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May 2, 2005

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RE: NWB Permit No. NWB5RES0308 Annual Report – supporting document

Mr di Pizzo:

Please find enclosed a copy of *Scientific Investigations and Research - Resolution Island 2004* prepared by Queen's University ASU. This document is provided as a supporting document to our annual report submitted in February 2005.

Should you have any questions regarding the submitted documents, please contact us.

Sincerely,

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ᐅᓇ ᐅᓂᑳᓕᐊᕆᓯᒪᔪᖅ 11ᒋᓕᖅᑕᖓ ᐊᕐᒍᑖᖅ ᐅᓂᑳᓕᐊᕆᔭᐅᖃᑦᑐᓂ ᓴᕿᑦᑕᐅᓯᒪᓪᓗᓂ ᖃᓄᐃᓪᓕᓇᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᓂᒃ ᐱᔪᑎᒋᓪᓗᒍ ᐊᕙᑎᐅᑉ ᖃᐅᔨᓇᓱᑦᑕᐅᓂᖓᓄᓐ ᐊᒻᒪ ᐅᑎᖅᑎᑕᐅᒐᓱᐊᕐᓂᖓᓄᓐ ᖃᓄᐃᑦᑑᓕᐅᕐᓂᖓᓄᓐ ᑖᓱᒪ ᐅᓇᓕᕐᓄᓐ ᓄᓇᒋᔭᐅᓕᐅᕐᑐᓐ ᑐᔭᓂ. ᑖᒃᑲᓕ ᐱᖓᓱᑦ ᐅᓂᑳᓕᐊᕆᔭᐅᓯᓕᐅᕐᑐᑦ, ᐸᓕᓇᕐᓂᐅᖃᑦᑕᕐᓯᒪᔪᓂ ᐱᒋᐊᕐᑐᒍ 1994 ᑎᑭᑦᑐᒍ 1996. ᐃᒪᐃᑦᑐᓂ ᐱᑕᖃᕐᑐᑎᒃ ᐃᓂᒋᔭᖓᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒥᒃ, ᐅᑎᖅᑎᑕᐅᓕᐊᓂᖏᓐᓂᒃ ᐱᓪᒪᓇᐅᓂᓇᔭᖏᓐ ᐊᒻᒪᓗ ᐊᕿᔮᑦᑕᐅᓂᖓᓂᒃ ᐱᕈᓇᖅᓴᐃᓂᕐᒧᓐ ᐸᕐᓇᐅᑎᐅᔪᓂᒃ ᐊᒻᒪ ᐊᑐᕐᑕᐅᒋᐊᕐᓂᐊᕐᑐᓂᒃ. ᑖᑯᐊ ᐱᓕᕆᐊᕆᔭᐅᔪᑦ ᑖᑯᓇᓂ ᐊᕐᒍᓂ ᐱᖓᓱᓂ ᐊᐅᓚᑦᑕᐅᓚᐅᕐᑐᖅ ᖃᓄᐃᓪᓕᓇᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᓂᒃ. ᑕᐃᒪᖓᓐ 1997ᒥᓂᓐ ᐱᒋᐊᕐᑐᓂ, ᑕᒪᓐᓇ ᐊᐅᓚᑦᑕᐅᓂᓇᔭᖓ ᐅᑎᖅᑎᖅᑎᕙᓪᓕᐊᓂᕐᒧᓐ ᖃᓄᐃᑦᑑᓂᓇᓚᐅᕐᑕᖓᓄᓐ ᐱᓕᕆᐊᖑᔪᖅ ᑲᒪᒋᔭᐅᖃᑦᑕᕐᓯᒪᓕᕐᑯᖅ ᕿᑭᖅᑖᓗᐸ ᑯᐊᐸᓇᓴᖓᓄᓐ. ᑖᑯᐊ ᖃᓄᐃᓪᓕᓇᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᑦ ᐱᑕᖃᕐᑎᕐᑎᓯᒪᕗᑦ ᖃᐅᔨᓴᕐᓂᓪᓚᓇᐅᔪᒥᒃ ᐱᔨᓯᓂᕐᓂᒃ ᐊᒻᒪᓗ ᖃᐅᔨᒪᔪᒻᒪᓇᓐᓄᓐ ᑕᒪᓐᓇ ᐃᑲᔪᕐᑕᐅᕙᑦᑐᓂ ᐅᑯᓇᖓᓐ ᖃᐅᔨᒪᔪᒻᒪᓇᐅᔪᖅ ᔫᓐ ᔮᓚᓐ ᐊᒻᒪᓗ ᖃᐅᔨᒪᔪᒻᒪᓇᐅᔪᖅ ᐋᓕᓴᓐ ᐅᐳᕐᑐᕐ ᑖᒃᑲᓕ ᖃᐅᔨᓴᕐᑎᒻᒪᓇᐅᔪᓐ ᐅᖃᐅᔨᒋᐊᕐᑎᐅᓪᓗᑎᒃ ᐅᑯᓄᖓ ᐃᓄᓕᓇᐳᕐᑯᓐᓄᓐ ᑳᓇᑕᒥ ᑕᒪᑐᒥᖓ ᐱᓕᕆᐊᖑᔪᒧᓐ. ᐅᓇᓕ ᐅᓂᑳᓕᐊᖑᓯᒪᔪᖅ ᓇᓗᓇᐃᔭᐃᓯᒪᑦᑎᐊᕐᑯᖅ ᐱᓕᕆᐊᕆᓯᒪᔭᖏᓐᓂᒃ ᐅᑯᐊ ᖃᓄᐃᓪᓕᓇᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᓂᒃ, ᑯᐃᓐ ᐃᓕᓐᓂᐊᕖᔭᐊᖓᓂᓐ ᐅᕙᓂ 2004ᖑᑎᓪᓗᒍ.

ᐅᓇ ᐊᕐᒎᑉ ᐊᐃᑉᐸᕆᓕᖅᑕᖓ ᐊᕐᒍᓄᓐ ᐱᖓᓱᓄᓐ ᐅᑎᖅᑎᖅᑎᕙᓪᓕᐊᓂᕐᒧᓐ ᖃᓄᐃᑦᑑᓂᓇᓚᐅᕐᑕᖓᓄᓐ ᐸᕐᓇᐅᑎᒋᓯᒪᔪᓄᓐ ᐱᔭᕇᖅᑕᐅᔪᒪᕐᓂᐊᕐᓂᖓᓄᓐ ᐱᕈᓇᖅᓴᖅᑕᐅᓗᓂ. ᐱᔪᑎᒋᓪᓗᒍᓕ ᓯᓚᑲᓪᒪᐅᖃᑦᑕᕐᓂᓇᓚᐅᖅᑕᖓ ᑕᓖᓂ ᐊᐅᔭᐅᔪᒥ, ᑕᒪᓐᓇᓕ ᐸᕐᓇᐅᑎᒋᓯᒪᔪᖅ ᑭᖑᕙᕐᓯᒪᕗᖅ ᐊᕿᑎᕐᓯᒪᔭᒃᑯᑦ ᐊᒻᒪ ᓱᕈᕐᓇᕐᑑᓕᑦ ᑭᓱᑐᐃᓐᓇᐃᓐ ᑐᕌᓇᓕᖅᑎᑕᐅᓚᐅᖏᓚᑦ II ᓄᓇᒧᓐ. ᑖᓇᓕ ᐃᓗᐱᐊᕈᑕᖓ ᐊᕿᓯᒪᓗᓂ ᐊᒻᒪᓗ ᑐᕌᓇᓕᑎᑕᐅᔪᒧᓐ II ᓄᓇᖓᓄᓐ ᐊᐅᓚᖅᑕᐅᓕᐊᒍᓐᓇᖑᓯᐸᖅ ᓄᓇᖓᓄᓐ 2005 ᐱᒋᐊᓕᖅᑦ ᐱᓕᕆᐊᖅᑲᐊᓕᖅᑦ. ᑖᒃᑲᓕ ᐊᖏᓂᖅᓴᐃᑦ ᐅᕙᓃᑦᑐᑦ ᑐᕌᓇᑎᑎᑕᐅᓯᒪᔪᓂ II ᓄᓇᖓ ᐅᕙᓃᑦᑐᖅ S1/S4 ᓇᖅᓴᒥ ᐱᔭᖅᑕᐅᓚᐅᖅᑯᑦ ᖃᓕᓇᓕᑎᑕᐅᓪᓗᑎᒃ ᐊᒻᒪᓗ ᓇᓗᓇᐃᑕᐅᓚᓪᓚᓇᓂᖓᓄᓐ ᖃᐅᔨᓴᕐᓂᐅᔪᖅ ᑖᑯᓇᓂ ᐱᔭᓇᖅᑕᐅᓪᓗᓂ. ᐅᕙᓂᓕ ᑐᕌᓇᓕᖅᑎᑕᐅᓯᒪᔪᒥ I ᓄᓇᖓ ᐸᒃᑕᐅᓚᐅᖅᑯᖅ ᑕᕙᓂ ᐊᕐᒍᒥ. ᐱᕙᓪᓕᐊᑎᐊᕐᑐᓪᓚᓇᐅᓪᓗᓂ ᐅᕙᓂ S1/S4 ᐃᒪᐅᑉ ᓯᓂᖅᐸᓯᐊᓂ. ᑎᓴᒪᑐᐃᓐᓇᐃᓐ 16ᖑᑎᓪᓗᒋᑦ ᑯᐊᑕᖏᓐ ᐱᑕᖃᖅᑐᑦ CEPA ᓄᓇᖓᓂᒃ ᐸᒃᑕᐅᔭᓇᐊᖅᑯᑦ. ᑖᓇ ᑐᕌᓇᑎᑎᓯᒪᔪᖅ I ᐊᒻᒪ ᑐᕌᓈᑎᑎᓯᒪᔪᖅ II ᓄᓇᖏᓐ ᑖᑯᓃᑦᑐᑦ ᐊᕐᒍᓖᖅᑐᖅ ᐸᒃᑕᐅᓖᖅᑯᑦ. ᐃᒪᓐᓇᐸᓗᒃ ᐱᖓᓱᐊᖅᑎᖅᑐᒍ 1200 ᐃᒪᐃᑦᑐᖅ CEPA ᓄᓇᖓ ᐸᒃᑕᐅᓚᐅᖅᑯᖅ ᑕᓕᓐ ᐊᕐᒍᒥ ᐊᒻᒪᓗ 752 ᓴᐱᕐᔪᑦ ᐱᒐᓚᑯᐹᑦ ᐳᖃᐃᐹᐅᓪᓗᑎᒃ. ᑖᒃᑲᖑᑎᓪᓗᒋᑦ 516 ᐊᐅᓚᖅᑎᑕᐅᓚᐅᖅᑯᑦ ᑕᕙᖓ ᐊᑦᑕᒃᑕᐅᔪᒪᕐᓂᐊᕐᑐᑎᒃ. CEPA ᑭᓱᐃᓐᓇᐃᓐ ᑕᕙᓃᓕᖅᑐᑎᒃ ᐃᓂᖓᓂ ᐃᒪᐃᓕᖓᓗᑎᒃ ᑎᓴᒪᐅᓪᓗᑎᒃ ᑯᐊᑕᓕᐊᕆᓯᒪᔪᑦ ᐸᒃᑕᐅᔪᒪᕐᓂᐊᕐᑐᑦ ᒫᓂ S1/S4 ᐃᒪᐅᑉ ᓯᓂᖅᐸᓯᐊᓂ. 236 ᓴᐱᕐᔪᑦ ᐳᓴᑦ ᓄᓇᒥᒃ ᑕᑕᕐᑐᑎᒃ, 27 ᓴᐱᕐᔪᑦ ᐃᓗᓪᓕᕐᑐᑎᒃ CEPA ᕿᔪᒥᒃ, ᖁᐊᖅᑕᕐᑐᒥᒃ ᐊᒻᒪᓗ

ᐊᓯᖏᓐᓂᒃ ᓱᓇᑯᑖᒐᓚᓐᓂᒃ ᐊᒻᒪᓗ ᑕᓪᓕᒪᓐ ᐊᔨᒌᖏᕈᓗᔭᕐᑐᓂᒃ ᐱᒐᓚᖃᐅᑏᑦ. ᑕᒪᑯᐊᓂ CEPA ᖃᓄᐃᑦᑐᕈᓘᔭᐃᑦ ᓄᓇᐅᖏᑦᑐᑦ ᐃᓚᑯᓕᕐᑎᑦᑐᒋᑦ, ᖃᐅᔨᓴᕐᑐᒋᑦ ᐊᒻᒪ ᖃᐅᔨᓇᓱᐊᕐᑐᒋᑦ ᑕᐃᒪᐃᒋᐊᖃᕐᓂᖕᒐᓄᓐ ᐊᒻᒪ ᐳᖃᕐᑐᒋᑦ ᐊᐅᓚᑎᓐᓂᐊᕐᖢᑕ ᑕᒫᓂ ᐊᕋᒍᒥ.

ᑕᒪᓐᓇᓕ ᖃᓄᐃᑦᑑᓂᕆᓚᐅᕐᑕᖕᒐᓄᓐ ᐅᑎᕐᑎᑦᑎᕙᓪᓕᐊᓂᖅ ᐱᒋᐊᕐᖕᒐᓐ 1997ᒥ, ᐃᒪᓐᓇᐸᓘᓚᐅᕐᑯᑦ 5000ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓖᑦ ᓱᕈᕐᓇᕐᑐᑦ (ᐲᓯᐲᑦ) ᐅᕐᓱᐊᓘᓗᑎᒃ ᐅᐊᔭᖃᐅᑎᓂ ᐊᒻᒪᓗ ᖃᑦᑕᐅᔭᓂ, ᐊᒻᒪ 4030ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓖᑦ ᓱᕈᕐᓇᕐᑐᑦ (ᐲᓯᐲᑦ) ᑲᑎᓯᒪᔭᑦ ᓄᓇᒧᓐ ᑕᒫᓂ ᓄᓇᑐᐃᓐᓇᒦᑐᑦ. ᑖᑯᐊᓕ ᓱᕈᕐᓇᕐᑐᓕᒫᓐ (ᐲᓯᐲᑦ) ᐅᕐᓱᐊᓘᓗᑎᒃ ᐊᐅᓚᕐᑎᓚᐅᕐᑯᑦ ᑕᕙᖕᒐᓐ 1999ᖑᑎᓪᓗᒍ. ᐃᒪᓐᓇᐸᓗᒃ 3790ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓖᑦ (94%) ᓱᕈᕐᓇᕐᑐᑦ (ᐲᓯᐲᑦ) ᓄᓇᒦᑐᑦ ᐸᒃᑲᑦᑕᐅᓯᒪᕗᑦ ᐊᒻᒪᓗ 2870ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓖᑦ ᑕᕙᖕᒐᓐ ᐊᐅᓚᕐᑎᑕᐅᓪᓗᑎᒃ; ᐃᒪᓐᓇᐸᓗᒃ 120ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓖᑦ (3%) ᓄᓇᖕᒐᓃᑐᑦ ᓱᕈᕐᓇᕐᑐᑦ (ᐲᓯᐲ) ᑐᑭᓕᕆᓕᕐᑎᑕᐅᒥᐊᖃᕐᑯᑦ II ᓄᓇᒥ. ᐃᖃᐅᒪᔭᐅᔭᕆᐊᖃᕐᒥᔭᖅ 97%ᖕᒐ ᓱᕈᓇᕐᑐᑦ (ᐲᓯᐲ) ᐅᕙᓃᑐᑦ CEPA ᓄᓇᖕᒐᓂ ᑕᕙᖕᒐᓐ ᐊᐅᓚᕐᑎᒥᐊᖃᕐᑯᑦ ᐃᒪᓐᓇᐸᓘᓗᑎᒃ 5000 ᐱᖕᒐᓱᐊᕐᑎᕐᑐᒍ ᐅᕙᖕᒐᕐᑐᓂ 3%ᖕᒐ ᑐᑭᓕᕇᓕᑎᓯᒪᔪᒥᓐ II ᓄᓇᖕᒐᓂᓐ, ᑖᑯᐊᓗ ᓴᑐᒻᒪᕆᑯᓘᓗᑎᒃ, ᐃᒪᓐᓇᐸᓘᓗᓂ ᐱᖕᒐᓱᐊᕐᑎᕐᑐᒍ 10,000. ᑐᑭᓕᕇᓕᑎᓯᒪᔪᒥ I ᓄᓇᖕᒐ ᐱᑕᖃᕐᑐᖅ ᐃᒪᓐᓇᑐᐃᓐᓇᕐᒥᒃ 30ᑭᓚᒍᓛᒥᒃ ᐅᕐᑯᒪᐃᓐᓂᓕᒻᒥᒃ ᓱᕈᕐᓇᕐᑐᒥᒃ (ᐲᓯᐲ) ᐃᒪᓐᓇᐅᑎᓪᓗᒍ ᐱᖕᒐᓱᐊᕐᑎᕐᑐᒍ 10,000 ᓄᓇᖕᒐᓂ.

ᑕᒫᓂ ᐊᕋᒍᒥ ᓄᓇᒥ ᐱᓕᕆᔭᖃᓚᐅᕐᑯᖅ ᐱᓇᓱᐊᕈᓯᕐᓂᒃ 12ᐸᓗᓐᓂᒃ ᐊᒻᒪ ᖃᓄᐃᓪᓚᕆᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᓂᒃ ᐃᖃᓇᐃᔭᕐᑎᓂᒃ ᑕᕙᓃᑐᖃᓚᐅᕐᑐᓂ ᐅᓪᓗᓂᒃ 76ᓂᒃ. ᐱᓕᕆᐊᕆᔭᐅᔪᖅ ᐅᑯᓇᖕᒐᓐ ᖃᓄᐃᓪᓚᕆᓐᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᓂᕐᒧᓐ ᐱᔨᓯᕐᑎᐅᕙᑦᑐᓂᒃ ᐱᓕᕆᐊᖃᓚᐅᕐᑯᑦ ᐃᓚᒋᓪᓗᒋᑦ ᓱᕈᕐᓇᕐᑐᓖᑦ ᓄᓇᐃᓐ ᐸᒃᑲᑕᐅᓪᓗᑎᒃ, ᓇᓗᓇᐃᕐᑐᕐᒥᑦ ᐊᒻᒪᓗ ᓇᒦᒪᖕᒐᑕ ᓄᓇᖑᐊᓕᐊᕆᓪᓗᒥᑦ ᐸᑲᑦᑕᐅᒐᔭᕐᑐᑦ, ᓄᐊᑦᑐᒥᑦ ᐊᒻᒪᓗ ᓄᓇᖕᒐ ᖃᐅᔨᓴᕐᑐᒍ ᑕᒪᓐᓇ ᐸᒃᑲᓐᓂᖅ ᑲᔪᓯᑎᐊᓚᐅᕿᓗᐊᕐᒪᖕᒐᖅ ᐊᒻᒪᓗ ᐸᑲᓐᓂᖅ ᐃᖏᕿᑦᑎᐊᓚᐅᕿᓗᐊᕐᒪᖕᒐᖅ ᖃᐅᔨᓴᕐᑐᒍ. ᑲᒪᒋᔭᐅᔭᓕᒫᓕ ᑎᑎᕿᑦᑕᐅᓚᐅᕐᑯᑦ ᐅᕙᓂ DGPS ᐊᒻᒪ ᑕᒪᕐᒥᑦᑎᐊᖅ ᑐᕿᖕᒐᓂᖃᕐᑐᑦ ᑎᑎᕿᑦᑕᐅᓪᓗᑎᒃ ᐊᒻᒪ ᐱᔭᕆᕐᑕᐅᑎᐊᕐᑐᑎᒃ. ᐊᕿᓯᒪᔭᒃᑯᑦ ᐸᕐᓇᓯᒪᕗᖅ 2005ᒥ ᐸᑲᓐᓂᐅᒐᔭᕐᑐᖅ ᐊᑐᓇᓕᕐᑕᐅᓪᓗᓂ ᐊᒻᒪ ᓇᓗᓇᐃᑯᓯᕐᑕᐅᓪᓗᓂ ᐱᑐᐃᓐᓇᕆᐊᖃᓕᕐᑎᑕᐅᓪᓗᓂ ᐸᒃᑲᕕᐅᒐᔭᕐᑐᖅ ᓱᕈᕐᓇᕐᑐᓖᑦ ᓄᓇᓐ. ᖃᐅᔨᓴᕐᓂᖅ ᐊᒻᒪ ᐊᑦᑐᐊᓂᖃᕐᑐᓂᒃ ᓄᓇᒥᒃ ᖃᐅᔨᓴᕐᓃᑦ ᐊᕿᑦᑕᐅᓚᐅᕆᕗᑦ ᑕᒫᓂ ᖃᓂᒋᔭᓂ ᑐᑭᓕᕇᓕᑎᓯᒪᔪᒥ II ᓄᓇᒥ ᐊᒻᒪᓗ ᒥᑦᑕᕐᕕᐅᑉ ᐊᑦᑕᑯᕐᕕᖕᒐᓂ ᐊᒻᒪ ᑖᑯᐊ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᕐᑐᑎᒃ 8ᕿᕐᑐᑎᒃ ᐱᓕᕆᔭᖃᕐᑎᓪᓗᒍ. ᐊᕿᒍᑕᒫᖅ ᑲᒪᒋᔭᐅᕙᑦᑐᑦ ᐃᒪᐃᑦᑐᑦ ᐃᒥᕐᑕᐅᔪᓐᓇᕐᑐᑦ ᐃᒦᑦ ᖃᐅᔨᓴᕐᑕᐅᓪᓗᑎᒃ, ᓴᐴᑐᑕᐃᑦ ᖃᐅᔨᓴᕐᑕᐅᓪᓗᑎᒃ, ᓄᓇᕿᐃᑦ ᐊᒻᒪ ᐃᒥᖅ ᖃᐅᔨᓴᕐᑕᐅᓪᓗᓂ, ᓯᓚ ᐊᓂᕐᓂᖅᓇᕐᑐᖅ ᖃᐅᔨᓴᕐᑕᐅᓪᓗᓂ ᐊᒻᒪᓗ ᖃᑦᑕᐅᔭᐃᑦ ᖃᐅᔨᓴᕐᑕᐅᓂᕆᔭᖏᓐ ᐱᔭᕆᕐᑕᐅᓪᓗᑎᒃ. ᖁᐊᕐᑕᕐᑐᖅ ᓇᑎᖕᒐ ᐃᒡᓗ ᐅᕙᓃᑐᖅ S4 ᖃᐅᔨᓴᕐᑕᐅᓪᓗᓂ ᐊᒻᒪ ᖃᐅᔨᒐᓯᑦᑕᐅᓪᓗᓂ ᓱᕈᓇᕐᑐᒧᓐ (ᐲᓯᐲ) ᖃᐅᔨᒪᑎᐊᕈᑕᐅᓂᐊᕐᒪᓐ CEPA ᓇᒦᓂᕆᔭᖏᓐ ᐱᔭᕐᓯᒪᓕᕿᓗᐊᕐᒪᖕᒐᑕ.

ᐱᐅᔪᒻᒪᓇᐅᓚᐅᖅᑯᖅ ᐱᕚᓪᓕᐊᓂᓇᔭᖓ ᑕᒫᓂ ᐊᕋᒍᒥ ᑖᑯᓇᓂ ᐅᕐᓱᐊᓗᒻᒧᓐ ᓱᕈᕐᓇᕐᑐᓕᓐᓄᓐ. ᑕᓯᕐᓗᒻᒥ ᐊᒻᒪ ᓴᓂᐅᔭᐃᑯᑎᒥᒃ ᓴᓇᔪᖃᓚᐅᕐᑐᓂ ᑖᑯᓇᓂ ᐅᕐᓱᐊᓗᖃᐅᑎᐅᔪᑦ ᑯᑉᕕᕕᖏᓐᓂ. ᓄᑖᒥ ᐊᖏᔪᓪᒪᓇᒻᒥᒃ ᓄᓇᒥᒃ ᓴᓇᔪᖃᕐᑐᓂ ᐃᓗᒻᒧᖓᖅ ᖃᕐᓂᑯᓂᒃ ᐅᕐᓱᐊᓗᖃᐅᑎᓂ ᖃᐅᔨᒪᓇᕐᑐᒃᑯᑦ ᓄᓇᖓ ᐱᑕᖃᕐᑎᓪᓗᒍ ᐊᖏᓂᕐᓴᒥᒃ 8000ᒥᒃ ᐊᓯᕈᕐᓂᐊᕐᑐᒥᒃ 1ᒪᓇᒥᒃ ᐳᓪᓚᓯᒪᔪᒥᒃ ᑖᑯᓇᓂ ᐅᕐᓱᐊᓗᓂ. ᐃᒪᐅᑉ ᓯᓈᓂ ᐅᕐᓱᐊᓗᑲᕐᕕᐅᔪᓂ, ᑖᓇ ᑕᓯᐊᕈᖅ ᐊᑯᓐᓂᖓᓃᑐᖅ ᐅᕐᓱᐊᓗᖃᐅᑏᑦ ᑯᕕᑎᑕᐅᓪᓗᓂ ᐊᕿᓯᒪᓪᓗᓂ ᑎᑎᕋᓯᒪᔪᒃᑯᑦ ᐊᒻᒪᓗ ᐊᑐᕐᑕᐅᔪᒪᕐᓂᐊᑐᒃᑯᑦ ᖃᓄᐃᑦᑑᓂᓇᓚᐅᕐᑕᖓᓄᓐ ᐅᑎᕐᑎᑦᑎᕙᓪᓕᐊᓂᕐᒧᓐ ᐸᕐᓇᐅᑎᒋᓯᒪᔪᒥ. ᐱᓕᕆᐊᕆᔭᐅᔪᖅ ᖃᐅᔨᒐᓯᕕᐅᔪᒥ ᓄᓇᓕᐊᕆᓯᒪᔪᒥ ᑲᔪᓯᑐᐃᓐᓇᓚᐅᓇᒍᖅ ᑕᒫᓂ ᐊᕋᒍᒥ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕈᑎᓪᓚᓇᐅᓂᐊᕐᑐᑦ ᐊᕿᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓵᑕᐅᓗᑎᒃ ᖃᓄᐃᑦᑑᓂᓇᔪᖓᓂᒃ ᓄᓇᒥ ᖃᐅᔨᓴᕐᓂᐅᖅᑕᓂᐊᕐᑐᒧᓐ.

ᑖᓇ ᐊᑕᐃᓐᓇᓂᐊᕐᑐᖅ ᐊᕙᓗᒋᓂᐊᕐᑕᖓ ᐊᕿᑦᑕᐅᓚᐅᖅᑯᖅ 2003ᒥ ᐊᒻᒪᓗ ᐊᖏᔪᓪᒪᓇᒻᒥᒃ ᐊᕿᓯᕕᐅᓪᓗᓂ ᐱᒋᐊᓕᕐᑕᕐᑎᓪᓗᒋᑦ. ᓴᕿᓚᐅᖅᑯᖅ ᐅᑎᕐᑎᑦᑎᕙᓪᓕᐊᓂᕐᒧᓐ ᖃᓄᐃᑦᑑᓂᓇᔪᖓ, ᐃᓚᑲᓂᕐᑐᒋᑦ ᑕᓯᕐᓗᐃᑦ ᐊᒻᒪ ᓇᑐᓇᐃᑯᓯᕐᑐᒋᑦ, ᐃᓚᔭᐅᑲᓂᕐᑐᑎᒃ ᑕᒫᓂ ᐊᕋᒍᒥ ᐱᓕᕆᐊᖅᑲᕐᑎᓪᓗᒍ ᐱᕓᓕᕈᑎᒋᑲᓂᕐᓂᐊᕐᒪᖓ ᓱᓪᓗᓕᒻᒧᖓ ᓄᖅᑲᑎᑦᑎᔭᑕᐅᑲᓂᕐᓗᓂ ᑕᒪᑯᓂᖓ ᐊᑐᕐᓂᐊᖏᑦᑐᓂᒃ. ᑖᑯᐊ ᓴᓂᐅᔭᐃᑯᑎᖏᓐ S1/S4 ᓇᕐᓴᒥ ᐊᒻᒪᓗ ᐃᓪᓗᓯᐅᑎᒐᓕᓐᓄᓐ ᐊᑦᑕᕐᕕᐅᔪᖅ ᐱᔭᕐᑕᐅᓚᐅᖅᑯᑦ ᐊᒻᒪ ᐅᑎᕐᑎᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᕐᕕᐅᔪᒧᖓ ᖃᐅᔨᓴᕐᑕᐅᒐᔭᕐᓂᖏᓐᓄᓐ ᐊᒻᒪ ᐱᐅᓴᕐᓯᒪᔪᒥᒃ ᓯᐅᖁᔭᓕᕐᑕᐅᖓᕐᑐᓂ ᐊᒻᒪᓗ ᑕᒪᑐᒥᖓ ᐱᐅᓴᕐᓯᒪᔪᒥᒃ ᐅᔭᖁᒥᒃ. ᓱᕈᓇᕐᑐᒧᓐ (ᐲᓯᐲ) ᖃᐅᔨᓴᕐᑕᐅᓪᓗᓂ ᓴᓂᐅᔭᐃᑯᑏᑦ ᓇᑐᓇᐃᕐᓯᕐᑎᐊᓚᐅᖅᑯᖅ ᐅᔭᖁᐃᑦ ᐱᐅᓴᕐᓯᒪᔪᑦ ᓴᓂᐅᔭᐃᑯᑎᒋᒋᐊᖏᑕ ᐱᐅᓂᕐᐹᖓᓴᐅᓪᓗᑎᒃ ᓄᐊᑦᑎᔪᑎᒋᓗᒋᑦ ᓱᕈᓇᕐᑐᓂᒃ (ᐲᓯᐲ). ᐊᖏᓂᓇᔪᖓᓕ ᓄᐊᑕᐅᔪᑦ ᓱᕈᕐᓇᕐᑐᑦ (ᐲᓯᐲ) ᑕᕓᓂ ᐃᓪᓗᓯᐅᑎᒐᓕᓐᓄᓐ ᐊᑦᑕᕐᕕᐅᔪᒥ ᐃᒪᐃᓕᖓᑎᑦᑎᕉᔭᓚᐅᖅᑯᖅ ᑕᒪᓐᓇ ᐊᑐᕐᑕᐅᖓᓇᓕᕐᑐᓂ ᐱᐅᒐᔭᕐᓂᖓᓂᒃ. ᖃᐅᔨᓴᕐᕕᐅᔪᒥ ᑭᓱᓪᓚᓇᐅᓂᖓᓄᓐ ᖃᐅᔨᓴᕈᑎᐅᔪᓐᓇᕐᑐᖅ ᓴᓇᔭᐅᓯᒪᓕᕐᑯᖅ ᐊᒻᒪᓗ ᒫᓇᐅᔪᖅ ᐊᑐᕐᑕᓕᕐᑐᓂ ᖃᐅᔨᓴᕈᑕᐅᓪᓗᓂ ᑭᓱᑐᐃᓐᓇᕐᓂᒃ ᐊᔾᔨᖏᑦᑐᓂᒃ ᓄᐊᑦᑎᕙᓪᓕᐊᔪᓐᓇᕐᓂᖏᓐᓄᓐ ᐊᒻᒪ ᐅᓂᑦᑎᑦᑎᒍᓐᓇᕐᓂᖓᓄᓐ ᓱᕈᕐᓇᕐᑐᒥᒃ (ᐲᓯᐲ) ᐊᒻᒪ ᐊᕙᐸᑐᖓᓂᒃ ᓄᓇᒥ ᖃᐅᔨᓴᕈᑕᐅᓗᓂ. ᓱᓕ ᐊᑐᕐᑕᐅᓂᐊᕐᒥᔪᖅ ᖃᐅᔨᓇᓲᑕᐅᓗᓂ ᐅᕐᑯᓂᖓᑕ ᖃᓄᐃᓐᓂᖓᓂᒃ, ᐅᓂᖃᑕᕐᓂᓇᔪᖏᓐᓂᒃ ᑭᓱᑐᐃᓐᓇᐃᓐ ᐊᒻᒪᓗ ᖃᐅᔨᒐᓲᑕᐅᓗᓂ ᓴᕿᔮᓚᓐᓇᑦᑐᓂᒃ ᖃᓄᑎᒋ ᐊᖏᔪᒥᒃ ᐅᓂᑦᑎᑦᑎᔪᓐᓇᕐᒪᖕᖑᖅ ᐃᑲᔪᕐᓯᔪᕐᒪᖓ ᐱᐅᓯᕓᓕᑎᑦᑎᓗᓂ ᐊᕿᔪᑕᐅᓂᐊᕐᑐᓂ ᑖᑯᓂᖓ ᐊᐳᐅᖕᖑᑦᑐᓂᒃ ᓴᐴᑐᑦᑕᖓ ᐊᑐᕐᑕᐅᒐᔭᕐᑐᓂᒃ.

EXECUTIVE SUMMARY

This report is the eleventh annual report produced by the Analytical Services Unit (ASU) relating to the environmental assessment and remediation of the former military base at Resolution Island. The first three reports, pertaining to visits from 1994 to 1996, involved site assessment, remediation of critical areas and the development of cleanup plans and strategies. The work in these three years was managed by the ASU. From 1997 onwards, the management of the remediation work has been conducted by the Qikiqtaaluk Corporation. The ASU has provided analytical services and expertise to support this work and Dr. John Poland and Dr. Allison Rutter have acted as Scientific Advisors to Indian and Northern Affairs Canada (INAC) for the project. This report details the work undertaken by the ASU, Queen's University in 2004.

This was the second year of the three year remediation plan designed to complete the cleanup of the site. Due to the very poor weather conditions on site this summer, the plan is somewhat behind schedule and no contaminated material was placed in the Tier II landfill. The liner is in position and Tier II soils can start to be transported to the landfill early in the 2005 season. Most of the Tier II soil in the S1/S4 valley area was scraped into piles and confirmatory testing completed in these areas. No Tier I soil was excavated in this area this year. Good progress was made at the S1/S4 beach area. Only four of the sixteen quadrants containing CEPA soil remain to be excavated. The Tier I and Tier II soils at this location will be excavated next year. Approximately 1200 m^3 of CEPA soil was excavated this year and 752 steel conical containers filled. Of these 516 were shipped off site for disposal. CEPA material left on site is now comprised of the 4 quadrants to be excavated at the S1/S4 beach area, 236 steel conical containers filled with soil, 27 steel conical containers filled with CEPA wood, concrete and other materials and 5 sea cans containing various materials. CEPA materials other than soil were sorted, sampled and analyzed as required, and packaged for transport this year.

At the start of the remediation project in 1997, there were approximately 5000 kg of PCBs as oil in electrical equipment and barrels, and 4030 kg of PCBs mixed with soil on the ground. All the PCBs as oils were shipped off site in 1999. Approximately 3790 kg (94 %) of PCBs in the soil have been excavated and 2870 kg (80 %) shipped off site; about 120 kg (3 %) of the mass of the PCBs is to be placed in the Tier II landfill. It should be remembered that the 97 % of the PCBs in the CEPA soil to be shipped off

site is in about 5000 m^3 whereas the 3 % in the Tier II soils, being much more dilute, is in about 10,000 m^3. Tier I soils contain 30 kg of PCBs in about 10,000 m^3 of soil.

This year the field season lasted approximately 12 weeks and ASU personnel were on site for 76 days. Much of the work of the ASU involved the contaminated soil excavation; marking and mapping areas to be excavated, collecting and analyzing soils to ascertain if the excavation was successful and ensuring that the excavation was conducted properly. All coordinates were recorded with DGPS and all associated record keeping was completed. Areas scheduled to be excavated in 2005 were roped and marked for excavation of contaminated soils. Monitoring wells and soil monitoring points were established around the Tier II landfill and the airstrip dump and these were sampled and analysed for metals, PCBs and hydrocarbons; the Tier II landfill monitoring wells were sampled up to eight times. Annual tasks such as drinking water testing, barrier monitoring, background plant and water monitoring, air sampling and analysis and barrel analyses were completed. The concrete floor of building S4 was sampled and analysed for PCBs to ensure that the CEPA area had been removed.

Excellent progress was made this year in the area of fuel contamination. A pond and filter system were constructed at the imploded tank drainage pathway. A new large landfarm was built at the imploded tank with all soils known to contain > 8000 ppm of diesel fuel. At the beach POL tank area, the pond between the tanks was largely drained allowing further delineation and the proposal of a remediation plan. The experimental trial landfarm continued to show excellent results for the fertilized soil plot this year. A major laboratory experiment was carried out to investigate the optimal conditions for the field study and confirmed that bioremediation and aeration can remediate TPH contaminated soils at low temperatures.

The permanent barrier installed in 2003 was clogged with large amounts of silt at the start of the season. An additional settling pond and chevrons, were added this season to increase the ability of the funnel portion of the barrier to trap more silt. The filters in the S1/S4 valley and furniture dump barriers were removed and returned to the laboratory for analysis and replaced with graded sand and granulated activated charcoal (GAC). PCB analysis of the filters and laboratory batch tests clearly indicated that GAC was the best filter medium to trap the PCBs. The amount of PCBs trapped at the furniture dump suggests that this should be made into a permanent feature. In the laboratory an apparatus has been constructed and is currently being used to test various materials for their ability to trap and hold PCBs and to mimic the field experiment.

I. OVERVIEW

A. General

This is the tenth year that the Analytical Services Unit (ASU) has conducted work at Resolution Island for Indian and Northern Affairs Canada (INAC). Over the period 1993-1996, environmental work at the site was detailed in a set of reports entitled "Environmental Study of a Military Installation at Resolution Island, BAF-5". These reports[1] fully described items such as site characteristics, history, and previous investigations. Scientific investigations have continued and have been reported annually[2]. From 1997 onwards, work at the site has been managed by the Qikiqtaaluk Corporation (QC) through a contribution agreement with INAC. This work started in 1997 with infrastructure improvements and expanded from 1998 onwards to include remediation activities and training. The three year plan to complete the work at the site was initiated in 2003[3] and thus, the work described here, represents year two of this plan. Map I-1 shows the location and general layout of the site at Resolution Island.

The work described in this report was conducted through a Contribution Agreement between Queen's University and INAC through their Nunavut Office. This report details the tasks carried out by the ASU in 2004 and outlines the progress made in the Resolution Island remediation project. The report includes a chapter detailing research and activities relating to the design and construction of permanent barriers to intercept PCBs in drainage pathways. A separate chapter is also devoted to the

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[1] Environmental Sciences Group (1994). Volume One, Analytical Services Unit (1995) Volume Two, Analytical Services Unit and Environmental Sciences Group (1996) Volume Three, and Analytical Services Unit (1997) Volume Four: Environmental Study of a Military Installation at Resolution Island. BAF-5. Prepared for Indian and Northern Affairs Canada.

[2] Analytical Services Unit (1998), (1999), (2000), (2001), (2002) and (2003). Resolution Island 1997: Scientific Investigations, Resolution Island 1998: Scientific Investigations: Resolution Island 1999: Scientific Investigations, Resolution Island 2000: Scientific Investigations: Resolution Island 2001: Scientific Investigations: Resolution Island 2002: Scientific Investigations and Resolution Island 2003: Scientific Investigations. Prepared for Indian and Northern Affairs Canada.

[3] Analytical Services Unit (2003). Resolution Island Project Description and New Remediation Plan Revision 1 March 2003. Prepared for Indian and Northern Affairs Canada.

environmental assessment, delineation and treatment of diesel contaminated soils and the ongoing research supporting the hydrocarbon remediation.

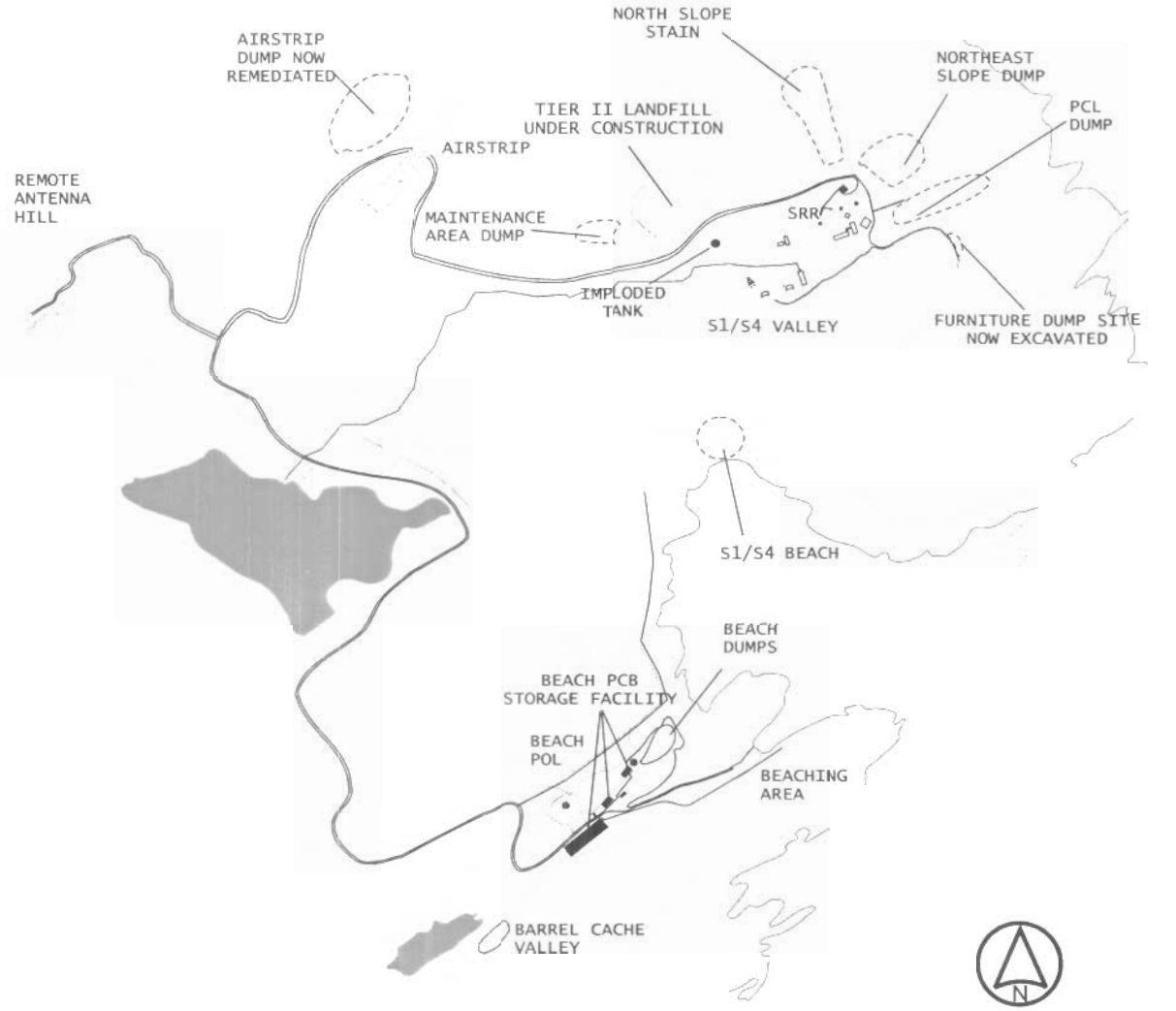
B. Site Activities

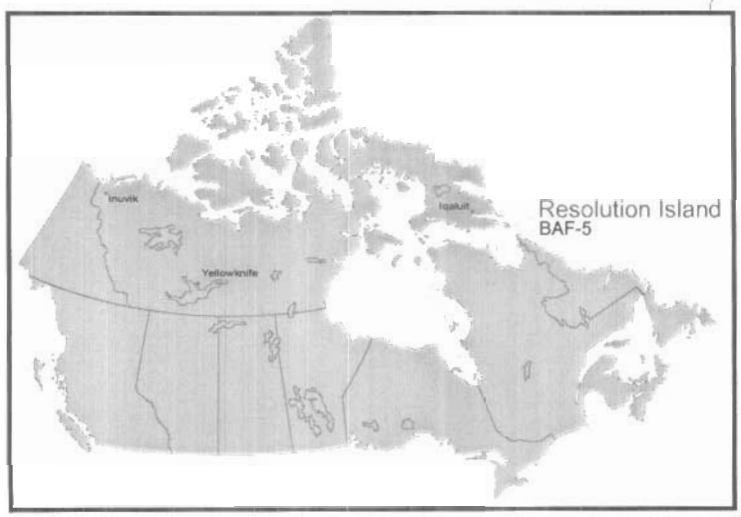
Most of the work conducted at Resolution Island this year was again managed by the Qikiqtaaluk Corporation (QC). QC managed the transportation to and from Iqaluit, provided meals and accommodation at the core camp and provided personnel and equipment to assist with our work.

The main activities and accomplishments are listed below:

- Excavation of nearly all the CEPA soil from the S1/S4 beach area.
- 752 conical steel containers were filled with CEPA soil. 516 of these containers were shipped to Bennett Environmental Inc for thermal destruction.
- Excavation of Tier II soils from a large area of the S1/S4 valley and buildings area was carried out and the contaminated soils were placed in piles awaiting transport to the Tier II landfill.
- The berms of the Tier II landfill were completed and the liner placed in position and covered with a thin layer of clean material. No Tier II material was placed in the landfill as the liner was not in place until early September.
- Building S4 was demolished.
- CEPA materials other than soil were packaged for off site disposal.

Map I-1: Location and General Layout of the Site at Resolution Island





C. On Site Scientific Investigations

The Queen's University team was on site from 30 June to 10 September 2004.

The activities conducted at the site this year by the ASU and described in Chapters II-VI of this report are listed below. Between three and five ASU personnel were on site for most of the time this summer. Two people were generally required full time to operate the laboratory. The successful operation of the laboratory ensured the ability to analyze PCBs and other parameters on site; this greatly facilitated the excavation and other activities on site. Equipment and supplies used by the ASU were flown to Iqaluit and transported into the site by helicopter or Twin Otter aircraft. Materials for the barrier installation and hydrocarbon migration control and solvents required by the laboratory were transported to the site by sea-lift.

Resolution Island meetings were attended in Iqaluit, and Ottawa this year.

The main tasks completed by the ASU this year are listed below:

- Provided scientific and engineering support at the site.
- Conducted analyses at the mobile laboratory. The analyses were mainly for PCB by the GC/ECD method in soil, water, and other matrices. The GC/ECD equipment and associated equipment for PCB analysis is complex. This year two GCs were on site to increase the throughput and in case of equipment breakdown. Additional backup was provided by provision of test kits (on-site) and another GC/ECD at Queen's (off-site); One GC was periodically used for the analysis of soil samples for TPH. Tested miscellaneous materials such as used decontamination supplies for PCBs, water, daily pH testing of drinking water, and identity of unknown materials. Two people were required full time to operate the laboratory.
- Confirmatory testing, mapping and roping at the S1/S4 Buildings and Valley areas (Tier II and Tier I) was conducted. Queen's had a person assigned to oversee these remediation operations.
- Confirmatory testing, mapping and roping at the S1/S4 Beach area was carried out. Queen's had a person assigned to oversee these remediation operations.

- Sampled the S4 concrete floor and analysed for PCBs to confirm remediation was complete.
- Barrels – testing, sorting and labelling as required.
- PCB Storage facilities – adding materials to, and keeping an inventory of, the Beach facility as required – reporting records of the contents of the Beach PCB storage facilities and off site disposal to INAC at the end of the field season - and keeping INAC informed of any additional CEPA violations so that they could be reported promptly to Environment Canada. Assist with sorting containers of CEPA material at the beach area. Collection and analysis of containers previously used to store PCBs.
- Drinking water and lake water were tested. pH was tested daily, and the potability of drinking water was tested during the summer: the lake water was also tested.
- The 1994 barriers still remaining in position were monitored, inspected and repaired.
- Collected and analysed air samples for PCBs and chlorinated hydrocarbons.
- Samples were taken from the Tier II landfill site. This included collection and analysis of soil samples from the current partially complete berms and from the gravel sources (PCBs metals, and TPH). Also additional samples were collected to characterize the landfill footprint.
- Tier II monitoring wells and soil were tested. All wells were sampled approximately weekly. New wells needed initial purging. Sampling of the wells depended on when the existing wells thawed and when the new ones were installed. Associated soil samples were sampled twice. Soil sampling points were established for the new wells.
- All wells and associated monitoring points were sampled at the airstrip landfill. The cobalt dump monitoring wells were not installed this year.
- Collected and analysed background plant and water samples.
- Continued the test trial landfarming study and monitored the progress.
- At the beach POL area, continued delineation when water had been removed from the pond between tanks.

- At the imploded tank area, oversaw the excavation and sieving of TPH contaminated soils including all > 8000 ppm areas. Established the landfarm having boomed the drainage pathway first.
- At imploded tank drainage pathway, constructed treatment pond and trial filter system. Also soil samples were taken from below cliff and water samples in the drainage channel.
- Continued to conduct field experiments with respect to the design and construction of permanent interceptor barriers. Inspected, sampled and modified the initial trial barriers installed in 2003.
- Investigated the S1/S4 beach area for installation of permanent barrier in 2005.
- Provided survey grade information by way of GPS files to UMA and Sinanni in order that they could estimate the amount of liner required for the Tier II landfill.
- Act as scientific resource to INAC and attend meetings as required.
- Hired two Inuit student as part of the Queen's team including a three week training period at the laboratory in Kingston (see Annex-I-1 for details). Both students were provided with letters confirming that they had completed the course.

D. Other Activities

Two research projects were continued this year. These were related to the construction of permanent PCB barriers at the site and assessment and remediation of hydrocarbon contaminated soils. Two graduate students are involved in these project, Indra Kalinovich with the PCB barrier work, and Krysta Paudyn with the hydrocarbon study. Rebecca McWatters completed her 4th year Engineering Chemistry thesis on the PCB barrier work this year.

A major part of the hydrocarbon remediation research involved the establishment of a laboratory experiment to duplicate the field trial landfarm. This required the design and construction of a large number of reactors set up at three different temperatures. The reactors were fitted with air inlets and carbon traps in order to monitor hydrocarbon loss by aeration.

An additional port allowed water to be added to keep moisture content within specified ranges. The eighty-seven reactors, each containing about 1.2 kg of diesel contaminated soil from Resolution Island were tested regularly for TPH. Airflow was monitored daily, and carbon traps were analysed and replaced several times during this initial five month experiment. The water content of the soil was monitored regularly. A second experiment was set up in February 2005 using a different set of operational parameters in order to further our understanding of the processes involved and to try to establish and optimise conditions for landfarming in the Canadian Arctic. Research continued with the trial landfarm at the site. A second major initiative with respect to TPH remediation was conducted with the design and construction of a pond and barrier system in the imploded tank drainage pathway. The system was designed in order to accelerate the natural remediation of diesel contamination occurring at this location. A pond with water exiting from below the pond and with a boom and a sediment control system was constructed to increase TPH loss by aeration and through absorption by the boom. A barrier filter system was placed below the pond and equipped with a sand filter and carbon absorbent to explore whether the use of this type of system in the Canadian Arctic would be practical, and beneficial. Both the landfarm and interceptor systems are very economical ways of treating TPH contamination and their low tech approach is most suitable for application at a remote site.

A PCB barrier system was designed and constructed in 2003 in the S1/S4 drainage pathway. This year the barrier was examined and filters removed and analysed. As a result of field observations and laboratory testing, the barrier was modified to increase its capacity to remove particulate matter through sedimentation. In addition, the four filters and cassettes used in 2003 were changed to two cassettes filled with sand and granulated activated charcoal. Further laboratory work continued with modifications to the apparatus designed to mimic the field filter system, development of analytical procedures for its use and batch testing of filters and absorbents.

Dr Poland attended the fourth International Conference on Contaminants in Freezing Ground in Fairbanks, Alaska and made oral presentations on the interceptor barriers and fuel contaminated soils remediation at Resolution Island. Cooperation with the Australian Antarctic Division, Environment Australia continued with discussions at the

meeting and the development of a work program as part of the proposed Canadian Antarctic Research Program (CARP). Dr Poland and Dr Rutter attended a meeting arranged by INAC in order to discuss the criteria and protocols to be used for the remediation of their DEW Line sites. ASU provided written material produced for the Resolution Island project to assist with this endeavour. Dr Rutter attended the 4th International Conference on the Remediation of Chlorinated and Recalcitrant Compounds in Monterey in May. Dr Poland, Indra Kalinovich and Krysta Paudyn attended the 12th Canadian Environmental Conference and Trade Show in Toronto in May and also visited Terrafix Geosynthetics Inc. to view their products and to discuss requirements for the barrier work. Indra Kalinovich attended the 57th Canadian Geotechnical Conference in Quebec City and presented a paper entitled "Investigating the design and application of a funnel and gate barrier for PCB remediation in the Canadian Arctic" authored by Indra Kalinovich, Allison Rutter, Rebecca McWatters, Kerry Rowe and John Poland.

Papers have been submitted and accepted for the ARCSAAC conference in Edmonton in May 2005 and the 6th International In Situ and On-Site Bioremediation Symposium in Baltimore in June 2005.

Annex I-1

ASU Resolution Island Trainee Program 2004

This program has been set up to introduce general laboratory techniques and to train students to perform two of the chemical analysis required for the Resolution Island project. Resolution Island soil is contaminated with high concentrations of PCBs. While at the ASU laboratory the trainees will learn to perform PCB analysis of soils. This will allow them to work in the ASU laboratory and perform PCB analysis on site. The other major contaminant problem at Resolution Island is metals. These samples are shipped back to the ASU laboratory in Kingston. The program will also include metal analysis to broaden the scope of the training.

The trainee is expected to be in the laboratory from Monday to Friday 9 am to 4:30 pm for the full three weeks. Training may not follow the schedule exactly and will depend on the availability of equipment and technicians. As the tasks are completed and the trainee gains competence in the individual tasks, the trainer will sign off on each task. Subject to the completion of this program, training will continue on site at Resolution Island. In addition to working at the on site laboratory, the trainee will be instructed in sampling and mapping techniques and may participate in the construction of the on site barrier at Resolution Island.

Week One: General Laboratory Skills

The student will be introduced to the laboratory. ASU is a CAEAL accredited laboratory and QA/QC will be explained as well as proper conduct in the laboratory. All equipment is regularly calibrated and students will first observe and then perform calibration of the balances, pipettes and syringes used in the laboratory. Familiarity with these techniques is essential for the analysis of PCBs and metals performed in the second and third weeks. The measurement of pH will also be taught this week. The water at Resolution Island is very acidic and therefore is buffered on site. The ASU monitors the pH on site daily. The measurement and calibration of the pH meter will be responsibility of the trainee while on site. The following topics will be covered.

Safety tour
Quality Manual
Procedures Manual
Glassware washing procedures
pH analysis
Balances – use and calibration
Pipettes – use and calibration
Syringes – use and calibration

Week Two: PCB Analysis of Soils by Shaker Method

Two methods for analysis of PCBs in soil are used at the Resolution Island mobile laboratory. Both methods will be demonstrated by ASU staff and then the students will perform the analysis independently. If the students demonstrate proficiency in the analysis they will perform the analysis at the ASU on site mobile laboratory at Resolution Island. The following steps are part of the analysis for PCBs in soils.

Wet dry analysis
Shaker run
Rotoevaporation and solvent exchange
Loading samples on the GC
Data Analysis
- Chromatogram integration and printing
- Entry of data in excel spreadsheet
- Calculation of results

Week Three: ICP/OES Analysis for Copper, Lead and Zinc

Metal contaminated soils are present at Resolution Island at the previous site of the beach dump. These soils have been analysis at the ASU in previous years by ICP/OES and metal analysis will be required once the soils are excavated in 2005. Students will perform analysis of Resolution Island soils from this area for copper, lead and zinc. This will introduce the trainee to metal analysis. The steps are outlined below.

Laying out soils
Grinding soils
Aqua regia digestion of soils
Filtering of samples
Analysis of samples by ICP/OES

Task	Date Task Observed	Initials of Trainer	Date Task Completed	Initials of Trainer
General Lab Skills				
Safety Tour				
Quality Manual				
Procedures Manual				
Glassware washing				
pH measurement				
Balance Use				
Balance Calibration				
Pipette Use				
Pipette Calibration				
Syringe Use				
Syringe Calibration				
PCB Soil Analysis:				
Wet dry analysis				
Shaker extraction short method				
Shaker extraction long method				
Rotoevaporation				
Prep for GC analysis				
Chromatogram integration				
Data entry in excel				
Calculation of results				
Metals by ICP/OES:				
Laying out soils				
Grinding soils				
Aqua regia digestion				
Filtering digests				
Loading samples on the ICP				
Data Analysis				