᓚᐱᐊᖓ ᐃᔾᔭᓂᓕᒃ 1.0 m-ᒥᒃ ᐊᐅᓚᒍᓐ-ᓇᖅᑐᒥᒃ ᐃᑭᐊᕐᒥᖃᓪᓗᓂ ᑎᑭᐅᑎᓯᒪᔭᒥᒃ ᒥᒃᓴᐅᓴᒃᑐᒧᑦ 2.0 to 2.5 metres ᐃᔾᔭᓂᖓ.

ᓄᓇᒨᖔᕙᑦ ᑕᒪᒃᑯᐊ ᓱᕐᕋᐃᔭᓐᓇᕐᑐᑦ ᐃᓚᒍᑕᑦ ᐊᒃᑐᐊᓂᓪᓚᑦ ᓯᓚ ᓱᕐᕋᓚᐃᖓᒪᑦ ᖁᐊᕐᓇᖅᓯᓚᐃᒻᒪᑦ ᐊᒻᒪᓗ ᑕᕆᐅᔪᕈᑉᐸᒃᑐᑦ ᐃᑭᐊᖓᒍᑦ ᓱᐱᕋᐃᓚᒥᒃ ᐊᒻᒪᓗ ᐊᒃᑐᐊᓂᖏᑦ ᓴᐱᕋᔪᒃᒧᑦ ᓱᕐᕌᓂᖏᑦ ᓱᖅᑯᐃ-ᖅᑕᐅᓯᒪᑦᓯᐊᖏᑦᑐᑦ ᒫᓇ ᓴᖅᑭᐅᒪᔭᒃᑯᑦ ᑕᐃᑲᓂ ᓄᓇᒥ ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᖕᒥ. ᓄᐊᑕᐅᓯᒪᔭᑦ ᐃᒪᖏᑦ ᐅᑎᖅᑕᐅᔮᒃᓴᑦ ᓴᐅᓯᒍᑕᐅᕚᒃᑐᑦ ᐅᔭᖅᑲᑦ ᖃᐅᔨᓴᖅᑕᐅᔭᓇᐊᖃᒻᒥᖓᒪᑕ ᖃᓄᖅ ᐊᒃᑐᐊᓂᖏᑦ ᐃᒥᕐᒧᑦ ᐃᓚᒍᑕᓂᖕᓄᑦ ᑕᕝᕙᖓᖔᔭᑦ ᓱᓪᓗᓂᖕᓄᑦ ᐊᖅᑯᑎᓄᑦ ᓱᑲᒃᑎᓇᔭᓐᓇᖅᑐᖅᑕᓂᖕᓄᑦ ᐊᒻᒪᓗ ᑭᖑᖔᒍᑦ ᖅᑭᓪᓛᓐᓂᑯᐃᑦ ᓱᕐᕋᐃᔭᓐᓇᖅᑐᖅᑕᓪᓚᑦ ᐃᒪᕐᒨᖓᓂᕐᓂᖅᐸᑦ ᐊᕙᑎᑦᑎᓐᓄᑦ ᑕᒫᓇ ᐋᕿᒃᓱᖅᑕᐅᓚᐅᕐᑎᓐᓇᒍ. ᒫᓇ ᓴᐅᓯᒍᑕᐅᕚᒃᑐᖅ ᐅᔭᖃᑦ ᐃᒪᒃ ᐃᔾᔭᓂᓕᒃ 1.75 metres ᐅᔾᔮᑐᖅᑕᐅᑦᓯᐊᕋᓱᐊᕐᒪᑦ ᖃᓄᐃᓪᓗ-ᐊᕐᓂᖓᓂᒃ ᒪᓕᒃᓱᑎᒃ ᓯᕗᖓᒍᑦ ᐋᕿᒃᑕᐅᓱᐊᖅᓱᓂ ᖃᓄᐃᓪᓗᐊᕋᔭᒪᖔᖅ ᐃᓘᓐᓇᓂ ᖁᐊᖑᐃᓐᓇᖅ-ᑐᖅ ᓯᓚᐱᐊᒃᓴᖏᓐᓂᒃ ᓱᓪᓗᓪᓚᑦ ᓈᒻᒪᒐᔭᕋᓗᐊᕐᒪᖖᖅ ᑕᐃᒪᓐᓇᐃᓕᖓᑉᐸᑦ.

ᓯᓚᐱᐊᓇᔭᐅᒐᔭᖅᑐᑦ, ᒪᒃᑯᐊ ᐅᔭᖅᑲᑦ ᕿᒥᐊᕐᔦᔭᑦ ᐃᒪᐃᓪᓗᐊᕐᑐᒥᒃ 1.0 m ᐃᔾᔦᑎᓂᖃᓪᓗᓂ ᐅᕙᓗᑭᐊᖅ ᒥᑭᓂᖅᓴᖅ ᓈᒻᒪᒐᔭᖅᑰᖅᑐᖅ ᐅᑎᖅᑎᑕᐅᔦᒫᕐᓂᐊᕐᒪᑕ ᑕᐃᑲᓂ Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᕐᐱᐊᓂ, ᒪᓕᒃᑕᐅᓗᓂᓪᓚᒃ ᑭᓯᐊᓂ ᕿᓪᓛᕐᓂᐅᓴᓂᖓ ᐃᒪᖓᑕ ᐅᔭᕋᒃᓴᓕᕆᔾᔦᑎᐱᓂᖅ ᓯᓚᒧᐊᖓᓂᖓ ᖁᐊᖑᓕᖅᐸᑕ ᐊᖅᑯᑏᑦ ᐊᒻᒪᓗ ᑲᔦᓯᒍᑕᐅᒐᔪᕐᓂᖓ ᐊᒃᑐᐊᓂᖓᓅᖔᔦᑦ ᒪᐅᖓᑐᐃᓈᑲᓪᓚᑦᑕᕈᐊᕐᒪᑦ ᐃᒪᕐᒧᑦ ᐊᓯᐊᓄᑦ ᐊᕙᑖᓃᑦᑐᒧᑦ.

ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᓂᖏᑦᑕ ᖃᓄᐃᓕᖔᓂᖏᑦ ᖁᐊᖑᐃᓐᓇᖅᑐᒨᖔᕙᑦ ᐊᑦᑎᓂᖃᕋᔭᖅᑰᖏᑦᑐᑦ ᓴᓇᔾᔦᑎ-ᓅᖔᑎᓪᓗᒍ ᒪᑯᓄᖓ ᐱᔾᔦᑕᐅᔦᓄᑦ:

- ᐃᔾᔦᓂᖓ ᓯᓚᐱᐊᕐ ᑲᑎᖅᑐᖅᓯᒪᓗᓂ ᖃᓄᐃᓪᓗᐊᓂᐊ ᐅᖃᐅᓯᓕᐊᓇᓯᔭᖓ ᐆᒪ Geocon (1993) ᐃᒪᐃᓪᓗᐊᕋᔭᖑᐊᕐᑐᒥᒃ 3 m ᐅᕙᓗᑭᐊᖅ ᐊᖏᓂᖅᓴᒥᒃ ᐅᔭᖃᓂᒃ ᕿᓂᒍᑎᒃᓴᓂ ᓈᒻᒪᒐᔭᖅᑐᖅ "ᑕᐃᒪᖓᓕᒫᖅ" ᖁᐊᖑᐃᓐᓇᓂᐊᕐᑎᓪᓗᒍ;
- ᑕᒫᓇ ᐊᑑᑕᐅᔫᓇᑐᐃᓐᓇᓇᐊᓕᒃ ᐊᖅᑯᑏᑦ ᓱᓪᓗᓪᓚᑦ ᖁᐊᖑᐃᓐᓇᓂᐊᕐᐸᑦ ᐃᓘᓐᓇᓂ, ᐃᓚᖃᖅᓱᓂ ᒪᑯᓂᖓ ᐊᑐᖅᑕᐅᔦᓂᒃ ᒫᓇ. ᑕᒪᒃᑯᐊ ᖁᐊᖑᓗᐊᓚᐅᖏᒃᑲᓗᐊᕐᓗᑎᒃ ᑭᖕᖑᖔᒍᑦ ᖁᐊᖑᐃᓐᓇᓕᕋᔭᖅᑐᑦ ᑭᓯᒥᓕ ᓈᒻᒪᒃᓯᒃᐸᑦ ᑭᓯᐊᓂᐅᒐᔭᕐᒥᖓᒪᑦ ᖁᐊᖑᐃᓐᓇᕐᓂᓇᒐᔭᕐᑕᖔᓄᑦ;
- ᑕᒪᒃᑯᐊ ᑕᓪᕗᐅᔦᑦ ᓯᑎᓪᓗᔫᓐᓇᕐᑐᑦ ᖁᐊᕐᓇᓵᖅᑎᑦᓯᓇᔭᖅᑐᑦ ᕿᕐᓛᖅᑐᓂᒃ ᐃᒪᕐᓂᒃ, ᖁᐊᕐᓇᒧᑦ ᖅᑭᕿᓐᓇᖅᑐᒧᑦ ᑎᑭᐅᑎᔭᐅᒃᐸᑦ ᓈᒻᒪᒐᔭᖅᑑᒐᓗᐊᖅ ᖅᑭᕿᓐᓇᓚᓇᓪᓗᓂ;
- ᐊᑯᓂ ᐋᑐᑎᓂᖃᕈᓐᓇᕐᑐᑦ ᐃᑭᐊᕐᒥᒃᓴᑦ ᐊᑑᑕᐅᔦᓐᓇᕐᓂᖏᑦ ᓄᓇᒧᑦ ᖅᑭᕿᖓᔦᒧᑦ ᓱᓪᓗᓕᖔᓄᑦ ᐊᖅᑯᑎᐱᓂᕐᓄᑦ ᓱᕐᕋᖅᑕᐅᒐᔭᖅᑰᖅᑐᑦ ᓯᓚᒧᑦ ᐆᓇᐃᓐᓇᓕᖅᐸᓪᓕᐊᔦᒧᑦ.

5.0 ᑭᖑᓪᓕᕐᕖᑦ ᐱᔾᔦᑕᐅᔦᑦ ᐊᒻᒪᓗ ᐊᑑᑎᓕᖁᔭᐅᔦᑦ

ᓴᓇᔾᔦᑎᓂᒃ ᕿᒥᕐᕈᔾᔦᑎᑦ ᒫᓇ ᐊᑐᖅᑕᐅᔦᓂᒃ ᓱᐱᓈᒃᑯᑎᓂᒃ ᐃᑭᐊᕐᒥᓂᒃ ᐊᒻᒪᓗ ᓄᓇᒦᑦᑐᑦ ᓴᓇᔾᔦ-ᑎᐱᓅᑦ ᖃᓄᐃᓕᖔᓂᖏᓐᓂᒃ ᑐᓴᒃᓴᑦ ᐃᑲᓂ Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᐊᓂ ᑕᒫᓇ ᐱᓕᕆᐊᖑᔦᖅ ᑐᓴᒃᓴᓕᐊᖑᓪᓗᑎᒃ ᓄᐊᑕᐅᔦᑦ ᐊᒻᒪᓗ ᐃᑲᖓᑦ ᓄᐊᑕᑦ Echo Bay ᐅᔭᕋᒃᓴᖅᓯᐅᖅᐱᐊᓂᒃ. ᕿᒥᕐᕈ-ᒍᑎᑦ ᐱᔪᔦᑦ ᐊᑐᐃᓐᓇᐅᔦᑦ ᑐᓴᒃᓴᓕᐊᓇᓯᒪᔦᑦ, ᑕᒪᒃᑯᐊᓗ ᐊᑑᑎᓂᖃᕈᓐᓇᕐᒪᑕ ᓴᖅᑭᐅᒪᕙᖏᑦᑐᑦ ᑐᓴᒃᓴᑦ ᐱᔾᔦᑎᓪᓚᑦ ᐅᓕᒃᓴᓕᓇᓂᕐᒥᒃ ᑕᒪᒃᑯᓄᖓ ᐊᖅᑯᑎᓄᑦ ᓱᕈᑎᓇᔦᓐᓇᕐᑐᓃᑦᑐᓄᑦ, ᐃᓚᒋᓪᓗᒍ ᓄᓇᒥ ᓴᓇᔾᔦᑎᒥᓃᑦ ᐃᓚᒍᑕᓪᓚᑦ ᓇᓗᓇᐃᔭᖅᑕᒥᓃᑦ Lupin-ᒥ, ᒪᑯᐊ:

- ᓴᖅᑭᐅᒪᔪᖃᒻᒪᑦ ᑐᓴᒃᓴᓯᐊᕙᖕᒥᒃ ᓄᓇᓕᕆᓂᕐᒨᖓᔪᓂᒃ ᓴᓇᔾᔭᑎᓄᑦ ᐊᒻᒪᓗ ᐃᓚᒍᑕᖅ ᐅᔭᕋᒃᓴᖅᓯᐅᕈᑎᓄᑦ ᓴᓇᔾᔭᑎᕕᓃᑦ ᑐᓴᒃᓴᐅᕆᓪᓗᑎᒃ Lupin ᐅᔭᕋᒃᓴᖅᓯᐅᖅᕕᐊᓂ ᕿᒥᕐᕈᓯᐊᕈ-ᑕᐅᔭᓐᓇᖅᓱᑎᒃ ᓴᖅᑭᐅᒪᓪᓚᕆᒃᑐᑦ ᑐᒃᓯᕋᐅᑎᓅᖓᔪᓄᑦ ᐅᑎᖅᑎᑦᓯᒍᑎᒃᓴᓄᑦ ᐊᑑᑕᐅᔭᓐᓇᖅᓱᑎᒃ ᓇᓪᓕᐊᒃᑯᑐᐃᓐᓇᖅ;
- ᐅᑎᖅᑎᑕᐅᓯᒪᔪᑦ ᐊᖅᑯᑎᑦ ᓱᓪᓗᓖᑦ ᒫᓐᓇ ᖅᑭᕿᓯᒪᔪᑦ ᖁᐊᑦ ᐊᕐᕈᓕᒫᐸᓗᒃ ᐃᓚᖓ ᐊᐅᒍᓐᓇᖅᑑᓚᓗᐊᖅ ᐃᒪᐃᓪᓗᐊᕐᑐᖅ 1.5 ᑎᑭᐅᑎᓯᒪᓪᓗᓂ 2.0 metres-ᓄᑦ ᐅᓕᖃᖅᓱᑎᒃ ᐃᒫᒃ ᐃᔾᔪᓂᓕᖕᓂᒃ 0.5 ᑎᑭᐅᑎᓯᒪᓪᓗᓂ 1.5 metres-ᓄᑦ;
- ᓴᐅᓯᒍᑕᐅᕙᒃᑐᑦ ᐅᔭᖃᑦ ᕿᒥᐊᕐᔪᔭᐃᑦ ᓈᒪᓈᖅᓯᒪᔭᐅᓚᓱᐊᕐᓱᑎᒃ, ᐊᑑᑕᐅᑕᐃᓕᔾᔭᓚᑎᒃ, ᐃᓗᒻᒧᐊᖃᑦᑕᕐᑯᓇᒍ ᓱᕕᕐᓇᖅ ᐊᓪᓕᕋᖕᓚᓄᑦ ᐃᒻᒪᖃᑦᑕᐅᖅ ᓱᕐᕋᐃᑳᓪᓚᕐᑯᓇᕆᑦ ᓱᓪᓗᓕᖕᒨᖓᔪᒥᒃ;
- ᐅᓕᒃ ᑐᑭᖃᒻᒪᑦ ᐊᑦᑕᓇᔭᓄᑦ ᓱᓪᓗᓖᑦ ᖅᑭᕿᖅᓯᒪᐃᓐᓇᕐᑯᓪᓗᕆᑦ ᖅᑯᐊᖕᒍᐃᓐᓇᕐᑯᓪᓗᕆᑦ ᑭᖑᖓᒍᑦ ᐊᑐᕐᓂᐊᕈᓐᓃᖅᑐᑦ ᒪᐅᖓᑐᐃᓐᓈᕐᑯᓇᕆᑦ ᐅᑯᐊ ᓈᓴᐅᑎᓖᒃ ᐃᓂᖕᒋᑦ (Cells 1 ᐊᒻᒪᓗ 2);
- ᒫᓐᓇᓯᐅᑦ ᐅᑎᖅᑎᑦᓯᒍᑦ ᐊᑑᑕᐅᔭᓐᓇᕐᒥᔪᖅ 1.75 ᐊᑐᐃᓐᓇᐅᕕᒃ ᓈᒪᖕᒋᑦᑐᒥᒃ ᐅᓕᒃᓴᒥᒃ ᐃᓘᓐᓇᑎᒃ ᓯᓚᐱᐊᖃᑦᓯᐊᕐᑯᓪᓗᕆᑦ ᓱᓪᓗᓖᑦ ᖅᑯᐊᖕᒍᐃᓐᓇᖅᑐᒨᖓᔪᑦ ᓄᓇᒧᑦ;
- ᓯᓚᐱᐊᓕᖅᑕᐃᓐᓇᓇᓚᓱᐊᕐᓗᕆᑦ ᓱᓪᓗᓖᑦ ᓈᒻᒪᓚᔭᖅᑰᖕᒋᑦᑐᖅ ᖅᑯᐊᖕᒍᐃᓐᓇᖅᑐᒧᑦ ᓄᓇᒨᖓᔪᑦ ᓴᓇᔾᔭᑎᓅᖓᖕᓚᑎᓪᓗᒍ ᓯᕗᓐᖓᒍᑦ ᓱᖅᑯᐃᔭᖅᓯᒪᓇᓱᐊᕐᓗᕆᑦ ᑕᐃᒪᓐᓇ;
- ᐅᓕᒃᑯᒍ ᐊᖏᓂᓕᒃ 1.0 m-ᒥᒃ ᐅᑉᐸᓗᑭᐊᖅ ᐃᔾᔪᔫᖏᓂᖅᓴᒥᒃ ᓈᒪᓂᖅᓴᐅᕙᓪᓚᐃᔪᖅ ᐅᑎᖅᑎᑕᐅᔪᒃᓴᒫᒧᑦ ᑭᓯᐊᓂᓛᒃ ᒪᓕᒃᑕᐅᕆᐊᖃᒻᒥᖕᒪᑦ ᐱᔾᔪᑕᐅᔪᖅ ᓄᓇᒦᑦᑐᖅ ᓴᓇᔾᔭᑎᕕᓂᖅ ᖃᓄᐃᑦᑑᓂᖓ ᕿᓛᕐᓂᖓᑕ ᖅᑯᐊᖕᒍᖏᓐᓂᖓᓅᖓᔪᖅ ᓯᓚᐱᐊᖅ ᓱᓪᓗᓕᖕᓄᑦ
- ᐃᓚᑯᐃᑦ ᐅᑯᐊ ᑕᓴᒃᓴᑦ ᐅᖅᑲᐅᓯᐅᕆᐊᓖᑦ ᑭᙵᓪᓕᖅᐹᖅᓯᐅᖅ ᐊᑑᑕᓚᐅᖕᒋᓐᓂᖓᓂ ᐅᑎᖅᑎᑦᓯᓂᖅ ᑭᙵᖓᒍᑦ ᓴᓇᕕᕕᓂᕐᒥᒃ ᐅᒃᑯᐊᖅᑕᓚᐅᖕᒋᓐᓂᖓᓂ ᓱᖅᑯᐃᔭᖅᑕᖅᑲᓇᐊᓕᒃ.

ᑐᓴᒃᓴ ᐃᓚᑰᒻᒪᑕ ᒪᑯᓂᖓ ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᐊᓪᓚᒃᓯᒪᔪᑦ ᓇᐃᓈᖅᓯᒪᓪᓗᑎᒃ ᐊᑖᓂ.

- ᒫᓐᓇ ᐅᔭᕋᒃᓴᓕᕆᔾᔪᑎᕕᓃᑦ ᖃᓄᐃᑦᑑᓂᖏᑦ ᓱᓪᓗᓕᖕᓃᑦᑐᑦ (ᓯᕗᓐᖓᒍᑦ ᖃᐅᔨᒪᔭᑦ ᐅᔾᔨᕆᔭᐅᓯᓐᓇᕆᐊᓖᑦ ᐃᓱᒪᒋᓗᕆᑦ ᑭᖑᖓᒍᑦ ᓱᕋᐃᓚᔭᕐᓂᖕᒋᑦ) ᑕᒪᒃᑯᐊ ᐃᓂᕆᐊᓖᑦ ᓱᓕ;
- ᐃᒥᐅᑉ ᖃᓄᐃᑦᑑᓂᖓ ᒫᓐᓇ ᐊᒻᒪᓗ ᓱᕋᑉᐸᑦ ᑭᖑᖓᒍᑦ ᖅᑭᕐᓛᖅᑐᖃᕐᓂᖅᐸᑦ ᖃᐅᔨᒪᔭᒃᓴ;
- ᖃᓄᐃᓪᓗᐊᖅᑐᓄᓪᓗ ᑕᓯᐊᕈᓐᓄᑦ ᓴᓗᒪᖅᓴᐅᑕᐅᓚᔭᖅᑐᑦ ᖅᑭᕐᓛᖅᑐᖃᖅᐸᑦ ᐃᒪᒃᑦᑕᐅᖅ ᐆᑎᕐᓇᖅᑐᒥᒃ ᐃᒪᕐᒥᒃ ᐱᔪᓂᒃ ᓱᓪᓗᓕᖕᓂᒃ ᐊᖅᑯᑎᕕᓃᑦ ᐃᓂᖏᓐᓂᒃ ᑕᑉᐸᖓᑦ ᓄᓇᒥᒃ ᐊᐅᓪᓛᓂᐊᖃᕋᔭᕐᒪᑕ.

ᑭᖑᓪᓕᕐᒥ ᐊᑑᑕᐅᔪᒪᖕᒥᔪᑦ ᖃᐅᔨᓴᕐᓂᖅ ᐃᓕᓐᓂᐊᕈᑎᒋᓯᓐᓈᑦ ᐊᑑᑕᐅᔭᓐᓇᖅᑐᑦ ᓄᐊᑕᐅᓗᑎᒃ ᑐᓴᒃᓴᑦ ᐃᑲᔪᖅᓯᒪᒍᓐᓇᖅᑐᑦ ᓇᓗᓇᐃᔭᕈᑎᒃᓴᓂᒃ ᐊᑑᑎᓂᖃᕈᓐᓇᖅᑐᓂᒃ ᒫᓐᓇ ᑐᒃᓯᕋᐅᑎᒃᑯᑦ ᑕᒪᓐᓇ ᐅᒃᑯᐊᖅᓯᒍᑎᒃᓴᖅ ᐸᕐᓇᑕᐅᑎᓪᓗᒍ.

ᓄᓇᒥ ᓴᓇᔾᔭᑎᒥᓃᑦ ᐅᔭᕋᒃᓴᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᐊ ᐊᑑᑎᓕᕐᑯᔭᐅᖕᒪᑦ ᐃᑲᓃᑦᑐᑦ ᖃᐅᔨᓴᕈᑕᐅᓪᓗᑎᒃ Cells 1, 2 ᐊᒻᒪᓗ 5. ᑕᒪᓐᓇᓗ ᐃᑲᔪᕐᓂᖅᑲᖅᓯᕐᒪᑦ ᑐᓴᒃᓴᖅ ᓄᐊᑕᐅᓯᒪᔪᖅ ᓴᖅᑭᐅᒪᓂᖅᑲᕈᑕᐅᓚᔭᕐᒪᑦ

ᐅᑉᕙᓗᑭᐊᖅ ᐅᔭᖅᑲᓂᒃ ᕿᒥᐊᕐᔦᔭᓄᑦ ᓴᐅᓯᒪᙱᖅᐸᑕ ᓱᓪᓗᓖᑦ, ᖃᖓᑐᐃᓐᓇᒃᑯᑦ, ᐆᑎᓇᔦᓐᓇᖅᑐᖅᑕᖃᕐᓂᖅᐸᑦ. ᑐᓴᒃᓴᖅ ᓄᐊᑕᐅᓯᒪᔦᖅ ᐊᑐᐃᓐᓇᐅᑲᔭᕐᒪᑦ ᓱᖅᑯᐃᕈᑕᐅᓗᓂ ᖃᓄᐃᑦᑐᑦ ᓴᓇᔾᔦᑎᕕᓃᑦ ᐅᔭᕋᒃᓴᓄᑦ ᐃᓚᒍᑦ ᐆᒃᑑᑕᐅᓪᓗᑎᒃ ᓱᖅᑯᐃᔭᕈᑕᐅᓪᓗᑎᒃ ᓯᕗᓐᖓᒍᑦ ᐅᑉᕙᓗᑭᐊᖅ ᑕᓯᐊᕈᖅ 1-ᒥ ᐅᑉᕙᓗᑭᐊᖅ ᑕᓯᐊᕈᖅ 2-ᒥ ᓴᓗᒪᖅᓴᖅᑕᐅᔦᓐᓇᕐᑐᒦᑦᑐᖅ ᕿᓪᓖᖅᑐᖃᕐᓂᖅᐸᑦ ᐆᑎᕐᓇᖅᑐᒥᒃ (ᐅᑉᕙᓗᑭᐊᖅ ᓴᓗᒻᒪᖅᓴᕈᑦ, ᓴᓐᖏᔦᒥᒃ ᐅᑎᕐᓇᓪᓚᕆᑦᑐᐊᓗᖕᒥᒃ ᐊᑦᑕᓇᖅᑐᒥᒃ) ᑯᕕᒃᐸᑦ ᐃᒥᕐᒥᒃ ᕐᑯᑦᓯᓂᖅᓴᒥᒃ ᐱᔦᒥᒃ ᓱᓪᓗᓕᖕᓂᒃ.

ᓴᖅᑭᐅᒪᓂᖏᑦᑎᒍᑦ ᑭᓐᖑᖕᒐᒍᑦ ᓄᓇᒨᖕᒐᔦᒍᑦ ᐱᓕᕆᔾᔦᑎᕕᓂᕐᒥᒃ ᐅᔭᕋᒃᓴᖅᓯᐅᕈᑎᓂᒃ ᑐᓴᒃᓴᑦ, ᐃᒥᖅ/ᐊᔾᔨᖏᒥᒃ ᖃᓄᐃᓪᓗᐊᕐᓂᓕᒃ ᐊᒻᒪᓗ ᐊᑦᑕᓇᕐᓂᓖᑦ ᖃᐅᔨᓴᕈᑎᑦ ᓱᓪᓗᓕᖕᓅᖓᔦᓂᒃ ᓱᕈᒃᑎᓇᔦᓐᓇᖅᑐᒥᒃ ᐱᑕᓕᖕᓂᒃ ᑕᒪᒃᑯᐊ ᐃᓂᖅᑕᐅᔭᓇᐊᓖᑦ. ᕐᑯᒃᓴᓇᖅᑐᓄᑦ ᖃᐅᔨᓴᕈᑎᑦ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑕᐅᔦᓐᓇᓂᐊᖅᑐᑦ ᐅᔭᕋᒃᓴᓂᒃ ᓴᓇᔾᔦᑎᓄᑦ ᐅᓯᔭᐅᕙᒃᑐᓄᑦ ᐱᔦᓂᒃ ᓇᑭᑐᐃᓐᓇᖅ ᖅᑯᐊᖑᖏᑦᑐᓂᒃ ᐃᑭᐊᕐᒥᖏᓐᓂᒃ ᐃᔾᔦᓂᓕᖕᓄᑦ ᐃᓗᐊᓃᑦᑐᓂᒃ ᓱᓪᓗᓖᑦ ᐃᓂᖏᓐᓂᒃ. ᖅᑭᓪᓖᖅᑐᖃᓪᓚᕆᐸᑦ ᐱᔦᒥᒃ ᓱᓪᓗᓕᖕᓂᒃ ᓱᕈᒃᑎᓇᔦᓐᓇᖅᑐᖅᑕᓕᖕᒥᒃ ᓱᓕ ᑕᐃᒪᐃᑉᐸᑦ ᐃᒪᓪᓚᓂᒻᒥᒃ ᐃᓚᖃᖕᓂᐅᓴᑐᐃᓐᓇᕋᔭᕐᒪᑦ, ᐊᓯᐃᓪᓖᒃ ᑭᓐᖑᖕᒐᒍᑦ ᑕᒪᓐᓇ ᐃᓚᒋᐊᖃᕋᔭᖏᑦᑐᖅ ᒫᓐᓇ ᐅᖃᐅᑕᐅᔦᑎᒍᑦ.

6.0 ᐅᒃᑯᐊᖅᓂᖅ

ᐅᒃᐱᕈᓱᒃᑐᒍᑦ ᑕᒪᓐᓇ ᑐᓴᒃᓴᖅ ᓈᒻᒪᓂᐊᖅᑐᖅ ᒫᓐᓇ ᑭᓐᖒᒪᔭᑦᓯᓐᓄᑦ. ᐊᐱᕆᔦᒪᒍᑦᓯ ᖃᓄᐃᓐᓇᖅ, ᐊᐱᕆᑦᑕᐃᓕᖏᓪᓗᓯ ᐅᕙᑦᑎᓐᓄᑦ.

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EBA Engineering Consultants Ltd.,

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Senior Environmental Geologist, Arctic Division

RBM/…

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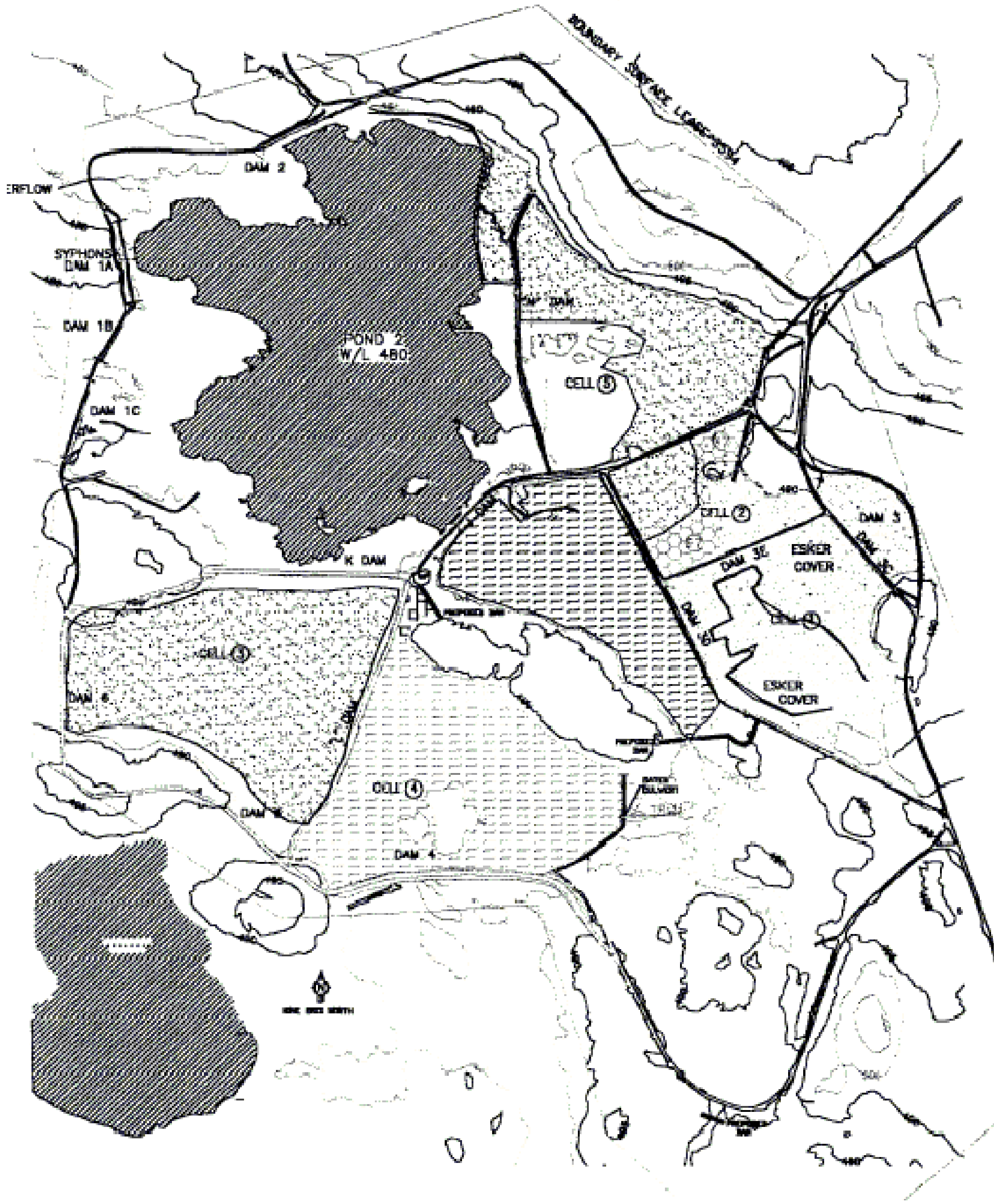

Figure 1 ᔫᐸᓐ ᐅᔭᕿᒃᓴᖅᓯᐅᕐᕕᐊᓂ ᓱᓪᓗᓈᑦ ᐃᓂᖏᑦ ᐊᕐᑯᑎᖏᑦᑕ - 2001