APPENDIX C

Report on Gender Equity Requirements for NML Submission to Government of Newfoundland and Labrador EIS Submission

NEW MILLENNIUM
CAPITAL CORP.

DIRECT-SHIPPING ORE PROJECT

Report on Gender Equity Requirements for NML Submission to Government of Newfoundland and Labrador EIS Submission

BY : Bobbie Boland, MSW.

5 January 2009

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List of Acronyms

EIS	Environmental Impact Statement
NOC	National Occupational Classification (code
NML	New Millennium Capital Corporation
WRDC	Women in Resource Development

1.0 Introduction

On May 5, 2008 New Millennium Capital Corporation (NML) registered an undertaking with the Department of Environment and Conservation pursuant to the Environmental Assessment Regulations under the Environmental Protection Act. The registered undertaking is phase one of a two-phased open pit iron ore mining project located in Western Labrador, approximately 10 kilometers northwest of Schefferville, Quebec. The site was previously mined and consists of 10 open pit deposits. Ore will be trucked to a plant for crushing, screening and washing to produce lump ore and sinter fine ores. From the plant the ore will be transported via rail to a marshalling yard in Schefferville and then sent via rail to Sept-Îles, Quebec, for shipment to customers. To the extent possible, the project proposes to use existing infrastructure or renovate/re-build infrastructure abandoned or decommissioned by other mining companies. Mine stripping and waste removal will take place year-round, but mining, processing and transportation will be restricted to approximately seven to eight months per year.

Phase one of the project includes mining two of four sectors: sector 2 and sector 3 which represents about 20% of the resources. The proposed start date of construction is July 2009. The proposed total construction period is approximately 15 months. It is estimated that the Project will employ a total of 150 people in the construction phase between 2009-2010. A similar number of indirect and induced jobs will also be created. The duration of the employment will be approximately 15 months. Construction will be contracted out.

The proposed start date of operations in Phase 1 of the Project is 1 August, 2010. The approximate duration of Phase 1 is 35 months. It is estimated that during the operation of Phase 1 between 2010 and 2013, 150 people will be hired. A similar number of indirect and induced jobs will also be created. The duration of the employment will be approximately 36 months.

Phase two of the project which is referred to as the Future Phase will involve mining of sectors 1 and 4. It is anticipated that production in Sectors 1 and 4 will start in 2013. Approximately 75% of NML's DSO resources are located in Sector 4. Based on historical estimates, production in Sector 4 is expected to span 10-13 years, and the life of the mineral processing facilities will be extended accordingly.

The Present Project Registration addresses only Sectors 2 and 3. There will be a separate Project Registration and a separate process of environmental impact assessment for the future phase. The total duration of the project, including future phases, will be approximately 15 years.

On December 12, 2008 the Minister of Environment and conservation issued the guidelines for the proponent to prepare and submit an environmental impact

statement. The guidelines specifically identify that during construction, the project must maximize benefits for the province, and require the proponent to present a strategy to ensure Full and Fair Opportunity and First Consideration for employment, contracting and procurement, education and training.

The Women's Policy Office recommends that the proponent be required to submit a plan (i.e. Women's Employment Plan) designed to prevent, reduce or eliminate employment inequities that may be or are experienced by women particularly in occupations related to trades, technology, science and engineering. Such a plan must be submitted for public comment and approved by the Minister Responsible for the Status of Women prior to the commencement of any construction related to the project and must include the following:

(i) positive policies, practices and reasonable accommodations to be instituted in the short term for the hiring, training, promotion and retention of women;

(ii) short term measures to be taken by the proponent to eliminate employment barriers;

(iii) a timetable for the implementation of the positive policies and practices and measures to eliminate employment barriers;

(iv) short term numerical goals for the hiring and promotion of women in each occupational category where under representation exists;

(v) longer term numerical goals for increasing women's representation including a strategy for achieving set goals; and

(vi) plans for monitoring and public reporting on progress.

This report addresses the above expectations to the extent possible, notes where further information, company decisions and policies must be defined and suggests actions to NML that will satisfy the requirements. Essentially, in order to respond to the specifics of these requirements NML must identify corporate hiring objectives, quantitative and qualitative goals, special measures and policies; monitoring of compliance with objectives, goals, measures and policies; duration of contracts and/or employment and provide for a communication plan and any required re-evaluation process of objectives, goals, measures and policies.

2.0 Women's Employment Plans

A Women's Employment Plan is a tool to aid the gender equity objective of the corporate hiring strategy. In conversation with the Women's Policy Office it is clear they expect a Women's Employment Plan as part of the EIS. The company's registration document cites a report on women's participation and contributions (Boland October 2007) which identifies issues and recommendations that the company intends to implement to create opportunities for the greatest number of qualified women and for persons of all age groups. NML listed 5 recommendations that they plan to implement to create opportunities for the greatest number of qualified women and for persons of all age groups (Table 1). While these statements are positive, activity in greater detail is required to constitute an employment equity plan. The Women's Policy Office recommends that proponents use the federal employment equity guidelines which provide a detailed map on how to develop and implement an employment equity program within their organization.

The equity guidelines suggest the following areas:

- Communications
- Consultation and Collaboration
- Collection of workforce information and workforce analysis
- Employment systems review and
- Employment Equity Plan

Equity action described in the Registration Document:

ensure that consultations directly include women, particularly Aboriginal women, and persons of all age groups, especially during the negotiation of IBAs;

ensure that IBAs include targets for women employees, particularly Aboriginal women, and employees of all age groups;

implement a training program before the construction phase, so that women and persons of all age groups are ready to work once construction begins;

implement affirmative recruitment and hiring practices where the workplace is welcoming to women and persons of all age groups at all positions and where there is a clear plan for progression and advancement; and

elaborate a process for employment monitoring on an annual basis that includes gender and age in order to track progress and to implement strategies if the targets are not being attained.

2.1 Communications

At this point the corporate information provided by NML does not openly demonstrate senior management support for women's employment or employment equity. For example, there are no women on the Board of Directors or member management team. In addition there are no publicly communicated corporate statements that identify gender equity or employment equity as corporate objectives.

Senior management support for women's employment or employment equity would be demonstrated by a publicly announced corporate objective and commitment to employment equity, communication of employment equity

objectives to all staff and hiring and promoting qualified women to key positions on board of directors and to other senior management positions.

The following steps can be taken by NML to better position the organization in undertaking an employment equity program and ought to be communicated in the EIS:

- Employment equity is established as a corporate policy
- The Employment equity policy is communicated to all staff and members
- Qualified women have been hired and promoted to the board of directors, senior management and other highly visible positions within the organization
- A senior executive is assigned responsibility for employment equity results
- An employment equity coordinator is (will be hired)

Employment equity statements need to be incorporated into the existing corporate communications strategy. This will help create a climate of understanding, commitment and support that will contribute to the success and effectiveness of the organization's employment equity plan and activities.

As part of the corporate strategy to communicate and promote compliance and support for its gender and employment equity policies, goals and initiatives NML might describe the following actions:

- The importance of achieving equity results has been emphasized in management meetings
- Information sessions regarding gender sensitivity and employment equity and its importance and value to the organization are a requirement for all employees and potential employees
- NML will meet (has met?) with labour organizations to explain the company's goals and objectives and to encourage the support of labour organizations in the process
- NML's employment equity goals and objectives and expectations will be communicated to contractors.

These communication activities will also provide an opportunity for NML to gather information about the issues and concerns of the various stakeholders which will need to be addressed to ensure successful development and implementation of the employment equity program.

2.2 Consultation and Collaboration

The federal employment equity guidelines regarding consultation and collaboration specifically refer to the employer's obligation to consult with employee representatives about specific matters related to the development and

implementation of employment equity. NML has identified that they will ensure consultations directly include women, particularly Aboriginal women, and persons of all age groups, especially during the negotiation of IBAs.

As part of consultation and collaboration strategy NML has to:

- Identify employee representatives with whom they have consulted regarding employment equity including the pool of non-unionized employees anticipated for operations.

- Identify and consult with representatives of the unions who will be part of the construction phase

- Identify the women's organization they have consulted with regarding identification of employment barriers as well as initiatives to overcome such barriers. (i.e. Women and Resource Development, Lab West Status of Women's Council)

2.3 Collection of Workforce Information and Workforce Analysis

Because the projected registered by NML is a new undertaking, the workforce information provided can be limited to the number of employees required in each occupational group identified by its 4 digit National Occupational Classification (NOC) code for construction and operation of the project.

In its registration document, NML provided some information on the occupations required for operation but not to the detail of the 4 digit NOC code. NML did not provide information on the occupations required for construction. Consultations with the Women's Policy Office indicates that regardless of whether or not construction will be contracted out, the company is responsible to provide estimates on the employment and occupations required for construction and will be required to set targets for women's employment in occupations where women are under-represented. Omission of such information may delay the approval process.

Prior to submission of the EIS NML needs to:

- Identify occupational requirements for construction to the 4 digit NOC
- Identify occupational requirements for operation to the 4 digit NOC
- Identify key educational and years experience requirements for occupational groups

In a new undertaking, where the employer has no existing workforce, the employer must look at the external labour market data to determine the

availability of designated group members in each occupational category. This data as well as additional labour market and education data is used to determine what proportional representation of designated groups the employer should have and help determine long and short term equity goals.

The most recent Employment Equity Data Report available is from the 2001 Census. This data indicates that for the occupational areas identified by NML for the operational phase of the project, women in Newfoundland and Labrador represent no less than 21% of the overall occupations identified (Table 1).

Table 1: Occupational Categories Identified by NML for Operation

Occupational Categories Identified by NML for Operation	Total Labour Needed	Available in NL in 2001			
		Men		Women	
		#	%	#	%
0811 Primary Production Managers	5	250	100%	0	0
121 Clerical Supervisors 122 Administrative and Regulatory Occupations 123 Finance and Insurance Administrative Occupations 124 Secretaries, Recorders and Transcriptionists 141 Clerical Occupations, General Office Skills 142 Office Equipment Operators 143 Finance and Insurance Clerks 144 Administrative Support Clerks	5	425	36%	765	64%
211 Physical Science Professionals 213 Civil, Mechanical, Electrical and Chemical Engineers 214 Other Engineers	8	2349	88%	325	12%
221 Technical Occupations in Physical Sciences 223 Technical Occupations in Civil, Mechanical and Industrial Engineering 224 Technical Occupations in Electronics and Electrical Engineering	16	2060	87%	315	13%
822 Supervisors, Mining, Oil and Gas	16	215	93%	15	7%
841 Mine Service Workers and Operators in Oil and Gas Drilling	16	195	100%	0	0%
941 Machine Operators and Related Workers in Metal and Mineral Products Processing 951 Machining, Metalworking, Woodworking and Related Machine Operators 861 Primary Production Labourers	75	3100	79%	800	21%
Total	141	8594	79%	2220	21%

Excluding clerical and administrative positions that are dominated by women, the Employment Equity Data Report indicates that women in Newfoundland and Labrador represent no less than 15% of the occupations identified (Table 2).

Table 2: Occupational Categories Identified by NML for Operation (Excluding Clerical and Administration Positions)

Occupational Categories Identified by NML for Operation (Excluding Clerical and Administration Positions)	Total Labour Needed	Available in NL in 2001			
		Men		Women	
		#	%	#	%
0811 Primary Production Managers	5	250	100%	0	0
211 Physical Science Professionals 213 Civil, Mechanical, Electrical and Chemical Engineers 214 Other Engineers	8	2349	88%	325	12%
221 Technical Occupations in Physical Sciences 223 Technical Occupations in Civil, Mechanical and Industrial Engineering 224 Technical Occupations in Electronics and Electrical Engineering	16	2060	87%	315	13%
822 Supervisors, Mining, Oil and Gas	16	215	93%	15	7%
841 Mine Service Workers and Operators in Oil and Gas Drilling	16	195	100%	0	0%
941 Machine Operators and Related Workers in Metal and Mineral Products Processing 951 Machining, Metalworking, Woodworking and Related Machine Operators 861 Primary Production Labourers	75	3100	79%	800	21%
Total	136	8169	85%	1455	15%

The Federal Guidelines for Employment Equity indicate that short term goals must at minimum reflect the availability of qualified designated members in the external workforce. The Guidelines recommend a review of labour statistics as well as trends that are likely to affect progress over time to inform decisions about gender equity goals.

The Employment Equity Data Report from the 2005 Census is not yet available. However, other information indicates that women's participation in occupations related to management, engineering, trades and technology has increased proportionately since 2001.

The MUN Fact Book indicates that from 2002-2007, Memorial University has graduated approximately 186 women from its Bachelor of Engineering Program, 26 women from its Masters of Applied Science Program and 31 from its Masters in Engineering Program. These graduates increase the pool of women candidates that can be attracted to work on this project.

Statistics from the College of the North Atlantic and private colleges in Newfoundland and Labrador were not able to be obtained within the timeframes of this report but should be obtained by NML and further analyzed in conjunction with information about key educational and years experience requirements before finalizing its targets for women's employment.

Based on current information the following are examples of reasonable hiring targets that NML may set for the operation of its project.

Table 3: Target Women Hires

Occupational Categories Identified (Excluding Clerical and Administration Positions)	Total Labour Needed	2001 Available Women		Target Women Hires	
		#	%	#	%
0811 Primary Production Managers	5	0	0%	1	25%
211 Physical Science Professionals 213 Civil, Mechanical, Electrical and Chemical Engineers 214 Other Engineers	8	1	12%	2	25%
221 Technical Occupations in Physical Sciences 223 Technical Occupations in Civil, Mechanical and Industrial Engineering 224 Technical Occupations in Electronics and Electrical Engineering	16	2	13%	4	25%
822 Supervisors, Mining, Oil and Gas	16	1	7%	3	19%
841 Mine Service Workers and Operators in Oil and Gas Drilling	16	0	0%	2	13%
941 Machine Operators and Related Workers in Metal and Mineral Products Processing 951 Machining, Metalworking, Woodworking and Related Machine Operators 861 Primary Production Labourers	75	16	21%	25	33%
Total	136	20	15%	37	27%

2.4 Employment System Review

An employment systems review examines corporate policies and practices to determine their impact on designated groups. This type of research and analysis informs the development of an employment equity plan though does not constitute an employment equity plan in itself. The review helps to identify employment barriers for designated groups that the employer will need to address and include in its employment equity plan to achieve its employment equity goals.

NML identified that a 100-person camp will be constructed to accommodate workers during construction and operations. While more detailed information about the work environment would be useful to determine the impacts on women, it is possible to anticipate the barriers for women on a remote construction site include: issues of privacy, personal safety, family friendly work scheduling and childcare.

The employment systems review, policies and practices would also identify barriers to women with respect to recruitment, selection, hiring, training, promotion, scheduling, and workplace accommodations. The ways in which NML addresses these issues will impact on women's access to employment and will need to be addressed in the Women's Equity Plan. NML should plan to review and discuss the employment systems planned with labour representatives and

women's organizations to determine what will be necessary to ensure designated groups have equitable access to employment.

2.5 Employment Equity Plan

The employment equity plan is the result of information brought forward from the communication, consultation and collaboration, the workforce analysis and the employment systems review. The employment equity plan needs to be very specific with respect to numeric goals, elimination of barriers and positive policies.

In summary, before developing an employment equity plan, NML needs to undertake the following:

- Establish employment equity as a corporate policy
- Communicate the policy objective to all staff and members
- Hire and promote qualified women to the board of directors, senior management and other highly visible positions within the organization
- Assign a senior executive responsibility for employment equity results
- Hire an employment equity coordinator
- Develop and implement a communication strategy to promote buy-in and support for employment equity within the organization
- Consult and collaborate with employee representatives, women's organizations and contractors
- Provide necessary workforce information related to construction and operation
- Conduct a workforce analysis
- Identify and evaluate employment systems

While there is an informal company expectation NML will focus on women employees because of their reliability, it is nevertheless necessary to be specific and set goals to increase representation of women in each occupational group where under-representation has been identified. Normally this will mean a separate goal for women in each occupational group where under-representation has been identified. However, where occupational groups are very small, the only practical option may be to set joint goals for a combination of them, with the understanding that the objective is to improve women's representation in each occupational group where under-representation exists.

These goals should, at minimum, reflect the results of the workforce analysis, the representation ("availability") of qualified women in the workforce, and to achieve reasonable progress towards a representative workforce. In the context of the reasonable progress requirement, it is important to consider statistical trends that might affect the impact of a goal over time.

It is recommended that goals exceed the representation figure, because this figure is inherently conservative. The representation figures for the Employment Equity Occupational Groups (EEOGs) and the National Occupational Classification (NOC) four-digit unit groups only include persons who have had some work experience in the seventeen-month period prior to the Census. Therefore, these representation figures do not include all women who may be qualified and potentially available to work. For example, they would not include those who have not yet entered the labour force or those who have become discouraged because of systemic or attitudinal barriers and have dropped out of the labour force. Thus, one would expect that in reality the availability of qualified women is higher than that indicated by the representation figures for the EEOGs and NOC unit groups. A “fair” employment equity plan would take this into consideration and set goals above such conservative representation figures.

3.0 Targeted Measures

Special measures are measures which, for a limited time, use gender as one criterion among many for acceptance into training programs; or as one criterion among many in hiring or promotion decisions. The purpose of special measures is to establish a “critical mass” of women in a workplace or an occupational group. While such measures should be carefully designed and normally approved by the Human Rights Commission, they can play an important role in terms of making change self-perpetuating. In addition, they are supported by the Canadian Charter of Rights and Freedoms (s. 15(2)); the Canadian Human Rights Act (s. 16); the Human Rights Code (s. 19). The Human Rights Code supersedes all other legislation. Special measures approved under the Human Rights Code are defensible outside a collective agreement.

NML might consider writing into the EIS that it will aapply to the Human Rights Commission for approval to:

- Set targets for the hiring of w omen in management, construction, engineering, trades and technology occupations where women are currently under-represented;

- Priority hire qualified women to occupational areas where women are currently under-represented

The following measures are offered in response to the requirements from Women’s Policy Office. However, it should be noted that they are insufficient and will need to be offered in conjunction with a Women’s Employment Plan.

A. *Positive policies, practices and reasonable accommodations to be instituted in the short term for the hiring, training, promotion and retention of women*

- Launch outreach efforts exclusively targeting women. This could include active participation in the co-op programs of universities and other post secondary educational organizations, attendance at career fairs and making information available where potential skills shortage exists.
- Develop and implement a human resources strategy for recruitment and retention of female employees and supporting pre-employment training programs
- As soon as possible, provide post secondary institutions with the lists of required skills and trades workers for both construction and operation phases.
- Identify skills shortages and work with post secondary institutions and Women in Resource Development OTT program to address those shortages and create opportunities for women
- Establish a working relationship with WRDC regarding the promotion of work opportunities for women and provision of training on Gender sensitivity and respectful workplaces.
- Create special training programs or bridging positions to prepare women for nontraditional occupations
- Establish internal mentoring and networking initiatives for women both during construction and operations
- Emphasize in public and corporate communications the importance of hiring within the local catchment area.
- Decide that, for a limited period of time, the applications of “qualified” or “qualifiable” women will be given careful or priority consideration for a certain percentage of new openings.
- Establish a family friendly work environment and work schedule. Two weeks fly in Fly out is a better schedule for families and for female workers who are mothering or have family responsibilities.
- Ensure there is a reliable communications route for families to contact employees at the remote site in case of emergency.
- Creation of a child care providers list.
- Mark dates of special significance to women (e.g. International Women’s Day);
- Inclusion of language in tender documents that requires bidders to meet gender equity targets.
- Inclusion of language in any Collective Agreement to support women’s memberships, the priority hiring of women to meet gender equity targets.
- Implement an employee assistance plan

B. *Short term measures to be taken by the proponent to eliminate employment barriers*

- Accommodations at site permit personal privacy
- Written, communicated and enforced policies regarding Respectful Workplace, workplace and sexual harassment and anti racism policies support a safe working and living environment.

- Establishment of a Management / Labour Respectful Workplace Committee to promote gender equity and address any such concerns
- Implement Mandatory Respectful Workplace Training both during construction and operation phases
- Establishment of a Zero Tolerance Harassment Policy both during construction and operation phases
- Establishment of a Management / Labour Joint Agreement on Harassment

C. *A timetable for the implementation of the positive policies and practices and measures to eliminate employment barriers*

- Many of the identified actions will cover both the construction and operations phases.
- Specific women's employment equity actions are required prior to construction and require policy statements from NML regarding gender equity employment. These have been outlines throughout this report.

D. *Short term numerical goals for the hiring and promotion of women in each occupational category where under representation exists*

- Identify any measures to be implemented that may require contractors and sub-contractors to include employment equity considerations.
- Provide specific numbers by National Occupational Classification (NOC-2006), gender and employment equity considerations and period of employment.

E. *Longer term numerical goals for increasing women's representation including a strategy for achieving set goals*

- Informally NML has indicated an expectation that women may provide up to 50% of the operations staff and an "on site" training plan. A description of how exactly this will roll out is required.
- See Table 3 for Target Hires for Operations.

F. *Plans for monitoring and public reporting on progress.*

- During construction and operations NML will gather human resources data according to gender and race, position, promotions, training and will complete exit interviews.
- A public report will be posted yearly with the above data.
- NML will engage WRDC, a provincial organization that supports the advancement of women in natural resource development, to provide consultation and advice on gender matters with regard to the workplace environment, and the recruitment, training and retention of women.

APPENDIX F

Survey of Breeding Birds at Future DSO Site
Final Technical Report

NEW MILLENNIUM
CAPITAL CORP.

DIRECT-SHIPPING ORE PROJECT

Survey of Breeding Birds at Future DSO Site
Final Technical Report

BY: Groupe Hémisphères inc.

October 2008

PROJECT TEAM

GROUPE HÉMISPHÈRES

Marie-Ève Dion	Biologist, M.Sc. Env., Project Manager
Daniel Néron	M.Sc. Geogr., Data Management
David Savoie	Tech. Applied Ecol., Bird Survey
Joel Poirier	Tech. Applied Ecol., Bird Survey
Julie Tremblay	Biologist, B.Sc. Biol., Certificate in Geomatics
Christian Corbeil	Professional Technologist, Logistics and Revision

Collaborators

François Morneau	Biologist, M.Sc., Drafting and Revision


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LIST OF ABBREVIATIONS AND SYMBOLS

km^2	square kilometre
m	metre
Mt	megatonne

REVISION AND PUBLICATION		
Number	**Date**	**Modification or Publication Details**
00	2008-09-18	Preliminary Technical Report
01	2008-09-25	Final Technical Report, Version 1
02	2008-10-02	Final Technical Report, Version 2
03	2008-10-10	Final Technical Report, Version 3
04	2008-10-21	Final Technical Report, Version 4

1.1 INTRODUCTION

1.2 Study Context

The price of iron ore has increased considerably since 2002, making the mining of the Millennium Iron Range, located in the Schefferville region, profitable. The Direct Shipping Ore Project (« DSOP ») is one of the three projects of New Millennium Capital Corp. (« NML »). It consists in mining direct-shipping ores. Phase 1 of the DSOP (hereinafter « the Project ») foresees the mining of two sites (DSO 2 and DSO 3, located in Québec and in Labrador) in order to produce one megatonne (Mt) of ore in Year 1 and 4 Mt in each of Years 2 and 3. Phase 2 of the DSOP foresees mining the DSO 4 site, also located in Québec and in Labrador. Yearly tonnages for Phase 2 have yet to be specified. Two of the three sites (DSO 2 and DSO 3) have already been partially mined by the Iron Ore Company of Canada (IOC), and their biophysical environment is fairly disturbed. The third site, DSO 4, is more undisturbed and natural.

1.3 Mandate and Objectives

Groupe Hémisphères was mandated by NML to conduct, among other things, the biological surveys of the Project site, including the survey of breeding birds. The objectives of the present study are as follows:

- to conduct a quantitative survey of breeding landbirds;
- to conduct a qualitative survey of birds present during the breeding season;
- to conduct a survey of birds with at-risk status;
- to evaluate the potential presence of birds with at-risk status;
- to cover the study areas for Phases 1 and 2.

1.4 Species of Birds with At-risk Status

There are six species with at-risk status that are likely to use the study area (defined in Section 3.1) (Table 1), including those that could theoretically reproduce therein on the basis of their breeding range and the existence of potential habitat (MRNF, 2007; Environment and Conservation, 2008; COSEPAC, 2008).

Table 1. Species with At-risk Status Potentially Present in Study Area

English Name	Latin Name	*Status*		
		Québec	Newfoundland/ Labrador	Canada
Golden eagle	*Aquila chrysaetos*	Vulnerable	—	Not at risk
Harlequin duck	*Histrionicus histrionicus*	SLDTV*	Vulnerable	Special concern
Peregrine falcon ssp. *anatum*	*Falco peregrinus anatum*	Vulnerable	Threatened	Special concern
Short-eared owl	*Asio flammeus*	SLDTV	Vulnerable	Special concern
Bald eagle	*Haliaeetus leucocephalus*	Vulnerable	—	Not at risk
Rusty blackbird	*Euphagus carolinus*	—	—	Special concern

*SLDTV: Species likely to be designated as threatened or vulnerable

1.4.1 Golden eagle

This species generally inhabits montainous or hilly areas, and sometimes slightly undulating areas (Brodeur et Morneau, 1999). The Golden eagle hunts predominantely in open habitats, including bare summits, burns, peatlands, swamps and even clear-cut areas (Tjernberg, 1983; Brodeur et Morneau, 1999; McGrady *et al*., 2004). The size of open environments is crucial for the occupation of a breeding area (Morneau, 2003;

McGrady *et al*., 2004). In the boreal forest, current knowledge indicates that the use of a breeding area by the Golden eagle is often temporary, since, sooner or later, vegetative succession eliminates burns and barrens until the next major disturbance (Whitfield *et al*., 1969; Morneau, 2003). Couples inhabit a living space that generally varies between 25 and 100 km^2 (McGrady *et al*., 2004). Cliffs constitute the principal support for nests in Québec (Morneau *et al*., 1994; SOS-POP, 2008).

1.4.2 Harlequin duck

The Harlequin duck nests along watercourses characterized by rapids. It generally inhabits watercourses of an order ≥ 4 (Morneau *et al*., 2008, in press). An order of 1 watercourse does not have a tributaries. It flows into an order of 2 watercourse, and so on. The distribution of the Harlequin duck in north-eastern Québec is poorly known.

1.4.3 Peregrine falcon, anatum subspecies

The Peregrine falcon nests predominantly on cliffs or on structures of human origin, such as bridges, tall buildings and quarries (Bird, 1997). Two subspecies occur in Québec: *tundrius* and *anatum*. The former lives, in Summer, in the northernmost area of Québec, but the southern limit of its breeding area is poorly known; conversely, the *anatum* subspecies, the numbers of which are on the rise, inhabits the south of Québec, at least as far as the rivière Saguenay, but the northern limit of its breeding area is poorly known.

1.4.4 Bald eagle

The Bald eagle inhabits the shores of large lakes, rivers and the ocean (Lessard, 1996; Fradette, 1998). Its nests are built at the top of tall trees, usually near a large water body.

1.4.5 Short-eared owl

During the breeding season, the Short-eared owl inhabits a variety of extensive open areas, such as dunes, peatlands, swamps, humid prairies, pastures or arctic tundra (Holt and Leasure, 1993). The abundance of the species is a function of that of voles, which fluctuates greatly. The Short-eared owl can even be absent in certain years if the vole population is at a low.

1.4.6 Rusty blackbird

During the breeding season, the Rusty blackbird lives close to water; it uses peatlands, marshes, swamps adjacent to forests, humid woodlands and thickets of large shrubs where pools persist. It is also found in the partially inundated surroundings of lakes and beaver ponds (Nadeau, 1995).

2 METHODOLOGY

2.1 Field Work Preparation

The biotopes[1] to be surveyed were identified and located based on an analysis of available maps. The survey points were spaced more than 250 m apart and located more than 125 m away from any ecotone. A preliminary meeting was held with the ornithologists in order to standardize the methods.

2.2 Survey Techniques

2.2.1 Listening Points

The survey of breeding birds targetted principally passerines and woodpeckers and was conducted using listening points. The technique is derived from a combination of that of counting within a limited radius (LRC; Bibby *et al*., 1992) and that of selective indices of abundance (SIA; Blondel *et al*., 1981). The latter technique involves recording all detected birds independently of their distance every five minutes. It has the advantage of enabling the coverage of a larger area, thereby improving the chances of detecting rare species. The census by limited counting started following a calming-down period of approximately five minutes, which allowed the birds to recover from the disturbance caused by the movement of the observers. Each listening point had a duration of 10 minutes, divided into two periods of five minutes. The decision to conduct 10-minute listening points is justified by the fact that the distance between the points represented more than 15 minutes of walking time (Ralph *et al*., 1995). Birds within a 50-m radius were distinguished from those situated further away. Although the survey by listening points targetted predominantly passerines and woodpeckers, observations of other bird species were also noted. The counting of breeding birds by listening points started at sunrise and lasted approximately four hours.

2.2.2 Visits to Wetlands

Many lakes, ponds and wetlands are present in the study area. Those environments were examined to identify the species possibly breeding therein. In total, 35 wetlands were examined. Visits occurred after the surveying of breeding passerines, namely after 09:00 hours. Each visit lasted between five and 10 minutes.

2.2.3 Examination of Cliffs

Cliffs were examined to verify the presence of breeding raptors. They were scrutinized with a view to ascertaining the presence of occupied or unoccupied nests.

2.3 Treatment of Data

2.3.1 Listening Points

The number of observations of passerines was compiled by habitat; the principal species observed are thus presented by habitat. The calculation of breeding birds is based on the birds detected within the 50-m radius.

2.3.2 Passerines Detected Outside the Breeding-Bird Survey

The number of observations of passerines detected outside the 50-m radius during the survey of breeding birds was totalled, as were the observations in wetlands and during movements.

[1] A biotope corresponds to a physical milieu that is relatively well delimited in space and that has a strictly defined plant composition. It includes various specific habitats.

2.3.3 Visits to Wetlands

The number of observations in the wetlands visited was compiled for each species and classified by group of species.

2.3.4 Total Richness of Study Area

The richness (number of bird species) of the study area for each survey period was calculated on the basis of all available data, including the data collected during movements.

3 RESULTS AND DISCUSSION

3.1 General Site Description

The study area is located north of the municipality of Schefferville. It stretches over approximately 40 km on a north-west/south-east axis. It is located between the Howells River valley, situated to the west, and a lacustrine area to the east. The elevation varies from 500 to 790 m, the northern part of the study area being generally higher.

In the southernmost part, which corresponds to DSO 2 and DSO 3, the study area is characterized principally by open forest vegetation, consisting of either moss or lichen spruce stands. Most summits are characterized by alpine vegetation (tundra). Some small lakes and wetlands, namely ponds and fens, occur in this part. It is also in this area that traces of former mining operations are found, including large deep and scarped pits, waste rock piles, stripped areas and numerous tracks, which are identified as barren areas hereinafter.

The northern part of the study area (DSO 4) is mainly characterized by alpine vegetation (tundra). The valley bottoms support moss or lichen spruce stands. Pools are the principal type of water body in this area; they are typically small and shallow, which explains why that type of water body can dry up at times.

A photographic report is presented at Appendix I.

3.2 Literature Review

Several studies of breeding-bird populations were conducted in 2005 for the LabMag Iron Ore Project. That project is located along the Howells River basin, less than 5 km away from the DSOP.

A survey of breeding birds by listening points was carried out by Golder Associates (2005). It was undertaken in two biotopes: forested taiga and wetlands. In total, 95 survey points of five minutes were conducted: 55 in forested taiga and 42 in wetlands. The forested taiga corresponds to the coniferous forest mentioned in the present report. In addition, listening points were conducted at control sites. Some of the control points were located around the Kivivic lakes, which lie within the DSOP study area.

Breeding anatidae and aquatic birds were also surveyed as part of the LabMag Project (Minaskuat Limited Partnership, 2008). The survey was conducted in mid May by helicopter. The study concluded that the anatidae species that breed early used mostly ponds, since they were free of ice earlier than large water bodies. The authors mentioned that construction near lakes would have less impact on populations of anatidae, since lakes constitute only temporary habitats, whereas ponds and wetlands serve as breeding areas.

3.3 Survey Conditions and Effort

Forty-nine (49) listening stations were visited on the future DSOP site between 11 and 16 July (Appendix II), yielding a total effort of 500 minutes. The stations were visited once. Their location is shown on Figures 1 and 2.

Survey conditions were deemed to range from average to excellent. The factor that had the most influence on survey conditions was the wind. The wind was usually continuous, but certain days were characterized by gusts of 4 or 5 on the Beaufort Scale (20 to 38 km/h). No precipitation was recorded during the survey.

The survey of breeding birds was undertaken in two habitats : tundra and barrens. The survey effort was greater in the tundra, since it is the most frequent habitat (Table 2). Certain listening points were conducted

in the coniferous forest. Moreover, the location of some points had to be changed from what had been planned before arriving in the field.

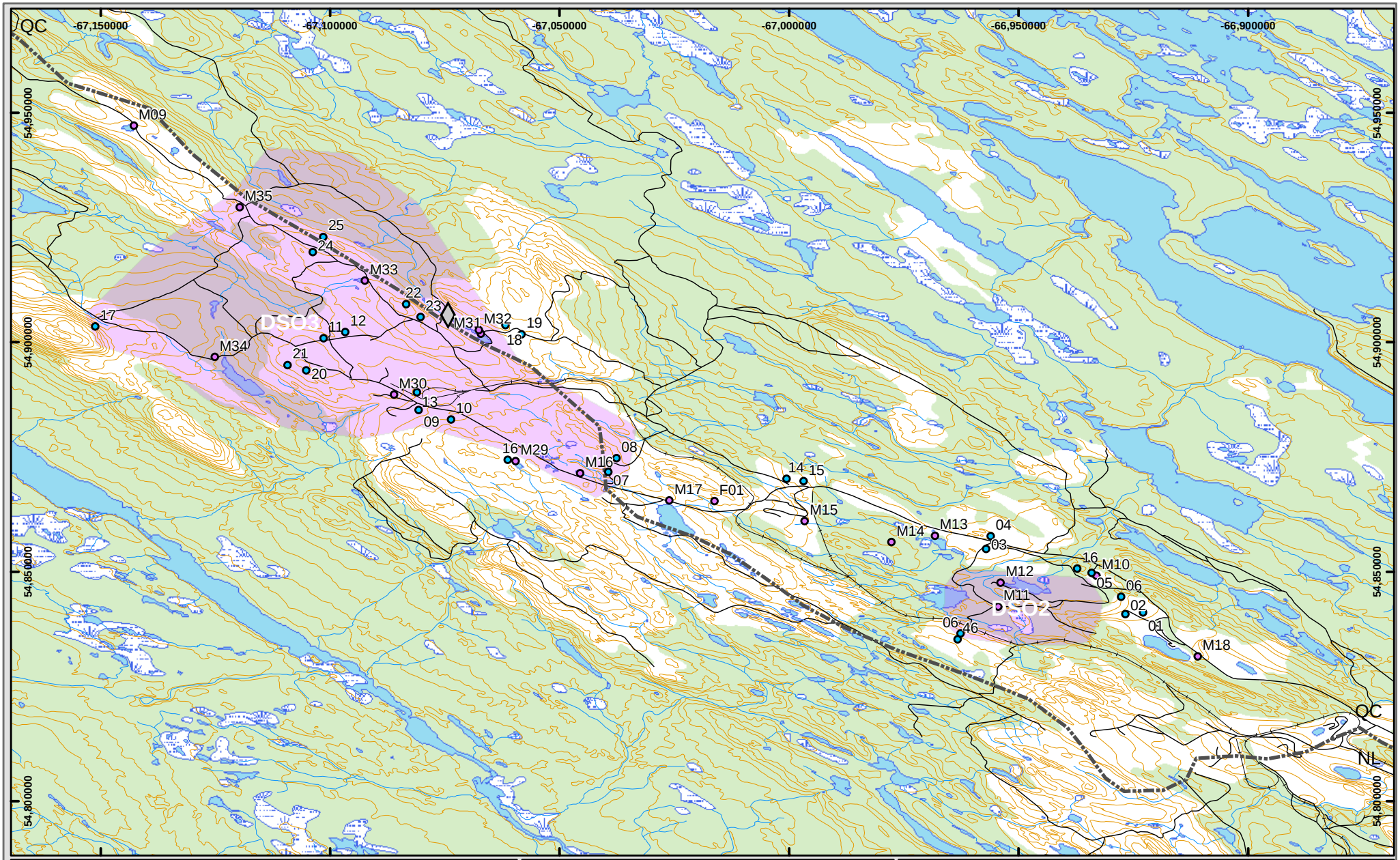
Table 2. Sampling Effort by Breeding-Bird Listening Point

Habitat	Barrens	Tundra	Coniferous Forest
Number of listening stations	13	32	5
Number of listening minutes	120	320	50
Name of stations	01 ; 02 ; 05 ; 06B ; 07 ; 08 ; 09 ; 10 ; 11 ; 12 ; 13 ; 14 ; 15	06 ; 16B ; 17 ; 18 ; 19 ; 20 ; 21 ; 22 ; 23 ; 24 ; 25 ; 26B ; 27B ; 28 ; 29 ; 30 ; 31 ; 32 ; 33 ; 34 ; 35 ; 36 ; 37 ; 38 ; 39 ; 40 ; 41 ; 42 ; 43 ; 44 ; 45 ; 46	03 ; 04 ; 16 ; 26 ; 27

3.4 General Remarks on Avifauna

The total richness of the site is 43 species (Appendix III). Two (2) species of raptors, 11 species of aquatic birds and 30 species of landbirds were detected. It is to be noted that identifications at the level of genus only are not counted in the number of species. Fourteen (14) passerine species were classified as confirmed, possible or probable breeders[2].

[2] This terminology is that used by Gauthier et Aubry (1995).



Legend

- Listening point
- Adapted visit
- Rusty Blackbird
- Railroad
- Road
- Watercourse
- Provincial Boundary
- Mining sites
- Waterbody
- Wetland

Location of Survey Points

Southern Sector

0 1 2 4 6 8

Kilometers

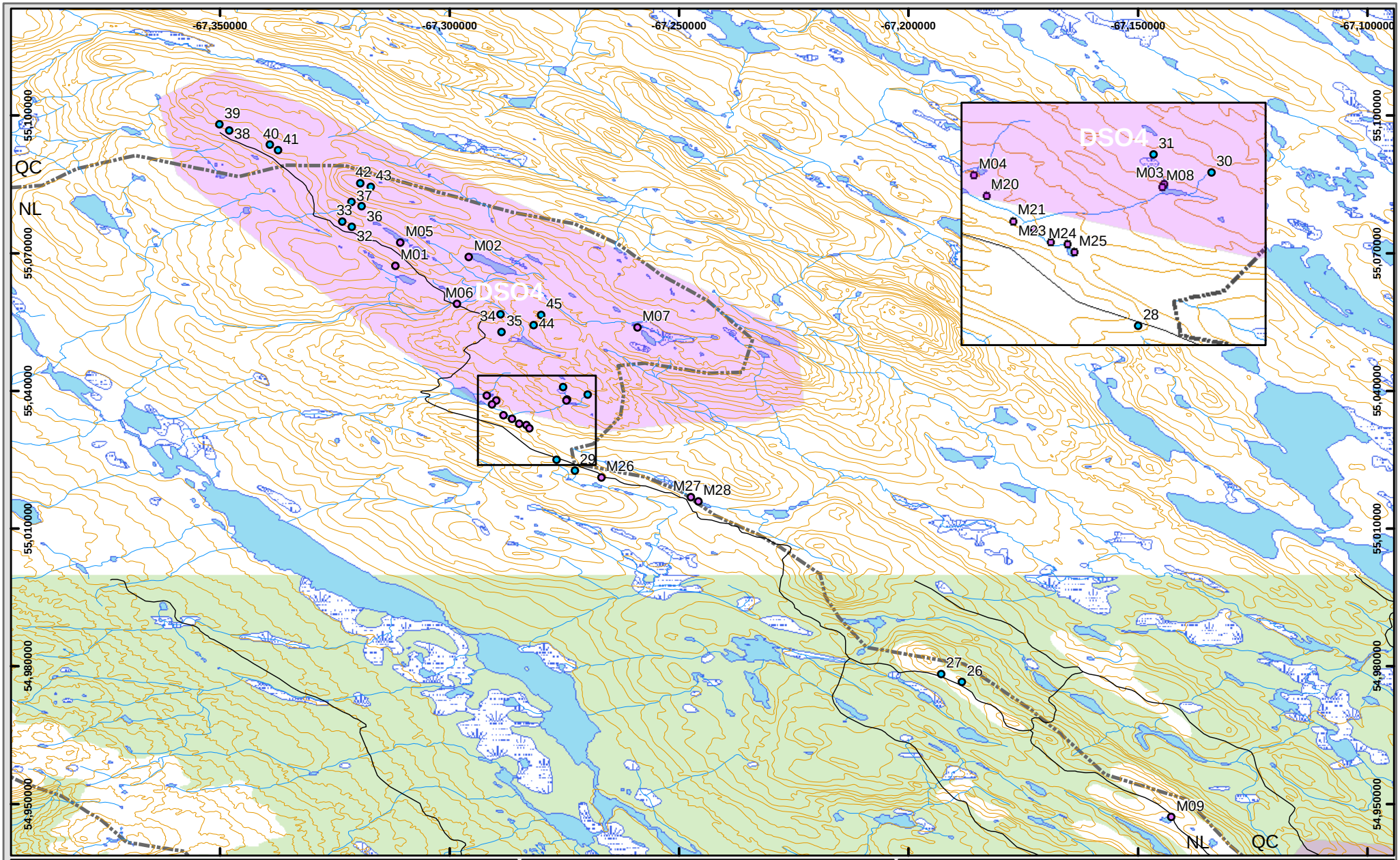
Scale: 1:125 000

Sources:
Government of Canada, BNDT, 1:50 000, 1979
Government of Canada, NRC, 1:250 000, 2003
Groupe Hémisphères, Hydrology update, 2008

Production date: August 13, 2008
Revision date: October 2, 2008
Projection: Long./Lat. Nad 83

HEMISPHERES
le groupe

FIGURE 1



Legend

- Listening point
- Adapted visit
- Railroad
- Road
- Watercourse
- Provincial Boundary
- Mining sites
- Waterbody
- Wetland

Location of Survey Points

Northern Sector

0 1 2 4 6 8

Kilometers

Scale: 1:125 000

Sources:
Government of Canada, BNDT, 1:50 000, 1979
Government of Canada, NRC, 1:250 000, 2003
Groupe Hémisphères, Hydrology update, 2008

Production date: August 13, 2008
Revision date: October 9, 2008
Projection: Long./Lat. Nad 83

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FIGURE 2

3.5 Avian Species at Risk

No species at risk was observed during the breeding-bird survey. During another survey, however, – that of fish habitat – a Rusty blackbird was formally identified by two observers (see Section 3.5.6). That observation is presented at Figure 2.

3.5.1 Golden eagle

The Golden eagle does not breed in the study area. The cliffs studied did not support any nests, and the species was not seen. Moreover, this raptor tends to avoid areas with human activity, which is the case for part of the study area, namely where mining occurred in the past as the roads are used to a certain extent today. Lastly, barrens are not favourable habitat given the rarity of potential prey. Nonetheless, the species breeds in the region, that is in a ±100-km radius (SOS-POP, 2008), and it is likely that one or more individuals come occasionally to hunt, including in the DSO 4 area, given the large area of open biotopes.

3.5.2 Harlequin duck

There is no watercourse of an order ≥ 4 or rapids in the study area. It is thus impossible that the Harlequin duck breeds in the study area. It is, however, possible that individuals of that species occasionally make a migratory stop-over on water bodies in the study area during their journey between their breeding area and their moulting or wintering area, since the study area lies between them (Morneau *et al*., 2008, in press).

3.5.3 Peregrine falcon, anatum subspecies

The Peregrine falcon does not breed in the study area for the same reasons as for the Golden eagle. Moreover, no nest of that species has been yet discovered between the Saguenay and the Ungava Bay area, aside from the coast of Hudson Bay (SOS-POP, 2008). It must also be mentioned that, in the north, the species generally inhabits the valleys of large rivers or the coast, and not ridges such as those in the study area (Bird, 1997). Furthermore, the cliffs observed correspond more to escarpments, as they do not have a vertical wall with an overhang, the rock being too friable. In the light of the foregoing, the cliffs located around the large mining pits or in a natural milieu could not satisfy this species.

3.5.4 Bald eagle

The Bald eagle certainly does not breed in the study area. There is no large water body and no river; and trees suitable for breeding are very rare.

3.5.5 Short-eared owl

The Short-eared owl was not seen in the study area. The surveys took place during daytime, whereas the species is crescupular and is not always easy to see. Moreover, it is present only in years when the abundance of voles is average or high. Lastly, we note the presence of large areas of favourable biotopes, namely the tundra in area DS0 4. It is therefore possible that the Short-eared owl breeds in the study area, at least in certain years.

3.5.6 Rusty blackbird

As mentioned earlier, one Rusty blackbird was observed on 18 July near Station M31, called Inukshuk Lake, by the limnological team. That sector is located outside the work area at the future DSO site and will serve as a control site for the impact study. A Rusty blackbird was also observed in 2005 during the surveys in the Howells River basin (Golder Associates, 2005). It may therefore nest in small numbers in the study area.

3.6 Species of Interest

Seven species of interest that are uncommon or rare according to David's (1996) list were seen in the study area (Table 3). Among the species mentioned in Table 3, two are noteworthy.

The American pipit was found slightly south of its breeding area. The large area of tundra at DSO 4 may have favoured its presence.

Several White-winged scoters were seen in small groups of two to 10 individuals in the study area. It is rather rare to observe so many so far away from their area of concentration, which is on the north shore of James Bay. The White-winged scoter probably does not breed in the study area.

Table 3. Species of Interest Observed in Study Area according to Status Recorded in David (1996)

English Name	Latin Name	Status
White-winged crossbill	*Loxia leucoptera*	Rare resident nester
Fox sparrow	*Passerella iliaca*	Rare migrator, uncommon winterer
Pine grosbeak	*Pinicola enucleator*	Rare resident nester
Gray-cheeked thrush	*Catharus minimus*	Rare migrator
White-winged scoter	*Melanitta fusca*	Rare migrator
Gray jay	*Perisoreus canadensis*	Rare resident nester
American pipit	*Anthus rubescens*	Rare migrator

3.7 Aquatic Birds

Eleven species of aquatic birds used the wetlands in the study area. Table 4 presents the species most frequently observed. In the case of the American wigeon (Lesser or Greater scaup), it was not possible to identify the species because of the difficulty in distinguishing the morphological differences. The full list of aquatic birds observed in the wetlands is presented in Appendix IV.

Table 4. Principal Species of Anatidae and Other Aquatic Birds Observed

Species	Number of Observations
Canada goose	20
White-winged scoter	17
Common goldeneye	11
American wigeon (Lesser or Greater scaup)	10
Green-winged teal	7

3.8 Raptors

Two species of raptors were observed: the osprey and the Rough-legged hawk. The osprey was seen at several places in the area. No nests or individuals were observed when examining the cliffs in this habitat.

3.9 Passerines and Other Landbirds

In total, 31 species of passerines and other landbirds were observed. The survey through listening points permitted the detection within the 50-m radius of 14 passerine species the breeding of which is confirmed, possible ou probable. Those species are listed in Table 5, which provides the number of observations for

each species of passerine, as well as the proportion of observations relative to the total observations by biotope.

Appendix V presents the list of species detected during the listening points, while Appendix VI presents the list of species detected during the listening points by habitat type. It is to be noted that those lists do not make a distinction between species within or outside the 50-m radius.

The White-crowned sparrow was the only breeding species detected within the 50-m listening radius in the barrens. It is also the species most frequently observed in the tundra. Even though few listening points were conducted in the coniferous forest, it is in that biotope where the richness, being the total number of species, was the highest.

Table 5. Number of Observations of Passerines and their Proportion during Listening Points

Species	Barrens		Tundra		Coniferous Forest	
	No. Observations	% Observations	No. Observations	% Observations	No. Observations	% Observations
White-crowned sparrow	**12**	100.00	**72**	64.29	2	12.5
Fox sparrow					2	12.5
American tree sparrow			23	20.54		
Pine grosbeak					1	6.25
Gray-cheeked thrush					2	12.5
Dark-eyed junco					2	12.5
American robin			2	1.79	1	6.25
Yellow-bellied flycatcher					1	6.25
Yellow-rumped warbler					1	6.25
Blackpoll warbler					2	12.5
American pipit			10	8.93		
Golden-crowned kinglet					1	6.25
Ruby-crowned kinglet					1	6.25
Common redpoll			5	4.46		

In bold: species most frequent in the biotope.

The 17 other species identified include, among others, those detected by listening points for which it was not possible to ascertain their breeding status, meaning that they were not detected within the 50-m radius used for surveying breeding birds. Three species were detected only in wetlands.

Table 6. Passerines observed during Listening Points and by other Methods

Species	Observation during Listening Point (outside 50-m radius)	Observation during Wetland Survey	Observation during Movements
White-winged crossbill	1		
White-throated sparrow	1		2
Song sparrow			1
Savannah sparrow	1		
American crow	3		
Common raven			5
Hermit thrush	1		
Tree swallow		2	
Willow ptarmigan			1
Boreal chickadee	1		
Gray jay	1	2	2
Northern waterthrush	1	2	
Yellow warbler		1	
Hairy woodpecker	1		
Rusty blackbird		1	
Golden-crowned kinglet	1		
Spruce grouse			1

4 CONCLUSION

Groupe Hémisphères was mandated by NML to conduct a survey of breeding birds on the future DSOP site. The survey occurred from 11 to 16 July, 2008, using listening points. Several wetlands were also visited. Observations by the limnological team were also incorporated into the results.

No species at risk was detected during the survey, but a Rusty blackbird (a species of special concern according to COSEWIC) was observed during another kind of survey. However, the Rusty blackbird probably breeds in the study area, as the type of habitat in which it breeds covers large portions of the study area. The same may be true for the Short-eared owl, since its breeding habitat also occurs in the study area.

The survey permitted the detection of 43 avian species, of which 14 are possible, probable or confirmed breeders.

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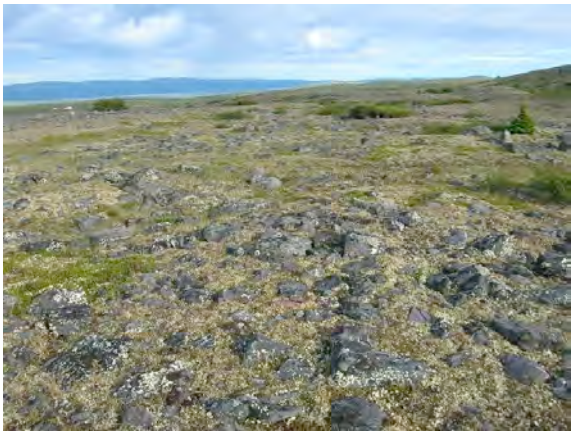
APPENDICES

APPENDIX I

PHOTOGRAPHIC REPORT

Tundra habitat type where listening points were conducted


Barrens habitat type where listening points were conducted


Pool in the tundra

Small lake visited

APPENDIX II

SURVEY EFFORT DURING BREEDING PERIOD

Survey Effort during Breeding Period

Site	Station	Biotope		Number of Listening Minutes
DSO				**870**
	DSO01	Barrens	Listening point	10
	DSO02	Barrens	Listening point	10
	DSO03	Coniferous Forest	Listening point	10
	DSO04	Coniferous Forest	Listening point	10
	DSO05	Barrens	Listening point	10
	DSO06	Tundra	Listening point	10
	DSO06B	Barrens	Listening point	10
	DSO07	Barrens	Listening point	10
	DSO08	Barrens	Listening point	10
	DSO09	Barrens	Listening point	10
	DSO10	Barrens	Listening point	10
	DSO11	Barrens	Listening point	10
	DSO12	Barrens	Listening point	10
	DSO13	Barrens	Listening point	10
	DSO14	Barrens	Listening point	10
	DSO15	Barrens	Listening point	10
	DSO16	Coniferous Forest	Listening point	10
	DSO16B	Tundra	Listening point	10
	DSO17	Tundra	Listening point	10
	DSO18	Tundra	Listening point	10
	DSO19	Tundra	Listening point	10
	DSO20	Tundra	Listening point	10
	DSO21	Tundra	Listening point	10
	DSO22	Tundra	Listening point	10
	DSO23	Tundra	Listening point	10
	DSO24	Tundra	Listening point	10
	DSO25	Tundra	Listening point	10
	DSO26	Coniferous Forest	Listening point	10
	DSO26B	Tundra	Listening point	10
	DSO27	Coniferous Forest	Listening point	10
	DSO27B	Tundra	Listening point	10
	DSO28	Tundra	Listening point	10
	DSO29	Tundra	Listening point	10
	DSO30	Tundra	Listening point	10
	DSO31	Tundra	Listening point	10

Survey Effort during Breeding Period

Site	Station	Biotope		Number of Listening Minutes
	DSO32	Tundra	Listening point	10
	DSO33	Tundra	Listening point	10
	DSO34	Tundra	Listening point	10
	DSO35	Tundra	Listening point	10
	DSO36	Tundra	Listening point	10
	DSO37	Tundra	Listening point	10
	DSO38	Tundra	Listening point	10
	DSO39	Tundra	Listening point	10
	DSO40	Tundra	Listening point	10
	DSO41	Tundra	Listening point	10
	DSO42	Tundra	Listening point	10
	DSO43	Tundra	Listening point	10
	DSO44	Tundra	Listening point	10
	DSO45	Tundra	Listening point	10
	DSO46	Tundra	Listening point	10
	DSOF01	Cliff	Adapted visit	10
	DSOM01	Wetland	Adapted visit	20
	DSOM02	Wetland	Adapted visit	15
	DSOM03	Wetland	Adapted visit	10
	DSOM04	Wetland	Adapted visit	20
	DSOM05	Wetland	Adapted visit	10
	DSOM06	Wetland	Adapted visit	10
	DSOM07	Wetland	Adapted visit	10
	DSOM08	Wetland	Adapted visit	10
	DSOM09	Wetland	Adapted visit	10
	DSOM10	Wetland	Adapted visit	10
	DSOM11	Wetland	Adapted visit	10
	DSOM12	Wetland	Adapted visit	20
	DSOM13	Wetland	Adapted visit	10
	DSOM14	Wetland	Adapted visit	10
	DSOM15	Wetland	Adapted visit	10
	DSOM16	Wetland	Adapted visit	5
	DSOM17	Wetland	Adapted visit	10
	DSOM18	Wetland	Adapted visit	10
	DSOM19	Wetland	Adapted visit	10
	DSOM20	Wetland	Adapted visit	10

Survey Effort during Breeding Period

Site	Station	Biotope		Number of Listening Minutes
	DSOM21	Wetland	Adapted visit	5
	DSOM22	Wetland	Adapted visit	5
	DSOM23	Wetland	Adapted visit	5
	DSOM24	Wetland	Adapted visit	5
	DSOM26	Wetland	Adapted visit	10
	DSOM27	Wetland	Adapted visit	10
	DSOM28	Wetland	Adapted visit	10
	DSOM29	Wetland	Adapted visit	10
	DSOM30	Wetland	Adapted visit	10
	DSOM31	Wetland	Adapted visit	20
	DSOM32	Wetland	Adapted visit	10
	DSOM33	Wetland	Adapted visit	10
	DSOM34	Wetland	Adapted visit	10
	DSOM35	Wetland	Adapted visit	10

APPENDIX III

COMPLETE LIST OF SPECIES OBSERVED

Appendix III

Code	French Name	English Name	Latin Name
Raptors			
BAPE	Balbuzard pêcheur	Osprey	*Pandion haliaetus*
BUPA	Buse pattue	Rough-legged Hawk	*Buteo lagopus*
Aquatic Birds			
SPAN	Anatidés sp. (canard ou oie)	Anatid (Duck or Swan)	
BECA	Bernache du Canada	Canada Goose	*Branta canadensis*
SAHI	Sarcelle d'hiver	Green-winged Teal	*Anas crecca*
SPFU	Fuligule sp.	American Wigeon	*Aythya sp.*
FUCO	Fuligule à collier	Ring-necked Duck	*Aythya collaris*
PEFU	Petit fuligule	Lesser Scaup	*Aythya affinis*
MABR	Macreuse brune	White-winged Scoter	*Melanitta fusca*
SPGA	Garrot sp.	Common Goldeneye	*Bucephala sp.*
GAOO	Garrot à oeil d'or	Common Goldeneye	*Bucephala clangula*
PLSE	Pluvier semipalmé	Semipalmated Plover	*Charadrius semipalmatus*
SPCH	Chevalier sp.	Plover	*Tringa sp.*
CHGR	Chevalier grivelé	Spotted Sandpiper	*Actitis macularius*
CHSO	Chevalier solitaire	Solitary Sandpiper	*Tringa solitaria*
SPGR	Goéland sp.	Gull	*Larus sp.*
GOAR	Goéland argenté	Herring Gull	*Larus argentatus*
STAR	Sterne arctique	Arctic Tern	*Sterna paradisaea*
Landbirds			
TECA	Tétras du Canada	Spruce Grouse	*Falcipennis canadensis*
LASA	Lagopède des saules	Ruffed Grouse	*Lagopus lagopus*
PICH	Pic chevelu	Hairy Woodpecker	*Picoides villosus*
MOVJ	Moucherolle à ventre jaune	Yellow-bellied Flycatcher	*Empidonax flaviventris*
ALHC	Alouette hausse-col	Horned Lark	*Eremophila alpestris*
HIBI	Hirondelle bicolore	Tree Swallow	*Tachycineta bicolor*
MECA	Mésangeai du Canada	Gray Jay	*Perisoreus canadensis*
COAM	Corneille d'Amérique	American Crow	*Corvus brachyrhynchos*
GRCO	Grand corbeau	Common Raven	*Corvus corax*
METB	Mésange à tête brune	Boreal Chickadee	*Poecile hudsonica*
ROCD	Roitelet à couronne dorée	Golden-crowned Kinglet	*Regulus satrapa*
ROCR	Roitelet à couronne rubis	Ruby-crowned Kinglet	*Regulus calendula*
GRJG	Grive à joues grises	Gray-cheeked Thrush	*Catharus minimus*
GRSO	Grive solitaire	Hermit Thrush	*Catharus guttatus*
MEAM	Merle d'Amérique	American Robin	*Turdus migratorius*
PIAM	Pipit d'Amérique	American Pipit	*Anthus rubescens*
PAJA	Paruline jaune	Yellow Warbler	*Dendroica petechia*
PACJ	Paruline à croupion jaune	Yellow-rumped Warbler	*Dendroica coronata*
PARA	Paruline rayée	Blackpoll Warbler	*Dendroica striata*
PARU	Paruline des ruisseaux	Northern Waterthrush	*Seiurus noveboracensis*
BRHU	Bruant hudsonien	American Tree Sparrow	*Spizella arborea*
BRPR	Bruant des prés	Savannah Sparrow	*Passerculus sandwichensis*
BRFV	Bruant fauve	Fox Sparrow	*Passerella iliaca*
BRGB	Bruant à gorge blanche	White-throated Sparrow	*Zonotrichia albicollis*
BRCB	Bruant à couronne blanche	White-crowned Sparrow	*Zonotrichia leucophrys*
JUAR	Junco ardoisé	Dark-eyed Junco	*Junco hyemalis*
QURO	Quiscale rouilleux	Rusty Blackbird	*Euphagus carolinus*
DUSA	Durbec des sapins	Pine Grosbeak	*Pinicola enucleator*
BCBI	Bec-croisé bifascié	White-winged Crossbill	*Loxia leucoptera*
SIFL	Sizerin flammé	Common Redpoll	*Carduelis flammea*

APPENDIX IV

SPECIES OBSERVED IN WETLANDS AND DURING MOVEMENTS

Species Observed during 2008 Breeding Season

*** indicates the species is listed as federally or provincially threatened

Observations number

Site / Survey	Group	Code & Name	Total
DSO			**257**
WETLAND			**196**
RAPTORS			**1**
	BAPE	Osprey	1
AQUATIC BIRDS			**134**
	SPAN	Anatid (Duck or Swan)	12
	BECA	Canada Goose	20
	SAHI	Green-winged Teal	7
	SPFU	American Wigeon	46
	FUCO	Ring-necked Duck	1
	PEFU	Lesser Scaup	1
	MABR	White-winged Scoter	17
	SPGA	Common Goldeneye	2
	GAOO	Common Goldeneye	13
	SPCH	Plover	2
	CHGR	Spotted Sandpiper	4
	CHSO	Solitary Sandpiper	2
	SPGO	Gull	1
	GOAR	Herring Gull	5
	STAR	Arctic Tern	1
LANDBIRDS			**61**
	LASA	Ruffed Grouse	2
	ALHC	Horned Lark	6
	HIBI	Tree Swallow	2
	MECA	Gray Jay	1
	ROCR	Ruby-crowned Kinglet	2
	MEAM	American Robin	1
	PIAM	American Pipit	1
	PAJA	Yellow Warbler	1
	PACJ	Yellow-rumped Warbler	4
	PARU	Northern Waterthrush	4
	BRHU	American Tree Sparrow	5
	BRPR	Savannah Sparrow	2
	BRFV	Fox Sparrow	1
	BRCB	White-crowned Sparrow	25
	JUAR	Dark-eyed Junco	3
	*** QURO	Rusty Blackbird	1
MOVING			**61**
RAPTORS			**1**
	BUPA	Rough-legged Hawk	1
AQUATIC BIRDS			**1**
	GOAR	Herring Gull	1
LANDBIRDS			**59**
	TECA	Spruce Grouse	1

Species Observed during 2008 Breeding Season

*** indicates the species is listed as federally or provincially threatened

Observations number

Site / Survey	Group	Code & Name	Total
	LASA	Ruffed Grouse	1
	ALHC	Horned Lark	4
	MECA	Gray Jay	2
	GRCO	Common Raven	5
	METB	Boreal Chickadee	4
	ROCR	Ruby-crowned Kinglet	1
	GRJG	Gray-cheeked Thrush	2
	MEAM	American Robin	3
	PIAM	American Pipit	2
	PACJ	Yellow-rumped Warbler	1
	PARA	Blackpoll Warbler	3
	BRHU	American Tree Sparrow	2
	BRCH	Song Sparrow	1
	BRGB	White-throated Sparrow	2
	BRCB	White-crowned Sparrow	17
	JUAR	Dark-eyed Junco	3
	SIFL	Common Redpoll	5

APPENDIX V

SPECIES OBSERVED AT LISTENING POINTS

Species Observed at Listening Points

Site	Group	Code & Name of Species		Number of Observations
DSO				**350**
	RAPTORS			2
		BAPE	Osprey	2
	AQUATIC BIRDS			8
		MABR	White-winged Scoter	1
		PLSE	Semipalmated Plover	1
		SPCH	Plover	2
		GOAR	Herring Gull	4
	LANDBIRDS			340
		PICH	Hairy Woodpecker	1
		MOVJ	Yellow-bellied Flycatcher	3
		ALHC	Horned Lark	11
		MECA	Gray Jay	1
		COAM	American Crow	3
		METB	Boreal Chickadee	1
		ROCD	Golden-crowned Kinglet	2
		ROCR	Ruby-crowned Kinglet	8
		GRJG	Gray-cheeked Thrush	11
		GRSO	Hermit Thrush	4
		MEAM	American Robin	18
		PIAM	American Pipit	11
		PACJ	Yellow-rumped Warbler	1
		PABA	Blackpoll Warbler	4
		PARU	Northern Waterthrush	2
		BRHU	American Tree Sparrow	44
		BRPR	Savannah Sparrow	1
		BRFV	Fox Sparrow	18
		BRGB	White-throated Sparrow	4
		BRCB	White-crowned Sparrow	142
		JUAR	Dark-eyed Junco	11
		DUSA	Pine Grosbeak	3
		BCBI	White-winged Crossbill	5
		SIFL	Common Redpoll	31

APPENDIX VI

SPECIES OBSERVED AT LISTENING POINTS BY BIOTOPE

Species Observed at Listening Points by Biotope

Site	Biotope	Code & Name of Species		Number of Observations
DSO				**350**
	BARRENS			63
		MABR	White-winged Scoter	1
		BAPE	Osprey	1
		PLSE	Semipalmated Plover	1
		SPCH	Plover	1
		MOVJ	Yellow-bellied Flycatcher	1
		ROCR	Ruby-crowned Kinglet	2
		GRJG	Gray-cheeked Thrush	1
		GRSO	Hermit Thrush	2
		MEAM	American Robin	1
		PARU	Northern Waterthrush	2
		BRHU	American Tree Sparrow	4
		BRFV	Fox Sparrow	8
		BRGB	White-throated Sparrow	2
		BRCB	White-crowned Sparrow	27
		JUAR	Dark-eyed Junco	3
		SIFL	Common Redpoll	6
	CONIFEROUS FOREST			49
		BAPE	Osprey	1
		PICH	Hairy Woodpecker	1
		MOVJ	Yellow-bellied Flycatcher	2
		MECA	Gray Jay	1
		METB	Boreal Chickadee	1
		ROCD	Golden-crowned Kinglet	1
		ROCR	Ruby-crowned Kinglet	3
		GRJG	Gray-cheeked Thrush	4
		MEAM	American Robin	4
		PACJ	Yellow-rumped Warbler	1
		PARA	Blackpoll Warbler	4
		BRFV	Fox Sparrow	9
		BRCB	White-crowned Sparrow	4
		JUAR	Dark-eyed Junco	7
		DUSA	Pine Grosbeak	3
		BCBI	White-winged Crossbill	1
		SIFL	Common Redpoll	2
	TUNDRA			238
		SPCH	Plover	1
		GOAR	Herring Gull	4
		ALHC	Horned Lark	11
		COAM	American Crow	3
		ROCD	Golden-crowned Kinglet	1

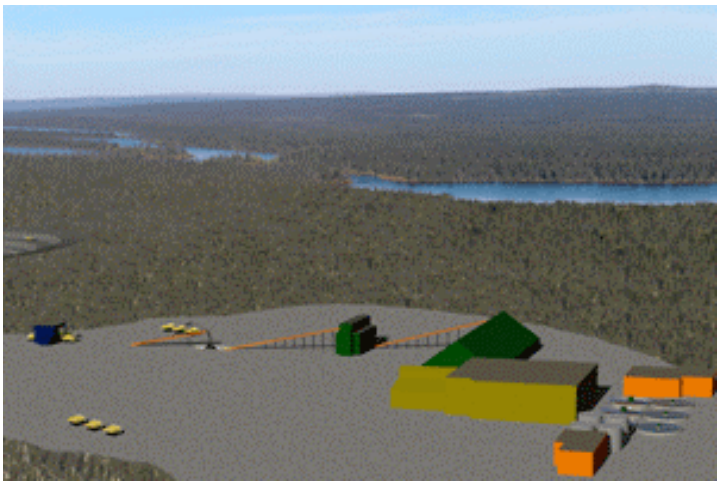
Species Observed at Listening Points by Biotope

*** indicates the species is listed as federally or provincially at risk

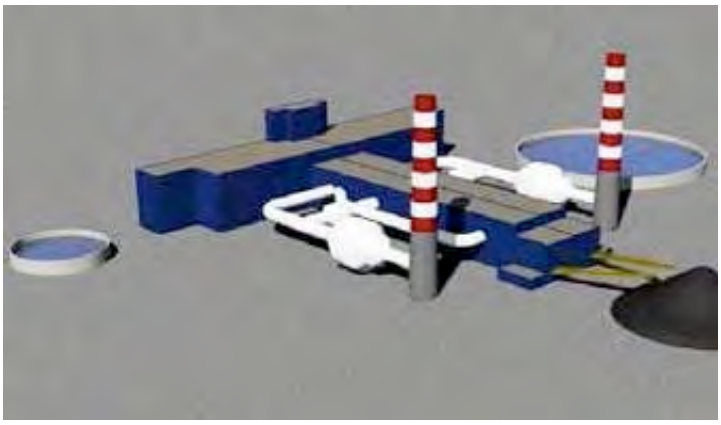
Site	Biotope	Code & Name of Species		Number of Observations
		ROCR	Ruby-crowned Kinglet	3
		GRJG	Gray-cheeked Thrush	6
		GRSO	Hermit Thrush	2
		MEAM	American Robin	13
		PIAM	American Pipit	11
		BRHU	American Tree Sparrow	40
		BRPR	Savannah Sparrow	1
		BRFV	Fox Sparrow	1
		BRGB	White-throated Sparrow	2
		BRCB	White-crowned Sparrow	111
		JUAR	Dark-eyed Junco	1
		BCBI	White-winged Crossbill	4
		SIFL	Common Redpoll	23

APPENDIX I

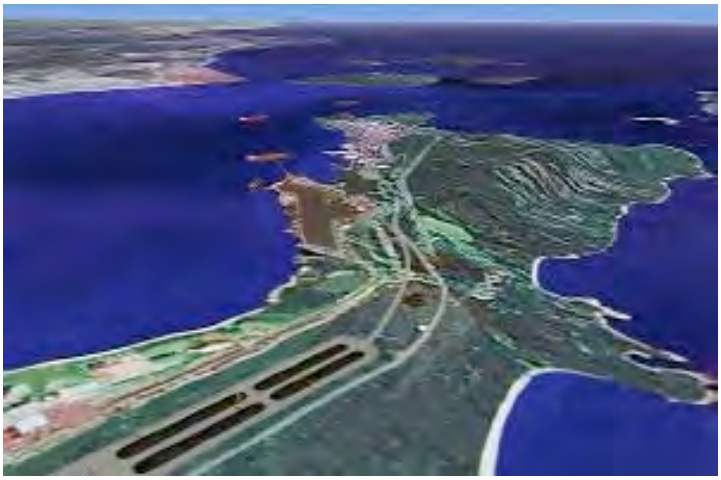
An Overview of the Commuter Mining Model



LabMag IRON ORE PROJECT



An Overview of the Commuter Mining Model



BY: Silvana Costa, SCosta Consulting Services

November 2007

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Executive Summary

Commuter mines are operations to which employees travel long distances and work long shifts in compacted work schedules, while staying on site for a fixed number of days followed by a fixed number of days of leave. Increases in the adoption of commuter mines can be attributed to: limitations of traditional mining towns; international investment trends; advances in technology; changes in regulatory environment and political climates; changes in industrial relations practices and labour force issues. In Canada, the intensification of the use of commuter mines has been quite rapid, as it has become the dominant approach to mining developments.

The purpose of this report is to provide a literature review on the challenges that the commuter model presents to employees, their families and communities. This review is a *topical paper* associated with the environmental impact statement for the LabMag Iron Ore Project in Labrador, Canada, and considers Canadian and international literature on the commuter model in the mining and offshore oil and gas industries.

The implications of the commuter model are classified in the following categories:

1. Implications for Organization of Work

Significant issues for the planning, design and operation of commuter mines are: costs of facilities; transportation systems; rotation cycles; labour management; and occupational health and safety.

2. Implications for the Workforce

The advantages and disadvantages of the commuter model for the workforce are illustrated in Table 1.

3. Implications for Employees' Families

Table 2 displays the advantages and disadvantages of the commuter model for employees' families.

4. Implications for Small and/or Aboriginal Communities

The commuter lifestyle makes it difficult for employees to participate in community life, which makes relationships vulnerable. Commuter employment has resulted in population decline and in a drain of needed local human resources. Another serious concern is the fly-over effect - when a community closer to a mine operation does not get large economic benefits and community members do not participate significantly in its workforce. On the other hand, commuter mining can support the economy and community viability in the region from where employees are flown.

Table 1: Advantages and Disadvantages of Commuter Mining for the Workforce.	
Advantages	**Disadvantages**
• **Financial rewards** Salaries are perceived to be higher and some operations pay camp allowances and abundant overtime. Moreover, the FIFO lifestyle might result in savings since home and personal expenses can be dramatically reduced when the employee is on site for extended periods of time. This seems to be particularly significant for single employees. • **Long periods of time-off** Long breaks might lead to a more fulfilling family life when at home and a clear separation of work and family lives. Moreover, these long breaks create opportunities to pursue other activities (educational, recreational, cultural, etc.). • **Stronger sense of community in the workplace** Because employees spend several consecutive days in the camp, there is more interaction and stronger personal and professional bonds tend to form. • **Growth of personal independence and freedom** FIFO employees have reported that separation from their principal partner in a relationship has given both parties more opportunities to develop personal interests and time to pursue their own goals. • **Adventurous spirit stimulated** Research has suggested that the remoteness of some FIFO operations stimulates some individuals' sense of adventure. • **Provision of camp services** Services such as catering and housekeeping are often seen as a convenience and help employees to focus on work or other activities after work. • **Reduced life disruption if there is an interest or need to change employer or workplace** Employees can easily change jobs from one FIFO operation to another without the need for relocation.	• **Fatigue** The long shifts and compact schedules in FIFO operations often result in increased workforce fatigue. • **Challenges with communication** In FIFO operations, it can be very challenging to communicate with family, friends and businesses such as banks and other service providers. • **Distress from partings and reunions** Frequent partings and reunions are stressful to most individuals. • **Long time away affects family life and social life negatively** The nomadic nature of FIFO lifestyle poses challenges to family and social life. Extended absence from home is often very challenging for couples and young families and increases risk of marital relationship strain and family dysfunction. For single workers, the FIFO lifestyle often makes it difficult to find a life partner. • **Rigid work schedules** Inflexible work schedules result in important family and community events being missed. • **Lack of privacy** Mine camps often provide very little privacy, since rooms and bathrooms are often shared. • **Some unpaid overtime** Some overtime might be unpaid when workers voluntarily continue to work after hours because of boredom or perceived need to complete a work task. • **Feelings of guilt and helplessness** Feelings of guilt and helplessness may result from leaving home and families or partners for extended periods. • **Increased risk of substance abuse** Long absences from home, stress, loneliness, feelings of guilt and boredom after work tend to increase the risk of substance abuse and depression.

Table 2: Advantages and Disadvantages of Commuter Mining for Families	
Advantages	**Disadvantages**
• **Increased opportunities for other family members' employment** Since FIFO employment implies that the whole family does not need to live in a small and isolated mining community, the family can choose to live in a community that offers good employment opportunities for other family members. • **Increased choice of where to live** Since FIFO mines often offer a variety of pick-up points, workers might be able to choose where to live. Even if the choice is made for a community other than the pick-up points, generally workers are able to travel to existing pick-up points if they wish or need to do so. • **Ability to change employers with minimum disruption to the family** For FIFO employees, job change would not necessarily result in relocation. Also, if any other family member wishes to move to another community for work, the employee might still be able to keep the FIFO job when adjustment of the travel arrangements is possible. • **Possibly greater access to educational, health and entertainment facilities** As compared to most mining communities, since FIFO employees are able to chose not to relocate from a community which offers good access to educational and health facilities. • **Reduced exposure to the impacts of boom and bust cycles, which is characteristic of single-industry communities**	• **Frequent partings and reunions are stressful to most families** • **Disruption of family routine** FIFO families' routines need to change every rotation, when family members need to adapt to the absence or presence of employee. Employees in FIFO operations often miss important dates/holidays. Extended absence from home increases the risk of marital and family dysfunction. • **Challenges with definition of roles within the family** The disruption of family routines often results in conflict over control, authority and decision-making within the family and conflicts over use of money. • **Children's difficulties in dealing with parental absence** • **Spouse's loneliness and other practical difficulties in dealing with employee absence** • **Need for a solid social and family support network to help out with childcare** This is particularly significant for employees who are single parents • **Fidelity issues that result from extended and frequent separation**

5. Strategies to Address Issues in Commuter Mining

This report also presents a summary of strategies to address the issues and impacts of commuter mines:

- Work-based strategic actions should be taken to address fatigue, communication, unrealistic expectations, physical and emotional well-being, and the connection with home community.
- Home-based strategic actions should be taken to address families' challenges, travel issues, interruption and dates of breaks.
- Community-based strategic actions should be taken to support local communities in regards to population decline and fly-over effects.

A detailed table of Strategic Actions is provided at pages 15 to 20.

6. Conclusion

It is clear that the commuter mine model has significant strengths while posing critical challenges. Individuals tend to attribute a wide range of problems to the commuter model, but the issues are complex, and many other factors influence employees' well-being. However, it is paramount that mine companies and mine managers understand and proactively respond to the impacts a commuter lifestyle has on the workplace, on employees and on their families by implementing strategies that enhance the positive and mitigate the negative effects of the commuter model.

Purpose

Silvana Costa, Principal of S.Costa Consulting Services was retained by LabMag GP Inc. to prepare a short report about commuter mines (fly-in-fly-out mines). The purpose of this report is to provide a literature review on the challenges that this model presents to employees, their families and communities. This review is a *topical paper* associated with the environmental impact statement for the LabMag Iron Ore Project in Labrador, Canada.

Organization of the Report

This report is divided into 6 sections.

The introduction provides an overview of the commuter model and its significance for the industry and communities.

Section 1 discusses the evolution of the commuter model in Canada, providing a historical overview of mining communities and a brief discussion of the circumstances that facilitated the introduction and growth of the commuter model in the Canadian mining industry.

Section 2 is a brief overview of the commuter model as it is currently used in Canada.

Section 3 introduces the implications of the commuter model to the workforce, families and communities. It includes a review of the literature and studies that focused on the impacts of the commuter model for the industry, for the workforce and for the employees' families.

Section 4 presents the strategies researchers have suggested to address the challenges posed by the commuter model.

Section 5 provides a brief conclusion to the report.

Section 6 presents the bibliographical references used in the report.

Introduction

Commuter mines, also known as *fly-in-fly-out (FIFO), Long Distance Commuting (LDC) or fly-in mines,* are operations to which employees travel long distances, mostly by air, but in some instances by car, bus or boat. Employees work long shifts in compacted work schedules, staying on site for a fixed number of days followed by a fixed number of days of leave.

Work is isolated from the employee's home and both meals and accommodation are provided on site. Even though commuting is not a new phenomenon in the natural resources extraction industry, it is of significance because of the regular and frequent separation of home and the workplace in time and space. There are significant implications of this separation for work organization, workforce lifestyle and the impacts on families, communities and regional development (Costa *et al.,* 2006; Storey, 2001).

From an industry perspective, commuter mines seem to be more cost effective and fit well with regulatory, labour and international investment trends. However, commuter mines create a very unique work environment where professional and personal life boundaries are often unclear. Relationships are more intense when teams work and live together for long periods (Costa, 2004; Costa *et al.*, 2006).

The commuter model has had a long history in the offshore oil and gas industry, which has resulted in a related body of literature on the impacts of commuting in this sector. A significant body of literature on commuter work has also been developed in Australia, the UK and Norway. Both the literature on offshore oil and gas and commuter mining in these countries were considered of significant interest and relevance for the purpose of this report.

1. The Evolution of the Commuter Mining Model in Canada

1.1. From Company Towns to Mining Towns

In Canada, as in many other parts of the world, several communities were historically built and populated exclusively to satisfy the workforce needs of mining operations (McGrath, 1986; Taylor, 1978; Veiga *et al.*, 2001). The mining camps or "company towns" of the 19th century generally lacked overall development plans, since very few companies were willing to make commitments to long-term town development. These communities were built with little consideration of social and health concerns; housing was often inadequate and reflected the temporary nature of the industry. Residential areas were secondary and subservient to the industrial operations (Robson, 1989).

The 20th century introduced technological advances and increased competition for labour. The "company town" evolved into the well-planned "mining town". The thrust to create these planned towns was mostly taken by the industry and continued after World War II. By the mid-1940's governments became partners in development and participated in the delivery of physical infrastructure and social services to avoid past mistakes in the planning of northern resource communities (Parsons & Barsi, 2001; Robson, 1989).

A recent Canadian example of a planned mining town is Tumbler Ridge, in British Columbia, which was built in the early 1980s to house the employees of the Bullmoose and Quintette Coal Mines. Tumbler Ridge was built to high physical and social standards and had very high development costs (McGrath, 1986). Another example is the Town of Leaf Rapids, in Manitoba, which was built in the early 1970's to support the Rattan Mine. Leaf Rapids become a world-renowned model town, combining modern convenience and luxury in a northern environment (The Town of Leaf Rapids, 2004). Mining communities such as Tumbler Ridge and Leaf Rapids were designed to be "perfect".

Some mining communities, such as Nelson (BC), Kimberly (BC) and Elliot Lake (ON), have pursued other economic activities after the mining operations were permanently closed. A few communities have survived well, with varying levels of mine development (e.g. Sudbury, ON, and Flin Flon, MB), while others, such as Alice Arm (BC) and Uranium City (SK), have dramatically changed or have been completely decommissioned once mining operations ceased.

In 2004, Natural Resources Canada reported that more than 100 Canadian communities, with a total population of over 600,000, were dependent on the minerals industry (Natural Resources Canada, 2004). Concerns with mine closure and sustainability of these communities have been reflected in

public policy that discourages the construction of towns and the development of communities exclusively to satisfy the needs of the mining industry (Veiga *et al.,* 2001).

1.2. The Advent of the Commuter Model

The commuter model is not a recent concept in the minerals sector. It was initially an extension of operations mounted during the exploration and development stages of mineral properties (Lightfoot, 1991). According to Shrimpton and Storey (1991), the first mine in Canada to fully adopt the commuter system was *Asbestos Hill*, which was in operation in Quebec from 1972 to 1983.

There are different reasons why the decision is made to operate a commuter mine instead of using an existing community or building a new community for the workers and their families. Often, Canadian commuter mine camps are built when mineral deposits are located in very isolated areas characterized by very low temperatures year round, such as the Diavik and Ekati Mines in the NWT.

In a comprehensive bibliographical review of commuter mining (2001), Dr. Keith Storey (Memorial University of Newfoundland, St. John's) described the trends supporting the rapid growth in the use of the commuter model worldwide:

- **Limitations of Traditional Single-industry Towns**

Some of the recognized limitations of most mining towns are:

  - high costs of construction, start-up and closure
  - lack of economic diversity and employment opportunities for spouses, since two-earner families are the current norm in our society
  - socio-demographic imbalances and inequality, where mineworkers often have higher standard of living and access to resources when compared to the general population
  - limited access to goods and services
  - often remote
  - often limited social and health services

- **International Investment Trends**

Risk aversion by fund-managing firms and frequent monitoring of fund performance have resulted in a relative undervaluation of larger mines with longer life in favor of projects that are relatively low-cost and with shorter mine life.

Another trend is the intensification of exploration and mine development in countries considered politically and economically stable but with sparse populations, such as Canada and Australia, or in countries that do not offer a skilled workforce, such as Indonesia and Papua New Guinea.

- **Advances in Technology**

Increasingly cheaper and more reliable transportation has made commuting operations safer and more affordable. Advances in communication systems have improved employees' ability to communicate with their families when they are at the mine site and with the mine site when they are at home.

Advances in mining and mineral processing technologies have resulted in the reduction of labour demand, which is reflected in a smaller workforce.

- **Changes in Regulatory Environment and Political Climates**

There are increasingly complex environmental and social impact review processes before mines can be developed. Society's desire to reduce the mining environmental footprint has resulted in stricter environmental conditions that favor compact development options.

Another trend is related to Aboriginal issues. Aboriginal title issues have made access to land increasingly difficult. In addition, the negotiation of Impact and Benefit Agreements (IBA) has highlighted the need to increase the inclusion of local Aboriginal peoples in the workforce without the need to remove them from existing communities or reserves.

- **Changes in Industrial Relations Practices and Labour Force Issues**

Some of the trends in labour and industrial relations issues that have supported and encouraged the adoption of commuter mines are:

  - increased labour costs
  - skilled labour shortages
  - aging workforce
  - increased use of contract labour

2. Current Status of Commuter Mining in Canada

Critical changes in mining and transportation technology, public policy and social and physical standards in town development have led to the abandonment of the mining town concept and rapid increases in the adoption of commuter mines in the mineral industry (Costa, 2004).

Since the early 1980's, when Tumbler Ridge was built in Northern British Columbia, no new mining towns have been built in Canada. Commuter mines have become the dominant approach to new mining developments. The intensification of the use of commuter mines in Canada has been quite rapid and has become the dominant approach to developments for uranium, metal and diamond exploration and mining, particularly in northern Canada. According to Storey (2001), since 1975 more than 20 commuter mines have gone into production. Moreover, the commuter model seems to be the preferred choice in feasibility studies of mines in northern BC, NWT, Quebec and Newfoundland and Labrador.

3. Implications of Commuter Mines

3.1. Implications for Work Organization

- **Costs of Commuter Mines**

Cost comparisons between establishing a mining town and setting up a commuter mine are complex and involve the consideration of several factors, including:

- life expectancy of the mine
- size of the workforce
- location of the mine
- rotation/rosters and shift system
- transportation costs
- capital costs of camp facilities
- costs associated with mitigation of problems arising from the FIFO schedule, such as counsellors on site

The costs associated with providing transportation and high quality accommodation, facilities and services in a mine camp are high. Often, mining operations hire contractors to manage mine camps and services. However, there are significant capital savings associated with building and maintaining a mine camp when compared with building and maintaining a mining town, particularly in the case of short-life mines (Storey, 2001).

- **Transportation Systems**

The mode of transportation used for commuting may involve airplanes, helicopters, boats and buses or a combination of different modes. Other issues to be decided upon are related to the number and location of pick-up points, frequency of trips, ownership versus charter transportation, reimbursement of travel costs and payment for travel time (Schmeichel & Semple, 1986; Storey & Shrimpton, 1989)

- **Rotation Cycles**

Typical commuter rotation cycles in the mining industry are in multiples of one week and may be symmetrical or asymmetrical, e.g. 2-weeks-in-2-weeks-out (2/2) or 4 weeks-in-4-weeks-out (4/4). Compared to Australian commuter mines, rotations at Canadian commuter mines have tended to become shorter and more symmetrical over time (Storey, 2001). Currently in Canada, typical schedules are 2/2 for staff, 4-days-in-3-days out (4/3) for managers, and variations of this pattern.

Unfortunately, there is very little scientific research on the adequacy of rotation cycles. However, it seems that across the industry, shorter rotations lengths are preferred (Hobart, 1989; Watts, 2004, Costa *et al.,* 2006). An exploratory study on the participation of women in the commuter workforce (Costa *et al.,* 2006) suggests that the 2-weeks-in-2-weeks-out rosters are still perceived as long, and therefore acceptable for singles not planning to start a family and those who have a mature family. For

individuals with young children, even shorter rotations (with the possibility to go home weekly) seem more attractive.

- **Occupational Health and Safety**

Long workdays of 10 to 12 hours are now the norm in the mining industry. In combination with long rotation cycles of 2 to 4 weeks, this has expected implications for productivity and occupational health and safety, but few conclusive relationships have been determined (Gramling, 1989; Kendall, 1987). Work accidents often have complex and multiple causes. Long shift and rotation cycles are probably contributing factors but may not be identified as the direct causes of accidents (Storey, 2001)

A study commissioned by the Government of the Northwest Territories (NWT) in the late 1980's failed to find any significant relationship between mining rotational work patterns, the long working days and employee health and safety (Gould, 1991). No conclusion was reached about the influence of the commuter schedule and shift lengths on occupational health and safety of mine employees. The inconclusive results were attributed to the variability of health and safety data from year to year, the differences in reporting measures from mine to mine, the different mine ages, and the difference in management systems at the mines (Gould, 1991). No clear accident patterns during rotations were found, but data from one of the mines suggested that accident rates decreased after the start of the rotation and then increased during the middle period whilst decreasing towards the end of rotations (Gould, 1991).

Fatigue in FIFO operations continues to be a serious concern. According to Storey (2001) the "view is widely held that for physically demanding jobs the 12-hour shift is too long and that when commute time significantly lengthens the work day fatigue is a serious safety and health issue".

- **Labour Management Relations**

Commuter mining requires a sophisticated approach to management. As Sibbel *et al*. (2006) explain: "Managers of FIFO operations often have to make decisions that are outside their particular educational and professional expertise because their role includes responsibilities towards employees far outside the day-to-day running of the mine itself, both during and outside working hours including fitness for work and to return home". According to recent research, high turnover is not an inevitable consequence of FIFO. Research on fly-in mines in Australia recently revealed that management styles and well-designed retention strategies are in fact the key to managing employee turnover in these operations (Beach *et al.*, 2003).

A commuter mine is a unique work environment where professional and personal life boundaries can be unclear. Therefore, relationships seem to be more intense when teams work and live together for long periods and in isolated locations (Costa *et al.*, 2006). Moreover, rotation cycles increase the importance of effective internal communications as a means to ensure continuity of work (Costa, 2004; Shrimpton & Storey, 1989a; Zehner & Lea, 1985).

3.2. Implications for Employees

Recent Australian research (Gallegos, 2006; Watts, 2004) has found evidence that most employees were reasonably satisfied with the commuter lifestyle. Other Australian studies also indicate that commuter mine employees, spouses and children generally have similar psychological well-being when compared to the wider Australian population - while many workers report stress associated with the lifestyle, they face *different*, rather than *more* stresses than the non-mining population (Reynolds, 2004; Sibbel, 2001).

According to Watts (2004), as a rule of thumb, the average length of time from start of employment in a commuter occupation to eventual acceptance or rejection of the lifestyle is about 6 months. Factors that could lengthen or shorten this process or add to the stress levels for the employees or families are: strength and characteristics of personal relationships; personality; personal and social support mechanisms; and ability to maintain communication (Watts, 2004).

Studies of offshore oil workers in the UK (North Sea), Canada and Norway reveal that the advantages of the commuter lifestyle are appreciated, but that long-distance commuting is problematic to some degree for all workers and highly problematic for some (Parkes *et al.*, 2005; Shrimpton & Storey, 1996; Sibbel *et al*., 2006; Storey & Shrimpton, 1989)

A recently completed exploratory study of women working in commuter mines in Canada (Costa *et al.*, 2006) found that commuter schedules create severe stress on relationships and on employees' psychological well-being, are generally incompatible with starting a family and caring for young children and often cause separation guilt and feelings of helplessness. On the other hand, commuter mines create the opportunity for young women, including Aboriginal women living in remote locations, to jump-start their careers, and opportunities for mature women to work while pursuing other personal or professional interests while off work.

Table 1 displays both the advantages and the disadvantages of the FIFO lifestyle for the workforce, as revealed by research in Australia, Canada, Norway and the UK.

Table 1: Advantages and Disadvantages of Commuter Mining for the Workforce.	
Advantages	**Disadvantages**
• **Financial rewards** Salaries are perceived to be higher and some operations pay camp allowances and abundant overtime. Moreover, the FIFO lifestyle might result in savings since home and personal expenses can be dramatically reduced when the employee is on site for extended periods of time. This seems to be particularly significant for single employees. • **Long periods of time-off** Long breaks might lead to a more fulfilling family life when at home and a clear separation of work and family lives. Moreover, these long breaks create opportunities to pursue other activities (educational, recreational, cultural, etc.). • **Stronger sense of community in the workplace** Because employees spend several consecutive days in the camp, there is more interaction and stronger personal and professional bonds tend to form. • **Growth of personal independence and freedom** FIFO employees have reported that separation from their principal partner in a relationship has given both parties more opportunities to develop personal interests and time to pursue their own goals. • **Adventurous spirit stimulated** Research has suggested that the remoteness of some FIFO operations stimulates some individuals' sense of adventure. • **Provision of camp services** Services such as catering and housekeeping are often seen as a convenience and help employees to focus on work or other activities after work. • **Reduced life disruption if there is an interest or need to change employer or workplace** Employees can easily change jobs from one FIFO operation to another without the need for relocation.	• **Fatigue** The long shifts and compact schedules in FIFO operations often result in increased workforce fatigue. • **Challenges with communication** In FIFO operations, it can be very challenging to communicate with family, friends and businesses such as banks and other service providers. • **Distress from partings and reunions** Frequent partings and reunions are stressful to most individuals. • **Long time away affects family life and social life negatively** The nomadic nature of FIFO lifestyle poses challenges to family and social life. Extended absence from home is often very challenging for couples and young families and increases risk of marital relationship strain and family dysfunction. For single workers, the FIFO lifestyle often makes it difficult to find a life partner. • **Rigid work schedules** Inflexible work schedules result in important family and community events being missed. • **Lack of privacy** Mine camps often provide very little privacy, since rooms and bathrooms are often shared. • **Some unpaid overtime** Some overtime might be unpaid when workers voluntarily continues to work after hours because of boredom or perceived need to complete a work task. • **Feelings of guilt and helplessness** Feelings of guilt and helplessness may result from leaving home and families or partners for extended periods. • **Increased risk of substance abuse** Long absences from home, stress, loneliness, feelings of guilt and boredom after work tend to increase the risk of substance abuse and depression.

3.3. Implications for Families

In the early 1980's researchers and psychologists concerned with the well-being of offshore oil and gas workers recognized the serious implications of working on commuter schedules. Later on, researchers started to focus on the adaptation of offshore families in local communities and in society more widely (Parkes *et al.*, 2005). Several studies have been completed, with diverse results.

UK researchers identified a pattern of emotional distress and behavioral changes sufficient to warrant psychiatric intervention in 10% of a sample of wives of offshore employees. This pattern was described as the "*intermittent husband syndrome*" (Morrice *et al.*, 1985). A further epidemiological study (Taylor *et al.*, 1985) found no differences in the mental and physical health between wives of employees onshore and offshore. However, potential problems of the "*intermittent husband syndrome*" impact not only workers' spouses, but also their children (Parkes *et al.*, 2005).

A recent Australian study (Sibbel, 2001) at FIFO mines did not find significant differences between the mental health of children of employees and their community-based mines counterparts, but found that mothers in FIFO families perceived unhealthy family functions in the areas of affection and definition of roles within the family. A study conducted by the Centre for Sustainability in Mining (Australia) provides evidence that the combination of long rosters (the 4-weeks-in-1-week-out) and 12-hour shifts had the most negative influence on families (Beach, 1999).

In contrast, studies in Australia (Gallegos, 2006; Watts, 2004), Canada (Costa *et al*., 2006) and the UK (Parkes *et al.*, 2005) documented several advantages of the commuter lifestyle as viewed by employees and their family members. Table 2 provides a summary of the advantages and disadvantages of commuter mining for families as revealed by these studies.

Table 2: Advantages and Disadvantages of Commuter Mining for Families	
Advantages	**Disadvantages**
• **Increased opportunities for other family members' employment** Since FIFO employment implies that the whole family does not need to live in a small and isolated mining community, the family can choose to live in a community that offers good employment opportunities for other family members. • **Increased choice of where to live** Since FIFO mines often offer a variety of pick-up points, workers might be able to choose where to live. Even if the choice is made for a community other than one of the pick-up points, generally workers are able to travel to existing pick-up points if they wish or need to do so. • **Ability to change employers with minimum disruption to the family** For FIFO employees, job change would not necessarily result in relocation. Also, if any other family member wishes to move to another community for work, the employee might still be able to keep the FIFO job when adjustment of the travel arrangements is possible. • **Possibly greater access to educational, health and entertainment facilities** As compared to most mining communities, since FIFO employees are able to chose not to relocate from a community which offers good access to educational and health facilities. • **Reduced exposure to the impacts of boom and bust cycles, which is characteristic of single-industry communities**	• **Frequent partings and reunions are stressful to most families** • **Disruption of family routine** FIFO families' routines need to change every rotation, when family members need to adapt to the absence or presence of employee. Employees in FIFO operations often miss important dates/holidays. Extended absence from home increases the risk of marital and family dysfunction. • **Challenges with definition of roles within the family** The disruption of family routines often results in conflict over control, authority and decision-making within the family and conflicts over use of money. • **Children's difficulties in dealing with parental absence** • **Spouse's loneliness and other practical difficulties in dealing with employee absence** • **Need for a solid social and family support network to help out with childcare** This is particularly significant for employees who are single parents • **Fidelity issues that result from extended and frequent separation**

3.4. Implications for Small and Aboriginal Communities

It has been argued that the commuter model is more tolerable for Aboriginal than non-Aboriginal workers, because Aboriginal family and community ties are usually stronger than in non-Aboriginal communities. The basis of this argument is some Aboriginal peoples' historical mutual dependence for survival: "rotation employment has typically proved to be the least disruptive of native life" (Hobart 1989: 27). However, there are conflicting sentiments regarding commuter mining among Aboriginal peoples: while rotation work allows for traditional activities to take place during time off, historical family structures have often been eroded – workers are not able to count on the family or community structure and network for childcare or care for their elders when they are at work (Costa *et al.*, in prep.). As a response to these challenges, where geographically feasible, some operations have made arrangements for local Aboriginal workers to commute daily to an otherwise long distance commuting mine.

Certainly, it is difficult for commuter mineworkers – Aboriginal or not - to attend community events and to contribute to community life and this tends to make relationships with other community members vulnerable (The Taskforce on the Churches and Corporate Responsibility, 1996).

It has been observed that some employees leave their communities as a result of an improved economic situation and consequent increased mobility (Hobart, 1989; Shrimpton & Storey, 1989). Even though there usually are very few transportation centers - pick up points - employees of commuter mines are in effect provided with more choices of where to live. This in turn can bring challenges to communities, as it may encourage employees to move out of their towns or villages to live closer to a pick up point (Shrimpton & Storey, 1989). Indeed, in the Pilbara Region in Western Australia, fly-in-fly-out mining has recently been identified as a contributor to population decline and as a threat to the diversity and growth of small local businesses (Watts, 2004).

Because Aboriginal individuals often have a very strong emotional and cultural connection to their land and community, the loss of community members as result of increased mobility is expected to be smaller in Aboriginal communities than in non-Aboriginal communities. However, such loss in Aboriginal communities is potentially extremely significant for their social, cultural and economic sustainability (Costa *et al.*, in prep.).

- **The Fly-over Effect**

Relevant to both Aboriginal and non-Aboriginal small communities, the "*fly-over*" effect is defined as a situation in which a community closer to a mining operation does not get significant economic benefits and community members do not participate significantly in its workforce. Because of the ability to bring employees from diverse locations to a mine site, the workforce might be brought in from larger centers, often much further away from the operation. The fly-over effect has been recognized as one of the biggest challenges that commuter mines present to northern development (Shrimpton & Storey, 1991, 1989). When communities are "flown-over", incomes are not spent locally, and supplies are acquired elsewhere (Aroca, 2001; Shrimpton & Storey, 1991).

- **Long Distance Effects**

On the other hand, because of the ability to bring in employees from various distant regions, the use of commuter mining may actually support economic development of communities at other locations (Storey, 2001). In Saskatchewan, commuter mining has been identified as an agricultural support: a number of uranium mines' workers are farmers during their days off. Newfoundland workers, often employed in mines throughout Canada, return home every rotation, but would be forced to move with their families if there were not commuter mining employment opportunities in other provinces (Storey, 2001).

4. Addressing the Impacts of Fly-in-fly-out Mining

4.1. The Role of the Mine Manager

The well-being of individual employees and the desirability of the FIFO mine camps depend on both the employer and employee (Sibbel *et al.*, 2006). Even though only some of these variables can be managed in the workplace, it is important to recognize that they should not be looked at in isolation (Sibbel *et al.*, 2006, Costa *et al.* 2005), as illustrated in Figure 1.

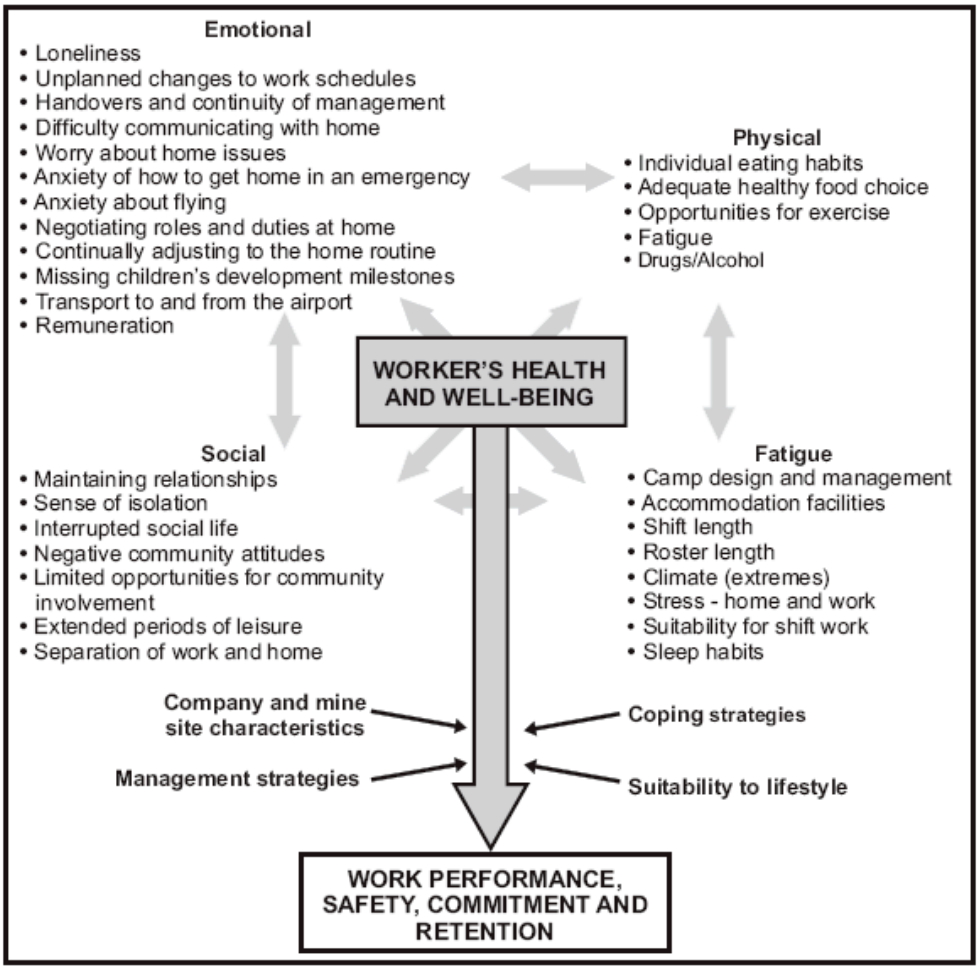

Fig. 1: Relationships among factors of workers' health and well-being as they impact performance, safety, commitment and retention (Source: Sibbel *et al.* 2006).

The complexity of the variables that impact FIFO mine camp desirability and workforce well-being (Table 3) implies that decisions regarding management strategies need to be taken on a case-by-case basis (Sibbel *et al.*, 2006). Even though research has suggested that managers have significant impact on work culture and practice (Beach *et al.*, 2003), mine managers' ability to influence certain variables, such as size of workforce, life of mine, and proximity to local community, is evidently fairly limited (Sibbel *et al.*, 2006).

Table 3: Employer and employee variables impacting well-being in FIFO operations and adaptation to FIFO lifestyle. Adapted from Sibbel *et al.*, 2006.

Employer (company and site)	• Size of the workforce • Expected life of the mine • Working hours and shift arrangements • Use of contractors • Proximity to local community or town • Quality of mine camp facilities • Provision of psychological support on site • Individual supervisor or manager practices • Company philosophy and commitment to work practices relating to work and family interface and balance
Employee (individuals and families)	• Cultural background and experience • Expectations of employees and families • Commitment to the job • Reasons for taking the FIFO job • Personality and coping skills • Pre-existing problems at home or with partner • Access to and acceptance of psychological support • Job class and type • Lifestyle • Stage in life – stresses vary with different stages depending on gender and /or family status • Availability of social and family support, particularly for single parents

4.2. Strategies as Suggested by Research

Several authors have described the impacts of commuter mining and have made recommendations to improve the model. These recommendations are incorporated in this section, along with suggestions resulting from three recent studies that provided extensive and detailed suggestions to improve the positive and to reduce the negative impacts of the commuter model for employees, families and communities. Table 4 is a summary of these strategies.

The first study was commissioned by the Western Australia Pilbara Regional Council (Watts, 2004), which worked with key stakeholders and the communities affected by FIFO operations to develop strategies to maximize identified benefits and minimize identified negative impacts of FIFO mine

employment in the region. This research stemmed from concerns aired by family and community members, Aboriginal peoples, service providers and business operators regarding the increasing incidence of FIFO operations in the Pilbara Region and the lack of action by stakeholders to address these concerns.

The second study, developed by Sibbel *et al.* (2006), drew on findings from recent Australian and international commuter mining research to establish key understandings of both the positive and negative impacts of the commuter model on employees and their families, and provided practical management strategies as an aid to the development of best practices.

The third study, an exploratory study conducted in Canada (Costa *et al.,* 2006), intended to provide insights on how women in the mining industry are coping with the commuter schedules and consequent intermittent relationships with families and partners and how the Canadian mining industry is adapting to recruit and retain female employees in FIFO operations.

Table 4: Impacts & Strategic Actions	
Issues/impacts	**Work-based Strategic Actions**
Employee Fatigue Employee fatigue impacts work performance, health and safety. Even though accidents cannot be attributed to a single cause, they may be associated with long shifts and rosters, personal sleep habits and disorders, stress and living conditions.	In the mine camp • Provide well insulated sleeping facilities • Provide single rooms with private bathrooms • Provide good-quality bedding • Consider issues of noise and privacy when designing the mine camp and sleeping areas • Provide reliable air conditioning and heating • Enforce adequate rules regarding noise levels Shift and roster arrangements • Establish flexible roster and shift arrangements to suit individual needs Professional services • Hire a “fitness for work” consultant • Hire a “fatigue management” consultant to minimize the impact of sleep disorders Work culture • Encourage employees with families to go straight home at the end of the rotation • Ensure employees take their breaks during the workday Education and training • Promote healthy sleeping habits and attitudes

Issues/impacts	Work-based Strategic Actions
Communication Adequate communication between the mine camp and employees' homes (and businesses such as banks) is one of the most important issues highlighted by commuter employees. Often, employees' access to adequate communication facilities is constrained by their job (e.g. truck driving). It is important to ensure all on-site employees have adequate access to communication facilities.	**Facilitate good communications with family/home** • Subsidize phone calls home • Provide phone/internet connections in employees' rooms as well as in public areas • Provide good access to public phones in areas where privacy can be protected • Provide training on communication technology (e.g. email, text messaging, for workforce and families) • Provide mobile phone coverage on site • Provide site and company contact details to families/partners
Unrealistic expectations about commuter lifestyle Unfamiliarity with the industry and the impacts of a commuter lifestyle can result in increased turnover as employees realize that this lifestyle is not for them, or in increased stress as they try to adjust.	**At recruitment** • Provide adequate information/literature to prospective employees and families about job and lifestyle (e.g., booklets, brochures, DVDs with testimonials) • Encourage prospective employees to talk to existing employees about commuter employment • Design interview questions to investigate prospective employees' understanding of and suitability for lifestyle • Organize site visits for prospective employees and families **During employment** • Identify and support employees/families who are not adapting easily to the commuter lifestyle • Provide access to on-site counselling professionals • Establish an open-door management style to improve managers' communication with the workers

Issues/impacts	Work-based Strategic Actions
Emotional well-being The commuter lifestyle can impact on the emotional well-being of employees. A commuter mine is a unique work environment where professional and personal life boundaries can be unclear, relationships seem to be more intense and it is emotionally difficult to be apart from families and friends for weeks at a time.	**Supporting employee emotional well-being** • Provide on-site trained counsellor (for employees and families), ideally located in a private location • Provide employee assistance programs (confidential and short term counselling services for employees with personal problems that affect their work performance) • Establish on-site mentoring and/or "buddy" system • Offer suicide gatekeeper training for supervisors and/or all employees • Encourage employees' interaction with local community if the mine camp located near or in a town • Provide after-hours social opportunities in the mine camp • Provide outdoor activities opportunities • If alcoholic beverages are allowed in the mine camp, provide adequate alcohol-free recreation areas to facilitate socialization amongst the workforce. These could include a coffee shop, barbecue area, phone and internet cafes or multi-purpose rooms. • Facilitate and support employment of couples
Physical well-being The commuter model provides the opportunity to positively contribute to employee fitness for work and general well-being. It is important, however, to cater to the diverse needs of employees.	**Employee fitness for work and well-being** • Provide education and training to enhance employees' fitness for work • Supply healthy, varied food in the mine camp, appropriate to the cultural diversity of the workforce • Provide facilities for cooking/self-catering • Provide sporting and exercise facilities, including fitness professionals • Encourage employees to maintain exercise frequency and intensity level when at home • Distribute a site-based newsletter including tips for healthy living • Organize health promotion activities on and off-site • Ensure adequate facilities for ill employees and prevent ill individuals from working • Ensure medical staff on site have adequate knowledge of female health (e.g., pregnancy)

Issues/impacts	Work-based Strategic Actions
Connection with home community It is often hard for employees to maintain social relationships in their home community and participate in community events and processes. As a result, employees might not feel a strong connection with their community, which can also represent a loss for the community.	**Encourage community-connectedness** • Encourage workers to become involved in the sporting/leisure sector and volunteering in their communities • Provide flexibility in work schedules so that Aboriginal workers can maintain their traditional activities and community/traditional commitments, such as attending funerals

General Work-based Strategic Actions

- Orientation programs for employees and their families
- Managers should model attitudes and behavior such as healthy eating habits and exercising, taking established breaks and getting enough rest
- Mine camp/facilities management – ensure catering company meets company's standards to maximize employees' health and well-being
- Encourage employees to personalize their rooms
- Provide flexible baggage allowance
- Ensure that employees of contractors have equitable facilities and living conditions
- Provide assistance with financial planning for employees and families
- Provide flexible rosters to accommodate different employees' needs
- Pay for traveling time – especially if it involves long flights
- Allow enough time for handovers where required
- For remote mine camps, provide the best medical care and facilities possible
- Provide rotation flexibility for employees with young families
- Establish standards and policies regarding maternity and family issues (including monitoring and periodic evaluation)
- Provide opportunity for pregnant employees to work at another facility while necessary
- Provide clear and generous emergency policies (e.g., need to leave camp because of family emergency or death)

Issues/impacts	Home Support Strategic Actions
Families' challenges in coping with the commuter lifestyle Often families are not aware of ways in which they can build their social support systems or access professional help.	• Provide a resource kit for workers' partners offering positive constructive solutions to anticipated problems • Develop or contribute to the development of an informative website and/or web forum that supports commuter mining families • Facilitate family get-togethers in town • Site visits for family members • Ensure families are aware of the company's Employee Assistance Program (EAP) scheme • Provide families with emergency contact details on site • When children/partner sick – consider funding for home or medical help if worker is unable to leave site • Ensure on-site newsletter is sent to families at home
Traveling to and from the airport/pick-up point	• Provide flights at family-friendly times • Encourage car pooling among employees
Time-off	• Avoid calling employees at home during their times-off
Uncertainty about return-home dates	• Ensure that rosters are consistent and employees return home when expected • Communicate any changes in schedule with as much lead time as possible • Keep track of and pay all overtime

Issues/impacts	Community Support Strategic Actions
Population decline	• Lobby local government for financial assistance to improve local conditions and infrastructure • Promote local resources/attractions/community activities • Contribute to local efforts to identify and address areas of resident dissatisfaction
Fly-over effects Local small businesses often see commuter mines as a threat. Ideally, mine development should boost local economies. It is important to recognize and exploit the untapped market potential in the commuters that do not live in the community.	• Ensure preferential local or regional recruitment • Encourage interaction between workforce and small business operators to find new opportunities for supply of goods and services • Contribute to local efforts to promote on-line commerce initiatives • Contribute to local efforts to undertake a yearly resource analysis to assess the capacity of existing training and skill development and identify needs • Contribute to local efforts to recognize and reward outstanding innovative local businesses

5. Conclusion

The introduction of commuter mines worldwide has led to much public and private debate about the relative merits of commuter versus community-based mining employment. While the commuter mine model has significant strengths, it poses critical challenges to managers, the workforce, families and small communities. It has therefore been the subject of conflicting messages from mining companies, researchers, communities and employees.

In the Canadian mining industry, the importance given to workforce well-being steadily increased throughout the years. Modern commuter mine camps (e.g., Ekati, Diavik) were built to relatively high standards and offer modern recreation and food service facilities and communication systems. Commuter camps are usually dry and have recently started to offer "healthy food" for the health-conscious or "country food" for Aboriginal workers and facilities/services such as gyms, as well as opportunities for outdoor recreation and traditional activities. Recently, the Eskay Creek Mine (BC) has taken a step further to address many of the challenges associated with commuter operations and has hired an on-site Social Development Coordinator who provides counselling services to the workers at the mine and also helps families with tasks that might otherwise need assistance from the mine employees (Mining Industry Training and Adjustment Council, 2005).

Nonetheless, community perceptions regarding commuter mines are often negative. There has been a tendency to attribute a wide range of problems to the commuter model. Shrimpton and Storey (2000: 2) describe this as the 'attributability problem'. They argue that although communities and employees tend to attribute all problems to the commuter lifestyle, issues are extremely complex and there are many other factors influencing employees' well-being. In conclusion, there seems to be a consensus among researchers that community-based and commuter mining both offer different benefits and challenges to the well-being of mineworkers and their families. It is paramount that mine companies and mine managers understand and proactively respond to the impacts a commuter lifestyle has on the workplace, on employees and on their families by implementing strategies that enhance the positive and mitigate the negative effects of the commuter model.

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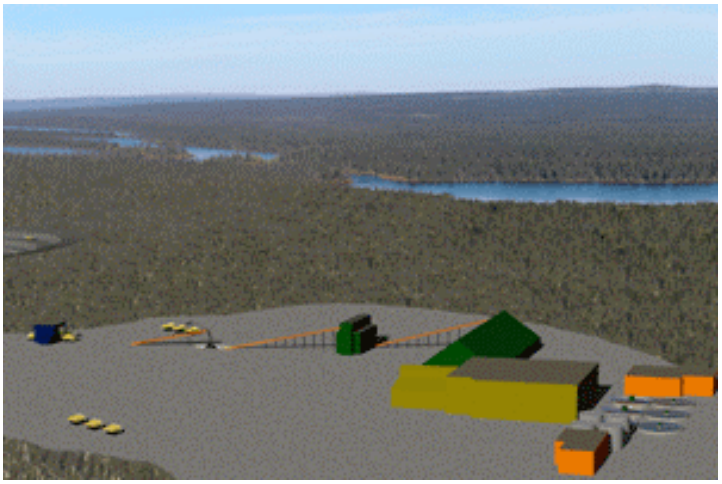
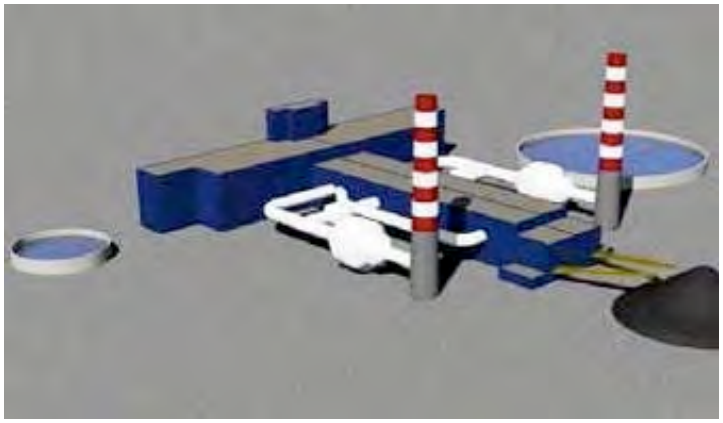
APPENDIX J

The Health of Aboriginal People and Northern Mining Projects

A Review of Recent Literature

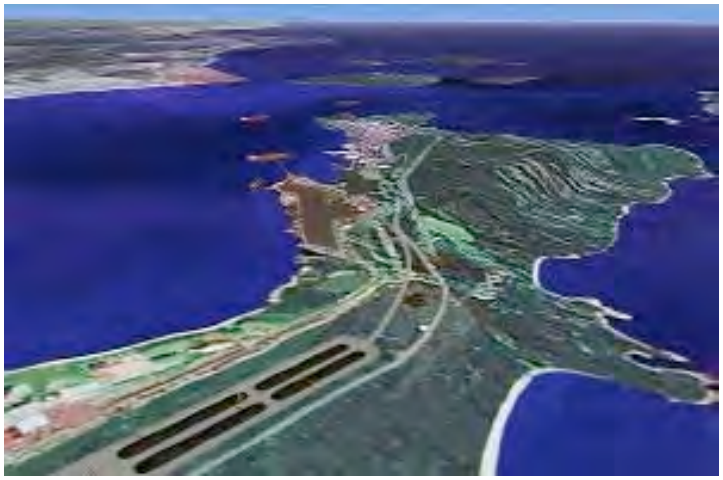


LabMag IRON ORE PROJECT



The Health of Aboriginal People and Northern Mining Projects

A Review of Recent Literature



BY: Adrian Tanner

November 2007

Table of Contents

1. Introduction.

This review has been undertaken for the LabMag Iron Ore Project (LIOP). However, I have not tried to second-guess which specific health issues will be relevant to questions of the impact the project will have on local Aboriginal groups. Instead I have undertaken a wider literature survey on the comparative health of Aboriginal peoples, and on the incorporation of health considerations within development planning and impact assessments, particularly as these relate to mining in the north. Some of the literature cited that is not directly relevant to the project may nevertheless provide a more general context for current public policy concerns about the health of Aboriginal communities, and about the impact of northern industrial projects. The literature on workplace safety of mine employees has been only briefly touched on as it does not concern Aboriginal health in particular. While I have mainly attempted to provide an objective literature survey, in some parts of the report I also address my own fundamental concern that neither the medical nor the social sciences have as yet provided an adequate understanding of Aboriginal social pathology. For this reason in the section on the health of Aboriginal people I have referenced some of my own published ideas on the origins of this phenomenon in northern Canada.

Many sources were accessed on the internet, via Memorial University Library, and some of these may not be accessible without such a library internet subscription. Consequently the report comes with a CD containing copies of several of these. Appendix A is an annotated list of sources, including some not specifically referenced in the report.

The LIOP description includes details of the mine site, the new roads and the utility corridors that will be created. It notes that the project will have implications for several First Nations, given that the mine, the transportation and utilities corridors and the processing facilities are located on the traditional areas of at least three groups, Naskapi Nation of Kawawachikamach ("NNK") ; Nation Innu Matimekush-Lac John ("NIMLJ"); Innu Takuaikan Uashat mak Mani-Utenam ("ITUM"); and Innu Nation (Sheshatshit). Most of these structures will be within areas of as yet unsettled Aboriginal land claims.

In the case of the NNK there is a partnership agreement that outlines various benefits. In addition the NNK owns 20% of the project, and has a royalty interest of 0.333% of the value of the annual production of iron ore pellets. It has yet to be determined if or how other First Nations might participate in the project. As with several other recent northern mining ventures, negotiation for Impact Benefit Agreements (IBAs)[1] were initiated in mid-2006, and these could have implications for addressing the health of Aboriginal people or their communities. Given that there remain some unknowns, some of the literature cited in this report may not have relevance for the project.

[1] See http://www.impactandbenefit.com/home.html

2. Changes to the Concept of ‘Health’

The concept of health is changing, including in Environmental Impact Assessment. No longer is it a term used only to refer to an absence of physical sickness or disease in individuals; instead, it is increasingly being used in the more general sense of ‘wellness’. The World Health Organization’s definition of health is: "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." (WHO 1948).

There has also been a general trend towards the medicalization of many conditions (Conrad 2007), either those previous considered normal, like childbirth or menopause, or others that used to be treated as moral failings, such as substance abuse and suicide (Loseke 2003:86-7, Peters and McRee 1996, Ajzenstadt and Burtch 1990), and now often included under the rubric of mental health. In the Canadian Aboriginal context, it has been stated that “Medicalization remains the predominant ideology underlying current health policies and services in Aboriginal services today” (Canada, Royal Commission on Aboriginal Peoples, 1996).

Alcohol abuse treatment provides an example of medicalization. Before the Second World War the Canadian government’s policies on Aboriginal health and social problems had been largely left to missionaries and local Indian Agents. By the time the Indian Act prohibition on alcohol and other restrictions were being removed in the 1950s and 60s, government educational and social services were being extended to Reserves and isolated northern communities, and social problems were becoming the responsibility of social workers. The shift from a social work to a more formal medical approach began in the 1970s. In response to an epidemic of alcohol-related problems the federal National Native Alcohol and Drug Abuse Program (NNADAP), which followed in 1982 from the 1975 National Native Alcohol Abuse pilot program[2], and which continues to fund treatment centres, adopted the medical and psychiatric approach. While initially treatment centres were located in the south, by the 1990s some northern communities either had their own centres or smaller treatment programs. Subsequently these programs came to incorporate Aboriginal pan-Indian symbolism and practices, but at the same time continuing to focus the treatment on problem individuals, in common the Western medical/psychiatric approach, rather than on addressing the relevant social conditions that appear to have prompted the epidemic. In this context, Bartlett (2003:166) has recently criticized “the increasing and disturbing trend of using Aboriginal terminology (and sometimes frameworks), yet simply delivering the same Western programs that have not proven very successful.”

Starting in the 1990s some Aboriginal groups initiated their own approaches to social pathologies, using a community-based approach, sometimes referred to collectively as the ‘healing movement’. This approach is in effect focussed on ‘community building’, that is, on healing the community, rather than focussing attention on specific problem individuals. It does this by re-incorporating within the new urbanized community life various collective ‘neo-traditional’ activities, such as ‘traditional gatherings’, spiritual

[2] See: http://www.hc-sc.gc.ca/fnih-spni/substan/ads/nnadap-pnlaada_e.html

ceremonies, periods of bush camp living, and the revival of some of the more physically challenging aspects of bush living, such as long-distance canoe trips or snowshoe journeys (Tanner 2004).

Some main-stream forms of medical treatment of social pathologies have also begun to incorporate a focus on 'community', with the recent emergence of 'community wellness' programs, and with an emphasis on addressing social and 'lifestyle' factors within an individual's treatment. A number of provinces and territories have adopted such approaches, particularly to address the health of Aboriginal people. For instance, the NWT has a community wellness program[3], as does Alberta[4]. The University of Manitoba offers an Aboriginal Community Wellness Diploma[5]. In April, 2007, the Yukon Territory established a 'community wellness' court, in order to "integrate a therapeutic problem-solving court into the Yukon justice system. Offenders with challenges such as addictions, Fetal Alcohol Spectrum Disorder (FASD), or mental health problems will now be able to work with the court to address their treatment needs."[6]

3. Health in Environmental Assessment.

Social Impact Assessment (SIA), has, at least in theory, if not in practice, been included within Environmental Impact Assessment (EIA), including impacts on human health (Spiegel and Yassi 1997, Galisteo Consulting Group 2002, Burdge 2002). In Canada the inclusion of SIA was envisioned from the first federal initiatives in the 1970s to the federal and provincial legislation of the 1970s, 80s and 90s (Lang and Armour 1981). The 1977 Berger Report is credited as influential on the inclusion of SIA (O'Faircheallaigh 1999:66; Hipwell, Mamen, Weitzner and Whiteman 2002:21[7]), particularly as social impacts were the main justification for the Commission's recommendation not to proceed with the project (Steinemann 2000). In looking at the proposed Mackenzie Valley pipeline the Commission addressed the social, as much as it did the physical, environmental impacts, noting, for instance, that northern industrialization had been accompanied by a rise in alcohol abuse and crime in Aboriginal communities (Berger 1977).

In 1987 the Canadian Environmental Assessment Research Council (CEARC) identified human health as a priority issue (Davies 1991; 1992[8]). "By maximizing community involvement in the SIA process - not just by consultation, but by directly involving locals in planning teams - uncertainty is reduced, the legitimacy of the SIA and the development project is enhanced, the accuracy of the SIA is increased, and the capacity for the SIA to mitigate impacts is maximized" (Burdge and Vanclay 1996:60-61). SIA has been noted as of particular relevance to the impacts that are often of most concern to Aboriginal people (Craig and Tester 1982, O'Faircheallaigh 1999).

[3] See: http://www.hlthss.gov.nt.ca/features/Programs_and_Services/comm_wellness/default.asp
[4] See: http://www.ncsa.ca/com_fam_well.asp
[5] See: http://umanitoba.ca/extended/afp/diploma/wellness/wellness.shtml
[6] See: http://www.gov.yk.ca/news/2007/07-078.html
[7] See the CD included with this report.
[8] See the CD included with this report.

Despite this potential for SIA, including health impacts, to be part of an EIA, this has only slowly and uncertainly been occurring, in Canada as well as elsewhere (Burdge 2002, Steinemann 2000). The 1994 Whitehorse Mining Initiative made no reference to social impacts or related health issues, despite its focus on Aboriginal issues[9]. However, within the assessment profession the place of health in assessments is now being emphasized. For example, health issues received much attention at recent meetings of the International Association of Impact Assessment (IAIA). In his review of the 2004 meeting, William A Ross noted:

> There is a need to develop means to do Health Impact Assessment (HIA) evaluations. The action plan proposed by HIA practitioners at the conference is for an "evaluation sub group" to set out an "Evaluation Cookbook" over the next six months – to be debated prior to IAIA'05 and delivered for further development. This is one of several activities started at IAIA'04 to be continued in the upcoming months (Ross 2004).

At the IAIA meeting the following year, ten health-related papers were presented, including one on the state of the practice of HIA in northern Canada (Noble 2005). Noble noted the considerable variation in the degree of attention that is paid to the issue in recent assessments.

As health issues have begun to receive at least some attention in some assessments, the term 'Integrated Impact Assessment' has been used, to draw attention to the inclusion of social and health factors alongside those of the biophysical environment (Kwiatkowski and Ooi 2003). Several web-based resources for information and training in HIA are now available, e.g the World Health Organization[10], the Health Impact Assessment Gateway[11], the Faculté de medicine at Université Laval[12], the Public Health Agency of Canada[13], and Heath Canada's Canadian Handbook on Health Impact Assessment[14]. The inclusion of health within an EIA is especially relevant to northern communities, since existing community health problems and vulnerabilities can be treated as baseline conditions, and potential health effects of a project may be treated as not just impacting individuals, but also the social conditions of communities. "Special attention should be given to vulnerable segments of the population to determine impact equity. SIAs should evaluate vulnerability, resiliency, and adaptability of communities, and of groups within communities." (Glyn 2004:11).

[9] See: http://www.nrcan.gc.ca/ms/pdf/accord.pdf
[10] See: http://www.who.int/hia/en/
[11] See: http://www.hiagateway.org.uk/page.aspx?o=hiagateway
[12] See: http://machaon.fmed.ulaval.ca/medecine/hia/home.asp
[13] See: http://www.phac-aspc.gc.ca/ph-sp/phdd/impact/
[14] See: http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/handbook-guide/vol_1/index_e.html

4. Health in Northern Mining Assessments - Nunavut.

The new focus on health in EIA is to be seen in some recent northern examples, including some of those for mining. In the following sections looking at EIAs from Nunavut, northern Ontario and northern Saskatchewan I have directly quoted extended passages from guidelines, or from Environmental Impact Statements (EIS), with my own insertions placed within square brackets.

In 2000 the guidelines for the Jericho diamond mining project, located near Contwoyto Lake in the West Kitikmeot Region of Nunavut, included the requirement for:

> "Taking into account the health of the workers, their families, and other residents (human health includes physical, psychological, emotional, spiritual, and mental health) […]
>
> The social life of the concerned communities, family and community stability, problems of substance abuse, and crime and violence, including the effects of a major employment base away from the communities. […]
>
> Increased pressure on existing social, institutional, and community services, transportation facilities and services, and infrastructure". (Nunavut Impact Review Board 2000)

However, the draft EIS of Jan 21, 2003 provided only minimal data on the existing health situation, limited to such issues as tobacco use and teen pregnancy, with much of its information based on informal sources, while very little attention was given to projected future health impacts (Tahera Corp. 2003) The draft was criticised for this by both Indian Affairs and Northern Development (2003) and by Health Canada (2003)[15]. Health impacts were only mentioned in the comments of the local authority, Kitikmeot Inuit Association (KIA), in the context of ground water quality (2003), while Nunavut Tunngavik Incorporated, the agency responsible for administering the benefits under the Nunavut Land Claim settlement, took the position that socio-economic issues were best dealt with by means of the IBA (2003)[16].

The 2002 guidelines for the Doris North gold mining project, in the same general region of Nunavut, went further, calling for a baseline description, to include "[…] human health, defined broadly to include mental health and well-being". The proponent was required to "[…] provide a rationale for the selection of communities for which baseline

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[15] See: http://ftp.nunavut.ca/nirb/NIRB_REVIEWS/PREVIOUS_REVIEWS/00MN059-JERICHO/Public%20Registry%20Documents/ ; 234- Health Canada subm.doc
and 236b- INAC Subm.pdf . I have been unsuccessful in my attempts to obtain access the revised final Jericho EIS, of October 2003.

[16] See: http://ftp.nunavut.ca/nirb/NIRB_REVIEWS/PREVIOUS_REVIEWS/00MN059-JERICHO/Public%20Registry%20Documents/ ; 237a- NTI Submission.doc
and 190b- KIA Submission Eng.doc

data are provided". As part of the description of the socio-economic environment, the proponent was required to

> "identify and justify specific indicators, such as […] teen birth rates; number of children in care; number of suicides; number, type, and severity of accidents; life expectancy; types and frequencies of communicable diseases; Social Assistance cases; number of alcohol- and drug-related crimes; number of property crimes; and number of complaints of family violence."

The proponent was also required to assess the potential impacts of the mine on socio-economic and cultural components, taking into account

> "[…] the health of the workers, their families, and other residents (human health includes physical, psychological, emotional, spiritual, and mental health); […] demographics, such as Project-induced changes in population numbers, migration, and distribution, and the effects of those changes, including interactions between local residents and non-residents; […] the traditional way of life of the residents of the Region especially their use of the land for economic, cultural, and other purposes, including the Project's contribution, if any, to increased levels of contaminants in traditional foods; […] the cultural well-being of the communities, based on indicators defined in collaboration with the concerned communities; […] the social life of the concerned communities, family and community stability, problems of substance abuse, and crime and violence, including the effects of a major employment base away from the communities.".

The Doris North guidelines also note that

> […] the impact of an industrial development in this region, particularly where human populations are low, is directly related both to its pace and scale. For example, given the small and relatively untrained work force, the scale of the Project might affect employment benefits, whereas its pace, if abrupt, could cause social or cultural disruption and prove to be more significant than its scale."

In particular, the Proponent was required to address

> […] the potential for social and cultural disruption by, among other things, discussing social problems and evaluating the potential impacts of the Project on exacerbating or relieving such problems. The fear that the difficulties of coping with prolonged absences of family members might increase stress in families already dealing with cultural disruption should also be addressed.

Moreover,

> "If an urban centre, such as Yellowknife, Kugluktuk or Cambridge Bay is to serve as the main point of hiring for non-Nunavummiut, Nunavummiut living there might suffer from the effects of in-migration by job-seekers, which could include housing shortages, prostitution, an increase in poverty, and strains on community resources to deal with such issues. Even if the foregoing are not considered to be probable direct effects of the proposed Project, they should be addressed in the assessment of its indirect and cumulative effects." (Nunavut Impact Review Board 2002).

Although Doris North is a small project compared to Jericho, the proponent took the matter of baseline socio-economic and community health issues more seriously than did the latter in its initial EIS. The baseline description of the 2003 draft EIS focuses on the

problems of staff shortages within the health facilities, high suicide rates, and high rates of alcohol and drug addiction, the latter conditions acknowledged as leading to high rates of family violence, elder abuse, child abuse, violent crime and incarceration. These problems were also said to be related of housing shortage and overcrowding (Miramar Hope Bay Ltd. 2003:4-5). The section of this draft EIS on negative social and health impacts, however, is very limited – it merely notes that crime tends to be higher in communities with higher income, so that income from jobs in the mine could have a negative impact on local crime rates (ibid:6-4). The technical chapter on Community Services and Infrastructure states: "This analysis of the effect of the Project on individual health and health care services is largely conceptual with few empirical indicators." (ibid: 25-18).

However, the amended Doris North EIS of 2005 did go a bit further:

> "The communities in the environmental assessment area also experience relatively high rates of crime with a high proportion of violent crime (e.g., sexual assaults) compared to national averages. Over 80% of crimes are considered to be related with alcohol abuse. The rate of suicide is extremely high across the north and is of great concern to the communities who are losing youth at such a high rate. In spite of research in that area, there is no agreement as to the root of the problem or to a solution.
>
> In Kugluktuk members of the Hamlet Interagency Committee cited the current high incidents of alcohol-related problems. They felt that alcohol consumption will likely increase during the Project construction and operations phases, which may compound increases in ill-health conditions and therefore add burden on the health and social services facilities. Kugluktuk is a community that has had more residents with work experience in mining in the past and as a result will have more residents with experience for this Project." (5.57)

Most of the report's mitigation strategies to address the project's impact on social problems are focused on the project's employees, and less on local communities from where the employees will be drawn.

> "Social Services
>
> • In order to support the emotional health of employees and avoid burden on community facilities, MHBL has made available a number of methods of communications for workers with their families such as telephone and Internet. MHBL plans to keep family groups or community groups of workers together for support while away from home;
>
> • MHBL will conduct an extensive orientation program to ensure that all workers are given full training, understand MHBL policies and procedures and have support to adjust to camp life;
>
> • MHBL will provide a workplace where individuals are treated in a fair, equitable and respectful manner to attract and retain good workers and reduce stress on employees;
>
> • MHBL will provide an issues resolution process for employees to be able to resolve any grievances and issues to avoid undue stress and pressure;

• as much as possible, MHBL will encourage opportunities for Inuit to speak and maintain their own language while at the same time operating in the language of the camp as long as safety of the employee, others or job performance are not compromised;
• alcohol and drug education will be provided to all employees and the site will continue to be an alcohol and drug free operation; and
• MHBL will provide to all employees a free and confidential Employee and Family Assistance Program (EFAP) that will provide emotional, psychological and mental health counselling for employees and their immediate families for work stress, marital and family issues.

In addition, monies returning to the communities through the NTI and KIA will enable residents to benefit and provide services to the fastest growing populations in Canada. Additional cash flow will enable workers to provide better nutrition, recreation and housing to their families during the time that they are working". (5-61)

5. Health in Northern Mining Assessments - Ontario.

We now turn to the report of a recently completed EIA of a northern mining project, that of the De Beers Victor diamond mine in Ontario (De Beers 2006). The health aspects of this report are particularly instructive, given the parallels with the LabMag proposal. In both cases the mines will be semi-isolated within the northern boreal forest, with neither directly connected to the North American road system, but (apart from by air) only indirectly, via a railway linkage (in the Victor case, from Cochrane to Moosonee), and from the rail by road to the mine site (in the Victor mine case, partly via a winter-only road). Moreover, like the LabMag proposal, power for the Victor mine will involve the construction of a long-distance connection to the electric grid. Both mines are open pit operations. Both mines are on the traditional lands of northern First Nations who have comparable cultural backgrounds, and some of whom continue to live off the land, at least for parts of the year. Neither mine will have a town on site, but workers will commute. However, other aspects of the two mines are different, in that raw diamond production will not require the kind of local processing and transportation infrastructure needed for iron ore.

Because of the relevance of the Victor case to this study, and because of the attention given to social and health impacts, extended passages from both the guidelines and the final EIS report are quoted below. While the Victor EIS outline plans to address physical health impacts, from emissions, noise and accidents, it also acknowledges, more than do most northern assessments, the current social problems in the adjacent Aboriginal community, including the possibility that the project may make these problems worse. However, citing the wording of federal EIA legislation, the report notes that any negative community social and health impacts cannot be taken into account by the panel in making its recommendations. Nevertheless, the report does specify some possible projected negative community health outcomes, without, however, specifying appropriate mitigation.

[The following is directly from the web-based version. My own additions or subtractions are within square brackets.]

[From the Victor EIA Guidelines, appendix A]

> 7.10 HUMAN HEALTH
> De Beers shall provide current information on the health status of the communities in the project study area. These data shall be quantitative wherever possible. […] Specifically, it should include data on health services available, family structure, incidence of diseases, mortality (infant mortality, leading causes of mortality), personal health practices (e.g., smoking), sexual health, and injuries. The scope and level of detail of the human health baseline information collected for each affected community should be commensurate with the potential likelihood and significance of changes to the community as a result of the project.
> […]
> 7.13 SOCIO-ECONOMIC ENVIRONMENT
> […]
> De Beers shall describe the existing social environment in the project study area and on reserve land that is located outside of the project study area. This includes but is not limited to:
> • crime, policing and security;
> • housing (including information such as overcrowding and homelessness);
> • language (including information on the percentage of population speaking and/or writing Cree);
> • recreation (including information on recreational events and activities, both physical and cultural);
> • drug and alcohol abuse;
> • suicide rates; and
> • family violence.
> […]
> 8.10 HUMAN HEALTH
> De Beers shall assess the potential effects of the project upon the physical, mental, spiritual and cultural health of affected communities, employees and their families. The analysis should include at least the following: [there follows a detailed listing of possible project impacts on health by changes to the physical environment. In addition:]
> • any potential effects of project-generated noise on human receptors within the project study area, including an assessment of the different effects of daytime and nighttime noise, and should examine continuous and intermittent noises (blasting, barging, and helicopter and air traffic); and
> • a consideration of the health effects of social, cultural and economic changes brought about by the project, including the effects of mine closure. Social and cultural changes include impacts on subsistence lifestyles, traditional activities, family relationships, and language.

[From the Victor Comprehensive Study Report]

5.0 DESCRIPTION OF THE EXISTING ENVIRONMENT
[…]
5.5 Valued Ecosystem Components (VECs) - Socio-economic Environment
[…]
5.5.2 Attawapiskat
[…]
Community Well Being [pp 5-31 to 5-33]
Although no quantitative data are available on the rates of incidence of social problems in Attawapiskat, results of consultations, observation and informal discussions over the years suggest the following:

- Alcohol abuse has been of such concern in the past as to result in a ban, including a ban on baker's yeast, which had been used for home brewing. An alcohol and drug addiction program has been put in place and peacekeepers have been assigned responsibility to control bootlegging and alcohol consumption. Despite these measures, alcohol abuse continues to be of concern, not only on physical health grounds, including fetal alcohol syndrome and suicide, but also because it is related to crime, family violence, and child neglect. Circumventing the ban is costly to family incomes, and alcohol is often replaced by drugs, which are reportedly easily available, at prices comparable to those in urban centers.
- Substance abuse is considered to be symptomatic of deeper problems, including lack of employment, poor education and consequently educational achievement, and lack of recreational opportunities. The inter-relationships between specifically education and social challenges are complex and mutually reinforcing. For example, drug abuse, housing overcrowding, and poor parenting, all constrain educational achievement, which in turn closes options for livelihood.
- Public health and education officials deal with family violence and its consequences on a reportedly daily basis. Women and children are the main victims, however, child violence against parents is also significant.
- Teenage pregnancies have been characterized as a social norm. There are suggestions that this is at least in part encouraged by the welfare system, which increases monthly allowances when children are born. Sexually transmitted diseases are common, as are multiple partners.
- Environmental health is poor, which can be attributed to crowded housing, high costs of healthy foods, smoking, and poorly vented wood burning stoves for heating and cooking. Lifestyle onset diabetes, asthma, lice infections, and communicable diseases such as tuberculosis are consequently of major concern.
- The extent of social challenges is also at least in part due to an insufficiency of social services. Specialist services can only be accessed outside the community - doctors and dentists only visit the community periodically, facilities are understaffed, there is no financial support for traditional healing, and health care tends to be focused on cure rather than prevention. The healing centre and safe house for women have recently been closed. Special education needs are left unmet.
- Anecdotal information indicates that in many instances individuals undergo treatment and/or healing only to return to their families who did not undergo the same treatment or healing processes. Because of this, many therefore revert to

their former ways and habits within a comparatively short time. Consultations suggest that the above issues are of serious concern to many in the Attawapiskat population, but since substance abuse, crime, preventable disease, and family dysfunction at virtually any level must be considered important, this is perhaps not surprising. Observations, such as of the banning of alcohol and yeast, the shortage of housing and public behaviours, in combination with public statistics on educational levels, incomes and lone parent families, do, however, suggest that Attawapiskat is particularly stressed in the area of individual and community well being.

7.0 ENVIRONMENTAL EFFECTS ANALYSIS – SOCIO-ECONOMIC ENVIRONMENT
[…]
7.2 Attawapiskat
[…]
7.2.3 Health [page 7-10]

7.2.3.1 Effects

Public Health and Security Related to Vehicular and Barge Traffic

Health concerns related to project air and water emissions are addressed separately in the next section. Vehicle traffic represents a risk to public health insofar as accidents may occur. Of particular concern is that children often grab onto vehicles, especially during the winter, to slide along with the moving vehicles. All heavy winter traffic will be routed along a new dedicated winter road that will avoid passing through the community to promote safety. During the construction stage, the major traffic risks will come with mobilization, as equipment is moved to site. Barges on the Attawapiskat River during the project construction phase, if used, also present some potential for accidents. Subsequently, infrequent transport of construction supplies, and then operations supplies, and of rotational project staff will add some traffic to the winter road. Traffic risks will be minimized with clear, enforced rules for vehicle operators in combination with public education on traffic risks. Nevertheless, there are presently accidents on the winter road and there are likely to continue to be traffic accidents over the mine life.

Health Related Project Emissions

Potential health effects related to project emissions include the accumulation of contaminants through the consumption of traditional foods and medicines, effects on potable water sources, direct air emissions, and noise.

According to TEK studies, almost all the harvesting of plants (plants, berries, and traditional medicines) for consumption by AttFN [Attawapiskat First Nation] members occurs within an area that extends approximately 50 km upstream along

the Attawapiskat River and on Akimiski Island. There is no reported meaningful harvesting of plants from areas near the Victor site. The only potential for project-related impacts to plants consumed by AttFN members is along the winter road, however, emission levels will be extremely low and will occur during the winter when plants are dormant.

With regard to meat, the concern is the potential for the magnification of metals, primarily heavy metals. An analysis of the area kimberlite ore and limestone shows that metal concentrations were all less than soil guideline values for residential and parkland settings, with the exception of two (out of 35) silver samples. Water samples tested for mercury and all other metals gave results that were better than drinking water standards, with the exception of sodium. Air emission modelling indicates that applicable environmental and health standards will be met for all parameters, with the possible exception of total particulate concentrations, which have the potential to occasionally exceed the provincial standard (marginal rare occurrences).

[…]

7.2.3.3 Significance

Irrespective of the rigour with which De Beers implements health and safety and traffic control measures, there will remain the possibility that over the life of the mine a serious accident(s) could occur. Such an event would have to be considered at least potentially of long-term high consequence to any affected individual(s). There is very low potential for health effects resulting from contamination of plant foods and medicines consumed by First Nations. There is some potential for the accumulation of heavy metals in game or fish. Effects on potable water are not expected. Noise at the mine site, of potential concern to project staff, will be within acceptable standards. Human health project effects are thus considered to be of low significance.

7.2.3.4 Comments/Concerns

Only Health Canada provided comments on health related issues. Some of these comments have been noted and addressed in the section on Aboriginal community. Additional information was also requested on air emissions from increased air traffic, effects of aircraft noise on human health and the potential contamination of country foods and water (including a screening level health risk assessment related to consumption of country foods and supporting documentation should the conclusion be that heavy metals are not considered to be a health threat).

7.2.3.5 Proponent's Response

The Proponent has responded, regarding air emissions of project-related aircraft, that the expected number of flights to the Victor site of a maximum of 5 to 7 flights per week during the construction phase is so small as to not warrant discussion within the context of potential health related effects. Nor were noise effects on human health considered significant, as Ontario Health and Safety Regulations will be adhered to so that there are no such effects.

With regard to contaminants of country foods, the Proponent has concluded that the only potential contaminant pathways would be directly through air and water, and indirectly through consumption of fish and wildlife. Air emission modelling

has demonstrated that at the mine site contaminant concentrations will not exceed occupational health and safety standards, nor will they exceed the more rigorous federal and provincial standards for environment and health. For water, there is only potential for mine discharges to result in slightly elevated concentrations of sodium in the Attawapiskat River. With regard to accumulation of heavy metals in fish and wildlife, the Proponent has presented data to demonstrate that those metals that do have the potential to accumulate (cadmium, lead and mercury) will only be present in amounts well below levels that would be of potential concern in site drainage, even before water reaches rivers. Other metals are calculated to be below PWQO and CEQG PAL values in all receiving waters, as well. However, there is potential for minor contamination from on-site incineration and from the diversion of Granny Creek. Therefore, the Proponent has committed to monitoring of country foods harvested by First Nations, in order to ensure that these contaminants remain at predicted low levels. Supporting documentation has been provided as part of formal responses to Health Canada comments.
[…]

APPENDIX F of the Victor EIS [unpaginated]

ADDITIONAL SOCIO-ECONOMIC DATA AND CONSIDERATIONS RELATING TO THE VICTOR DIAMOND PROJECT

This Appendix contains certain socio-economic information relating to the Victor Diamond Mine that that was collected pursuant to paragraph 16(1)(e) of the *Canadian Environmental Assessment Act* ("the CEAA") in response to concerns raised by the local First Nation communities. This information is restricted to socio-economic effects that are not the result of any change in the environment caused by the project, and as such, are not "environmental effects" as defined in the CEAA. The content of this appendix is therefore not required for the consideration by the Minister of the Environment, under section 23 of the CEAA, of the likelihood of the project causing significant adverse environmental effects. However, in the event that the Minister of the Environment determines, under section 23 of the CEAA, that the project is likely to cause significant adverse environmental effects, he will be required to determine whether or not such effects are justifiable in the circumstances. The information contained in this appendix may be relevant to the question of justification, should such question arise.

[…]

Increased income can have negative effects at the individual and family level, and these can spill over into negative community effects.
Although increased incomes generally produce socio-economic benefit, there are also potential downsides, experienced at the individual, household and community levels. Essential to realizing the positive benefits of increased income

is the capacity to manage that income in the interests of the household. There can be an association between increased disposable income and poor choices, such as increased gambling and use of drugs and alcohol. It is possible not only to spend income unwisely, such that potential benefits are not achieved, but also to spend it in ways that cause harm. Substance abuse harms individuals and their families, and in addition is the source of negative behaviour that harms the community as a whole.

Steady employment and the wages paid to a portion of the community will contribute to an income gap within the community, increasing inequity. Not all residents will be able to benefit from either the direct, indirect or induced Project-related employment. For the particularly disadvantaged, many of whom may be on relatively fixed incomes, the potential for inflation can exacerbate this effect. The widening of income distribution also has some potential to create social conflict.

[…]

On the other hand, experience at Musselwhite [a gold mine 500k north of Thunder bay that began operation in 1997] suggests that employment and income created by the project, and the fly-in, fly-out nature of the operation, may motivate residents of Attawapiskat to move out of the community, into large communities in the region that are perceived to have more to offer in terms of quality of life. With comparatively large Cree populations in Timmins for example, it is possible to achieve better access to services while still remaining a part of an Aboriginal group, with access to elements of traditional life. While outmigration may benefit the individuals involved, Attawapiskat needs employment for residents, with the induced economic benefit that occurs when people spend their money locally.

[…]

The project has the potential to result in increased inter and intra-community conflict and security issues, and substance(s) abuse, flowing from income disparity, inflationary pressures and potential in-migration of current non-resident community members.

A follow-up program could potentially be set up through the cooperative efforts of the First Nation, De Beers and the federal government to monitor the effects of the proposed project on the health of community members to determine whether project related activities and related social change are contributing to an increased health risk to local residents through increased inter and intra-community conflict, security issues, and substance abuse. It is anticipated that the First Nation and government will actively participate in the sharing of information that will help to prevent or mitigate unintended social change.
Public Health and Security

Potential public health and security concerns are related to poor choices in the face of increased disposable incomes and consequent ripple effects, health effects of net in-migration and contact with out of area mine workers, behaviours of mine workers and others who will travel through Attawapiskat, and health and safety of mine workers resident in Attawapiskat. To the extent that social services are unable to meet any increased demand for services as a result of these potential project effects, public health and security could potentially be further compromised.

It is of concern to the people of Attawapiskat that out-of-area workers, some of whom may be migrants who chose to reside in Attawapiskat, are a potential source of disease. Workforce management best practice will be implemented to limit the potential for contact between workers and local populations. The out-of-area workforce stationed in Attawapiskat, and linked to the development of access and power supplies for the project, is expected to be not that different in scale from workforces that have been based out of the community on previous occasions. Such workforces appear not to have led to important health or security stresses in the community in the past.

Additional disturbances could be caused by outsiders attracted by new opportunities to profit from illicit activities within the community, or by worries related to the presence of unwanted visitors in the community. As indicated by a recent case study in a Cree community on the eastern coast of James Bay, increased security concerns related to the presence of outsiders in the community can lead people to start locking their doors (DeBeers 2006).

6. Health in Northern Mining Assessments – Saskatchewan.

Much of the literature on uranium mining in Northern Saskatchewan, as well as in adjacent parts of NWT (Myers 1982, Blow 1999, Deline First Nation 2005), is of limited relevance to this survey, in that health issues have largely concerned radiation, including the decommissioning of mines to minimize future radiation. Uranium mining was established in the region in the 1940s (Buckley, Kew and Hawley 1963) before any environmental assessment had been undertaken. “Initial federal regulation towards uranium was quite narrow during the first rounds of development in the Beaverlodge area on Lake Athabasca. Limited attention was paid to workers’ occupational health and safety, less to environmental protection, and no attention at all to reclamation, communities, or socioeconomic performance.” (Parsons and Barsi 2001) Whatever the actual impacts of mining in this region may have had on health, community social problems, and the mental health of the region’s Aboriginal people were initially overshadowed by the radiation issue, and by political opposition in principle to uranium mining. Both levels of government resisted open public debate because of the political and strategic importance of uranium at the time (e.g. Golstick 1987, Yih *et al* 1995). Local opposition can by seen from the fact that in the 1970s over 80 percent of northern Aboriginal men supported a moratorium on further mine development (Parsons and Barsi 2001).

However, by the 1980s a number of Aboriginal-owned businesses and joint ventures had been formed to supply services to the mining industry, and local opposition to uranium mining had declined (Parsons and Barsi 2001), even though the perception remained among some Aboriginal people in the region that human and animal health remains at risk due to the mines (Elias, O'Neil and Yassi 1997). In April 1991 Canada and Saskatchewan created a joint federal-provincial environmental assessment on Saskatchewan Uranium Mining, to review several new proposed uranium mine developments in the Athabasca Basin. Human health and safety was one of the issues raised to the panel in public consultations (Parsons and Barsi 2001). Many of the presentations to the panel by Aboriginal people focused on the importance to their collective wellbeing of maintaining hunting, and on their political rights and claims, matters not addressed in the panel report. "Although the *Guidelines* made reference to the Dene people's deep cultural attachment to their traditional territory, the report deals with social impacts almost entirely in economic terms of employment and working conditions, business opportunities, and training programs." (Wiles, McEwen and Sadar 1999:112). The panel report stated that "there has been no detectable regional contamination of the food web in northern Saskatchewan" as a result of uranium mining operations (Joint Federal-Provincial Panel, 1997 page 41, cited in Wiles, McEwen and Sadar 1999:107).

In 1993 the Athabasca Working Group was formed, composed of three Aboriginal bands four other communities in the mining area, along with three mining companies. Provisions were made for "compensation from the companies for any loss of personal property, country (traditional) food, traditional medicines, harvest incomes, and any loss of use and enjoyment of community land, air, and potable water that results directly from any emission attributable to mining that prevents residents from harvesting, gathering, or collecting local plants, animals, and fish." Health concerns were addressed by the group, by means of the annual sampling of water, air, plants, fish and animal tissues. In most cases these samples have showed few environmental effects from uranium mining operations (Canada North Environmental Services 2003). In 1999 the companies entered into the Impact Management Agreement (IMA) with the communities, providing well beyond their legal requirements a variety of benefits in the form of summer jobs, training, placements, scholarships, and donations (Parsons and Barsi 2001). Today the companies have largely succeeded in changing many of the earlier negative attitudes of Aboriginal people in the region towards mining.

7. The Health of Canadian Aboriginal People.

As has often been noted over the past three decades, Aboriginal people in general tend to suffer from higher rates of certain health problems, both physical and mental conditions, compared to the general Canadian population (Indian Affairs and Northern Development 1980; Health Canada 2000; Health Council of Canada 2005; Waldram, Heering and Young 2000). While these generally higher rates for certain illnesses among Aboriginal people are well known, given the different ways that statistics are collected between registered Indians, Inuit and non-Indians, the fact that health and health records are a provincial responsibility, the lack of clarity as to who is or is not counted as Aboriginal, as well as the changes over time in the methods of collection of statistics, the actual comparative figures are not always reliable, although moves are under way to standardize

data collection.

Among the physical conditions is diabetes, which affects 10.5% of First Nations and Inuit vs 3.5% for the general population (Heart and Stroke Foundation of Canada 1999:36; c.f. Young *et al* 2000). Circulatory diseases, including high blood pressure, affect 18.5% of First Nations and Inuit vs 10% of the general population (Heart And Stroke Foundation of Canada 1999:30). Heart problems affect 8.5% for First Nations and Inuit vs 4% for the general population (Heart And Stroke Foundation of Canada 1999:66-7, 78). Other conditions for which Aboriginal people have elevated levels include fetal alcohol syndrome (or fetal alcohol spectrum disorder), infant anaemia, accidental injury, pertussis**,** rubella, shigellosis, and genital Chlamydia (Health Canada 2004). In Newfoundland and Labrador the Innu and Inuit have hospitalization rates for pneumonia 4 times that of the non-Aboriginal population (11.6 per 1000, compared to 3 per 1000) (Alaghehbandan, Gates and Macdonald 2006).

The social pathologies and mental problems for which Aboriginal people have higher levels include substance abuse, addictions, family violence, child neglect, self-injury and suicide (Adelson 2004). "The single most important group of health problems in terms of morbidity and mortality" among Aboriginal Canadians are accidents and violence, often involving alcohol (Young 1988:54). For the year 2000 "The most common causes of death for First Nations people aged 1 to 44 years was injury and poisoning. Among children under 10 years, deaths were primarily classified as unintentional (accidental). For First Nations aged 45 years and older, circulatory disease was the most common cause of death (Health Canada 2004).

Youth suicide is a major concern for many communities. In 1999, suicide accounted for 38% of all deaths in Aboriginal youth aged 10-19 and for 23% of all deaths in those aged 20-44 (Centre for Suicide Prevention 2003). The total First Nation suicide rate was 27.9 deaths per 100,000; the Canadian suicide rate was 13.2 deaths per 100,000 population (Assembly of First Nations nd). In a study conducted in 1992 researchers found that of 100 Inuit youth (14-25 years of age) residing in a community on the Hudson Bay Coast in Northern Québec thirty-four percent reported a past suicide attempt and 20% had attempted suicide more than once. Forty-three percent reported past thoughts of suicide (26% in the month before the survey) and over 40% had friends who had attempted or completed suicide in the past. (Malus, Kirmayer and Boothroyd 1994)

Other indirect indications can be seen in such statistics as the large numbers of children in care, and a disproportionate per capita numbers of criminal charges and incarcerations (York 1990)[17]. It has been estimated that alcohol abuse directly affects approximately one third of all Canadian Aboriginal people (Maracle 1993:10). In some of the smaller northern Aboriginal communities, social pathologies may periodically become so widespread as to disrupt normal social functioning (York 1990, Driben and Trudeau

[17] Despite the generalizations sometimes made about the health impacts of mining, I am not aware of any studies that distinguish the health of those Aboriginal people impacted by mining from others who were not.

1983). These conditions may also impair the normal levels of care that individuals are expected to give to themselves and others, adding to the already high rates of physical injury commonly noted among adults and their dependants (Fiddler 1985).

Despite the efforts of health professionals to address these situations, they face particular difficulties, especially where what are required are changes in lifestyles and cultural practices (Desapriya and Pike 2006). Despite the attention that has been paid to social pathologies, the overall situation does not, as yet, seem to be improving. There are even some indications that certain mental health conditions can be, by their nature, self-reproducing from one generation to the next. Specific examples of this include fetal alcohol syndrome (Tait 2003) and 'trans-generational trauma' (Ralph, Hamaguchi and Cox 2006); there may also be trans-generational impacts that affect survivors of sexual abuse (Young and Katz 1998) and children of alcoholics (Reich *et al* 1993).

Many of the health problems that are especially prevalent among Aboriginal people, particularly social pathologies, occur among a wide array of diverse groups, living in many different kinds of communities, from the most isolated to the most urban. These kinds of social pathologies are encountered not only in North America, but in other 'settler' societies such as Australia and New Zealand, encompassing a wide variety of contact and colonial experiences and conditions. Yet not all these colonized indigenous peoples exhibit the same degree of pathology. Unfortunately, partly in order to maintain the confidentiality of the information, official health data are not generally made available for individual communities (O'Neil 2001), meaning that the generalized form in which the statistics are generally presented may mask significant variations between different local Aboriginal groups.

When it is possible for health statistics to be examined on a community-by-community basis, a different picture sometimes emerges. For instance, in BC, while generalized suicide rates for First Nations people in the province are significantly higher than for the general population, certain communities have consistently lower suicide rates, in some cases even lower than for the overall population (Chandler and Lalonde 1998, Chandler *et al* 2003). Initially Chandler and Lalonde reported that the common factors in those First Nations communities that have low suicide rates were indicators of "cultural continuity". In later work, these authors have shown that these factors also reflect a greater degree of local control by the group over matters affecting the daily lives of community members. They have now extended this kind of research to Manitoba. In Quebec, when the statistics on suicide have been examined for just the James Bay Cree they prove to be no worse than for the general Quebec population (Barss *et al* 1997). An unfortunate implication of these observations is that, if some particular Aboriginal communities have better health statistics than the published generalized figures, there must be other Aboriginal communities where the statistics are actually even worse. For instance, a related group to the James Bay Cree, the Innu of Labrador, have a rate of suicide that is reported by one source to be 17 times that of the general population of Newfoundland and Labrador (Sullivan 2004), and a higher number of suicide attempts (Alaghehbandan, Gates and Macdonald 2005)

The practice of only providing generalized health statistics, rather than on a community by community basis, also means that if EIAs are to include a serious examination of existing community health issues, proponents may have to undertake their own baseline health studies. We have seen above that in some recent EIAs only a general impression of baseline conditions is given, without providing actual statistics, because unless the proponent actually collects them they are not generally available. A baseline community health survey would establish the physical, mental and community health of the particular Aboriginal communities that will be impacted by the development. For northern parts of provinces regional statistics specific to Aboriginal people are unlikely to be available, unless there is a regional Aboriginal health authority such as the James Bay Cree Health board (Cree Board of Health and Social Services of James Bay 2005). In jurisdictions with relatively large Aboriginal populations, such as Nunavut, NWT and Yukon, public statistics are likely to be more useful. In some cases census data expressed by census districts may also provide some useful Aboriginal health information.

In the case of social pathologies, beyond the issue of baseline conditions, there is little consensus among medical and social scientists about the exact reasons for these conditions, and what kinds of treatment are most effective. Given the kinds of behaviour that needs to be understood - suicide, alcohol and other substance abuse, violence – this is a demanding area of research. Various explanations for the phenomenon have been proposed, but I am not aware of any that have been scientifically verified, so that rather than well-established causes, we have a number of assumptions and hypotheses. Most scholars assume that Aboriginal social and mental problems are the result of European contact and colonization, but this does not account for why there is a crisis now, and not at an earlier period, closer to the initial impact from such traumas as widespread deaths from European diseases, and a loss of culture and political autonomy. Some use psychological concepts in their explanations, the most common being ‘stress’ (e.g. Vallee 1968, Chance 1968, Wintrop 1968, Berry 1990, Bennett 2003). This idea has been refined by others through the diagnosis of ‘post-traumatic stress disorder’ (PTSD) (Kirmayer 1994 c.f Napoleon 1992, Manson et al 1996). Muid (2006) refers to ‘historical trauma’ to account for the observation that the disorder can last over several generations.

Without questioning these psychological concepts and theories, social scientists have tended to point to the causal role of a variety of social factors, such as poverty and industrialization (Niezen 1993), dispossession (Kulchyski 1988), forced settlement or relocation (Shkilnyk 1985, Loney 1987), cultural discontinuity (Chandler and Lalonde 1998), worklessness (Elias 1996) or residential schooling (Hodgeson 1990; Miller 1996; Malloy 1999).

Forecasting the future impacts that projects may have on communities that are already suffering from social pathologies poses a difficult problem for social impact assessment. Using the medical model of social pathology, scientific studies tend to be specialized; that is, each tends to be restricted to a specific pathological condition. This means that few medical studies can take account of real world situations, in which there may well be a complex of multiple interrelated co-occurring conditions, like depression, alcohol

abuse, family violence, fetal alcohol syndrome, gas sniffing, and drug abuse. The medical literature tends to treat each of these as a distinct health issue, each requiring a distinct diagnosis.

Given such difficulties, and setting aside, for the time being, the question of causes, the complex of Aboriginal social pathology symptoms might be referred to more broadly as 'social suffering' (Tanner In Press). It is not as difficult to identify the origins of the symptoms of Aboriginal social suffering as it is to look for causes, at least for northern Canada. Although alcohol was introduced by the fur trade, the complex of symptoms we are discussing here are of much more recent origin, having emerged with the move from hunting camps to houses within villages or towns. Most northern Aboriginal peoples, defined generally as those living north of the agricultural zone, were only settled within the past half-century or so, having previously lived as nomadic hunters and trappers. This settlement process was essentially a federal initiative, one intended to improve living conditions by providing access to housing, Western health care, formal education and social services. An underlying assumption of the policy was that the move to a settlement would lead to a change in the local Aboriginal economy from 'living off the land' to market-based wage employment and consumption. However, in most places these new wage employment opportunities did not keep pace with the newly settled and rapidly expanding Aboriginal populations.

The process of settlement from the camps effectively became the 'starting process' for a number of health problems, both physical and mental. Settlement did bring about some physical health improvements, such as reduced infant mortality and extended life expectancy, but it had unintended consequences, including the rise in certain problems like diabetes and obesity, most likely due to such factors as dietary change from bush food to store food, and reduced physical activity, apparently along with a genetic predisposition (Young *et al* 2000). Other diseases were likely exacerbated by poor and overcrowded housing, a lack of clean water, exposure to pollution and unhealthy life style choices like smoking. These kinds of risks to physical and mental health problems have not affected all northern Aboriginal communities equally, in that some have exhibited more resilience in adjusting to settlement life and the cash economy.

8. Mining and Aboriginal Health.

Mining has, in the past, been associated with health risks potentially affecting both Aboriginal people and others in the area, especially the mine employees. While underground mines generally have a worse record of accidents and poor air quality than do open pit operations, some of the latter have also experienced accidents, for instance with the unexpected collapse or slumping of pit walls, heavy equipment malfunctions or blasting accidents. Dust may become a problem, and can be associated with lung disease. Other hazards may include excess noise or vibration. Settling ponds may be a source of environmental pollution, potentially affecting ground water, and the health of animals and possibly humans.

Some scholars have generalized about the health impacts of mining on northern Aboriginal communities. For example, Gibson and Klinck (2005), drawing on other studies, outline a number of risks to northern Aboriginal people from mining, including mental stress and anxiety that may result from the nature of mining work, road fatalities during long commutes that may also be attributable to mental exhaustion and loss of concentration, and depression that may be triggered by stresses in mining work, which is especially dangerous because of its well established link to suicide, even though they also note that, as a group, miners do not suffer significantly higher rates of suicide. They also note that an increase in alcoholism and drug abuse at northern Canadian mines has been facilitated by high wages (2005:120-9)[18].

According to another source:

> In addition to health impacts on local populations as a result of contamination of air and water by the mining process, numerous other impacts may result from mining development including: increased rates of alcoholism and sexually-transmitted diseases as a result of in-migration of miners from outside the area; increased levels of family violence due to changes in the socio-economic structure of the community; and decreased access to country foods (e.g., wild meat) as a result of ecological degradation and an increase in conflicting human activities in traditional harvesting areas. These issues are addressed in great detail by the North-Slave Métis Alliance (2000) in their report *Can't Live Without Work* (Hipwell, Mamen, Weitzner and Whiteman 2002:11)[19].

Ritter looks at some implications of the current popularity of long distance commuting in northern mining:

> On the positive side, the long distance commuting option provides employment for workers from older established mining towns, thereby helping maintain such communities. On the negative side, employment opportunities may be lost to residents of communities somewhat closer to the mine site. Furthermore, the stimuli to small businesses provided by the consumer demand on the part of the mine workers may migrate to the towns of origin of the commuting miners. This may be desirable or undesirable depending on the circumstances (Ritter 2001).

Other concerns over potential negative social impacts of mining have been raised at public hearings on proposed mines, such as those for the Voisey's Bay nickel mine. Some local Aboriginal people expressed mixed feelings about the new, but possibly stressful, employment opportunities, available only for those with qualifications, along with an increase in the availability of consumer goods, alcohol, drugs and gambling. Some feared that with outsiders taking most jobs they would for the first time become a minority, possibly subject to racial stereotyping, while some women were concerned with their possible increased vulnerability to sexual exploitation. Wage work and shift schedules, along with attendant changes in the organization of time, were seen by some to involve a difficult adjustment, one that may have ramifications for family life. (Voisey's Bay Nickel Co. 1997, Chapter 24).

[18] See the CD attached to this report.
[19] See the CD attached to this report.

In the Victor case noted above it was suggested that differences in income would emerge, undermining a previously egalitarian social order (De Beers 2006). This could well undermine efforts at community building, that is, the willingness of community members to voluntarily work together on community issues, including health problems.

To summarize, mining might accelerate the same kinds of urbanizing processes that were apparently involved in moving from camps to the settlement, exacerbating the associated social problems and other health issues that are generally attributed to stress.

Negative health impacts on local Aboriginal people have been attributed to northern industrialization in general, and especially to mining. The Faro Mine in the Yukon is said to have negatively impacted local Aboriginal people, mainly due to "alcohol abuse, racism, violence against the Ross River Dena, and ignorance toward their culture and traditions. The impacts include among others, high death rate related to alcohol and drug abuse (e.g. car accidents, burning in cabins, freezing in the cold, suicide), family violence and break-up, rape, loss of self- respect" (Dreyer and Meyers 2004:29).

Mines require a highly trained work force, both blue collar and white collar, which may rule out many local people who lack the required qualifications, although mechanisms to overcome this problem have been included in IBAs. Mines generally have a limited life, so that they may cause, or contribute to, a boom and bust economic cycle, which has been linked to health problems. For instance, when, in 1982, the uranium milling and mining operations at Uranium City in northern Saskatchewan closed and local people returned to the home communities, the population of one village suddenly increased by 50%. As a result, drunkenness and violence became such a serious problem that the Medical Services Branch refused to station a nurse there for 19 months (Elias *et al* 1986:53).

Ritter, in an overview of mining in northern Canada, notes that:

> There may also be social problems for indigenous peoples. Mining activities and the relocation of outsiders into these areas may introduce transient mining personnel who may bring with them alcohol, different patterns of consumption and foreign life-styles. These disrupt community life and traditional ways of living, with adverse impacts on indigenous societies generally. However, in most but not all parts of Canada, these negative effects occurred well before the advent of mining. But secondly, there may also be negative effects upon the economic activities of indigenous peoples. For instance, hunting, herding, or foraging areas risk being disturbed or destroyed. Rivers may be polluted and fishing activities damaged. Third, the environmental impacts of mining may affect the health of indigenous peoples directly through air and water pollution, and indirectly through their impact on fishing or other economic activities (Ritter 2001).

Ritter goes on to note that after Aboriginal land rights were acknowledged in Canada in the 1970s there was a period of "pseudo-participation", but that it was not until the 1990s that Aboriginal groups gained a significant influence in the planning of the mine, and in the sharing of the benefits, through such mechanisms as Impact Benefit Agreements.

Beyond the health of a particular community, or the impacts of a particular project, there is the issue of the overall health of the environment of a region, including the health of its human inhabitants. One format for assessing overall environmental health is used by the Northwest Territories, in the form of an Environmental Audit. The recent audit report concludes that one of the two most serious concerns is the lack of progress in "community wellness" (SENES 2005).

9. Conclusions.

In this report I have emphasized some of the health problems of Aboriginal people, including those that have been associated with mining in the literature. However, the mining industry has improved its health record, and with good research, good planning and good will, most work-related health problems of employees can be avoided. For this reason I have focussed on the literature dealing with health problems of communities outside the work site, including, as background conditions, health problems that are independent of mining. It needs to be emphasized that each northern Aboriginal community is unique; some have largely avoided most such problems, while others are on the road to healing themselves as communities. Moreover, some mining companies that operate in the region of Aboriginal communities have come to recognize the vulnerabilities as well as the strengths of this social environment, and have gone well beyond their legal requirements in order to address concerns of local Aboriginal people. Northern Saskatchewan illustrates the remarkable degree to which the previously poor relationship between the mines and the Aboriginal communities has been significantly turned around.

One issue that has emerged in this literature is the uncertainty and ambiguity that surrounds issues of the inclusion of health within environmental assessment. This is particularly the case for social and mental, as opposed to physical, health. This may reflect the fact that there is little unanimity in the literature on the causes and cures for the most common social pathologies affecting Aboriginal people. The psychological approach emphasizes various kinds of stress, while the social science approach focuses on the impact of rapid changes to a wide variety of social, economic and political conditions.

Health impacts are included in the Nunavut and Ontario EIAs, even though the issue of mitigation was not fully addressed. The guidelines ask for baseline data on both direct and indirect heath indicators, including for community wellness, specifically asking for both direct and indirect indicators of social pathologies. The Nunavut EIAs generally interpret the health impacts requirement as applying mainly to employees, less so to their communities. The Victor EIA does set a precedent, in that the EIS acknowledges in some detail potential impacts on both individual and the health and wellness of employees and of the adjacent community, including the impacts on existing social pathologies. Given that the Nunavut cases involve fly-in fly-out employment, there is the question of the mine's degree of responsibility for impacts on the communities from where these employees are drawn. Does commuting via a road linkage to the employee's community,

which will be the situation between the Victor mine and the community of Attawapiskat, imply a greater degree of responsibility?

Another question that comes out of this literature concerns whether the existence of pre-project community health problems is to be taken as equivalent to a baseline component of the physical environment, such that, for example, a project could be required to avoid any community where the social environment is judged to be too vulnerable? Although it has been noted that the Berger Enquiry did successfully recommend against the Mackenzie Valley pipeline of the 1970s on such grounds, this remains the exception, not the rule. The Victor EIS bases itself on the assumption that either avoiding or being able to mitigate health or social impacts cannot constitute a make-or-break EIS requirement. In the absence of specific mitigations, and given the uncertainties and the potentially time period over which such impacts might occur, such projects probably require an independent health monitoring program, with specific future mitigation to depend on its findings.

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Appendix A. Annotated Sources

The following includes annotations written by me, passages abstracted from the text, and descriptions or abstracts supplied by the publisher. In the latter circumstance I have labelled the annotation as "Publisher's abstract" and included it without my own comments or corrections.

Alaghehbandan, Reza, Kayla D Gates and Don Macdonald 2006 Hospitalization due to pneumonia among Innu, Inuit and non-Aboriginal communities, Newfoundland and Labrador, Canada. *International Journal of Infectious Diseases.* Mar 11.

Author's abstract: OBJECTIVES: The objective of this study was to compare hospitalization rates due to pneumonia between Innu/Inuit communities in Labrador and non-Aboriginal communities on the Northern Peninsula of Newfoundland, Canada. METHODS: This is a comparative study using data on hospitalization due to pneumonia for the period from April 1, 1995 to March 31, 2001, for the Innu/Inuit communities in Labrador and a sample of non-Aboriginal communities on the Northern Peninsula of Newfoundland. Data were obtained from the provincial hospital database. Hospitalization rates among the study groups were compared by age, gender, and type of pneumonia. RESULTS: The hospitalization rate due to pneumonia for the Innu/Inuit communities was 11.6 compared to 3.0 per 1000 population for non-Aboriginal communities ($p<0.01x10(-4)$). Among the Innu/Inuit communities, infants had the highest rate of hospitalization due to pneumonia (93.4 per 1000 population), while the elderly (10.2 per 1000 population) were found to have the highest rate among the non-Aboriginal sample. Overall hospitalization rate for the Innu communities (16.9 per 1000 population) was higher than that for Inuit communities (8.4 per 1000 population) ($p<0.01x10(-4)$). CONCLUSIONS: Aboriginal communities, particularly the Innu communities, had higher rates of hospitalization due to pneumonia compared to the non-Aboriginal sample. Findings of this study will be used as a foundation for more specific studies in an effort to increase our understanding of pneumonia and associated risk factors.

Alaghehbandan, Reza, Kayla D Gates and Don Macdonald 2005 Suicide attempts and associated factors in Newfoundland and Labrador, 1998-2000. *Canadian Journal of Psychiatry* 50(12):762-8

Author's abstract. OBJECTIVE: This study examined the epidemiology and associated factors for suicide attempts requiring hospitalization in the province of Newfoundland and Labrador. METHOD: We extracted data from the provincial hospital separation database. Outcome measures included incidence rates (IRs) of suicide attempts by age, sex, and geographical region of residence. We also analyzed sociodemographic data to determine associated factors. RESULTS: A total of 978 patients who were hospitalized owing to suicide attempts were identified for 1998-2000, giving an overall IR of 68.7 per 100,000 person-years (P-Y). The age-specific rate for people aged 15 to 19 years was much greater, at 143.0 per 100,000 P-Y. The overall female-to-male ratio was 1.3, with an attempted suicide rate of 76.1 per 100,000 P-Y for female patients and 60.3 per 100,000 P-Y for male patients ($P = 0.001$). Labrador (210.2 per 100,000 P-Y), a region

with a high Aboriginal population, had a higher rate of suicide attempts, compared with the island portion of the province (59.0 per 100,000 P-Y) (P < 0.001). More than 70% of hospitalizations were associated with psychiatric diagnosis. Poisoning was the most frequent method of attempting suicide. Higher IRs of suicide attempts were found among people who were divorced or separated and among those who were less educated (P < 0.001). CONCLUSIONS: Suicide attempt represents a significant public health concern in the province, particularly in Labrador. An increased risk of suicide attempts was associated with single status, female sex, younger age (teen or young adult), and low educational level during the index attempt. Further research is needed to explicate these findings and increase our understanding of attempted suicide.

Athabasca Working Group 2005 *Annual Report 2004*.

This working group is composed of companies mining uranium in northern Saskatchewan and the local Aboriginal and part-Aboriginal communities that are impacted. In 1994 the major concerns of the Aboriginal communities were identified to be: "jobs; training and business; environmental protection; and benefits to the communities." The report lists the group's current activities as including: "distributing corporate donations and sponsorships, awarding northern post-secondary scholarships, participating in the Mineral Sector Steering committee to guide Multi-Party Training Plan programs to train Northerners for mining positions business activities related to developing Northern contractors and suppliers, funding and involvement for the Community Vitality Process (out-migration study, Northern Youth Workshop and northern health food basket survey), co-funding the Multi-Party Training Plan and helping to ensure that northern issues and concerns are considered in uranium mining activities." The group also administers a Trapper Compensation Agreement, and the construction of a Retreat Shelter.]

Bodely, John H.1999 *Victims of Progress.* Fourth Edition. Mountain View CA, Mayfield.

The text includes the following references to the impact of development on tribal peoples: "… development leads to social disorder …" (p133) "Under the impact of major economic change, family life is disrupted, previous social controls are often lost, and many indicators of social anomie such as alcoholism, crime, delinquency, suicide, emotional disorders, and despair may increase." (P.144)

CARC 1995 Concerns of Aboriginal Peoples *Northern Perspectives* 23(1) [Special Issue on Mining]

This includes a quote on the impact of mining from a local Aboriginal leader. "Social Disruption - Large numbers of transient workers during further exploration and construction of facilities are a threat to the stability of the community. The expectation [is] for escalating levels of social problems...." Chief Joe Johnson, Kluane First Nation.

Costa, Silvana 2004 'A Review of Long Distance Commuting: Implications for Northern Mining Communities' Paper given at the Canadian Institute of Mining Conference.

The text includes the following passage: “Mining companies have attempted to establish dialogue with Aboriginal groups regarding a mutual understanding of both parties’ interests, but reports suggest that major gaps still exist (Keith 1995; Sosa and Keenan 2001). Problems include inadequate understanding of Aboriginal values and ways of life and concerns regarding development activities; failure to provide project details to the indigenous community in a timely and accessible fashion; failure to incorporate traditional knowledge into the environmental impact assessment and mining development enterprise; and failure to incorporate an understanding of the nature of indigenous concerns (Cleghorn 1999; Tongamiut Inuit Annait Ad Hoc Committee on Aboriginal Women and Mining in Labrador 2001). Specific concerns in health and well-being include socio-cultural stress; racism; the need for assistance with finances and budgets; personal development; self-esteem and confidence; physical health and positive mental health, housing provision issues and family structure breakdown (Hobart 1989; Whiffen 1991; TCRC 1996; Kwiatkowski and Ooi 2003).”

Dreyer, Doris and Heather Myers 2004 *Impact and Benefits Agreements: Do the Ross River Dena Benefit from Mineral Projects?* Report to Northern Land Use Institute, University of Northern British Columbia.

Publisher’s Abstract: “The negotiation of Impact and Benefits Agreements (IBAs) for large-scale hard mineral developments has become common practice within Canada and increasingly throughout the world. Initially, Canadian IBAs were negotiated between the Federal government and industry in the interest of indigenous people affected by the development. With the empowerment of indigenous peoples in Canada, the negotiation of IBAs has shifted from government to the First Nations themselves. Although IBAs are increasingly used for large-scale developments, only little information is available to their actual success in providing long-term benefits. This project aims to close this knowledge gap through the analysis of IBAs negotiated by the Ross River Dena, a First Nation community in the Yukon Territory. Through the use of a theoretical IBA framework developed from a review of current IBA literature two IBAs, the Faro Mine and the Kudz Ze Kayah agreement, have been analysed according to their success in providing short and longterm benefits to the community. The result is a set of recommendations that can be used by the community to improve future IBA negotiations, and as hypotheses for further studies.”

Driben, Paul and Robert S. Trudeau 1983 *When Freedom is Lost. The Dark Side of the Relationship between Government and the Fort Hope Band.* Toronto, The University of Toronto Press.

The study deals with the four Ojibwa communities of the Fort Hope band: Fort Hope, Webequie, Landsdowne House and Summer Beaver. Only the first is a reserve. Landsdowne House in 1975 had a reputation as being “one of the most violent Indian communities in northern Ontario. Public drunkenness, fist-fights and vandalism are all commonplace. […] young children lying on the ground in an unconscious stupor from sniffing gasoline in […] not uncommon.” (p. 7). Drunks were tied to trees by the OPP

until they sobered up. When the drinking and violent attacks got too bad, people headed for the bush to wait until the trouble died down. In 1977 the violence reached epidemic proportions. Three white teachers were attacked, and the school was closed. (p. 8) In 1978 the problems recurred, and in response half the people had left to establish a new community at Summer Beaver. (p. 9).

Throughout this book reference is somewhat misleadingly made to 'White Paper programs', to refer to various federal Indian Affairs and Manpower make work and economic development programs. The study sees the root of the problem in the economic dependence of the communities on the federal government. This was not due to a plan by government officials. Rather, it is "rooted in the zeal that characterized the way government agencies promoted their White Paper initiatives in the band and the paternalistic methods they used to deliver their programs." (p. 10)

Chapter 3 includes the following: "The [nomadic hunting and trapping] life-style that existed in the band from the time the treaty was signed [#9, 1905] came to an abrupt end during the 1960s." (p. 23) The authors says this was due to two moves: the 1962 shift from residential to local schools and, after the Fort Hope band became dependant on welfare and social assistance, the [1969] White Paper resulted in a massive flow of new make-work, job-training, and community development programs. This led to greater dependence, and vulnerability to cut-backs (p. 23-4). Local schools resulted in the need for housing, and in 1966 a housing program was begun, but only enough so that only those with the biggest families got a house. "Altogether these changes meant that by the beginning of the 1970s the people were being governed by a hastily constructed government geared to sedentary life and to interacting with federal and provincial officials." (p. 27) It led to people having to decide between trapping and keeping their families united. "[…] by the end of the decade [of the 1960s] it [trapping] was on a downward spiral (see Fig 1)." (p. 27) [However, fig 1, p. 28, does not convincing illustrate such a downward spiral. But fig 2, p. 42, does show this happing between 1969 and 1975.].

Chap 4. In the section 'Why people stay'. "Government employment and training programs have the additional benefit, along with income, of allowing people to stay and to keep their communities intact. […] They are places where people act the same way, speak the same language, think along the same lines, believe in the same things, and share the same goals. In a survey of 221 band members 'an overwhelming majority indicated that they would rather live in the villages than in a city or town. (page 46). Even teenagers […] have a strong sense of community. […] most lived in the villages after they quit school" (p. 47). Among those who left to go to school, the main reason for the 50% dropout rate was homesickness. (p. 47).

Gitzel, Tim President & CEO, Cogema Resources Inc. 2002 'Developments in Canada's Uranium Industry' [Speech]

" … Aboriginal participation in northern Saskatchewan uranium mines is also an integral part of the industry. The challenge is now to increase employment levels above the 50%-

60% range by finding candidates with specialized technical and academic training who are also residents of small, remote northern communities. Our industry continues to support a variety of scholarship, apprenticeship and other training programs to help make this happen. The industry has worked with northern communities to develop innovative joint projects such as the Athabasca Working Group, focused on environmental, economic and social effects of several mines, in relation to the Athabascan communities.

The Negotiated Impact Management Agreement provides a plan for a number of joint activities, such as the community-based environmental monitory program, where northern hunters and fishermen help monitor these aspects of the environment, which are particularly important to them. The Community Vitality Project works with all of the northern communities to jointly monitor aspects of social well-being for quality of life that are important to the north. Examples are migration patterns, youth issues and healthy eating. This public support and community involvement may seem a bit off topic but it is such an important aspect of our industry, which can affect nearly all of our decisions. This support, in addition to some exceptional geology, provides us with considerable comfort about the future of uranium mining in Saskatchewan."

Hipwell, William, Katy Mamen, Viviane Weitzner and Gail Whiteman. 2002. *Aboriginal Peoples and Mining in Canada: Consultation, Participation, and Prospects for Change*. North-South Institute.

Publisher's Abstract: "Some forty years ago, Canada's Aboriginal Peoples – First Nations, Inuit and Métis – had no say in decision-making about mining activities on or near their ancestral lands. Today, there has been a proliferation of different mechanisms for including Aboriginal perspectives in decision-making, and a growing body of literature is devoted to examining the issues at the crossroads of mining and Indigenous Peoples in Canada. While some authors highlight the inroads made by industry with respect to changing corporate practices (e.g., Sloan and Hill 1995), others point out there is still a long way to go before Aboriginal views are appropriately integrated into decision-making (e.g., Innu Nation/MiningWatch Canada 1999).
This paper examines some of the factors that led to this 'flip' in corporate and government policy, focussing in particular on the topic of consultation. In recent years, consultation has become a hot topic in Canadian Aboriginal, policy, legal, industry and NGO circles as one means of ensuring more community input into decision-making about mining. Multistakeholder processes such as the Whitehorse Mining Initiative (WMI) and the more recent National Round Table on the Environment and the Economy (NRTEE) Task Force on Aboriginal Communities and Non-renewable Resource Development have underscored the need for better consultation processes as a means to defuse potential conflict and ensure more equitable Aboriginal participation in decision-making. The Supreme Court of Canada has also ruled that Aboriginal people whose Aboriginal rights might be infringed should – at a minimum – be consulted.
Environmental Impact Assessment procedures now include public participation mechanisms. Mining policies and regulations have undergone an apparent shift toward principles of sustainable development and more inclusive processes. And a handful of exploration and mining companies have developed corporate codes of conduct and

policies with regards to activities near Aboriginal territories, some with guidelines for consultation.
Regardless of all these developments, there is a dearth of understanding of Aboriginal perspectives on consultation in relation to mining activities, and what constitutes appropriate and meaningful consultation and participation mechanisms. Some Aboriginal groups have begun to articulate their perspectives to attempt to stop what many of them regard as a looting of the wealth of their land.
However, these efforts have been far and few between, and Aboriginal groups are often in a situation where they are reactive rather than proactive."

Keith, Robert F. 1995 Aboriginal Communities and Mining in Northern Canada *Northern Perspectives 23(3-4)*

Includes the following: "Issue 8. Protecting Societies Universal concern for the social, economic, and cultural impacts from all stages of mineral development is juxtaposed against a keen interest by aboriginals in participating in the benefits of economic development. For many aboriginal people, the challenge to integrate "culture and economics" means trying to infuse resource development decisions with the customs, traditions, and values of their societies. For others, the challenge is to plan in ways that limit the "boom and bust" swings in market economies. For still others, the issue is to prevent social pathologies and all the socio-psychological problems these conditions bring upon communities, especially among children. As women, in particular, give testimony to these cultural issues, there is a sentiment in some quarters that women can and should play more central roles in development decision making. After the miners are gone, people from the various northern regions will remain and still will need to find ways to sustain themselves and their families. CARC's NMP research team has centred on the concept of "healthy communities," believing that environmentally sustainable development depends on sustainability in social, economic, cultural, and political (self-governing) realms. This suggests that both social impact assessments and socio-cultural community planning should be part of the overall mineral development process. Opportunity. The Northern Minerals Programme [a 1995 CARC initiative] will attempt to assess the state of both these concerns in the Slave Geological Province (SGP). As aboriginal communities in other jurisdictions wish, these initiatives could be expanded to examine cultural, economic and social issues outside the SGP."

The Labrador West Status of Women Council and Femmes Francophones de l'Ouest du Labrador 2004 *Effects of Mining on Women's Health in Labrador West.* Report.

Includes the following: "Social Health: The following services were rated as inadequate by women in our survey: accessibility for people with disabilities, public transportation, specialized health care (including gynecological services and visiting psychiatrist), child health assessments and evaluations, well paid economic opportunities for women, occupational training that matches available jobs, housing, legal services relating to child support, divorce and custody, services to women of other cultures (including Francophone and Aboriginal), mental health, services for elderly women, equal opportunities for women and contributions to living by the mining companies and

governments. Social problems identified include addictions and depression, possibly caused by isolation and shift work. Mental Health: Among both Anglophone and Francophone women, lack of specialist mental health workers, depression and dust were identified as mental health issues. Among the Francophone women, who have less support and fewer services, low self-esteem, addictions, gambling, eating disorders, family breakdown, cycles of suicide, stigma around seeking help and navigating the system were identified as major issues."

MacDonald, Sandy *2006* "Building Healthy and Safe Communities" — The Health Perspective. *Northern Perspectives* 30(1)
http://www.carc.org/pubs/v30no1/CARC_Northrn_Perspctves_Winter_2006.pdf

Includes the following quote: "*What are the largest health challenges facing Northerners now?* The major health challenges for Northerners are in the areas of infectious diseases, mental health and cancer. There is a higher than average amount of respiratory illness; there is a higher incidence of sexually-transmitted infections and other infectious diseases like tuberculosis. These are forms of infectious diseases you find among people who live in less than adequate housing. The mental health issues have to do with higher incidences of suicide and suicidal behaviour, mostly among younger people in Nunavut. Associated with that there is a kind of malaise among younger people that makes them more prone to attempt to hurt themselves, seemingly impulsively, to abuse substances and so on. Much of these troubles stem from the social upheaval the population has undergone over the past 40 or 50 years."

Mining Watch Canada 2006 *There Are No Clean Diamonds: What You Need to Know About Canadian Diamonds*. MiningWatch Canada, December 2006.
http://www.minesandcommunities.org/Action/press1300.htm

Text includes references to the social impacts on the Victor mine on the community of Attawapiskat. On the Victor Mine: "There is definite concern regarding inflationary pressures, first on wages and then more broadly in the local economy. Inflation will put pressure on housing costs, energy costs and food stuffs. The average wage from the Victor project will be $40,000. Present average income in Attawapiskat is $17,000. The total increase in community wages will be $3-4 million annually. The increase to average household income and the economy as a whole will be in the order of 26 to 35%. […] 'Increased income can have negative effects at the individual and family level, and these can spill over into negative community effects.' There is an association with increased incomes and gambling, drugs and alcohol, and there is a likelihood that there will be a greater income gap and increasing inequity. […] The Victor project may draw home some of the almost 45% of Attawapiskat First Nation members that live off reserve. These returnees may obtain jobs instead of the on-reserve population, and put pressure on supplies and services, particularly housing. They may cause 'inflation, contribute to drug and alcohol problems, undermine traditional values, compromise public health and security'. They may create demands for increased social and recreational services."

Noble, Bram 2005 Assessing Human Health in Canadian Northern EA: A State-of-Practice Survey. Paper given at the 2005 IAIA conference.

Publisher's Abstract. "In response to the 1987 World Health Organization's conceptualization of health in EA to extend beyond physical health and to include social and public health concerns, several studies have addressed the need for, and challenges to, bridging public health and environmental assessment. Few studies, however, have empirically examined the state-of-practice of health assessment in project EA from the practitioners' perspective. From the Berger Inquiry of the 1970s to the more recent Mackenzie Valley gas project, EA at the federal level is strongly reflected in Canada's northern regions. The consideration of human health impacts in Canadian northern EA is guided by several pieces of federal, provincial and territorial legislation including the Canadian Environmental Assessment Act, which defines an 'environmental effect' as including any change that a project may cause in the environment, including any effect of any such change on health. The practice of addressing human health as part of the EA process is receiving increased attention from EA and health practitioners alike. That being said, there has not been a systematic examination of the practice of health integration in Canadian northern EA since a 1990 workshop by the Canadian Environmental Assessment Research Council acceded that human health is not adequately considered by processes that evaluate the effects of northern development projects. This paper presents the results of a practitioner survey of health integration in Canadian northern EA. Based on the experiences of Northern EA practitioners, community health workers, administrators, and project proponents, the state-of-practice of health assessment in Northern EA is explored, including the extent to which human health and health determinants are considered in each phase of project assessment, perspectives on the importance of health integration in Northern EA, and the perceived barriers to effective health integration."

Niezen, Ronald 1998 *Defending the Land*. Boston, Allyn and Bacon.

Publisher's abstract: "What are the social forces that are destructive to a native society and how are their leaders trying to overcome them? Many have already heard of the campaign of the Cree people to protect their forest way of life from the impact of hydro-electric development in northern Quebec; few have heard in any detail the outcome of this campaign and what it means for the future of indigenous societies. Readers will find a systemic method for documenting the social impact of large-scale development on village communities. This study serves to balance the more common theme that focuses exclusively on the forces of acculturation and social destruction of native communities."

NWT 2005 Environmental Audit.

From Summary and Conclusions, the following quote: "The two most disturbing of these [conclusions] are: the recent large decreases recorded for the size of caribou herds that Aboriginal people living in the NWT rely on as a major source of subsistence; and, the need for action in the area of socio-economics and community wellness. With respect to the latter, while traditional economic indicators show that the NWT population and

economy are growing, there is no commensurate progress in community wellness with numerous measures of social well-being being found to be less favourable than national comparisons. The social problems identified appear even more pronounced in the NWT smaller communities and are more associated with the Aboriginal population. This situation requires action by government agencies that have health and social service mandates."

O'Faircheallaigh, Ciaran and Tony Corbett 2005 'Indigenous Participation in Environmental Management of Mining Projects: The Role of Negotiated Agreements.' *Environmental Politics*, Vol. 14 (5):629 – 647.

Publisher's Abstract: "The principle that indigenous people should participate in the environmental management of resource projects on their traditional lands is increasingly recognised by international law and institutions. Negotiation of agreements between indigenous groups and resource developers represents one way in which that principle can be given effect. However, virtually nothing is known about the environmental provisions of negotiated agreements or their efficacy in enhancing indigenous participation. This article examines environmental provisions of agreements involving Aboriginal landowners and mining companies in Australia. It concludes that while agreements certainly have the potential to enhance Aboriginal participation in environmental management, a majority do not have this effect, reflecting the weak negotiating position of many Aboriginal peoples in their dealings with mining companies."

Ritter, Archibald R. M. Canada: From Fly-In, Fly-Out to Mining Metropolis in *Gary McMahon and Felix Remy* (eds) Large Mines And The Community. Socioeconomic and Environmental Effects in Latin America, Canada, and Spain. Ottawa, IDRC

Includes the following quotes: "There may also be social problems for indigenous peoples. Mining activities and the relocation of outsiders into these areas may introduce transient mining personnel who may bring with them alcohol, different patterns of consumption and foreign life-styles. These disrupt community life and traditional ways of living, with adverse impacts on indigenous societies generally. However, in most but not all parts of Canada, these negative effects occurred well before the advent of mining." "The [Voisey's Bay Nickel mine] compensation and participation dimensions would be incorporated in the Impact and Benefits Agreement (IBA) being negotiated between the Innu Nation, the Labrador Inuit Association and VBNC. The Panel recommended that reaching this agreement be a *precondition* for the implementation of the project." "The panel foresaw major disruption to the town of Nain and called for a variety of specific measures to facilitate its adjustment. Perhaps most significant, it recommended that the VBNC pay the community to cover some of the additional costs imposed by the mine, for the use of community facilities and infrastructure by the VBMC during the construction. This is appropriate especially as the mine site is outside of Nain's current jurisdiction, and it would have difficulty imposing property taxes on the mine (CEAA 1999a, pp.12-16)."

Roberts, Lance W. (1974) "Education and work adjustment among the Eskimos of the Northwest Territories." M.A. Thesis, University of Alberta.

University Abstract: “This thesis investigates the relationship between education and work adjustment among male Eskimos in the Northwest Territories. Such an investigation has implications for theoretical, substantive, and policy formulation issues regarding the native situation.
The review of the relevant educational literature leads to the conclusion that, during the 1950s, it was a widely held assumption that education was directly and closely related to employment acquisition and maintenance. Such as assumption has been challenged by recent empirical investigations. It is argued that native education in the north has been based on the educational assumptions of the 1950's and, therefore, deserves critical examination in light of recent educational literature. Such an empirical test is carried out in this study.
Using reference group theory and what limited data are available, it is argued that a U-shaped curvilinear relationship between education and work adjustment should exist. Furthermore, it is hypothesized that various demographic and socialisation variables should affect the degree of this relationship. Finally, it is suggested that education's affect upon work adjustment is likely considerably less than that predicted by educational policy. Specific hypotheses to test each of these ideas are forwarded.
Initial analysis shows that no U-shaped curvilinear relationship exists between education and work adjustment. Further, multiple regression analysis suggests that all of the education, demographic and socialisation variables considered tell us little about work adjustment. What limited knowledge we do have about predictors of work adjustment is discussed. Further inspection of the models shows that predictive knowledge of educational attainment is considerably greater.
We conclude that the theoretical insights offered by a symbolic interactionist perspective for our problem are limited and that a more contingent, less cognitive theoretical framework may improve prediction. Substantively it is suggested that, although NWT educational policy has isolated relevant variables for substantially increasing educational attainment, this increased education does not have its assumed benefits for work adjustment. Given these findings some policy implications for native education are discussed.”

Ross, William A. 2004 Review of IAIA’04 Annual Conference

Includes the following quote: “3. There is a need to develop means to do Health Impact Assessment (HIA) evaluations. The action plan proposed by HIA practitioners at the conference is for an “evaluation sub group” to set out an “Evaluation Cookbook” over the next six months – to be debated prior to IAIA’05 and delivered for further development. This is one of several activities started at IAIA’04 to be continued in the upcoming months.”

Spiegel, Jerry and Annalee Yassi 1997 The Use of Health Indicators in Environmental Assessment. *Journal of Medical Systems* 21(5):275-289.

Publisher's Abstract: "Environmental assessment (EA) is required in Canadian federal and provincial jurisdictions as part of the process for decision-making on the acceptability of development projects. With increasing recognition of the relationship between environment and health, assessing "health" impact has growing importance. This paper presents the framework that is being developed by the World Health Organization (WHO) for addressing environmental health indicators, reports on the findings of a series of five regional workshops held in 1995-96 to examine the role of health professionals in environmental assessment in Canada, and presents a case study illustrating how human health has been addressed in a prominent EA conduct in northern Saskatchewan. Opportunities for future development of environmental health indicators are considered, with special reference to the potential use of medical data to address these challenges."

Saggers, Sherry, and Dennis Gray 1998 *Dealing with alcohol : indigenous usage in Australia, New Zealand and Canada*. Cambridge, Cambridge University Press.

Publisher's abstract: "The devastating impact of alcohol on indigenous populations is well known, but debate often overlooks the broad context of the problem and the priorities of indigenous people themselves. This book provides readers with a coherent explanation of alcohol misuse among indigenous peoples in Australia, New Zealand and Canada. Written with the desire to improve the level of informed debate and lead to constructive action, the book argues that our understanding of alcohol misuse needs to be reconceptualized and structural inequalities addressed."

Saggers, Sherry, and Dennis Gray 1991 *Aboriginal health and society: the traditional and contemporary aboriginal struggle for better health.* North Sydney (Australia), Allan and Unwin.

Publisher's abstract: "A collaborative work by an academic and a public servant drawing on their experience in research and fieldwork. Provides an analysis of the current debate on Aboriginal health, and is a useful aid to students and health workers in the field. Includes a comprehensive bibliography and index."

Taku Wilderness Association 2001 *The Impact of Resource Developments on Traditional Land-based Economies.* A Submission to the Tulsequah Chief [Mining] Project Committee.

The following quote is from the Introduction "The purpose of this paper, therefore, is to present examples from Canada and Alaska that highlight the actual, not predicted, physical impacts resource developments have had on aboriginal land-based economies and practices. Individual examples from across the north are presented with a summary of the key impacts at the end. As the case studies will show, there are many impacts. These include: disturbance to wildlife and the application of traditional knowledge; displacement from family use areas; increased hunting competition from new residents or visitors; damage to equipment, supplies, cabins and traplines; avoidance of use due to perception of contamination; and avoidance of hunting areas because of the presence of others."

Wiles, Anne, John McEwen and M. Husain Sadar 1999 Use of traditional ecological knowledge in environmental assessment of uranium mining in the Athabasca Saskatchewan. *Impact Assessment and Project Appraisal* 18(2):107-114.
["Summary. We conclude that there is a mismatch between the narrow, often technical treatment of TEK in the EA and the much broader and more cultural comments of the Dene interveners in the review. This mismatch casts doubt on the relevance to the IIA of the ethnographic information collected, and the statements made by Dene interveners in public hearings.
We suggest three levels on which TEK can relate to EA, with different approaches:
1. Detailed information from experienced local people on the environment and local wildlife is needed for baseline studies or monitoring activities. Clarify the purpose and the context for TEK in the EA and ensure a direct link between information required and information received.
2. To gain insight into the possible socio-cultural effects of a project under review and ensure the protection of culturally valued sites or features, the terms and scope of‘ the IIA may need to bc adapted to accommodate the cultural implications of traditional ecological knowledge. In addition, a more appropriate, less economically based subsistence model should be adopted to capture the interactions between culture and the environment in Aboriginal societies.
3. Changes to a landscape or a people's relationship with it may threaten the people's deep identification with their environment, and constitute an issue of social planning or raise a political debate on the control of resources. Recognize that environmental issues that are deeply integrated into broader social issues may not be a matter for the standard information gathering and assessment approach of EA."]

York, Geoffrey 1990 *The Dispossessed; Life and Death in Native Canada*. Toronto, Vintage.

Includes reference to the following cases of arctic and subarctic locations where York notes community-wide social pathology: Shamattawa, Ontario (p1- 16; 18 – 21), Cross Lake and Norway House, Manitoba (p. 96-97), Moose Lake, Manitoba (p. 107-110), Easterville, Manitoba (p. 110-114), Wollaston Lake, Saskatchewan (p. 115-119), Whitedog and Grassy Narrows, Ontario (p. 120), Sekani Band (p. 120-121), South Indian Lake, Manitoba (p. 123-125), and Lubicon, Alberta (p. 126-128).

Pp. 192-195. Factors leading to aboriginal alcohol abuse: 1. Transfer payments and decline of trapping, due to industrial development, which leads to economic dependency & loss of pride. Makes reference to Hugh Brody, Maps and Dreams, that Indians do not drink, nor are violent, when in the bush. Makes reference to Driben and Trudeau [see above] on the relation between social breakdown and dependence on government programs. Makes reference to A. Shkilnyk, A Poison Stronger than Love, on 'psychic trauma' due to lost independence and traditional culture. Makes reference to a Saskatchewan study that shows a relation between welfare and alcohol abuse. 2. Loss of traditional values, introduction of conflicting values, resulting in anomie. 3. Grief over loss of language and other aspects of culture, due to residential schools, leading to depression.

The table below consolidates the material on Aboriginal communities referred to by York.

Location	Proximate event leading to social problems	Social Problems	York pages references
Shamattawa	Settled in 1940s; children required to attend local school. Economic dependency.	Peak 1985-6; Violence, alcohol abuse, youth gas/solvent sniffing. Response to crisis; Return of violence	1- 16; 18 - 21
Lytton, B.C.	1964-74; Residential school sexual abuse	Alcohol abuse and suicide	27-39
Hobbema, Alberta	1980s; Social disruption due to sudden wealth	Suicides, alcohol-related car accidents	88-96
Cross Lake & Norway House, Man	1980s; Hydro flooding of trapping grounds	1980s; Suicides	96-97
Moose Lake, Man	Early 1960s; Hydro flooding, forced part-relocation	1970s and 80s; Gang violence	107-110
Chemawawin, Man (Easterville)	Early 1960s; Hydro flooding, forced relocation	Late 1960s; Alcohol abuse, vandalism, depression	110-114
Woolaston Lake, Sask.	Early 1970s; Uranium mines	?	115-119
Whitedog and Grassy Narrows, ON	1958; hydro flooding of traplines; 1962-70; mercury	1970s; Alcohol abuse, crime, suicide	120
Cheslatta Lake, B.C.	1952; hydro flooding	Now; Alcohol abuse	120
Sekani Band, BC	1952; hydro flooding and relocation	?	120-121
Chibougamau, Que	1951-170s, mining, forced relocation	?	121-122
South Indian Lake, Gods Lake, and 4 others, Man	1969; hydro flooding, forced relocation	Vandalism	123-125, 141-143
Cree, Quebec	1970s; Hydro flooding, one relocation	?	125-126
Lubicon, Alberta	1980s; Oil, forestry	1980s; Alcohol abuse, violent deaths	126-128
Alkalai Lake, BC	1940s; death of strict chief, bootleggers, unemployment, residential school sexual abuse	Alcohol abuse, violence	175-

Northern Territory, Australia	Mid ‘60s; western education	20% of Aboriginal children sniff gas	17
U.S. (Pueblo, New Mexico, Oklahoma)	19th Century forced migration	Youth gas sniffing	17-18