



**Coffee Gold Mine**  
**YESAB Project Proposal**  
**Appendix 25-A Community Health and Well-being**  
**Valued Component Assessment Report**

**VOLUME IV**

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## EXECUTIVE SUMMARY

Community Health and Well-being is identified as a Valued Component (VC) to consider the proposed Coffee Gold Mine's (Project's) potential to affect the health and well-being of the Project workforce directly and indirectly, as well as their families and other community members and resources. Indirect influences on health and well-being may occur through Project-related effects on environmental quality, quality of experiences, lifestyle choices, or other human health influences in the vicinity of the Project.

The Community Health and Well-being VC reflects the fundamental importance of health and well-being to people who live and work in the region where the Project will be developed. The VC incorporates an assessment of health effects of noise or contaminant exposures; decreased confidence in safety of country foods and decreased food security; collisions on the Northern Access Route (NAR); workplace injuries; increased crime (theft) along the NAR; and potential adverse effects to mental health and wellness due to stress or increased substance use. Subcomponents for the Community Health and Well-being VC include the environmental, biomedical, and social determinants of health: air quality; noise; country food quality; crime; food security; accidents and injuries; infectious disease; mental health and wellness; and health services structure and capacity.

Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. (Goldcorp or Proponent) has designed the Mine Site and will manage site activities to mitigate potential Project-related health effects on employees. The placement of mine infrastructure, inclusion of noise barriers and attenuation structures, routine dust suppression, careful management of Bulk Explosives Storage Area and explosives use, implementation of the International Cyanide Management Code, and compliance with the Yukon *Occupational Health and Safety Act* will all help mitigate adverse effects related to air quality, noise, and accidents and injuries. These mitigations will decrease physical environment stressors, increase employee engagement, and enhance overall safety and security of the Project and Project-related activities. Goldcorp's safety culture extends beyond the workplace, and reinforces Goldcorp's vision to ensure that work environments are *Safe Enough for our Families*. Goldcorp has developed a formal set of 'Golden Rules' in a *Golden Guide* employee handbook, which dictates key principles for employees to remain safe in the workplace and maintain the highest preventative measures. As part of their Occupational and Health and Safety Policy Goldcorp's stated intent is to "Promote health and safety in all aspects of our work, family and local community," extending the commitment to safety beyond the Mine Site.

With the application of mitigation, the Project may still result in residual effects related to: increase in crime, increase in infectious disease rates resulting from sexually transmitted infections and other infectious diseases, some decreases in mental health, and increased demand for mental health services in Local Assessment Area communities. A potential increase in crime is related to winter road access south of Sulphur Creek along the NAR. In cooperation with other road users, Goldcorp will consider road management options that could mitigate security concerns. Effects related to increased frequencies of

physical and mental illness are likely to be not significant, primarily due to an existing level of support provided by governments and broad community member experience with mining industry employment. These residual effects were also considered under the cumulative effects assessment: no significant adverse residual cumulative effects are likely to result from the Project on the Community Health and Well-being VC.

## TABLE OF CONTENTS

|  |            |
|--|------------|
| <b>EXECUTIVE SUMMARY .....</b>   | <b>I</b>   |
| <b>ACRONYMS, ABBREVIATIONS, SYMBOLS, AND UNITS OF MEASURE .....</b>            | <b>VI</b>  |
| <b>SYMBOLS AND UNITS OF MEASURE.....</b>                                       | <b>VII</b> |
| <b>1.0 INTRODUCTION.....</b>   | <b>1.1</b> |
| 1.1 OVERVIEW OF REPORT STRUCTURE.....  | 1.2        |
| 1.2 SCOPE OF ASSESSMENT .....  | 1.3        |
| 1.2.1 Issues Scoping.....  | 1.3        |
| 1.3 VALUED COMPONENT SELECTION .....   | 1.5        |
| 1.3.1 Candidate and Selected Valued Components.....                            | 1.5        |
| 1.3.2 Community Health and Well-being Subcomponents .....                      | 1.7        |
| 1.3.3 Indicators.....  | 1.9        |
| 1.4 ASSESSMENT BOUNDARIES.....   | 1.12       |
| 1.5 ENVIRONMENTAL QUALITY ASSESSMENT BOUNDARIES.....                           | 1.12       |
| 1.5.1 Spatial Boundaries .....   | 1.12       |
| 1.5.2 Socio-economic Factors Assessment Boundaries .....                       | 1.14       |
| 1.5.3 Temporal Boundaries.....   | 1.17       |
| 1.5.4 Administrative Boundaries .....  | 1.17       |
| 1.5.5 Technical Boundaries .....   | 1.17       |
| <b>2.0 ASSESSMENT METHODS .....</b>  | <b>2.1</b> |
| 2.1 HUMAN HEALTH RISK ASSESSMENT METHODOLOGY .....                             | 2.1        |
| 2.2 HEALTH IMPACT ASSESSMENT METHODOLOGY .....                                 | 2.2        |
| <b>3.0 EXISTING CONDITIONS.....</b>  | <b>3.1</b> |
| 3.1 REGULATORY AND MANAGEMENT CONTEXT.....                                     | 3.1        |
| 3.2 BACKGROUND INFORMATION AND STUDIES .....                                   | 3.1        |
| 3.2.1 Traditional Knowledge .....  | 3.2        |
| 3.2.2 Scientific and Other Information.....                                    | 3.2        |
| 3.2.3 Baseline Studies Conducted during the Project’s Feasibility Program..... | 3.3        |
| 3.2.4 Data Collection.....   | 3.4        |
| 3.3 DESCRIPTION OF EXISTING CONDITIONS.....                                    | 3.5        |
| 3.3.1 Environmental Quality .....  | 3.5        |
| 3.3.2 Socio-economic Factors .....   | 3.5        |

|            |  |            |
|------------|--|------------|
| <b>4.0</b> | <b>ASSESSMENT OF PROJECT-RELATED EFFECTS .....</b>   | <b>4.1</b> |
| 4.1        | POTENTIAL PROJECT-RELATED INTERACTIONS WITH COMMUNITY HEALTH AND WELL-BEING ..                     | 4.1        |
| 4.2        | POTENTIAL PROJECT-RELATED EFFECTS .....  | 4.2        |
| 4.2.1      | Potential Health Effects Related to Changes in Air Quality .....                                   | 4.2        |
| 4.2.2      | Potential Health Effects Related to Noise.....   | 4.4        |
| 4.2.3      | Potential Health Effects Related to Country Food Quality .....                                     | 4.6        |
| 4.2.4      | Potential Health Effects Related to Social Determinants of Health .....                            | 4.8        |
| 4.2.5      | Potential Health Effects Related to Health-Related Behaviours.....                                 | 4.9        |
| 4.2.6      | Potential Health Effects Related to Food Security.....   | 4.10       |
| 4.2.7      | Potential Health Effects Related to Accidental Injuries.....                                       | 4.11       |
| 4.2.8      | Potential Health Effects Related to Infectious Disease .....                                       | 4.11       |
| 4.2.9      | Potential for Increase of Non-infectious Diseases .....  | 4.12       |
| 4.2.10     | Potential Health Effects on Mental Health and Wellness .....                                       | 4.12       |
| 4.2.11     | Potential Effects on Health Services Structure and Capacity.....                                   | 4.13       |
| 4.3        | MITIGATION AND ENHANCEMENT MEASURES.....   | 4.13       |
| 4.3.1      | Project Design.....  | 4.13       |
| 4.3.2      | Mitigation Measures For Country Food Quality .....   | 4.14       |
| 4.3.3      | Mitigation and Enhancement Measures for Social Determinants of Health–<br>Children and Youth ..... | 4.14       |
| 4.3.4      | Mitigation Measures for Social Determinants of Health – Increased Crime .....                      | 4.15       |
| 4.3.5      | Mitigation Measures for Health-related Behaviours – Increased Smoking.....                         | 4.15       |
| 4.3.6      | Mitigation Measures for Health-related Behaviours – Increased Substance<br>Use.....                | 4.15       |
| 4.3.7      | Mitigation Measures for Health-related Behaviours – Changes to Nutrition.....                      | 4.16       |
| 4.3.8      | Mitigation Measures for Health-related Behaviours – Reduced Physical<br>Activity .....             | 4.16       |
| 4.3.9      | Mitigation and Enhancement Measures for Food Security.....   | 4.16       |
| 4.3.10     | Mitigation Measures for Accidents and Injuries .....   | 4.17       |
| 4.3.11     | Mitigation Measures for Infectious Diseases .....  | 4.18       |
| 4.3.12     | Mitigation Measures for Mental Health and Wellness.....  | 4.18       |
| 4.3.13     | Mitigation Measures for Health Services Structure and Capacity .....                               | 4.19       |
| 4.3.14     | Summary of Mitigation and Enhancement Measures.....  | 4.19       |

|            |   |            |
|------------|---|------------|
| 4.4        | RESIDUAL EFFECTS AND THEIR SIGNIFICANCE .....                                 | 4.24       |
| 4.4.1      | Residual Effects Characteristics .....  | 4.24       |
| 4.4.2      | Significance Definition.....  | 4.26       |
| 4.4.3      | Residual Effects .....  | 4.27       |
| 4.4.4      | Summary of Project-related Residual Adverse Effects and Significance .....    | 4.31       |
| <b>5.0</b> | <b>CUMULATIVE EFFECTS ASSESSMENT .....</b>                                    | <b>5.1</b> |
| 5.1        | PROJECT-RELATED RESIDUAL EFFECTS .....  | 5.1        |
| 5.1.1      | Cumulative Effects Baseline Information .....                                 | 5.2        |
| 5.2        | SPATIAL AND TEMPORAL SCOPE OF THE CUMULATIVE EFFECTS ASSESSMENT .....         | 5.2        |
| 5.3        | EFFECTS DUE TO OTHER PROJECTS AND ACTIVITIES.....                             | 5.2        |
| 5.4        | POTENTIAL CUMULATIVE EFFECTS .....  | 5.5        |
| 5.5        | MITIGATION MEASURES FOR CUMULATIVE EFFECTS.....                               | 5.10       |
| 5.6        | RESIDUAL CUMULATIVE EFFECTS AND SIGNIFICANCE OF RESIDUAL CUMULATIVE EFFECTS.. | 5.10       |
| <b>6.0</b> | <b>SUMMARY OF EFFECTS ASSESSMENT OF COMMUNITY HEALTH AND WELL-BEING ....</b>  | <b>6.1</b> |
| <b>7.0</b> | <b>EFFECTS MONITORING AND ADAPTIVE MANAGEMENT .....</b>                       | <b>7.1</b> |
| <b>8.0</b> | <b>REFERENCES.....</b>  | <b>8.1</b> |
| 8.1        | PERSONAL COMMUNICATIONS.....  | 8.10       |

**List of Tables**

|             |   |      |
|-------------|---|------|
| Table 1.3-1 | Candidate Valued Components – Evaluation Summary.....   | 1.6  |
| Table 1.3-2 | Indicators for Community Health and Well-being Valued Component .....   | 1.10 |
| Table 1.5-1 | Summary of Spatial Boundary Definitions for Environmental Quality Subcomponent<br>(Noise, Air Quality, and Country Food Quality)..... | 1.12 |
| Table 1.5-2 | Summary of Temporal Scope for Environmental Quality Indicators.....   | 1.13 |
| Table 1.5-3 | Spatial Boundary Definitions for Socio-economic Factors Subcomponent .....  | 1.15 |
| Table 3.2-1 | Examples of Information Sources .....   | 3.3  |
| Table 3.2-2 | Summary of Desktop and Field Studies Related to Community Health and Well-<br>being .....   | 3.4  |
| Table 3.3-1 | Number of Births, Canada and Yukon (final and estimated), 2010 – 2011 to 2014–<br>2015 .....  | 3.7  |
| Table 3.3-2 | Fertility Rate and Crude Live Birth Rate, Canada and Yukon .....  | 3.8  |
| Table 3.3-3 | Crude Live Birth Rates in the Local Assessment Area .....   | 3.9  |
| Table 3.3-4 | Mortality, Yukon .....  | 3.10 |

|              |  |      |
|--------------|--|------|
| Table 3.3-5  | Rank of Leading Causes of Death, Yukon and Canada .....  | 3.12 |
| Table 3.3-6  | Infant Mortality Rate, Yukon.....  | 3.14 |
| Table 3.3-7  | Low Birth Weight Rate, Yukon .....   | 3.14 |
| Table 3.3-8  | Census Family Structure: Families with Children, Canada and Yukon .....  | 3.17 |
| Table 3.3-9  | Police-reported Crime Severity Index, Yukon, 2004 – 2014.....  | 3.21 |
| Table 3.3-10 | Reasons for Seeking Shelter Reported by Women’s Emergency Shelter and<br>Transition Home Residents, Canada and Yukon, April 16, 2014 ..... | 3.24 |
| Table 3.3-11 | Health-related Behaviours, Yukon .....   | 3.26 |
| Table 3.3-12 | Rates of Heavy Drinking, Yukon, 2013 – 2014.....   | 3.27 |
| Table 3.3-13 | Percentage of Households Reporting Moderate and Severe Food Insecurity .....   | 3.28 |
| Table 3.3-14 | Injuries, Yukon .....  | 3.29 |
| Table 3.3-15 | Motor Vehicle Collisions by Severity, Yukon, 2002 – 2012 .....   | 3.32 |
| Table 3.3-16 | Motor Vehicle Collisions by Severity, Yukon Commercial Traffic, 2002 – 2012.....   | 3.33 |
| Table 3.3-17 | Motor Vehicle Collisions by Severity, North Klondike Highway, 2002 – 2012.....   | 3.33 |
| Table 3.3-18 | Aircraft Accidents, Canada and Yukon 20014 – 2013.....   | 3.34 |
| Table 3.3-19 | Infectious Diseases, Yukon.....  | 3.35 |
| Table 3.3-20 | Chronic Diseases .....   | 3.36 |
| Table 3.3-21 | New Cases of Primary Cancer, Canada and Yukon.....   | 3.36 |
| Table 3.3-22 | Mortality from Cancers, Age-standardized Mortality Rate per 100,000 Population.....  | 3.37 |
| Table 3.3-23 | Mental Health and Wellness Indicators, Yukon .....   | 3.38 |
| Table 3.3-24 | Hospital Service Utilization, Whitehorse General Hospital and Dawson City<br>Community Hospital.....                                       | 3.43 |
| Table 4.1-1  | Potential Interaction between Community Health and Well-being Subcomponents<br>and the Project.....  | 4.1  |
| Table 4.1-2  | High-level Screening of Potential Project Interactions with Community Health and<br>Well-being .....                                       | 4.2  |
| Table 4.2-1  | Threshold of Effects Levels for the Noise Subcomponent.....  | 4.5  |
| Table 4.3-1  | Summary of Potential Residual Effects and Mitigation and Enhancement Measures<br>for Community Health and Well-being .....                 | 4.20 |
| Table 4.4-1  | Effect Characteristics Considered When Determining the Significance of Residual<br>Effects to Community Health and Well-being .....        | 4.24 |
| Table 4.4-2  | Residual Effect Characteristic Ratings for Increase in Crime.....  | 4.27 |

|             |  |      |
|-------------|--|------|
| Table 4.4-3 | Residual Effect Characteristic Ratings for Increase in Infectious Disease Rates .....  | 4.28 |
| Table 4.4-4 | Residual Effect Characteristic Ratings for Positive Effects on Food Security .....   | 4.29 |
| Table 4.4-5 | Residual Effect Characteristic Ratings for Adverse Effects on Mental Health and<br>Wellness.....   | 4.30 |
| Table 4.4-6 | Residual Effect Characteristic Ratings for Increased Pressure on Health Services<br>Structure and Capacity .....   | 4.31 |
| Table 4.4-7 | Summary of Potential Residual Adverse Effects for Community Health and Well-<br>being .....  | 4.32 |
| Table 5.1-1 | Project-related Residual Effects Considered in the Cumulative Effects Assessment .....   | 5.1  |
| Table 5.3-1 | Potential Residual Adverse Effects of Other Projects and Activities on Community<br>Health and Well-being.....   | 5.3  |
| Table 5.4-1 | Potential Cumulative Effects on Community Health and Well-being due to<br>Interactions between the Project and Other Projects and Activities (Quartz)..... | 5.6  |
| Table 5.4-2 | Potential Cumulative Effects on Community Health and Well-being .....  | 5.9  |

**List of Figures**

|              |  |      |
|--------------|--|------|
| Figure 1.4-1 | Community Health and Well-being Spatial Boundaries.....  | 1.16 |
| Figure 3.3-2 | Actual Incidents of Crime, Dawson .....  | 3.22 |
| Figure 3.3-3 | Actual Incidents of Crime, Yukon.....  | 3.23 |
| Figure 3.3-4 | Workers’ Compensation Accepted Claims by Event or Exposure, Yukon.....   | 3.30 |
| Figure 3.3-5 | Workers’ Compensation: Lost-time Rates per 100 Full-time Equivalents in Yukon<br>for Mining-related Industries ..... | 3.31 |
| Figure 3.3-6 | Intentional Self-harm Rate, Canada and Yukon .....   | 3.39 |
| Figure 3.3-7 | Access to Medical Care .....   | 3.41 |
| Figure 3.3-8 | Emergency Wait Times for Physician Initial Assessment, Whitehorse General<br>Hospital (Hours, 90th Percentile) ..... | 3.42 |



## ACRONYMS, ABBREVIATIONS, SYMBOLS, AND UNITS OF MEASURE

| Acronym / Abbreviation | Definition   |
|------------------------|--|
| AAQO                   | Ambient Air Quality Objectives                                       |
| AQO                    | air quality objective  |
| CAC                    | criterion air contaminant  |
| CEA                    | cumulative effects assessment  |
| COPC                   | contaminant of potential concern                                     |
| CSI                    | Crime Severity Index   |
| Dawson                 | City of Dawson   |
| DCCH                   | Dawson City Community Hospital                                       |
| FIFO                   | fly-in/fly-out   |
| FNNND                  | First Nation of Na-cho Nyäk Dun                                      |
| Goldcorp               | Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. |
| HHRA                   | human health risk assessment   |
| HIA                    | health impact assessment   |
| HSS                    | (Yukon) Health and Social Services                                   |
| IC                     | Intermediate Component   |
| KDFN                   | Kwanlin Dün First Nation   |
| LAA                    | Local Assessment Area  |
| NAR                    | Northern Access Route  |
| NO <sub>2</sub>        | nitrogen dioxide   |
| NWT                    | Northwest Territories  |
| Project                | proposed Coffee Gold Mine  |
| Proponent              | Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. |
| PYLL                   | potential years of life lost   |
| RAA                    | Regional Assessment Area   |
| RCMP                   | Royal Canadian Mounted Police  |
| SFN                    | Selkirk First Nation   |
| STI                    | sexually transmitted infection                                       |
| TB                     | tuberculosis   |
| TH                     | Tr'ondëk Hwëch'in  |
| TK                     | Traditional Knowledge  |
| VC                     | Valued Component   |
| WGH                    | Whitehorse General Hospital  |
| WHO                    | World Health Organization  |
| WRFN                   | White River First Nation   |
| YG                     | Government of Yukon  |

| Acronym / Abbreviation | Definition   |
|------------------------|--|
| YESAA                  | <i>Yukon Environmental and Socio-economic Assessment Act</i> |
| YESAB                  | Yukon Environmental and Socio-economic Assessment Board      |
| YWCHSB                 | Yukon Workers Compensation Health and Safety Board           |

## SYMBOLS AND UNITS OF MEASURE

| Symbol/Unit of Measure | Definition                                  |
|------------------------|---|
| %                      | percent                                     |
| Km                     | kilometer                                   |
| Mt                     | million tonnes                              |
| dBA                    | A-weighted decibels                         |
| dB                     | Decibel                                     |
| Kg                     | kilogram                                    |
| µg                     | microgram                                   |
| m <sup>3</sup>         | Cubic metre                                 |
| PM <sub>10</sub>       | particulate matter smaller than 10 microns  |
| PM <sub>2.5</sub>      | particulate matter smaller than 2.5 microns |

## 1.0 INTRODUCTION

Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. (Proponent or Goldcorp), is proposing to construct and operate a high-grade, open-pit gold mine in west-central Yukon, on its property located approximately 130 kilometres (km) south of the City of Dawson (Dawson), accessible by a 214-km Northern Access Route (NAR) in the White Gold District. The proposed Coffee Gold Mine (Project) is scoped as an open pit gold mine using a cyanide heap leach process to extract ore. Its temporal boundaries consist of a three-year construction period, followed by a 12-year mine life with an average operation rate of five million tonnes per annum of heap leach feed.

The Project is located on Crown land within the established Traditional Territory of the Tr'ondëk Hwëch'in (TH). The NAR is located within the Traditional Territory of TH, and portions are located within the shared Traditional Territories of the Selkirk First Nation (SFN) and the First Nation of Na-cho Nyäk Dun (FNNND). The Mine site and a portion of the NAR are located in the asserted territory of White River First Nation (WRFN).

The Community Health and Well-being Valued Component (VC) Assessment Report presents the existing conditions relevant to human health in communities potentially affected by the Project, as well as an assessment of the potential direct and indirect effects of the Project on human health and well-being. The Project study team identified Community Health and Well-being as a VC to consider the Project's potential to directly and indirectly affect the health and well-being of the Project workforce, as well as their families and other community members and resources. Indirect influences on health and well-being may occur through Project-related effects on environmental quality, quality of experiences, lifestyle choices, or other human health influences in the vicinity of the Project.

The assessment of potential human health impacts arising from Project-related changes in environmental quality was informed by a quantitative human health risk assessment (HHRA), which examined how changes in environmental quality (i.e., noise, air quality, water quality, soil quality) may influence human health. The HHRA relies on information provided in the Project Proposal, specifically **Section 9.0 Air Quality and Greenhouse Gas Emissions Analysis, Section 10.0 Noise Analysis, Section 11.0 Surficial Geology, Terrain, and Soils Assessment, and Section 12.0 Surface Water Quality Assessment**. The complete Human Health Risk Assessment Technical Report is provided in **Appendix 18-B**.

The assessment of the multiple factors that may indirectly contribute to health outcomes uses a Health Impact Assessment (HIA) approach, which describes possible adverse health effects related to a project, and recommends strategies to mitigate these impacts. The HIA involves examining the many factors that contribute to health outcomes, including social determinants of health, health-related behaviour, and risk factors for disease, and assessing the complex interactions between a host of health determinants. Drawing

from methodologies in public health, community consultation, environmental risk assessment, and community planning, the HIA process works best using a multi-disciplinary team and extensive community input. Generally speaking, HIA contributes to a project's cost-effectiveness and efficiency in that it anticipates issues before a project takes place. A project's proponents can plan how best to design facilities, structures, and workforce policies rather than trying to change what has already been developed.

The HIA process has been adapted to enable appropriate assessment of the Project and the communities that may be affected. Guidelines for Canadian HIAs are provided by the *Canadian Handbook on Health Impact Assessment* (Minister of Public Works and Government Services Canada 2004).

Past experiences in northern Canada and around the world with changes in community health and well-being from resource extraction projects (NAHO 2006, 2008) reinforce the need to consider Project-related influences on both toxicological and social determinants of health. Yukon Health and Social Services (HSS), Health Canada, the World Health Organization (WHO), the Proponent, the Project study team, and many others recognize that human health and well-being encompasses far more than physical health. Self-determination, lifestyle choices, food security and nutrition, education, cultural identity, social status, economic factors, one's relationship with the natural and built environments, and other factors all play a role in a person's (and community's) overall health and feeling of well-being. Another major purpose of this report, therefore, is to evaluate potential Project-related influences on community health and well-being via the potential effects on social determinants of health and well-being.

Since a large number of cultural, social, economic, and other factors influence health and well-being, Project-related influences on many other VCs will have an important influence on community health and resilience, as well as on the health and well-being of individuals. The methodology presented herein is complementary to and relies on information presented in the Project Proposal, specifically **Section 19.0 Demographics Analysis, Section 20.0 Economic Conditions Assessment, Section 21.0 Social Economy Assessment, Section 22.0 Community Infrastructure and Services Assessment, Section 23.0 Education Services Assessment, and 24.0 Land and Resource Use Assessment.**

The information provided in this VC assessment report supports the Project Proposal submitted to the Yukon Environmental and Socio-economic Assessment Board (YESAB) Executive Committee for screening under the *Yukon Environmental and Socio-Economic Assessment Act*, SC 2003, c. 7 (YESAA), and applications to be submitted for a Quartz Mining Licence and a Type A Water Licence from the Yukon Water Board, among other permits and licences.

## 1.1 OVERVIEW OF REPORT STRUCTURE

This report presents the results of the assessment of potential Project-related effects and cumulative effects on Community Health and Well-being, including the following:

- **Scope of assessment**, including issues scoping, a description of the subcomponents and indicators included in the assessment, and the spatial and temporal scope (**Section 1.2**).
- **Existing conditions** relevant to Community Health and Well-being (**Section 3.0**).
- **Assessment of potential interactions** between Project components and Community Health and Well-being (**Section 4.0**) and potential effects. Each plausible interaction between Community Health and Well-being and a change or condition related to the Project is examined, along with those mitigations that can be implemented to eliminate, reduce, or control adverse influences. Residual adverse effects following application of concrete mitigation strategies and measures are identified and categorized to assess significance and likelihood.
- **Potential cumulative effects** on Community Health and Well-being (**Section 5.0**) due to possible interactions between the residual effects of the Project and the residual effects of other past, present, and future projects and activities.
- **Monitoring** required to verify predictions and evaluate effectiveness of mitigations (**Section 8.0**).
- **Adaptive management programs** (**Section 8.0**) to be implemented to address any unexpected Project-related effects on Community Health and Well-being.

## 1.2 SCOPE OF ASSESSMENT

### 1.2.1 ISSUES SCOPING

Issues scoping of possible adverse health effects related to mining activity was undertaken initially using peer-reviewed publications on the social and health effects of resource development, particularly in northern regions (Canadian territories, Alaska) as well as regions with similar levels of health care and extensive mining activity, particularly Australia. White papers on the identified topics, as well as those more broadly related to community health and wellness, were reviewed for ideas about the health issues that are important to communities and the ways to measure those issues. The compiled topics, as well as indicators and measures developed from this information scan and were presented to First Nations, key stakeholders, including regulators and assessors to receive feedback.

The Proponent has undertaken an engagement and consultation process as defined under section 50 (3) of YESAA to support the scoping of issues for the Project (**Section 3.0** of the Project Proposal). Community health and well-being has been raised as an issue of concern by government agencies including Yukon HSS, TH, WRFN, and stakeholders and community members in Dawson and Whitehorse. The selection of Community Health and Well-being as a VC was informed by this consultation process.

A meeting with Yukon’s Chief Medical Officer of Health was also held to discuss the need for and value of HIAs in managing resource development projects in Yukon. Discussions with assessors and regulators, the TH Technical Working Group, community members, and interview participants suggested a need for taking a broader view of health.

Major themes of interest related to Community Health and Well-being identified through the consultation, and reviews of other information, included the following:

- Accidents and injuries:
  - Motor vehicle collisions on the NAR due to increased traffic; concern was expressed about visibility issues, particularly blind corners on the single-lane road, which may contribute to head-on collisions; the need for communication between vehicles; and an increased number of pull-outs. Additionally, the current quality of the road surface requires improvement.
  - Workplace safety during mine operation.
- Mental health and wellness:
  - Concern about current access to care.
  - Concern about a possible increase in substance abuse as a consequence of employment at the Project (through increased income as well as the effects of a fly-in/fly-out (FIFO) operation, e.g., isolation, disconnect from the land, and removing people from their sources of support).

Major themes of interest for the Community Health and Well-being VC were also developed in consideration of the available Traditional Knowledge (TK), and based on consultations focused on Land and Resource Use (**Section 24.0**).

This Community Health and Well-being assessment includes an evaluation of the health risks associated with the gathering and consumption of country foods in areas that may be influenced by the development of the Project. This is particularly important in light of the traditional and ongoing importance of local and regional country food and medicinal plant resources to First Nations people and others.

The Proponent continues to consult and engage with affected First Nations and communities, government agencies, and interested people and/or other stakeholders who may be interested in the Project and its related activities. This consultation and engagement process has included a Technical Working Group (TWG) established with TH, government departments, community meetings, one-on-one and small group meetings, and ongoing communications such as print communication, newsletter website updates, and specific presentations.

### 1.3 VALUED COMPONENT SELECTION

Community Health and Well-being was selected as a VC based on the VC selection process set out in **Section 5.0 Assessment Methodology** of the Project Proposal. The process includes consideration of candidate VCs based on the issues scoping, and selection of a VC and potentially subcomponents if they serve to focus the assessment. Indicators were chosen to describe the existing conditions for the VC component and subcomponents, and to evaluate potential effects.

#### 1.3.1 CANDIDATE AND SELECTED VALUED COMPONENTS

Community Health and Well-being was initially identified as a candidate VC based on professional judgement, issues identification, and previous experience with resource development projects (**Table 1.3-1**). The Project may directly affect the health and well-being of employees living in camp accommodations (which will allow for a maximum of 400 persons), but may also affect all Project workers, as well as their families and other community members and resources. The maximum estimated workforce is 663 people during the Construction Phase and 372 people during Operation. Indirect influences on health and well-being may occur through Project-related effects on environmental quality, quality of experiences, lifestyle choices, or other human health influences in the vicinity of the Project.

The Community Health and Well-being VC reflects the fundamental importance of health and well-being to people who live and work in the region where the Project will be developed. The VC incorporates an assessment of health effects of noise or contaminant exposures; decreased confidence in safety of country foods and decreased food security; collisions on the NAR; workplace injuries; increased crime (theft) along the NAR; and potential adverse effects to mental health and wellness due to stress or increased substance use.

The Community Health and Well-being VC is influenced by social, economic, and environmental conditions, and includes such attributes as safety, the ability for community members to meet their basic needs such as housing, as well as the presence of infectious and non-infectious diseases. By virtue of having communities in proximity to the Project, as well as the presence of workers at the Project, Community Health and Well-being is an important value.

**Table 1.3-1 Candidate Valued Components – Evaluation Summary**

| Candidate VC                    | Project Interaction |  |   | Third Party Input                                     |   | Supports the Assessment of Which Other VC? | Selected as a VC?  | Decision Rationale  |
|---------------------------------|---------------------|--|---|---|---|--|--|---|
|                                 | Interaction?        | Project Phase / Project Component / Activity   | Nature of Interaction   | Source  | Input   |  |  |   |
| Community Health and Well-being | Yes                 | <ul style="list-style-type: none"> <li>• Construction Phase</li> <li>• Operation Phase</li> <li>• Reclamation and Closure Phase</li> <li>• Post-closure Phase</li> </ul> | The Project may directly and indirectly affect community and occupational health through direct influences on the workforce of 663 people during Construction and 372 people during Operation, through effects on environmental quality in the vicinity of the Project, and through Project influences on broader determinants of health. | First Nations<br>Government<br>Public<br>Stakeholders | Concerns and comments related to: <ul style="list-style-type: none"> <li>• Accidents and injuries on the NAR and at the Mine Site</li> <li>• Effects of dust fall on human health, via contamination of country foods</li> <li>• Effects of other airborne contaminants on human health such as nitrogen dioxide, sulfur dioxide, or fine particulate matter</li> <li>• Effects of continuous and impulsive noise on human health</li> <li>• Effects on community health, including infectious disease, mental health, and community resilience of combined Project influences on the natural and built environments as well as cultural, social and economic conditions</li> </ul> | None                                       | Yes, selected as the Community Health and Well-being VC. Includes the subcomponents: <ul style="list-style-type: none"> <li>• environmental quality</li> <li>• socio-economic factors</li> </ul> | Community Health and Well-being was selected as a VC to represent Project interactions with community and occupational health through direct and indirect potential effects on the following indicators: <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Noise</li> <li>• Country food quality</li> <li>• Social Determinants of Health</li> <li>• Health-related Behaviours</li> <li>• Food Security</li> <li>• Accidental Injuries</li> <li>• Infectious Disease</li> <li>• Non-infectious Disease</li> <li>• Mental Health and Wellness</li> <li>• Health Services Structure and Capacity</li> </ul> |



### 1.3.2 COMMUNITY HEALTH AND WELL-BEING SUBCOMPONENTS

Subcomponents are used to focus on different aspects of the Community Health and Well-being VC, specifically the biomedical (or toxicological), and social determinants of health, as well as accidents and injuries. The Community Health and Well-being VC is influenced by social, economic, and environmental conditions, and includes such attributes as safety and the ability for community members to meet their basic needs, as well as the presence of infectious diseases. Two subcomponents were selected for this assessment: environmental quality, which includes indicators described in the HHRA, and socio-economic factors, which includes socio-economic indicators of individual and community health.

Environmental quality describes:

- **Exposure to Environment Contaminants or Hazardous Materials:** This category considers Project-related changes resulting from exposure to hazardous materials, and includes changes to:
  - Air quality
  - Workplace exposure to hazardous materials (e.g., cyanide)
  - Contamination of subsistence food
  - Contamination of drinking water.
- **Noise:** This category considers health risks due to noise from the mine site and access road. Possible risks to human health include stress and annoyance, sleep disturbance, or interference with the quality of speech, comprehension, and learning.

During scoping and consultation with First Nations, the subject of vibration was also raised as a potential IC; however, due to the large separation distance between the Mine Site and the closest sensitive receptors, perceivable vibration effects are not likely. For this reason, it was determined that a vibration assessment would not be required and vibration was not selected as an IC.

The category Water and Sanitation frequently appears in HIAs. In this case, water treatment will be assessed by Yukon Government Health and Social Services, and must meet all regulations; therefore, this category is not addressed in the assessment (Adapted from State of Alaska HIA Program 2011).

Socio-economic factors are based on a standard set of health effects categories developed by the IPIECA (formerly known as the International Petroleum Industry Environmental Conservation Association), the global oil and gas industry association for environmental and social issues, which are based on extensive international experience (IPIECA 2005). This framework provides a structure to organize assessments of human health and wellness to inform the Project design process from a health perspective. These categories were modified and adopted by the Alaska collaborative HIA working group for use in HIAs of resource development projects (State of Alaska HIA Program 2011). This framework was modified to be appropriate to Yukon and comprehensively capture health issues. These health effect components are to assess potential effects on the Community Health and Well-being VC resulting from Project activities during

Construction, Operation, Reclamation and Closure, and Post-closure. Socio-economic factors in this assessment are:

- **General Health Indicators:** describes health indices including birth rates, fertility rate, mortality, leading causes of death, infant mortality rate, and low birth rate. General health indicators provide information pertinent to existing conditions and are not included as an indicator for the assessment.
- **Social Determinants of Health:** describes the effect of living conditions and social situations on human health and well-being. Some elements include:
  - Economic factors, jobs, education
  - Work rotations, shift length, hiring practices (e.g., hiring locally vs. out of Yukon)
  - Family structure, family stress, availability of child care
  - Community relationships, level of integration or isolation
  - Crime, domestic violence
  - Changes to a community's culture.
- **Health-related Behaviours:** describes individual behaviours that affect health outcomes. Some examples include:
  - Smoking
  - Alcohol and drug use
  - Physical activity
  - Nutrition.
- **Food Security:** considers the effect of food security and subsistence activity on health outcomes. Some considerations include:
  - Effect on diet based on changes in hunting and food collection (e.g., changes in availability of free time; perception of contamination)
  - Effect on food security based on changes in food availability and cost.
- **Mental Health and Wellness:** considers the health effects of perceived health and well-being and mental wellness, such as:
  - Effect of stress, isolation, and mental health conditions (e.g., depression, anxiety)
  - Sense of belonging to a community
  - Addiction and related impacts (alcohol and drug abuse, gambling, compulsive behaviour).
- **Accidents and Injuries:** considers fatal and non-fatal injury patterns for both individuals and communities:
  - Workplace injuries
  - Travel-related accidents (by air or road)
  - Changes to transportation infrastructure (roads, airstrips); e.g., improvements to roads and airport represent a positive Project-related effect
  - Transportation and health and safety policies.

- **Infectious Disease:** considers potential changes in the incidence of infectious diseases in both individuals and communities:
  - Impact of workers moving into the community (increased population)
  - Crowded or enclosed living and working conditions (living conditions at camp)
  - Gastrointestinal infections
  - Sexually transmitted infection
  - Respiratory illnesses.
- **Non-infectious Disease:** considers potential changes in the incidence of non-infectious diseases in both individuals and communities:
  - Chronic disease: obesity, diabetes, heart disease
  - Cancer attributed to diet changes or environmental exposures.
- **Health Services Structure and Capacity:** considers Project-related changes to the structure and capacity of health services:
  - Effects on health services, e.g., primary care, emergent care, emergency medical services, and medevac
  - Positive effects through tax revenue to support social services
  - Adverse effects through increased demand on the health system.

### 1.3.3 INDICATORS

Indicators are quantitative or qualitative measures used to describe existing VC or VC subcomponent conditions and trends, and to evaluate potential Project-related effects and cumulative effects to the VC.

Indicators were selected from the components of the HHRA and the socio-economic factors outlined in Section 1.3.2. Indicators based on their ability to measure Project-related change, and are listed along with the rationale for their selection in **Table 1.3-2**. These indicators were used to evaluate potential adverse effects, characterize potential residual adverse effects, and determine effect significance.

Measurable or descriptive parameters are included for HHRA (environmental quality) indicators and socio-economic factors, respectively. In the case of the Community Health and Well-being VC, the only indicators for which changes can be reasonably and confidently quantified are those related to potential toxicological effects from the Project, which are discussed in the HHRA. Given that the other indicators of Community Health and Well-being are subject to many interconnecting variables, it is not practicable to provide quantitative measures for changes in the indicators.

**Table 1.3-2 Indicators for Community Health and Well-being Valued Component**

| Indicator                                  | Rationale for Selection  | Measurable / Descriptive Parameters   |
|--|--|---|
| <b>Environmental Quality Subcomponent</b>  |  |   |
| <b>Air Quality</b>                         | Possible risk to human health through inhalation of airborne contaminants or via exposures to contamination of soils, water, or country foods associated with mining-related dust fall contamination.  | Estimated levels of CACs in air (NO <sub>2</sub> , SO <sub>2</sub> , CO, PM <sub>2.5</sub> , PM <sub>10</sub> , TSP)<br>Estimated levels of combustion-related contaminants in air<br>Estimated exposures to trace elements in airborne dust<br>Estimated contaminant concentrations in soil and food/medicinal resources from dust fall or fine particulate / aerosol wet and dry deposition |
| <b>Noise</b>                               | Noise arising from Project activities pose a possible risk to human health through stress and annoyance, sleep disturbance, or interference with the quality of speech, comprehension, and learning.   | Stress and annoyance<br>Interference with speech comprehension and cognition<br>Sleep disturbance, per WHO night-time noise guidelines (2009)<br>Annoyance from low-frequency, high impulsive noise (e.g., blasting)  |
| <b>Country Food Quality</b>                | Possible risk to human health through exposures to mining-related contaminants while engaged in the gathering and consumption of edible/medicinal plants and fish/wildlife.  | Contaminant uptake into edible/medicinal plants and wildlife resources<br>Contaminant uptake into edible fish tissues   |
| <b>Socio-economic Factors Subcomponent</b> |  |   |
| <b>Social Determinants of Health</b>       | This indicator provides information about personal security and safety and general well-being in a community. The health and well-being of individuals and communities are affected by social issues such as living conditions, economic conditions, family structures and crime; however, these factors influence health in complex ways. | Time off work (average No. days/year)<br>Housing condition (% needing repairs)<br>Census family structure<br>Children in care (%)<br>Crime rates, incidents, crime severity<br>Family violence (reasons for women seeking shelter)  |
| <b>Health-related Behaviours</b>           | Health-related behaviours are of interest for the Project. Fly-in, fly-out workers may be more likely to be current smokers, drink alcohol at risky levels, and be overweight or obese as compared to other employment types.  | Smoking rates (%)<br>Heavy drinking rates (%)<br>Physical activities (% moderately active)<br>Nutrition (rates of fruit and vegetable consumption)  |

| Indicator                                     | Rationale for Selection   | Measurable / Descriptive Parameters  |
|---|---|--|
| <b>Food Security</b>                          | Food security may be affected by the Project based on the community's perception of traditional foods being contaminated, which may reduce consumption. High transportation costs and environmental changes affecting traditional food sources are identified as current threats to food security in Dawson and by TH.  | Households reporting moderate or severe lack of access to nutritious foods (% , % with children)   |
| <b>Accidental Injuries</b>                    | Possible risk to individual health through workplace- and transportation-related injuries. Accidental injuries are ranked as a leading cause of death in Yukon and also have high hospitalization rates.  | Overall injuries (% causing limitations, % requiring medical attention, life years lost)<br>Workplace injuries (lost-time rates, No. claims)<br>Transportation-related injuries (No. caused by collisions, aviation)   |
| <b>Infectious Disease</b>                     | Possible risk to community health through increased infectious disease rates. Gastrointestinal and respiratory infections can be transmitted easily in crowded living conditions. An increase in sexually transmitted infection rates is common with an influx of young, male workers.  | Infectious disease rates (% respiratory, gastrointestinal, sexually transmitted infections)  |
| <b>Non-infectious Disease</b>                 | This indicator provides information about rates chronic diseases and cancer in Yukon. Modifiable health-related behaviours may lead to chronic diseases.  | Chronic disease rates (% diabetes, % obese)<br>Cancer rates (%)  |
| <b>Mental Health and Wellness</b>             | Possible risk to community health through changes in stress levels, substance use, and rates of mental health disorders. Perceived health, mental health, and life stress levels are important indicators of wellness and quality of life. This indicator provides information about the mental health status of a community or region, including alcohol and drug misuse and stress, which are associated with socio-economic changes. | Perceived health (% excellent, very good, fair, poor)<br>Perceived mental health (% as above)<br>Perceived life stress (%)<br>Sense of community belonging (%)<br>Life satisfaction (% satisfied)<br>Mood disorder (%)<br>Rates of self-harm (rates, cause of death) |
| <b>Health Services Structure and Capacity</b> | Possible risk to community health through changes in access to health services. This is an indicator of health system performance, specifically whether care is delivered in a timely way, and whether people are using the health care services that are available.  | Access to family physician (%)<br>Influenza immunization (%)<br>Emergency room wait times (hours)<br>Hospital service use (No./year)   |

**Notes:** CAC – criterion air contaminant; CO – carbon monoxide; dB – decibel; NO<sub>2</sub> – nitrogen dioxide; PM<sub>2.5</sub> - particulate matter smaller than 2.5 microns, PM<sub>10</sub> - particulate matter smaller than 10 microns; SO<sub>2</sub> – sulphur dioxide; TSP – total suspended particles.

## 1.4 ASSESSMENT BOUNDARIES

This section presents the spatial, temporal, administrative, and technical boundaries identified for the Project’s assessment of effects on Community Health and Well-being. Spatial and temporal boundaries encompass the areas within and times when the Project will likely interact with Community Health and Well-being. The administrative and technical boundaries represent any constraints that may be placed on the effects assessment due to political, social, and economic realities (i.e., administrative boundaries), or limitations in predicting or measuring changes (i.e., technical boundaries). The spatial, temporal, administrative, and technical boundaries for assessment of Project-related effects on Community Health and Well-being differ for the environmental quality and socio-economic factors subcomponents.

## 1.5 ENVIRONMENTAL QUALITY ASSESSMENT BOUNDARIES

### 1.5.1 SPATIAL BOUNDARIES

Descriptions of the assessment areas for the noise, air quality, and country food quality subcomponents are provided in **Table 1.5-1** and shown in the Human Health Risk Assessment Technical Report (**Appendix 18-B**). The LAA and RAA for Intermediate Components (ICs) and VCs that are of relevance to Community Health and Well-being may have local scales that differ from one another and over which a Project-related influence may be detectable. As such, the LAA for each subcomponent, and for this Community Health and Well-being assessment overall, may not be consistent with that for other subcomponents.

**Table 1.5-1 Summary of Spatial Boundary Definitions for Environmental Quality Subcomponent (Noise, Air Quality, and Country Food Quality)**

| Spatial Boundary            | Description of Assessment Area   |
|-----------------------------|--|
| <b>Noise</b>                |  |
| Local Study Area            | Area extending 3 km from the mine site and 1 km from either side of the NAR. Additional discrete receptors of interest that have been identified by First Nations and through other consultations have also been included. |
| Regional Study Area         | Includes the Local Study Area and covers an area extending 10 km from the mine site and 3 km from either side of the NAR.  |
| <b>Air Quality</b>          |  |
| Local Study Area            | Area surrounding the Project footprint plus 1-km radius of the NAR centerline  |
| Regional Study Area         | 44 km x 28 km centered around the mine site and a 2-km radius of the NAR centreline  |
| <b>Country Food Quality</b> |  |

| Spatial Boundary         | Description of Assessment Area  |
|--------------------------|---|
| Local Assessment Area    | The area within which direct effects could occur that are associated with: <ul style="list-style-type: none"> <li>• Areas where mining related dust fall or deposition of other airborne contaminants may deposit to soils or plants surfaces, generally consistent with the LAA for the air quality and dust fall assessment (immediately above)</li> <li>• Areas where surface soil quality will be altered Post-closure as a result of mine waste deposits or mining physical disturbances</li> <li>• Any area where surface water quality may change as a result of the Project, either within habitat that supports edible freshwater resources upstream.</li> </ul> |
| Regional Assessment Area | Regional and cumulative effects assessment area that supports Aboriginal and Non-aboriginal resource use (country foods and medicinal plants), generally within 100-km radius of the Project.   |

**1.5.1.1 Temporal Boundaries**

The temporal scope for the environmental quality indicators as characterized in **Appendix 18-B HHRA Technical Report** is summarized in **Table 1.5-2**.

**Table 1.5-2 Summary of Temporal Scope for Environmental Quality Indicators**

| Indicator            | Project Phase  |  |   |  |
|----------------------|--|--|---|--|
|                      | Construction   | Operation  | Decommissioning / Closure   | Post-Closure   |
| Noise                | Year -1 noise modelled as near-worst case  | Year 6 modelled as near-worst case   | Assessed indirectly based on expected similarity to or lesser noise-generating activity than during construction or peak operations | Not assessed: No mining related noise sources anticipated  |
| Air Quality          |  | Year 6 modelled as near-worst case   | Assessed indirectly based on expected similarity to or lesser emissions than during construction or peak operations                 | Not assessed: No mining related noise sources anticipated  |
| Country Food Quality | Not assessed: Changes in soil quality expected to be much smaller than for subsequent Project phases | Assessed indirectly based on expectation that any magnitude of change in soil quality from dust fall or direct disturbance and mine water deposition will be lower than for the cumulative influence of mining as reflected in post closure conditions | As for the operation phase  | Focus of assessment as being near-worst case scenario. Assessed based on predicted chemistry of surface accessible waste deposits following closure as well as cumulative mass inputs of trace elements as a result of dust fall |

### **1.5.1.2 Administrative Boundaries**

The administrative boundaries that inform the HHRA are as discussed in **Section 4.0 Project Setting**. Trapline concession areas which overlap with the Mine Site and with the NAR are important to the HHRA. Also of particular relevance to the HHRA is the existing and anticipated future land and resource use, as discussed in **Section 24.0** and **Appendix 24-A** of the Project Proposal.

### **1.5.1.3 Technical Boundaries**

The degree of confidence in conclusions about human health risk potential that result from an HHRA are related to the following:

- (i) Predictive accuracy of changes in environmental quality that may influence human exposures to contaminants or stressors (i.e., as provided in the noise and air quality assessments)
- (ii) How well the modelled exposure scenarios capture the true interactions between humans and their environment, through interactions with soil, breathing, food and medicinal plant consumption, listening/hearing, and other experiential modes
- (iii) Adequacy of the available thresholds of effects estimates used in the assessment to protect the health of humans, including those individuals and groups that may be more sensitive to contaminants/stressors than the population in general (e.g., developing children, the elderly, pregnant mothers, or those suffering from other diseases).

There is some degree of uncertainty in any predictive analysis, and the HHRA for each of noise, air quality, and country food consumption includes a discussion about uncertainties. For HHRA in general, such uncertainty is addressed by conservatively assuming conditions that would tend to over-estimate levels of exposures relative to the true case, and to use lower thresholds of effects levels than specifically supported by epidemiological and toxicological studies. Thus, HHRA is biased toward over-predicting health risks if there is any uncertainty about key inputs into the risk characterization.

## **1.5.2 SOCIO-ECONOMIC FACTORS ASSESSMENT BOUNDARIES**

### **1.5.2.1 Spatial Boundaries**

The spatial boundaries for the consideration of socio-economic factors consist of a Local Assessment Area (LAA) and Regional Assessment Area (RAA), as defined in **Table 1.5-3** and shown in **Figure 1.4-1**. The assessment focuses on those communities that may be affected by the Project. This includes a 1 kilometer (km) buffer around the Project footprint, and the communities of Whitehorse, Dawson, Beaver Creek, Pelly Crossing, and Mayo.



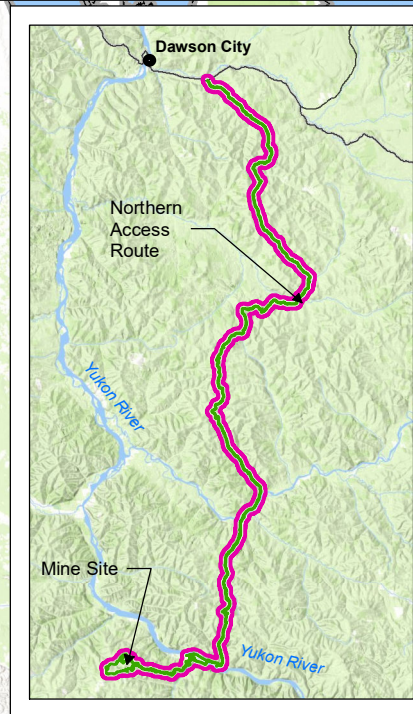
Dawson is the closest incorporated community to the Project site, including the NAR. Whitehorse and Dawson will serve as locations for staff pickup and drop-off. As a consequence, the Project may result in both positive and adverse effects on community health and well-being through changes in patterns of employment and level of income for community members, population influx, and increased demand for resources related to health and well-being, including health services.

**Table 1.5-3 Spatial Boundary Definitions for Socio-economic Factors Subcomponent**

| Spatial Boundary                       | Description of Assessment Area  |
|--|---|
| <b>Community Health and Well-being</b> |   |
| Local Assessment Area                  | 1 km buffer around Project footprint, communities of Whitehorse, Dawson, Beaver Creek, Mayo, and Pelly Crossing |
| Regional Assessment Area               | Yukon Territory   |
| Cumulative Effects Assessment Area     | An area inclusive of active and proposed major mine projects, as shown in <b>Appendix 5-B</b>                   |

In encompassing the communities of Beaver Creek, Pelly Crossing, and Mayo, the LAA captures data related to the administrative centers of the WRFN, SFN, and FNNND, respectively, and reflecting the availability of economic data at the community scale. Not all of these communities have administrative boundaries, and as a result, the LAA boundaries were approximated based on the apparent physical boundaries of the communities. The LAA boundaries selected do not necessarily exclude from the assessment entities that may be located immediately adjacent to but outside those communities. Although these smaller communities are a further distance from the Project location and are unlikely to experience population influxes associated with the Project, the communities may experience changes in income as a result of potentially providing a source of labour, goods, and services associated with the Project.

The RAA encompasses the LAA and provides a larger regional context when quantifying the potential effects of the Project on Community Health and Well-being that can be used to assess the magnitude and importance of changes within the LAA. The RAA encompasses an area within which both direct and indirect effects could potentially occur, and includes Yukon communities in general.



**COFFEE GOLD MINE**

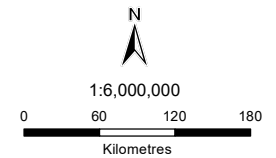
**Community Health and Well-being Spatial Boundaries**

**Legend**

- Highway
- National/International Border
- Project Footprint
- Local Assessment Area
- Local Assessment Area
- Community Health and Well-being Regional Assessment Area

**Notes**

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.



NAD 1983 UTM Zone 8N

Page Size: 8 1/2" x 11"

Figure 1.4-1

Date: Mar 22, 2017

Drawn by: JS

Reviewed: DP



### 1.5.3 TEMPORAL BOUNDARIES

The temporal characteristics of the Project's Construction, Operation, Reclamation and Closure, and Post-closure Phases are described in **Section 2.0 - Project Description** of the Project Proposal. The temporal boundaries established for the assessment of Project-related effects on the socio-economic factors that influence Community Health and Well-being encompass all of these Project phases. Different Project phases are likely to have differing degrees of influence on the subcomponents evaluated herein, and particulars regarding temporal scope are discussed in more detail in the effects evaluation for each subcomponent.

### 1.5.4 ADMINISTRATIVE BOUNDARIES

The administrative boundaries include government administrative boundaries for Whitehorse, Dawson, Beaver Creek, Pelly Crossing, and Mayo, where such administrative boundaries are in place. Issues involving health, including the provision of health and social services and factors such as speed control on the NAR, involve participation and oversight by local officials including First Nation governments.

The Project is located on Crown lands that are within the established Traditional Territory of TH, with portions of the proposed NAR within the established Traditional Territories of the SFN and the FNNND. The Mine Site and a portion of the NAR are within the asserted territory of WRFN as defined in the "Northern Boundary Document" presented to Canada and YG in February 2013.

The major portion of the Project is located within the Dawson Land Use Planning Region. The Project footprint is not located within any Special Management Area or Habitat Protection Area as enabled under the *Wildlife Act*, RSY 2002, c.229.

### 1.5.5 TECHNICAL BOUNDARIES

The outputs of HIA make it challenging to make summary decisions about the significance of potential adverse effects on community health and well-being, or various other types of clear-cut dichotomous decisions. Nonetheless, the HIA process encourages a more complete discussion about the often unintended consequences of a project for communities. This, in turn, creates a stronger foundation for the explicit consideration of the types of mitigative actions that can be used to manage against adverse effects to community health and well-being, based on the various subcomponents and indicators identified in this assessment (**Table 1.3-2**).

The explicit recognition that a large number of environmental, social, cultural, economic, and other factors influence human health and well-being allows for a greater focus on some of the potential secondary and tertiary influences on community health and wellness of a project or activity, as reflected in community resilience. A technical challenge, however, is that no single factor will have a large influence on health and well-being independently of any other factor; many factors will continually interact in often complex ways;

and the level of health and wellness of individuals and communities will reflect the cumulative past influences of many experiences and conditions. As such, it is challenging to objectively measure community health and well-being, or to predict the overall influence of one factor or change on the overall community status.

## **2.0 ASSESSMENT METHODS**

The methods used to identify and assess potential Project-related and cumulative effects were developed from assessment requirements identified in YESAA and YESAB guidance documents (e.g., YESAB 2005). The assessment of potential Project-related effects on Community Health and Well-being was informed by two complementary approaches: a quantitative HHRA which informed the selection of environmental quality indicators, and a qualitative HIA which informed the socio-economic indicators. The HHRA assessed the direct health implications of exposure to Project-related noise, air emissions, and contaminant exposures associated with the gathering and consumption of country foods. The qualitative HIA methodology assessed the indirect effects on health due to Project-related changes in key socio-economic factors that can indirectly affect community health and well-being.

### **2.1 HUMAN HEALTH RISK ASSESSMENT METHODOLOGY**

Human health risk assessment is a tool that is useful for examining how changes in environmental quality (e.g., air quality, environmental noise, water quality, soil quality) could influence human health. The underlying premise is that changes in environmental quality can drive changes in the characteristics and magnitude of human exposures to stressors such as noise, or chemicals such as those trace elements present at atypically high concentrations in mine wastes or ore.

Human health risk assessment is based on toxicological dose-response relationships that have been defined through epidemiological and laboratory-based scientific studies. The analysis assumes that the degree of human exposures to stressors or substances of interest can be measured or predicted. The analysis also assumes that a threshold for exposure can be identified with adequate confidence below which any associated risks of adverse health outcomes are highly unlikely. HHRA, by its quantitative nature, is narrowly focussed on identifying information such as the amount of an identified stressor or substance of interest that may not be exceeded to protect the health of humans, and what activities or situations may result in exposures that could exceed that amount.

The World Health Organization, Health Canada, and a large proportion of health authorities, organizations, researchers, and health care providers define human health and well-being far more broadly than the physiological health status associated with toxicological effects, as can be addressed using HHRA. The overall health and well-being of people and communities is influenced by a complex series of interacting health determinants, including various social determinants of health. Those linkages and relevant health determinants that cannot be adequately captured in simple dose-response relationships are the major subject of HIA. HHRA and HIA, therefore, are complimentary approaches for developing an adequate understanding about adverse effects on health.

## 2.2 HEALTH IMPACT ASSESSMENT METHODOLOGY

The methodology employed in HIA is modified from that used for the Project Proposal's effects assessment (**Chapter 5.0**), and follows the steps outlined below:

- **Screening** determines the types of potential health categories that may interact with and be affected by the Project. The screening process utilized for the Project involved review of available literature including HIAs conducted for similar projects in the North as well as an interview with Yukon's Chief Medical Officer of Health. Screening of issues for inclusion in the assessment is documented in **Section 1.2 and 1.3** of this report.
- **Scoping** creates objectives and an outline for the process. The scoping process for the Project included establishing temporal and spatial boundaries, as well as assessing the categories of health determinants for the HIA and determining the data elements to be collected. Scoping for the HIA is documented in **Section 1.2** of this report.
- A **Baseline Health Profile** provides information about the existing health conditions of the potentially affected populations, and consists of data collected from the Project study area to populate the health determinant categories selected during the scoping process. The existing conditions for the assessment is documented in **Section 3.0** of this report.
- The **Assessment** section predicts potential Project-related health effects and includes proposed mitigations against possible adverse health effects, maximize health benefits, and provide a plan for action. These recommendations are based on information gained through the primary data collection process, and developed using professional judgement. The assessment is documented in **Section 4.0** of this report.
- **Reporting** provides the findings to First Nations, reviewers, regulators, communities, and other interested parties. The final document represents partial fulfilment of the reporting process.
- **Evaluation** activities enable practitioners to assess the HIA process, as well as the effect of the HIA and any health outcomes. **Monitoring** measures health indicators that can be used to inform evaluation (Pew Trust 2016). These steps are described in the relevant sections of the Community Infrastructure and Services Valued Component Assessment (**Appendix 22-A**), the Community Health and Well-Being Valued Component Assessment (**Appendix 25-A**), as well as in the Socio-economic Management Plan (refer to **Section 31.0 Environmental and Socio-economic Management Program** of the Project Proposal).

This assessment of Community Health and Well-being, including the assessment of Project-related effects and cumulative effects, was conducted according to the methods set out in **Section 5.0 Assessment Methodology** of the Project Proposal. The assessment has been informed by input such as TK, statistical, and other information provided to the Project team through consultation and engagement with potentially affected First Nations, government agencies, and the public, as well as information from **Appendix 18-A Socio-economic Baseline Report, Appendix 18-B Human Health Risk Assessment Report**.

### 3.0 EXISTING CONDITIONS

A summary of existing regulatory and baseline conditions is provided for local context and to enable the reviewer to identify and understand the potential interactions between the Project and Community Health and Well-being. Existing conditions are described based on available information, including legislation and/or policy applicable to the Community Health and Well-being VC, available TK relevant to Community Health and Well-being (subject to confidentiality constraints), baseline reports describing desktop and studies, as well as scientific and other information.

#### 3.1 REGULATORY AND MANAGEMENT CONTEXT

Health is included as part of socio-economic effects in YESAA, section 42(1)(g), which includes recognition of:

...the need to protect the rights of Yukon Indian persons under final agreements, the special relationship between Yukon Indian persons and the wilderness environment of Yukon, and the cultures, traditions, health and lifestyles of Yukon Indian persons and other residents of Yukon.

Workplace health is protected by the Yukon *Occupational Health and Safety Act*, RSY 2002, c.159; amended by SY 2005, c.4; SY 2009, c.21; SY 2010, c.12 and the Yukon Occupational Health and Safety Regulations.

The *Workers' Compensation Act*, SY 2008, c.12, amended by SY 2010, c.12; SY 2011, c.4, provides an open and fair system of compensation for work-related injuries, promotes recovery from workplace injuries, and provides a means to enforce health and safety standards.

#### 3.2 BACKGROUND INFORMATION AND STUDIES

This section presents a summary of the background information and studies conducted in support of the assessment of Project-related effects on Community Health and Well-being. It includes information sources gathered from TK, as well as scientific and technical information, and describes the baseline studies that were conducted during the Project's feasibility program.

The HHRA was completed in part using information on: existing environmental conditions (i.e., acoustic environment and air quality, soil and water and sediment quality); traditional knowledge; locations within the proposed Mine Site where occupational workers could be exposed to airborne contaminants or noise over extended durations; and predictions for air quality, dust fall and noise. **Section 1.2 of Appendix 18-B Human Health Risk Assessment** provides further detail.

### 3.2.1 TRADITIONAL KNOWLEDGE

Traditional Knowledge related to the Community Health and Well-being VC was obtained from published documents and reports as well as through consultation and engagement with First Nations. Published reports included the following:

- Specific to the HHRA: Land and resource use, and locations of residences or various activities close to the access route or proposed Mine Site for the Tr'ondëk Hwëch'in, White River First Nation, Na-cho Nyäk Dun, Selkirk First Nation, and various other interested parties, affected communities, and the public (**Section 3.0 Consultation** and **Section 4.0 Project Setting; Section 18.0 Introduction to the Human Environment** and **Section 24.0 Land and Resource Use Assessment**)
- Tr'ondëk Hwëch'in Resource Report (TH 2012)
- White River First Nation Knowledge and Use Study (Bates et al. 2011)
- Socio-Economic Setting for the Proposed Mayo Hydro Enhancement Project (InterGroup Consultants 2009)
- Mini-Project-Specific Traditional Land Use Study For the Tarsis Resources White River Property (Campbell 2012)
- Rabbit Stew for Grandma (Leary 2009)
- Opening the Land: A Study of the Impacts of the Casino Trail on the Northern Tutchone of Pelly Crossing and Carmacks, Yukon Territory (Pearse and Weinstein 1988).

Some of the information considered included the importance of sharing food with Elders, sense of place, resources used, and species of importance (e.g., grouse, waterfowl, fish, small game, plants and berries). This information was used in the identification and analysis of potential environmental effects, including the selection of several representative locations for assessing the effects of dust fall on environmental quality.

### 3.2.2 SCIENTIFIC AND OTHER INFORMATION

Baseline conditions were assessed through desktop research using existing data sources as well as primary data collection through key informant interviews.

Socio-economic and health information for existing conditions was obtained from data sources including Statistics Canada, Yukon Bureau of Statistics, Yukon Workers' Health and Safety Board, and YG (see below). Reports published by local organizations also provided baseline information. A summary of the information sources referenced for this report is presented in **Table 3.2-1**



**Table 3.2-1 Examples of Information Sources**

| Source Type                | Information Source   |
|----------------------------|--|
| HIA Methodology Guidance   | <ul style="list-style-type: none"> <li>• <i>Canadian Handbook on Health Impact Assessment</i> (Minister of Public Works and Government Services Canada 2004)</li> <li>• Good Practice Guidance for Health Impact Assessment (International Council on Mining and Metals 2010)</li> <li>• Technical Guidance for Health Impact Assessment in Alaska (State of Alaska HIA Program 2011)</li> <li>• Health Impact Assessment: Principles and Practice. Routledge (Birley 2011)</li> <li>• Health Impact Assessment in the United States (Ross et al 2014)</li> <li>• A Guide to Health Impact Assessments in the Oil and Gas Industry (IPIECA 2005).</li> </ul> |
| Statistical Databases      | <p>Statistics Canada. CANSIM (database). Available at <a href="http://www5.statcan.gc.ca/cansim/home-accueil?lang=eng">http://www5.statcan.gc.ca/cansim/home-accueil?lang=eng</a>. Accessed multiple dates to April 21, 2016.</p> <p>YG Socio-Economic Web Portal. Available at: <a href="http://www.sewp.gov.yk.ca">http://www.sewp.gov.yk.ca</a> Accessed multiple dates to April 21, 2016.</p>  |
| Statistical Reports        | <p>Allen, M. and S. Perreault. 2013. Police-reported crime in Canada's Provincial North and Territories. Statistics Canada. Available at <a href="http://www.statcan.gc.ca/pub/85-002-x/2015001/article/14165-eng.htm">http://www.statcan.gc.ca/pub/85-002-x/2015001/article/14165-eng.htm</a></p>   |
| White Papers               | <p>Angel, A. 2014. Beyond the “Roughneck” stereotype: Revealing the actual face of mobile workers in the Alberta Oil Sands and North Dakota’s Bakken Oil Region and why It matters to health. Target Logistics white paper.</p>  |
| Peer-reviewed Publications | <p>Goldenberg SM., J.A. Shoveller, A.C. Ostry, and M. Koehoorn. 2008. Sexually transmitted infection (STI) testing among young oil and gas workers: the need for innovative, place-based approaches to STI control. <i>Can J Public Health</i>: 99(4):350-4.</p> <p>Paci, C. and N. Villebrun. 2005. Mining Denendeh: A Dene Nation Perspective on Community Health Impacts of Mining. <i>Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health</i>: 3(1).</p>  |
| Data Requests              | <p>YG, Highways and Public Works. Data request for traffic collisions. Received December 30, 2015.</p> <p>Yukon Workers’ Compensation Health and Safety Board. Information request for mining-related injuries. Received June 12, 2015.</p> <p>YG, Yukon Bureau of Statistics. Data request for information on crude birth rates in Yukon. Received March 6, 2017.</p>   |

**3.2.3 BASELINE STUDIES CONDUCTED DURING THE PROJECT’S FEASIBILITY PROGRAM**

Desktop and field studies that are of relevance to Community Health and Well-being and its subcomponents are provided in **Table 3.2-2**.

**Table 3.2-2 Summary of Desktop and Field Studies Related to Community Health and Well-being**

| Study Name  | Study Purpose, Duration and Spatial Boundaries  |
|---|---|
| <b>Appendix 18-A<br/>Socio-economic<br/>Baseline Report</b> | <p>The Socio-economic Baseline Report describes the existing socio-economic and health conditions for the Project. Through this report, the existing socio-economic and health landscape is introduced, and the Project's socio-economic and health IC and VCs are described. The study began in December 2015 and was completed in April 2016.</p> <p>Recommendations to support community health and well-being were developed in consultation with community members and key stakeholders in YG and non-governmental organizations working in areas related to health and well-being, this aspect of the HIA methodology took place from May 2015 to April 2016, and included an assessment for the City of Dawson and Yukon as a whole.</p> |
| <b>Appendix 18-B<br/>Human Health Risk<br/>Assessment</b>   | <p>The HHRA was conducted to estimate the nature and probability of adverse health effects in humans who may be exposed to hazards as a result of Project activities. The HHRA took place in April 2016 and included the area surrounding the proposed Project.</p>   |

### 3.2.4 DATA COLLECTION

Data collection activities to support the Project's HIA methodology included a desktop review of existing information and statistical data, interviews with key individuals and groups and consultation with participants at community meetings, where quantitative and qualitative data were compiled. This process and the data collected informed the selection of key health impacts, identification of opportunities, and development of mitigation measures related to the Project. The data collection process also provided a formal mechanism for feedback from the community and stakeholders.

#### 3.2.4.1 Primary Data Collection

Primary data collection was conducted in Dawson and Whitehorse using the following approach:

- Semi-structured face-to-face and telephone interviews with First Nations, government representatives, and other key stakeholders
- Informal conversations at community meetings
- Documentation of questions and concerns voiced during presentations and community meetings.

#### 3.2.4.2 Secondary Data Sources

A review of existing information included the following sources:

- Statistical databases
- Reports summarizing local, regional, and territorial health status and trends
- White papers on health trends in resource development, best practices, guidelines, and standards
- Peer-reviewed publications regarding the health effects of resource development projects and economic activity
- Published HIAs for similar projects, particularly resource development projects in Alaska and Yukon
- Other health-related publications including facilitator guides and workbooks for wellness initiatives.

Data requests were also fulfilled by governmental agencies, providing an additional source of secondary data.

### **3.3 DESCRIPTION OF EXISTING CONDITIONS**

#### **3.3.1 ENVIRONMENTAL QUALITY**

Existing conditions for air quality and noise are described in **Section 9.0 Air Quality and Greenhouse Gas Emissions Analysis** and **Section 10.0 Noise Analysis** respectively, as well as in the accompanying **Appendix 9-A Baseline Air Quality and Noise at the Coffee Gold Project 2015**. Sampling was also completed to characterize the chemistry of soil and plant tissue as part of existing conditions around the proposed Project location, as discussed in **Appendix 15-A Vegetation Baseline Study Report**.

The areas at and around the proposed Mine Site area are in a generally natural state. There are no local sources of airborne contaminants, and the soils and plants reflect background regional concentrations, except in the immediate vicinity of areas where there has been substantial disturbance as a result of mining exploration activities. Dust fall in the area reflects natural sources of dust such as tree pollen, as well as deposits from forest fires while they are occurring. Baseline noise measurements are consistent with a quiet environment. Similarly, the areas adjacent to the NAR tend to be largely undeveloped, and can be considered in a generally natural state with regard to air quality, water quality, soil quality, and the quality of country foods, except perhaps in very limited locations around active placer mines.

Based on the baseline information collected, natural resources in important harvesting areas such as the mouth of Coffee Creek are good quality and provide good nutritional, medicinal, and cultural resources, in areas where they are adequately abundant.

#### **3.3.2 SOCIO-ECONOMIC FACTORS**

Socio-economic factors include: social indicators of individual and community health (e.g., crime), health-related behaviours (e.g., smoking and substance use), food security, accidents and injuries, infectious and non-infectious disease, mental health and wellness, and health services structure and capacity. Socio-economic health factors are described for the RAA, and for the LAA where available.

Although health indicators were generally similar for the RAA as compared to Canada as a whole, the baseline study revealed several observations of note:

- Yukon has the third lowest life expectancy, behind Nunavut and Northwest Territories (NWT).
- Yukon has very high rates of unintentional injuries causing death, consistently appearing as the third leading cause of death behind cancer and heart disease. Accidental injury is typically the fifth leading cause of death Canada-wide.

- Rates of intentional self-harm decreased from 2005 to 2009 to a low of 5.1 per 100,000, then increased each year thereafter to a rate of 18.7 per 100,000 in 2012. The Canadian rate remained relatively consistent over the same period (average rate 10.5 per 100,000 for 2005 to 2012).
- The Crime Severity Index and Violent Crime Severity Index showed an increase in 2013 and 2014 in both Dawson and Whitehorse. Both indices are higher than that of Canada as a whole.
- Family violence rates have been reported to be the third highest in Canada.
- Rates of heavy drinking are elevated as compared to Canada as a whole.

These findings suggest that injury and self-injury are key areas of interest. Additionally, alcohol use is of concern. Existing conditions for socio-economic factors are described for the RAA, and for the LAA where available.

### **3.3.2.1 General Health Indicators**

General health information is described to provide context for the discussion of socio-economic factors that contribute to individual and community health. General health information includes births (i.e., number of births, fertility rate and crude live birth rate), deaths (i.e., mortality, causes of mortality, infant mortality), and low birth weight rates.

#### ***Births***

Demographic information for the Project's effects assessment is provided in the Project Proposal, **Section 19.0 (Demographics IC Analysis Report)**. An average of 434 births per year in Yukon was reported for the period 2010–2011 to 2014–2015 (**Table 3.3-2**) (Statistics Canada 2015a). Yukon's total fertility rate per 1,000 females was approximately 1,617 on average between 2003 and 2011, with age-specific rates shown in **Table 3.3-2** (Statistics Canada 2016a).

The total fertility rate is an estimate of the average number of live births a female can be expected to have in her lifetime, based on the age-specific fertility rates of a given year. For Yukon in 2011, the total fertility rate was 1,729.7 per 1,000 females, meaning females might be expected to have a total of 1.7 children on average, slightly above the Canadian average of 1.6.

Age-specific fertility rate refers to the number of births to females in a particular age category in a particular year compared to the number of females in that age category, and is usually expressed as births per woman or births per 1,000 women in the age category. This rate is usually calculated for the age range of 15 to 49, because only a very small proportion of births occur to women outside of that age range. Age-specific fertility rates are usually calculated for single years of age or for five-year age categories. In Yukon in 2011, the age-specific fertility rate for women aged 20 to 24 was 51.9 per 1,000 women; for women aged 25 to 29, 97.1 per 1,000; for women aged 30 to 34, 103.1 per 1,000; and for women aged 35 to 39, 70.4 per 1,000 (Statistics Canada 2016a).

**Table 3.3-1 Number of Births, Canada and Yukon (final and estimated), 2010 – 2011 to 2014–2015**

|        | 2010 / 2011 | 2011 / 2012 | 2012 / 2013 | 2013 / 2014 | 2014 / 2015 |
|--------|-------------|-------------|-------------|-------------|-------------|
| Canada | 376,951     | 377,897     | 382,980     | 386,044     | 388,729     |
| Yukon  | 404         | 440         | 445         | 439         | 443         |

**Note:** The time period is from July 1 to June 30. The number of births is final up to 2010/2011, updated from 2011/2012 to 2013/2014, and preliminary for 2014/2015.

**Source:** Statistics Canada 2015a.

**Table 3.3-2 Fertility Rate and Crude Live Birth Rate, Canada and Yukon**

| Place of Residence of Mother           | Characteristics   | 2003    | 2004    | 2005    | 2006    | 2007    | 2008   | 2009    | 2010   | 2011  |
|--|---|---------|---------|---------|---------|---------|--------|---------|--------|-------|
| Canada                                 | Age-specific fertility rate (per 1,000 females):        |         |         |         |         |         |        |         |        |       |
|  | 15 to 19 years  | 14.5    | 13.7    | 13.4    | 13.7    | 14      | 14.3   | 14.2    | 13.5   | 12.6  |
|  | 20 to 24 years  | 52.7    | 51      | 50.4    | 51.1    | 52.6    | 53     | 51.2    | 48     | 45.7  |
|  | 25 to 29 years  | 98.6    | 97.4    | 97.3    | 98.5    | 101.7   | 102    | 100.6   | 96.4   | 95.2  |
|  | 30 to 34 years  | 93.7    | 95.8    | 97.4    | 100.9   | 106     | 107.4  | 107     | 105.7  | 105.9 |
|  | 35 to 39 years  | 38.7    | 40.1    | 42.1    | 44.9    | 48.5    | 50.1   | 50.6    | 51.6   | 52.3  |
|  | 40 to 44 years  | 6.5     | 6.9     | 7.1     | 7.4     | 7.9     | 8.4    | 9.2     | 9.9    | 10.3  |
|  | 45 to 49 years  | 0.3     | 0.3     | 0.3     | 0.3     | 0.4     | 0.4    | 0.4     | 0.4    | 0.5   |
|  | Crude birth rate, live births per 1,000 population      | 10.6    | 10.5    | 10.6    | 10.9    | 11.2    | 11.3   | 11.3    | 11.1   | 11    |
| Total fertility rate per 1,000 females | 1,525.1   | 1,525.8 | 1,543.4 | 1,586.2 | 1,658.9 | 1,680.8 | 1,668  | 1,626.9 | 1610   |       |
| Yukon                                  | Age-specific fertility rate (women) (per 1,000 females) |         |         |         |         |         |        |         |        |       |
|  | 15 to 19 years (5)                                      | 22.7    | 22.9    | 12.2    | 19.1    | 16.6    | 26.3   | 23.3    | 19.2   | 16.2  |
|  | 20 to 24 years  | 70.9    | 82.1    | 52.6    | 66      | 51.8    | 55.3   | 63.9    | 61.3   | 51.9  |
|  | 25 to 29 years  | 90.2    | 96.3    | 92.7    | 96.9    | 104.6   | 94.4   | 94.6    | 92.8   | 97.1  |
|  | 30 to 34 years  | 80.1    | 91.5    | 89.8    | 100     | 94.7    | 95.4   | 85.5    | 84.5   | 103.1 |
|  | 35 to 39 years  | 29.2    | 34.3    | 33.8    | 45.5    | 39.6    | 47.3   | 51.4    | 45.3   | 70.4  |
|  | 40 to 44 years  | 10.6    | 3.7     | 9.6     | 7.3     | 8.3     | 9.2    | 10.8    | 11.9   | 8.7   |
|  | 45 to 49 years  | 0       | 2.6     | 0.6     | 0.6     | 0       | 0      | 0       | 0.6    | 0     |
|  | Crude birth rate, live births per 1,000 population      | 11      | 11.8    | 10.3    | 11.7    | 10.9    | 11.3   | 11.4    | 11     | 12.2  |
| Total fertility rate per 1,000 females | 1518.4  | 1666.8  | 1476.6  | 1686.1  | 1580.2  | 1637.9  | 1656.2 | 1604.5  | 1729.7 |       |

**Note:** Crude live birth rate indicates the number of live births occurring during the year, per 1,000 population estimated at midyear.

**Source:** Statistics Canada 2016a.

Crude birth rates for communities in the LAA are provided in **Table 3.3-3**.

**Table 3.3-3 Crude Live Birth Rates in the Local Assessment Area**

| Community       | Year |      |      |
|-----------------|------|------|------|
|                 | 2014 | 2015 | 2016 |
| Whitehorse Area | 10.9 | 11.5 | 11.3 |
| Dawson          | 9.7  | 10.6 | 7.0  |
| Beaver Creek    | -    | 16.5 | 9.2  |
| Pelly Crossing  | 10.1 | 21.2 | 5.2  |
| Mayo            | 10.2 | 12.6 | 12.4 |

**Source:** Yu Pers. Comm. 2017

**Note:** Beaver Creek data for 2014 are not available.

### ***Mortality***

Yukon has the third lowest life expectancy in Canada, with only NWT and Nunavut having lower average life expectancies (Conference Board of Canada 2016a). In Canada and Yukon, cancer and heart disease are the first and second leading causes of death, respectively. However, Yukon has reported higher rates of death due to accidental injury than Canada as a whole (Statistics Canada 2015c; Statistics Canada 2015f).

**Table 3.3-4 Mortality, Yukon**

| Cause of Death   | ICD 10 Code <sup>1</sup> | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|--|--------------------------|------|------|------|------|------|------|------|------|------|
| Total, all causes of death   | A00-Y89                  | 133  | 166  | 164  | 178  | 192  | 198  | 201  | 198  | 193  |
| Tuberculosis   | A16-A19                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Malignant neoplasms  | C00-C97                  | 49   | 46   | 56   | 62   | 67   | 59   | 63   | 68   | 59   |
| Malignant neoplasms of colon, rectum, and anus   | C18-C21                  | 5    | 5    | 4    | 7    | 10   | 8    | 6    | 6    | 10   |
| Malignant neoplasms of trachea, bronchus, and lung                                     | C33-C34                  | 17   | 13   | 19   | 14   | 9    | 13   | 18   | 23   | 18   |
| Malignant neoplasm of breast   | C50                      | 5    | 3    | 0    | 4    | 1    | 2    | 6    | 4    | 2    |
| Malignant neoplasm of prostate   | C61                      | 1    | 3    | 2    | 4    | 4    | 1    | 2    | 4    | 3    |
| Diabetes mellitus  | E10-E14                  | 2    | 5    | 3    | 4    | 4    | 2    | 5    | 6    | 5    |
| Major cardiovascular diseases  | I00-I78                  | 34   | 39   | 36   | 32   | 54   | 43   | 37   | 41   | 48   |
| Acute myocardial infarction  | I21-I22                  | 2    | 8    | 8    | 3    | 12   | 2    | 6    | 7    | 4    |
| Cerebrovascular diseases   | I60-I69                  | 9    | 8    | 7    | 8    | 7    | 11   | 8    | 10   | 8    |
| Influenza  | J09-J11                  | 0    | 1    | 0    | 0    | 0    | 1    | 1    | 0    | 0    |
| Pneumonia  | J12-J18                  | 1    | 2    | 2    | 2    | 1    | 5    | 2    | 4    | 1    |
| Chronic lower respiratory diseases   | J40-J47                  | 3    | 7    | 9    | 7    | 6    | 14   | 10   | 10   | 12   |
| Accidents (unintentional injuries)   | V01-X59 Y85-Y86          | 20   | 25   | 21   | 23   | 18   | 18   | 27   | 19   | 14   |
| Transport accidents  | V01-V99 Y85              | 6    | 6    | 7    | 10   | 6    | 6    | 12   | 7    | 7    |
| Motor vehicle accidents  | Note 1                   | 6    | 6    | 5    | 9    | 5    | 6    | 10   | 5    | 7    |
| Other land transport accidents   | Note 2                   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Water, air and space, and other and unspecified transport accidents and their sequelae | V90-V99 Y85              | 0    | 0    | 2    | 1    | 1    | 0    | 2    | 2    | 0    |
| Non-transport accidents  | W00-X59 Y86              | 14   | 19   | 14   | 13   | 12   | 12   | 15   | 12   | 7    |
| Falls  | W00-W19                  | 1    | 1    | 3    | 0    | 1    | 1    | 4    | 3    | 1    |
| Accidental discharge of firearms   | W32-W34                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |

<sup>1</sup> The International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) is an international standard for reporting clinical diagnoses developed by the World Health Organization. (Canadian Institute for Health Information, 2016)



| Cause of Death  | ICD 10 Code1          | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|-----------------------|------|------|------|------|------|------|------|------|------|
| Accidental drowning and submersion  | W65-W74               | 3    | 3    | 1    | 0    | 1    | 1    | 0    | 1    | 1    |
| Accidental exposure to smoke, fire, and flames                                    | X00-X09               | 2    | 1    | 0    | 2    | 0    | 1    | 2    | 0    | 0    |
| Accidental poisoning and exposure to noxious substances                           | X40-X49               | 3    | 7    | 3    | 6    | 5    | 7    | 7    | 4    | 3    |
| Other and unspecified non-transport accidents and their sequelae                  | Note 3                | 5    | 7    | 7    | 5    | 5    | 2    | 2    | 4    | 2    |
| Intentional self-harm (suicide)   | X60-X84 Y87.0         | 6    | 6    | 5    | 3    | 2    | 2    | 2    | 4    | 5    |
| Intentional self-harm (suicide) by discharge of firearms                          | X72-X74               | 3    | 3    | 0    | 1    | 1    | 1    | 1    | 1    | 2    |
| Intentional self-harm (suicide) by other and unspecified means and their sequelae | X60-X71 X75-X84 Y87.0 | 3    | 3    | 5    | 2    | 1    | 1    | 1    | 3    | 3    |
| Assault (homicide)  | X85-Y09 Y87.1         | 1    | 7    | 0    | 0    | 1    | 3    | 1    | 0    | 0    |
| Assault (homicide) by discharge of firearms                                       | X93-X95               | 1    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Assault (homicide) by other and unspecified means and their sequelae              | X85-X92 X96-Y09 Y87.1 | 0    | 6    | 0    | 0    | 1    | 3    | 1    | 0    | 0    |

**Notes:** ICD-10 = World Health Organization (WHO), International Statistical Classification of Diseases and Related Health Problems, Tenth Revision

**Source:** Statistics Canada 2015c.

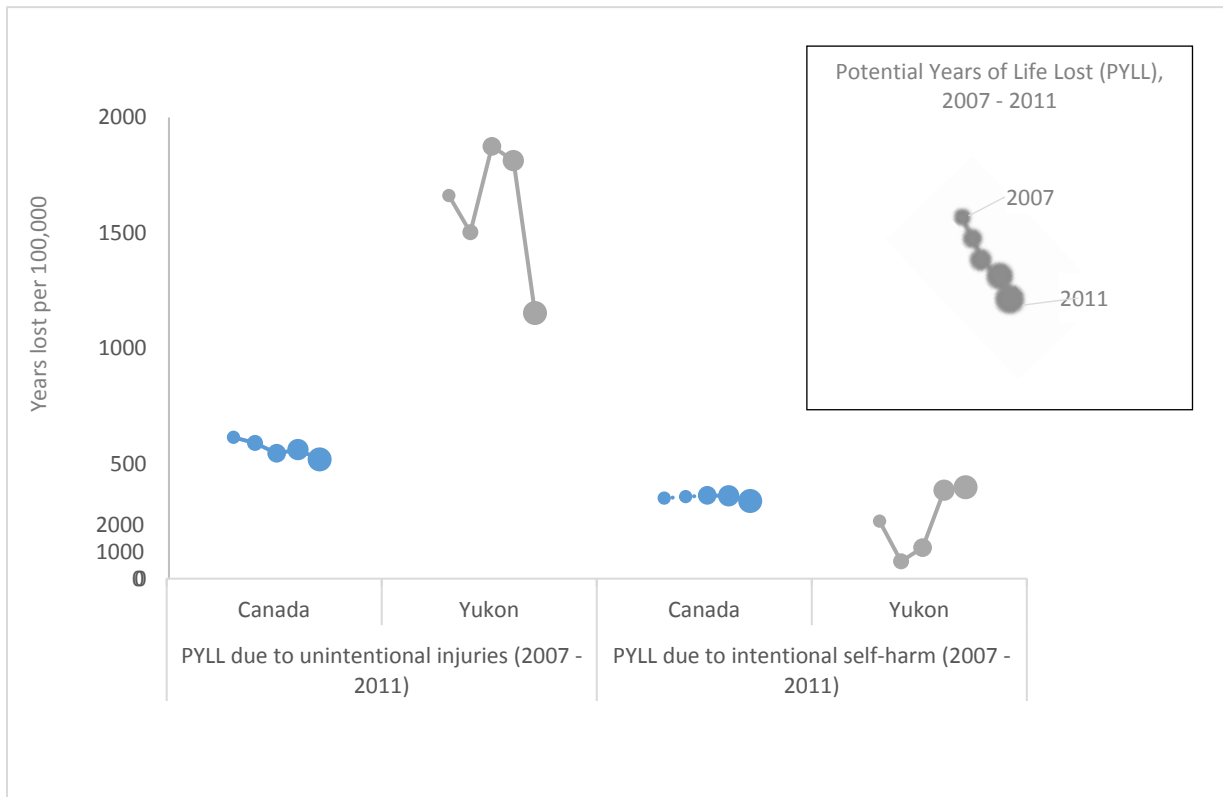
**Table 3.3-5 Rank of Leading Causes of Death, Yukon and Canada**

| Leading Causes of Death            |                                 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------------------------------|---------------------------------|------|------|------|------|------|
| Malignant neoplasms (cancer)       | Rank of leading causes of death | 1    | 1    | 1    | 1    | 1    |
|                                    | Rank in Canada                  | 1    | 1    | 1    | 1    | 1    |
|                                    | Number of deaths (Yukon)        | 67   | 59   | 63   | 68   | 59   |
| Diseases of the heart              | Rank of leading causes of death | 2    | 2    | 2    | 2    | 2    |
|                                    | Rank in Canada                  | 2    | 2    | 2    | 2    | 2    |
|                                    | Number of deaths (Yukon)        | 43   | 32   | 27   | 30   | 36   |
| Cerebrovascular disease (stroke)   | Rank of leading causes of death | 4    | 5    | 5    | 4    | 5    |
|                                    | Rank in Canada                  | 3    | 3    | 3    | 3    | 3    |
|                                    | Number of deaths (Yukon)        | 7    | 11   | 8    | 10   | 8    |
| Chronic lower respiratory diseases | Rank of leading causes of death | 5    | 4    | 4    | 4    | 4    |
|                                    | Rank in Canada                  | 4    | 4    | 4    | 5    | 4    |
|                                    | Number of deaths (Yukon)        | 6    | 14   | 10   | 10   | 12   |
| Accidents (unintentional injuries) | Rank of leading causes of death | 3    | 3    | 2    | 3    | 3    |
|                                    | Rank in Canada                  | 5    | 5    | 5    | 4    | 5    |
|                                    | Number of deaths (Yukon)        | 18   | 18   | 27   | 19   | 14   |

**Source:** Statistics Canada 2015f.

Potential years of life lost (PYLL) is a measure of premature death based on life expectancy. For example, an individual who dies of a heart attack at 62, but had a life expectancy of 82, would have 20 potential years of life lost. On a population scale, this measure of premature death can be used to assess the effect of a particular issue, such as intentional self-harm.

The PYLL for Canada as a whole and for Yukon pertaining to unintentional injuries (accidents) and intentional self-harm show higher losses for unintentional injuries in Yukon as compared to Canada as a whole **Figure 3.3-1** (Statistics Canada 2015b). This higher incidence rate mirrors the concern expressed by Yukon’s Chief Medical Officer of Health regarding Yukon’s high injury rates, which are approximately 1.5 to 2 times the Canadian average (YG 2009, HSS 2013a).



Source: Statistics Canada 2016e.

**Figure 3.3-1 Unintentional and International Injuries**

The infant mortality rate (deaths for children 1 year of age and younger) shows that the Yukon rate for males is substantially higher than the Canadian rate from 2007 to 2009; however, this elevated statistic illustrates how rates can be affected by small numbers in a small population, since there were few deaths (three in 2007, two in 2008, and three in 2009) (Statistics Canada 2013b).

**Table 3.3-6 Infant Mortality Rate, Yukon**

| Location | Sex        | Characteristics          | 2007 | 2008 | 2009 | 2010 | 2011 |
|----------|------------|--------------------------|------|------|------|------|------|
| Canada   | Both sexes | Number of deaths         | 1881 | 1911 | 1872 | 1902 | 1810 |
|          |            | Mortality rate per 1,000 | 5.1  | 5.1  | 4.9  | 5    | 4.8  |
|          | Males      | Number of deaths         | 1043 | 1057 | 993  | 1063 | 1020 |
|          |            | Mortality rate per 1,000 | 5.5  | 5.5  | 5.1  | 5.5  | 5.3  |
|          | Females    | Number of deaths         | 838  | 854  | 879  | 839  | 790  |
|          |            | Mortality rate per 1,000 | 4.7  | 4.6  | 4.7  | 4.6  | 4.3  |
| Yukon    | Both sexes | Number of deaths         | 3    | 2    | 3    | 2    | 0    |
|          |            | Mortality rate per 1,000 | 8.5  | 5.4  | 7.8  | 5.2  | 0    |
|          | Males      | Number of deaths         | 3    | 2    | 3    | 1    | 0    |
|          |            | Mortality rate per 1,000 | 16.1 | 10.8 | 14.7 | 5.1  | 0    |
|          | Females    | Number of deaths         | 0    | 0    | 0    | 1    | 0    |
|          |            | Mortality rate per 1,000 | 0    | 0    | 0    | 5.4  | 0    |

Source: Statistics Canada 2013b.

**Low Birth Weight Rate**

Table 3.3-7 shows that Yukon has experienced low birth weight rates more frequently than the Canadian average. Low birth weight is an indicator of the general health of newborns, and is linked to infant survival in the first year of life and the risk of developing chronic health conditions (Government of Canada 2016b).

**Table 3.3-7 Low Birth Weight Rate, Yukon**

| Birth Weight  |            | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|------------|------|------|------|------|------|------|------|------|------|
| Birth weight less than 2,500 grams                        | Number     | 17   | 17   | 12   | 20   | 23   | 16   | 26   | 24   | 21   |
|   | Proportion | 5.1  | 4.7  | 3.8  | 5.5  | 6.4  | 4.3  | 6.8  | 6.3  | 4.9  |
| Birth weight 500 grams or more, but less than 2,500 grams | Number     | 14   | 15   | 12   | 19   | 23   | 16   | 24   | 24   | 21   |
|   | Proportion | 4.2  | 4.1  | 3.8  | 5.2  | 6.4  | 4.3  | 6.3  | 6.3  | 4.9  |

Note: Number and proportion of low birth weight births should be interpreted with caution due to a small underlying count (Statistics Canada 2013c).

Information on mortality, leading causes of death and low birth weight rate are not available for the LAA at the time of writing.

### **3.3.2.2 Social Determinants of Health**

The health and well-being of individuals and communities are affected by social issues such as living conditions, economic conditions, and community and family structures; however, these factors influence health in complex ways. It is important to consider and assess social determinants of health while recognizing that there typically is no direct cause-and-effect relationship between social determinants of health and health outcomes.

#### ***Employment***

Issues relating to employment and economic development are discussed in Section 8.0 of **Appendix 18-A Socio-Economic Baseline Report**.

Statistics on time off work for personal reasons are reported by the Yukon Bureau of Statistics. In 2014, an average of 12.6 days of work were lost per Yukon worker for personal reasons, which is similar to the 12.9 days reported Canada-wide. Occupations in social science, government service, and religion (27.6 days); trades helpers, construction, and transportation labourers and related occupations (27.1 days); and occupations in art, culture, recreation, and sport (26.5 days) had the highest numbers of days lost for personal reasons (YBS 2015b).

#### ***Housing***

Housing issues are an important component of health and well-being, particularly when considering the adequacy, suitability, and affordability of housing. Adequacy considers the condition of a home and whether it needs repairs; having adequate heat is also a consideration. Suitability considers whether a home has enough bedrooms to accommodate all residents. Affordability considers whether the cost of housing exceeds 30 percent (%) of the household's gross income (CMHC 2016).

Housing considerations are described in the Project Proposal in **Section 22.0 Community Infrastructure and Services**. Generally speaking, Dawson has been experiencing a chronic shortage in housing; this has been identified numerous times as an issue of concern during the Project's consultation process, and was also identified in a recent survey as necessary to improve the region and attract more year-round residents (KDO 2014). Although housing is somewhat less expensive in Dawson than in Whitehorse, vacancy rates have been extremely low, with increased pressure on housing during the summer months due to seasonal employment in tourism and mining (YBS 2015b). Additionally, many homes require major repairs in Dawson as compared to Whitehorse and Yukon as a whole (YG 2016c) (see **Section 22.0 Community Infrastructure and Services**).

In 2011, 29% of Yukon First Nations members lived in homes needing major repairs, and 7% lived in crowded homes, with more than one person per room. The corresponding figures for the non-Aboriginal population were 12% and 4% respectively (Arriagada 2016). Housing was frequently mentioned as a concern in Dawson, in terms of availability, affordability, and adequacy (Interview 2, Pers. Comm. 2016;

Interview 7, Pers. Comm. 2016; Interview 8, Pers. Comm. 2016; Interview 20, Pers. Comm. 2016; Interview 21, Pers. Comm. 2016; Interview 28, Pers. Comm. 2016).

### ***Family Structure***

Overall, the structure of Canadian families is becoming more diverse, with a decrease in the number of married two-parent households with children, although this remains the majority family structure (Statistics Canada 2015f). There is a higher percentage of common-law families with children in Yukon (25.1% in 2011), as well as a higher percentage of lone-parent households (20.5% in 2011), as compared to Canada as a whole (16.7% and 16.3%, respectively) (Statistics Canada 2016a).

The percentage of lone-parent families is included as an indicator in the framework presented in *Kids Count: Measuring child and family wellness in Yukon* (HSS 2012). The report advises that lone-parent households are more likely to be economically and materially challenged, and that children of lone-parent households are more likely to experience poorer educational and health outcomes and to engage in health risk behaviours (HSS 2012). Lone-parent families are also more vulnerable to certain health-related effects, particularly with regard to child care and food security. In 2011, 38% of Yukon First Nations children aged 14 and younger lived with both parents, as compared to 74% of non-Aboriginal children (Arriagada 2016). **Table 3.3-8** provides an overview of family structure for Canada and Yukon.

**Table 3.3-8 Census Family Structure: Families with Children, Canada and Yukon**

| Geography     | Family                | 2006      | 2007      | 2008      | 2009      | 2010      | 2011      | 2012      | 2013      | 2014      | 2015      |
|---------------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Canada</b> | Total census families | 9,062,931 | 9,166,403 | 9,284,491 | 9,381,966 | 9,454,687 | 9,556,039 | 9,643,124 | 9,749,732 | 9,831,316 | 9,921,634 |
|               | Couple families       | 7,593,227 | 7,684,881 | 7,771,989 | 7,846,811 | 7,890,403 | 7,976,173 | 8,047,927 | 8,149,590 | 8,221,956 | 8,304,040 |
|               | Lone-parent families  | 1,469,704 | 1,481,522 | 1,512,502 | 1,535,155 | 1,564,284 | 1,579,866 | 1,595,197 | 1,600,142 | 1,609,360 | 1,617,594 |
| <b>Yukon</b>  | Total census families | 8,747     | 8,764     | 8,893     | 9,117     | 9,410     | 9,990     | 9,921     | 9,950     | 10,092    | 10,180    |
|               | Couple families       | 6,918     | 6,880     | 6,964     | 7,141     | 7,344     | 7,968     | 7,792     | 7,903     | 8,027     | 8,130     |
|               | Lone-parent families  | 1,829     | 1,884     | 1,929     | 1,976     | 2,066     | 2,022     | 2,129     | 2,047     | 2,065     | 2,050     |

Source: Statistics Canada 2015d.

### ***Children in Care***

The Child and Family Services division of Yukon Government Department of Health and Social Services provides child placement services including adoption, foster care, and child abuse treatment services (YG 2015a). The Child Protection Branch provides programming intended to reduce family violence, child abuse, and neglect, and engages family home workers to provide intensive in-home support (YG 2015b).

A recent Aboriginal Children in Care report specified that 64% of Yukon children in care are Aboriginal, although 33% of the child population is Aboriginal (Aboriginal Children in Care Working Group 2015). Of all Yukon Aboriginal children aged 14 and younger, 4% were in foster care in 2014 (Arriagada 2016). There were 30% fewer Aboriginal children in care in 2013 and 2014, compared to 2007 and 2008 (Aboriginal Children in Care Working Group 2015).

Yukon's *Child and Family Services Act* (SY 2008, c. 1) established a Cooperative Planning Process for Child Welfare Services, which mandated First Nations involvement in all aspects of planning and decision-making for their children (Aboriginal Children in Care Working Group 2015). This legislation, developed in collaboration with Yukon First Nations, includes collaborative and inclusive decision-making, and incorporates culture and community. In 2012, the Department of Health and Social Services and Kwanlin Dün First Nation (KDFN) developed the Child Protection Memorandum of Agreement regarding child welfare services provided to KDFN families. The Department of Health and Social Services fully included KDFN in the delivery and evaluation of child welfare services. Similar memorandums of agreement will likely be developed with other Yukon First Nations (Aboriginal Children in Care Working Group 2015).

### ***Children and Youth***

Child care is often a necessity for working parents, especially when families do not have the support of extended family or for lone-parent households. Access to child care is a challenge throughout Canada, with one estimate suggesting that day care centres only have space for approximately 20% of children needing care. The quality of child care also affects language and cognitive development as well as emotional development (Cohen et al 2004). Early influences on emotional development have long-term consequences on the development of children and youth (Cohen et al. 2004).

The Social Inclusion Survey conducted in 2010 by Government of Yukon reported that 31% of parents had difficulty finding child care, and 28% had difficulty finding affordable child care, particularly for people living outside of Whitehorse. Of the families surveyed with children under 14 living in their households, 45% had a full-time stay-at-home parent (the mother in 72.3% of families), and 30.4% of families included a parent who worked reduced hours to care for children (the mother for 73.3% of families) (HSS 2010).

Dawson is currently experiencing a shortage in child care availability. In June 2015, the wait list at the Little Blue Early Child Care and Learning Centre was longer than the number of spaces (Windeyer, 2015a), and



the lack of child care has been adversely affecting people's ability to work (Windeyer, 2015b). The Centre has 20 spaces for children.

Young families in Dawson are also serviced by Healthy Families, Healthy Babies, which is part of the Canadian Prenatal Nutrition Program funded by the Public Health Agency of Canada. This program currently offers programming for approximately 40 families with children up to the age of 2, and has two staff members, each working 30 hours per week. The program's coordinator is responsible for programming, coordinating lending resources such as breast pumps and other higher-cost baby-related equipment, securing funding, and providing support for families. A respite worker provides individual support and respite care for participating families, and can support up to six clients at a time. The program also offers Handle with Care workshops, which are designed for parents and caregivers to support the mental health of children from birth to 6 years (Interview 9, Personal Communication 2016).

Tr'ondëk Hwëch'in operates a daycare facility, Trinke Zho, which offers care for both First Nations and non-First Nations children. Trinke Zho can accommodate 60 children.

Tr'ondëk Hwëch'in citizens are also supported by a prenatal group offered through the Community Centre. The importance of family, children, and youth was mentioned frequently by TH citizens, with the birth of children being particularly important to show strong family ties. Many Elders care for children in the community. The TH government provides support for pregnant women, families with young children, Elders, and others needing support, working in collaboration with other resources in the community. Elders receive support with health needs, practical needs such as completing tax returns, and activities and outings (Interview 6, Personal Communication 2016).

### ***Crime***

Community safety is an important component of a community's well-being. In 2014, the crime rate in Yukon was the third highest in Canada, behind Nunavut and NWT, at 23,919 incidents per 100,000 people (Allen and Perreault 2013). This rate reflected an increase of 0.3% over the 2013 rate and an increase of 7.8% over the 2005 rate (YBS 2015a).

There were 8,733 Criminal Code violations in 2014, with 19.0% being violent, as compared to 20.6% for Canada as a whole. The majority (41.9%) were "other" violations, primarily disturbing the peace (2,634 incidents) and administration of justice (840 incidents); 39.1% were property crimes, as compared to 61.4% nationally. This positioned Yukon as the lowest in the country for property crimes, the sixth lowest for violent violations, and the highest for "other" violations (YBS 2015a).

The Crime Severity Index (CSI) is a tool that is weighted to account for the severity of police-reported crime, using the year 2006 in Canada as a reference point of 100.

Similar to the other territories, Yukon has a higher CSI than Canada as a whole; Yukon's CSI showed an increasing trend in 2013 and 2014, but the 2014 rate of 188.03 was substantially lower than the 2004 rate of 245.46 (**Table 1.3-9**) (Statistics Canada 2016c). For the same period, there was an increase of 50% in Yukon's violent CSI, with an increase from 157.21 in 2013 to 238.91 in 2014 (**Table 1.3-9**) (Statistics Canada 2016c).

The police-reported Crime Severity Index for the LAA is summarized for each community:

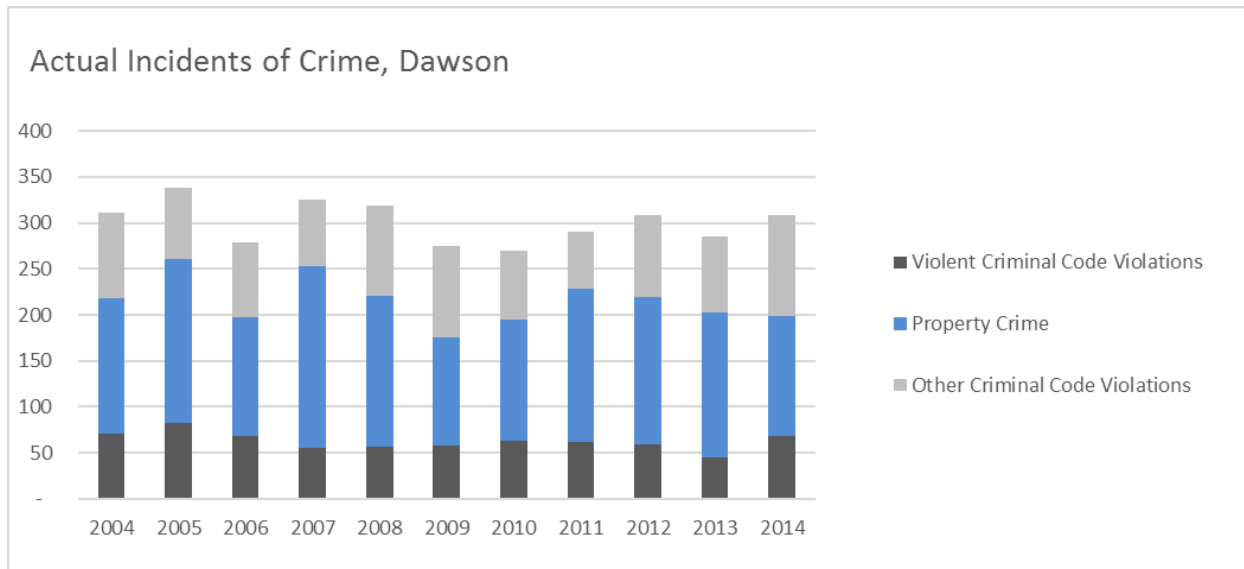
- Dawson had a jump of 137% in its violent CSI from 2013 (90.71) to 2014 (214.90) (Statistics Canada 2016d).
- Whitehorse reported a high of 6,380 total violations in 2014, and a low of 4,354 violations in 2006, reflecting a generally upward trend in recent years (Statistics Canada 2016c). Violent *Criminal Code* violations for Whitehorse were variable for 2004 to 2014, with a peak of 1,070 in 2014 and a low of 671 in 2006 (YBS 2015). Whitehorse showed a 83% increase, from 111.72 in 2013 to 204.05 in 2014 (**Table 1.3-9**) (Statistics Canada 2016c).
- Beaver Creek reported a high of 60 total violations in 2009, and a low of 24 violations in 2014, reflecting a generally downward trend in recent years (Statistics Canada 2016c). Violent Criminal Code violations were variable for 2004 to 2014, with a peak of 16 in 2012 and a low of 4 in 2014 (YBS 2015).
- Pelly Crossing had a range of 135 (2004) to 368 (2010) total violations, with violent Criminal Code violations ranging from 32 in 2005 and 2006 to 74 in 2010 (Statistics Canada 2016c; YBS 2015).
- Mayo had a range of 113 (2010) to 214 (2013) violations for the reported period, with 17 (2008) to 60 (2014) violent Criminal Code violations. The highest reported rates were observed in 2013 and 2014 for both categories (Statistics Canada 2016c; YBS 2015).

**Table 3.3-9 Police-reported Crime Severity Index, Yukon, 2004 – 2014**

| Geography  | Statistics                               | 2004   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   |
|------------|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Yukon      | Crime severity index                     | 245.46 | 199.41 | 180.43 | 186.25 | 182.79 | 180.86 | 171.00 | 154.74 | 156.19 | 169.80 | 188.03 |
|            | % change in crime severity index         | -5.11  | -18.76 | -9.52  | 3.23   | -1.86  | -1.06  | -5.45  | -9.51  | 0.94   | 8.71   | 10.74  |
|            | Violent crime severity index             | 294.33 | 166.86 | 158.10 | 198.41 | 195.49 | 200.22 | 186.20 | 176.61 | 163.47 | 157.21 | 238.91 |
|            | % change in violent crime severity index | 22.82  | -43.31 | -5.25  | 25.50  | -1.47  | 2.42   | -7.00  | -5.15  | -7.44  | -3.83  | 51.97  |
| Dawson     | Crime severity index                     | 255.82 | 185.17 | 158.96 | 194.48 | 168.57 | 176.72 | 176.10 | 240.90 | 160.41 | 168.45 | 193.95 |
|            | % change in crime severity index         | -11.63 | -27.62 | -14.15 | 22.35  | -13.32 | 4.83   | -0.35  | 36.80  | -33.41 | 5.01   | 15.14  |
|            | Violent crime severity index             | 409.86 | 174.88 | 157.61 | 162.18 | 144.94 | 167.27 | 143.06 | 401.93 | 117.01 | 90.71  | 214.90 |
|            | % change in violent crime severity index | -19.22 | -57.33 | -9.88  | 2.90   | -10.63 | 15.41  | -14.47 | 180.95 | -70.89 | -22.48 | 136.91 |
| Whitehorse | Crime severity index                     | 205.99 | 168.53 | 147.70 | 140.88 | 150.14 | 142.55 | 135.91 | 121.40 | 125.85 | 137.24 | 159.15 |
|            | % change in crime severity index         | -10.05 | -18.19 | -12.36 | -4.62  | 6.57   | -5.06  | -4.66  | -10.68 | 3.67   | 9.05   | 15.96  |
|            | Violent crime severity index             | 200.35 | 138.67 | 116.03 | 145.78 | 172.53 | 151.47 | 142.70 | 115.45 | 124.84 | 111.72 | 204.05 |
|            | % change in violent crime severity index | 0.24   | -30.79 | -16.33 | 25.64  | 18.35  | -12.21 | -5.79  | -19.10 | 8.13   | -10.51 | 82.64  |

Source: Statistics Canada 2016c.

**Figure 3.3-2** and **Figure 3.3-3** detail the reported incidents of crime in Dawson and Yukon. In Dawson, a reasonably consistent pattern of violations is presented overall, with total violations ranging from a high of 377 in 2005 and a low of 319 in 2006 for the period 2004 to 2014 (**Figure 3.3-2**) (YG 2015a). Violent Criminal Code violations ranged from a low of 45 in 2013 to a high of 83 in 2005 (**Table 3.3-9**).

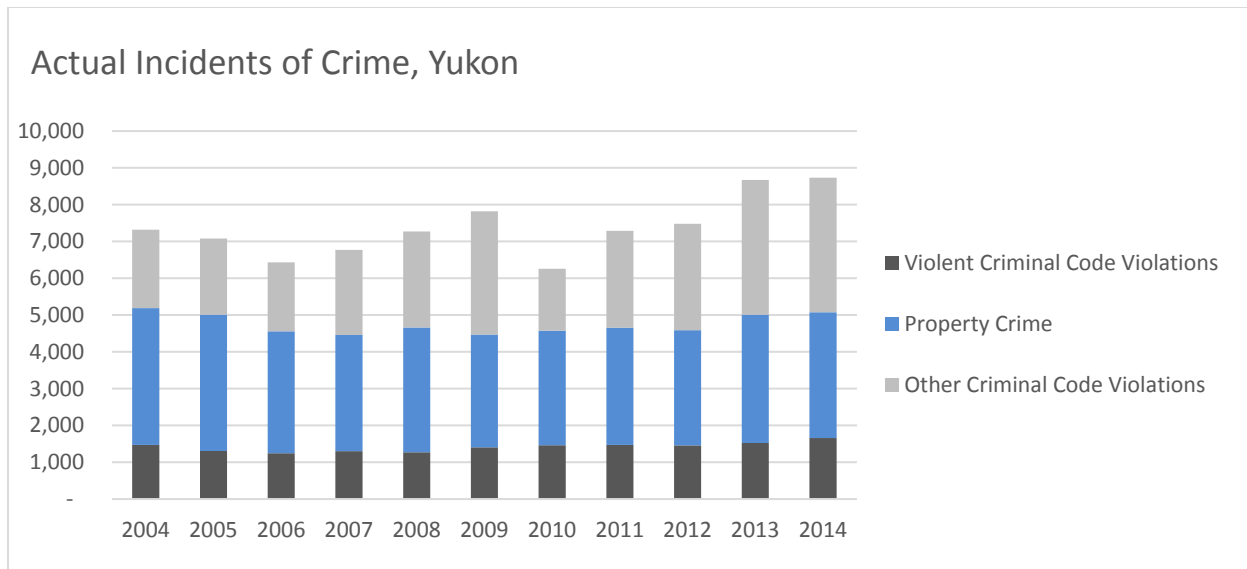


**Note:** Location is based on Royal Canadian Mounted Police detachment areas.

**Source:** YG 2016a.

**Figure 3.3-2 Actual Incidents of Crime, Dawson**

Overall, the total number of violations has shown an increasing trend over time in Yukon, with a total of 8,670 violations in 2013 and 8,733 in 2014, as compared to 7,914 in 2004 (**Figure 3.3-3**) (YG 2015a). Similarly, violent Criminal Code violations have increased in number in recent years, with 1,525 and 1,660 violations reported in 2013 and 2014 respectively (**Figure 3.3-3**) (YG 2015a).



Source: YG 2016b.

**Figure 3.3-3 Actual Incidents of Crime, Yukon**

***Family Violence***

Family violence is considered to be any form of abuse, mistreatment, or neglect from a family member or intimate partner (PHAC 2014). In Canada, almost half (48%) of family violence incidents reported in 2013 were perpetrated by a spouse or former spouse (Statistics Canada 2015e). Aboriginal women are approximately twice as likely to experience family violence; and young women report the highest rates overall (PHAC 2015). In Yukon, the rate of female homicides for Aboriginal females was 12 times higher (7 per 100,000) than the rate of female homicides for non-Aboriginal females (0.58 per 100,000) between 2001 and 2014 (Yukon Women’s Directorate 2016).

Yukon recorded a rate of family violence of 911.6 per 100,000 population in 2014, the third highest rate in Canada behind Nunavut and NWT. There was a 20% increase in reported rates of family-related physical assault in Yukon between 2012 and 2013, whereas every other province and territory reported a decrease. Yukon police-reported rates of intimate partner violence were 1,247.0 victims per 100,000, as compared to the national rate of 310.3 victims per 100,000, the third highest rate behind Nunavut and NWT (Statistics Canada 2015e). Violence against women has been mentioned as a concern associated with the proposed Project (Interview 31, Personal Communication 2015).

A recent survey found that most women in Yukon shelters had experienced emotional (85%) and physical (62%) abuse (**Table 3.3-10**). Women were most commonly fleeing abuse from a common-law partner (38%); the rate of women experiencing abuse from a common-law partner was six times higher than those experiencing abuse from a married partner. A total of 518 women and children were admitted to Yukon shelters in 2014 (Statistics Canada 2016d).

**Table 3.3-10 Reasons for Seeking Shelter Reported by Women’s Emergency Shelter and Transition Home Residents, Canada and Yukon, April 16, 2014**

| Reason for Seeking Shelter (Women) | Canada          |                      | Yukon                |
|------------------------------------|-----------------|----------------------|----------------------|
|                                    | Frequency Cited | Percent of Residents | Percent of Residents |
| Emotional abuse                    | 2,933           | 66                   | 85                   |
| Physical abuse                     | 2,193           | 50                   | 62                   |
| Financial abuse                    | 1,671           | 38                   | 23                   |
| Threats                            | 1,593           | 36                   | 31                   |
| Harassment                         | 1,183           | 27                   | 31                   |

**Note:** Categories are not mutually exclusive. Respondents may indicate multiple reasons for seeking shelter; thus, percentages will not add up to 100%.

**Source:** Beattie and Hutchins 2014.

Whitehorse-based Kaushee’s Place provides emergency shelter for women and their children, as well as advocacy and support services. It serves Whitehorse as well as outlying communities because sometimes even when a shelter is available locally, women cannot stay there for safety reasons (Interview 31, Personal Communication 2015). Kaushee’s Place has 15 emergency beds and five apartment units for longer-term housing. Similarly, Betty’s Haven provides 10 units for longer-term housing. Between April 1, 2014 and March 31, 2015, 288 women were admitted to Kaushee’s Place, accompanied by 171 children (Yukon Women’s Directorate 2016) Yukon women’s shelters are operated independently, but work closely and coordinate funding priorities and requests (Interview 32, Personal Communication 2015).

The Dawson women’s shelter provides emergency housing for women in transition and experiencing temporary homelessness, and prioritizes offers of shelter and safety to women and children fleeing from abuse (Interview 16, Personal Communication 2016). Established in 1989, the shelter currently has four bedrooms, including one double family room with two bunk beds. The shelter typically holds four families with a maximum of 18 people (Interview 16, Personal Communication 2016). Boys under 17 are permitted to stay with their mothers (Interview 16, Personal Communication 2016). Although statistics are confidential, the demand for emergency housing and services has been increasing in recent years (Interview 16, Personal Communication 2016).

### 3.3.2.3 Health-related Behaviours

Health-related behaviours are individual choices such as not smoking, participating in regular physical activity, and eating nutritiously, which are associated with reducing the incidence of health conditions including diabetes, heart disease, cerebrovascular disease, and certain cancers. Preventative strategies include smoking cessation, dietary considerations, and promotion of physical activity. Health-related behaviours are of interest for the Project, since FIFO workers in Australia were found to be much more likely to be current smokers, drink alcohol at risky levels, and be overweight or obese as compared to other employment types (Joyce et al 2013).

### ***Smoking***

Smoking rates in Yukon have been showing a generally decreasing trend in recent years, with a peak rate of 35.5% reported in 2009. The smoking rate declined to 25.9% in 2013 (**Table 3.3-11**) (Statistics Canada 2014). Yukon has the third highest rates of smoking in Canada, behind Nunavut and NWT, but smoking rates are decreasing more quickly than the rest of Canada, at a rate of 6% per year as compared to 3% for Canada as a whole (CBC News 2016b).

### ***Physical Activity***

Many people in Yukon enjoy participating in a variety of outdoor activities and recreational sports. Mountain biking, hiking, running, skiing, and snowmobiling are popular pursuits, and Yukon has been described as a very active place (Interview 1, Personal Communication 2016). Approximately two-thirds of Yukoners reported being moderately active in their leisure time in 2012 and 2013 (**Table 3.3-11**) (Statistics Canada 2014). Exercise has been identified as being very important for maintaining worker wellness while in camp (Interview 1, Personal Communication 2016).

### ***Nutrition***

Rates of fruit and vegetable consumption appear to be on a downward trend, with only 32.6% of Yukoners reporting eating five or more fruits and vegetables per day, down from 52.5% in 2010 (**Table 3.3-11**). Potential Project interactions with access to healthy food are discussed in **Section 4.2.5**.

**Table 3.3-11 Health-related Behaviours, Yukon**

| Health-Related Behaviour (Percent of Population)                | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|------|------|------|------|------|------|------|------|------|------|------|
| Current smoker: daily or occasional (%)                         | 27.6 | N/A  | 30.4 | N/A  | 36   | 31.6 | 35.5 | 27.9 | 29.3 | 29.4 | 25.9 |
| Current smoker: daily (%)                                       | 21.6 | N/A  | 25.7 | N/A  | 31.8 | 25.7 | 27   | 22.4 | 25.2 | 22.8 | 20   |
| Leisure-time physical activity: moderately active or active (%) | 61.2 | N/A  | 58.5 | N/A  | 56.3 | 54.3 | 53.8 | 61.7 | 61.7 | 66.4 | 66.1 |
| Leisure-time physical activity: inactive (%)                    | 38.8 | N/A  | 41.5 | N/A  | 43.7 | 45.7 | 46.2 | 38.3 | 38.3 | 33.6 | 33.9 |
| Fruit and vegetable consumption: 5 times or more per day (%)    | 44.8 | N/A  | 44.8 | N/A  | 39.8 | 36.5 | 45.7 | 52.5 | 41.5 | 38.8 | 32.6 |

Source: Statistics Canada 2014.



**Substance Use**

Heavy drinking refers to men having five or more drinks, or women who have reported having four or more drinks, on one occasion, at least once per month in the past year. In 2013, the rate of heavy drinking in Yukon was 32.4% higher than the national average, second only to NWT (Statistics Canada 2015a) (Table 3.3-12).

**Table 3.3-12 Rates of Heavy Drinking, Yukon, 2013 – 2014**

|         |                   | Canada    |           | Yukon |       |
|---------|-------------------|-----------|-----------|-------|-------|
|         |                   | 2013      | 2014      | 2013  | 2014  |
| All     | Number of persons | 5,531,638 | 5,281,113 | 9,843 | 8,622 |
|         | Percent           | 18.9      | 17.9      | 32.4  | 27.8  |
| Males   | Number of persons | 3,544,588 | 3,305,464 | 5,517 | 5,184 |
|         | Percent           | 24.5      | 22.7      | 36.0  | 32.6  |
| Females | Number of persons | 1,987,050 | 1,975,649 | 4,326 | 3,438 |
|         | Percent           | 13.4      | 13.2      | 28.8  | 22.7  |

**Source:** Statistics Canada 2015h.

Dawson has been described as having a drinking culture, where alcohol use is common and normalized as a coping mechanism (Interview 3, Personal Communication 2016; Interview 16, Personal Communication 2016). Previous experience by the community suggests that some mining workers participate in heavy drinking while in Dawson on breaks, which corresponds to other reports of an increase in alcohol and drug addiction correlating with mining activity in the north (Knotsch et al. 2011, Maksimowski 2014, Paci and Villebrun 2005, Gibson and Klinck 2005). When needed, treatment for substance use is available in Whitehorse and outside Yukon, but community input suggested more local support is needed (Interview 6, Personal Communication 2016; Interview 16, Personal Communication 2016).

**3.3.2.4 Food Security**

Food insecurity is typically measured using surveys with a range of questions designed to assess the ability to obtain nutritious food, by household. Yukon households both with and without children have rates of food insecurity somewhat above the national average (Table 3.3-13), and food security has been mentioned as a concern (Interview 9, Personal Communication 2016).

**Table 3.3-13 Percentage of Households Reporting Moderate and Severe Food Insecurity**

| Geography | Presence of Children in Household              | 2007/2008 | 2011/2012 |
|-----------|--|-----------|-----------|
| Canada    | Total of households (%)                        | 7.7       | 8.3       |
|           | Child(ren) less than 18 years old present (%)  | 9.7       | 10.3      |
|           | No children less than 18 years old present     | 6.8       | 7.5       |
| Yukon     | Total of households (%)                        | 11.3      | 11.4      |
|           | Child(ren) less than 18 years old present (%)  | 12.9      | 12.1      |
|           | No children less than 18 years old present (%) | 10.6      | 11.2      |

**Source:** Statistics Canada 2013a.

Tr’ondëk Hwëch’in has launched several

The City of Dawson Official Community Plan includes food security as a priority, defining it as “...the ability to secure nutritious, affordable and culturally appropriate food through healthy systems” (City of Dawson 2012). The plan cautions that multiple factors, including high transportation costs and environmental changes affecting traditional food sources, threaten food security in Dawson City. To that end, strategies outlined in the OCP include supporting local food production via the local Farmers Market; supporting the development and expansion of community gardens; possible participation in a local steering committee promoting agriculture development and food security initiatives; and supporting household food production as an allowable land use (City of Dawson 2012.) A 2011 report found that 82% of respondents were concerned about long-term access to affordable and nutritious food (CKS 2011).

Dawson City residents have choices for obtaining food, through local grocery stores and through local farmers, via the Farmers Market and individual vendors; however, locally grown produce is only available seasonally, and food prices are generally higher than in Whitehorse (see **Appendix 18-A Human Environment Baseline Report**). In addition, demand is considered to exceed supply (TH Technical Working Group, Mar 22, 2016; CKS 2011). Growing food locally presents an opportunity as well as a cost, in that the area has good growing conditions, but using land for agricultural purposes means there is less land available for housing (Int. 20, Personal Communication 2016). Dawson City residents can travel to Whitehorse to purchase food and other goods, but this poses a cost in terms of both travel expenses and time, and is not a practical solution for perishable products or for people without transportation options.

Harvesting food from the land is popular, as many people hunt and fish (Int. 3, Personal Communication 2016). These activities do have a cost in terms of the requirements for equipment, transportation and processing, and time; however, one moose or caribou can potentially feed several families, and the custom of sharing food can ensure many people benefit. Meat is distributed both informally and in partnership with community organizations (Int. 9, Personal Communication 2016). One estimate of the local meat harvest was \$285,000, representing 19.4% of the total value of meat consumption in the Dawson area. More than 50% of households are also reported to consume at least some wild food (CKS 2011).

The average spending on food was found to be \$7,540 per year in Dawson City, with 25.9% of spending on fruit and vegetables. This was higher than the Yukon average of \$7,496 and 21% respectively (CKS 2011). It was also found that Dawson City respondents shop at the farmer’s market an average of 5.5 times, with total annual spending of \$93,000, including both food and non-food items; respondents indicated that availability was a barrier to consuming more locally produced food, and they were willing to pay a price premium of approximately 15% for local food (CKS 2011).

Tr’ondëk Hwëch’in has launched several initiatives to enhance food security, including a collaborative Teaching and Working Farm in collaboration with Yukon College, with classes beginning in Spring 2016 (TH n.d.a). The Farm School includes both formal classroom instruction and field experience.

A recent community-based study in collaboration with TH found that sharing and trading food remains a common practice that strengthens the community’s spiritual development (Institute for Sustainable Food Systems 2015). Citizens are enthusiastic about growing their own food, in part because it reduces dependence on imported food, but also because the quality is higher, and it increases the community’s well-being. Overall, it was found that having healthy, affordable, locally produced food was very important for the community, and passing along traditional knowledge to youth is necessary to strengthen TH culture (Institute for Sustainable Food Systems 2015).

**3.3.2.5 Accidents and Injuries**

Yukon has very high rates of unintentional injuries causing death, and is typically ranked as the third leading cause of death (the second leading in 2009), behind cancer and heart disease (Statistics Canada 2015f). In Canada, unintentional injury is the fifth leading cause of death (**Table 3.3-4**) (Statistics Canada 2015f). In general, the rates of injuries requiring hospitalization are approximately 1.5 to 2 times the national average; this may be partly attributed to the popularity of high-risk recreational opportunities in Yukon, such as snowmobiling (HSS 2013b).

According to the Canadian Community Health Survey, approximately 15% to 20% of Yukoners typically report an injury that has limited their normal activities in the past year, and approximately 11%, on average, look for medical attention for their injuries (**Table 3.3-14**) (Statistics Canada 2016b).

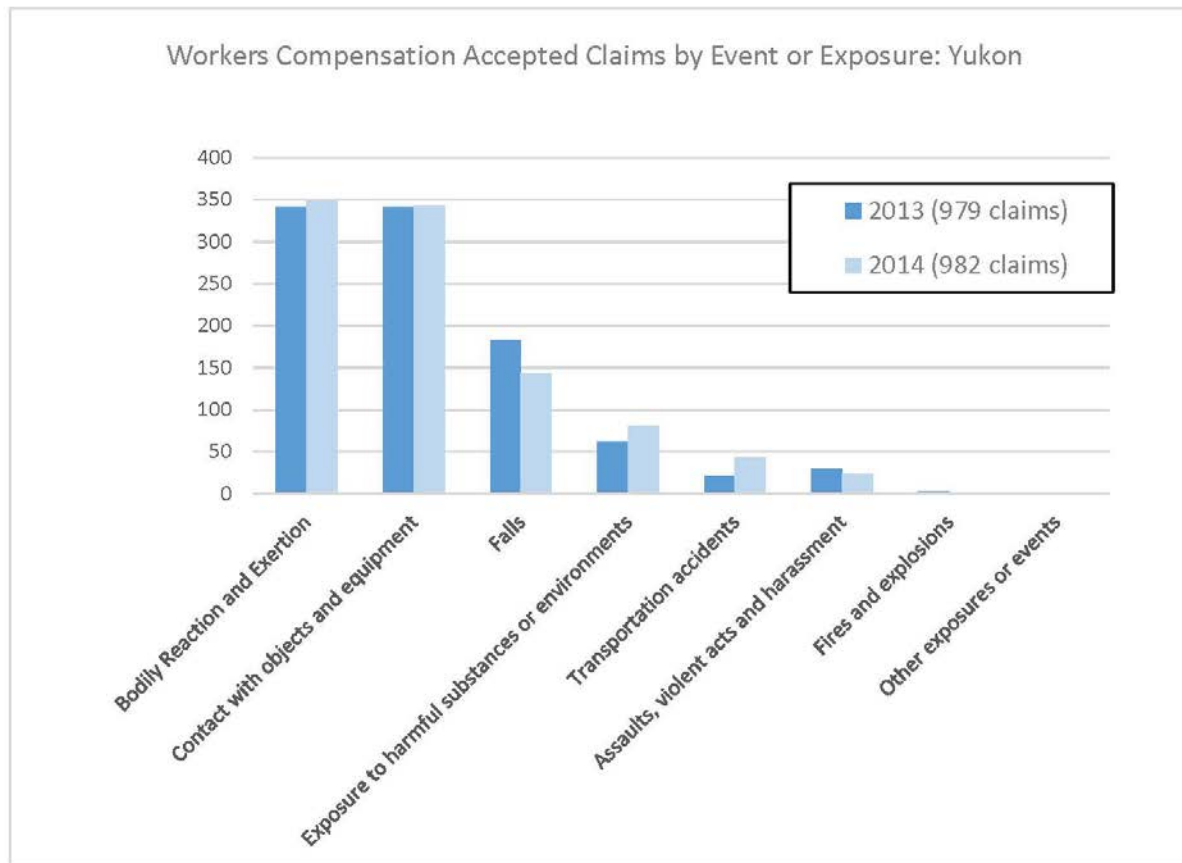
**Table 3.3-14 Injuries, Yukon**

|  | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010  | 2011 | 2012 | 2013 |
|--|------|------|------|------|------|------|------|-------|------|------|------|
| Injuries within the past 12 months causing limitation of normal activities (%) | 17.0 | N/A  | 15.7 | N/A  | N/A  | N/A  | 14.7 | 18.3  | N/A  | N/A  | 24.2 |
| Injuries in the past 12 months, sought medical attention (%)                   | 9.2  | N/A  | 9.2  | N/A  | N/A  | N/A  | 9.8  | 13.2* | N/A  | N/A  | 13.0 |

Source: Statistics Canada 2016b.

**Workplace Health and Safety**

Yukon worker compensation claims are most commonly due to the result of contact with objects and equipment, bodily reaction and exertion, and falls (**Figure 3.3-4**). Transportation accidents, fires, explosions, assaults, violent acts, and harassment are less common causes of an accepted workplace claim (YWCHSB 2014).



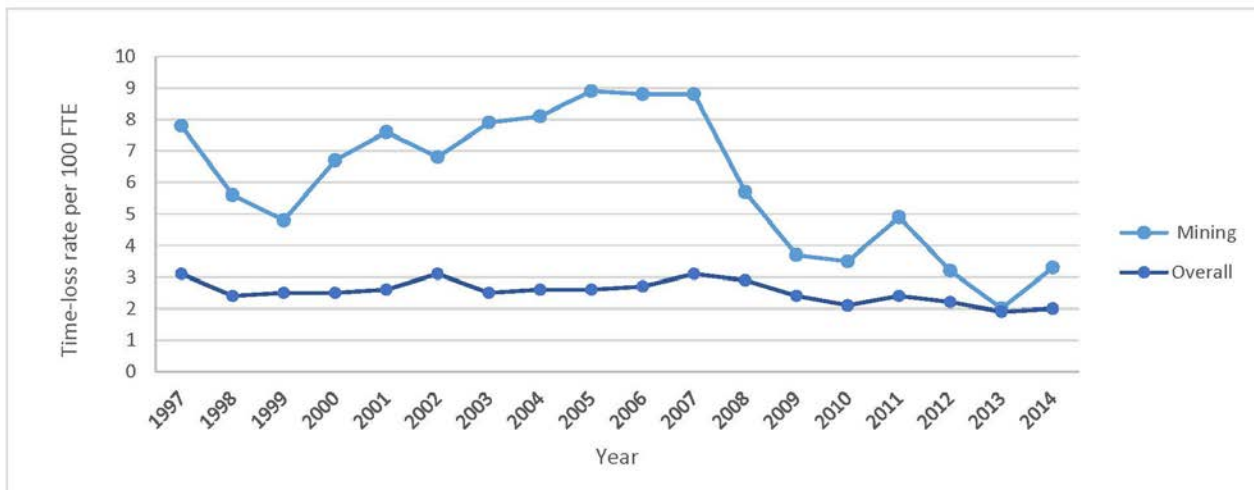
Source: YWHSB 2014.

**Figure 3.3-4 Workers' Compensation Accepted Claims by Event or Exposure, Yukon**

By occupation, the category with the highest published number of worker compensation claims in 2013 and 2014 was for Trades, Transport and Equipment Operators and Related Occupations, with 427 and 430 claims, respectively. From a total of 979 and 982 claims, claims in this occupational category comprised 43.6% and 43.8% of all claims (YWCHSB 2014).

Similarly, workplace injuries for mining-related industries in Yukon have shown consistently higher rates for lost time as compared to all industries as a whole, from 1997 to present. According to the data reported to Yukon Workers’ Compensation Health and Safety Board (YWCHSB), mining-related activities include the following categories: diamond drilling; drilling of gas or oil wells; drilling of water wells; exploration; gravel crushing or stockpiling; mapping; surveying; or prospecting. Because of the broad categorization of mining activities, these results should be interpreted with caution. A review of trends shows that mining-related lost-time rates appear to be higher in the earlier years of the reporting period (1997 to 2008), and decrease in more recent years, with 2013 lost-time rates for mining approximating the overall rate (2.0 vs. 1.9 respectively) (Figure 3.3-5) (YWCHSB 2015).

Other mining-specific workplace health concerns include the presence of dust in the crushing area and pit, as well as in the Camp Site and on the access road. Baseline monitoring for dust fall and air quality have taken place in the Project area, and models for air quality and noise considerations are included in the HHRA (Appendix 18-B).



**Note:** For this table, mining includes the following YWCHSB industries: diamond drilling, drilling gas or oil wells, drilling water wells, exploration, gravel crushing or stockpiling, mapping, surveying, or prospecting.  
**Source:** Yukon WCHSB, data request.

**Figure 3.3-5 Workers’ Compensation: Lost-time Rates per 100 Full-time Equivalents in Yukon for Mining-related Industries**

**Transportation-related Injuries**

Motor vehicle collisions accounted for approximately 35% (from a range of 26.5% to 50.0%) of deaths in Yukon due to accidental injuries, based on data collected between 2007 and 2011 (Transport Canada 2012). No fatalities were reported due to collision with an animal from 1999 to 2003 (Transport Canada 2012). In 2011, the rate of traffic fatalities appeared to be higher in Yukon than the rate for Canada as a whole, with a territorial rate of 11.6 fatalities per 100,000, compared to a national fatality rate of 6.5 fatalities per 100,000 (Transport Canada 2012).

From 2002 to 2012, annual motor vehicle collisions in Yukon averaged approximately 770 per year, with an average of 8.6 fatal and 216 injury collisions (**Table 3.3-15**). For commercial traffic, an average of 65 collisions were reported annually, or approximately 8.4% of all collisions. No fatal collisions were recorded, and an average of 13 injury collisions, or approximately 6% of all collisions, was reported for the same period (**Table 3.3-16**). The North Klondike Highway experienced 6.7% of all collisions for this reporting period, with 14% of the total fatalities and 13% of injury collisions. These statistics suggest that collisions are less likely to occur on this highway as compared to Yukon as a whole, but are more likely to be of consequence (**Table 3.3-17**). It is probable that the majority of collisions happen in the Whitehorse area, where the population is concentrated, and where fewer collisions would take place at highway speed.

**Table 3.3-15 Motor Vehicle Collisions by Severity, Yukon, 2002 – 2012**

| Year                      | Total | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Collision Severity</b> |       |      |      |      |      |      |      |      |      |      |      |      |
| Total Collisions          | 8,477 | 751  | 756  | 680  | 691  | 771  | 796  | 803  | 825  | 828  | 744  | 832  |
| Fatal Collisions          | 78    | 12   | 7    | 5    | 6    | 13   | 5    | 8    | 7    | x*   | 9    | x    |
| Injury Collisions         | 2,381 | 271  | 233  | 213  | 195  | 232  | 208  | 240  | 174  | 224  | 191  | 200  |

**Note:** \* “x” indicates that the cross-tabulated result produced a number between 1 and 4, inclusive and must be suppressed due to concerns about the confidentiality of the data.

**Source:** YG 2017c.

**Table 3.3-16 Motor Vehicle Collisions by Severity, Yukon Commercial Traffic, 2002 – 2012**

| Year                      | Total          | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---------------------------|----------------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Collision Severity</b> |                |      |      |      |      |      |      |      |      |      |      |      |
| Total Collisions          | 722            | 58   | 46   | 69   | 42   | 68   | 70   | 68   | 67   | 83   | 55   | 96   |
| Fatal Collisions          | X <sup>1</sup> | x    | x    | x    | x    | X    | x    | x    | x    | x    | x    | x    |
| Injury Collisions         | 145            | 18   | 5    | 19   | 9    | 13   | 17   | 18   | 19   | 21   | 12   | 11   |

**Note:** \* “x” indicates that the cross-tabulated result produced a number between 1 and 4, inclusive and must be suppressed due to concerns about the confidentiality of the data.

**Source:** YG 2015c.

**Table 3.3-17 Motor Vehicle Collisions by Severity, North Klondike Highway, 2002 – 2012**

| Year                      | Total | 2002           | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---------------------------|-------|----------------|------|------|------|------|------|------|------|------|------|------|
| <b>Collision Severity</b> |       |                |      |      |      |      |      |      |      |      |      |      |
| Total Collisions          | 568   | 52             | 53   | 45   | 38   | 45   | 57   | 64   | 68   | 50   | 52   | 44   |
| Fatal Collisions          | 11    | x <sup>1</sup> | x    | x    | x    | X    | 0    | x    | x    | X    | x    | x    |
| Injury Collisions         | 313   | 39             | 34   | 20   | 22   | 23   | 32   | 35   | 31   | 29   | 24   | 24   |

**Note:** \* “x” indicates that the cross-tabulated result produced a number between 1 and 4, inclusive and must be suppressed due to concerns about the confidentiality of the data.

**Source:** YG 2015c.

**Aviation Incidents**

The Project will be an FIFO operation, and there will be occasional use of helicopters for transportation on site; accordingly, information about aviation accidents and fatalities has been included in this report. In general, the majority of aviation incidents involve private aircraft, rather than commercial aircraft; for example, incidents in Canada in 2012 were comprised of 143 incidents involving private airplanes and 45 incidents involving commercial airplanes (TSB 2014a, 2014b).

Overall, fatality rates for aviation incidents in Yukon are low (**Table 3.3-18**) (TSB 2014a, 2014b). In Dawson, it was noted that previous experience with an increase in aviation traffic resulting from mining activity did not result in a local increase in aviation incidents (Interview 33, Personal Communication 2015).

**Table 3.3-18 Aircraft Accidents, Canada and Yukon 20014 – 2013**

|                                    | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|------------------------------------|------|------|------|------|------|------|------|------|------|------|
| Total Aviation Accidents in Canada | 308  | 306  | 303  | 323  | 294  | 297  | 288  | 257  | 291  | 275  |
| Total Aviation Accidents in Yukon  | 7    | 5    | 4    | 7    | 7    | 4    | 3    | 8    | 8    | 4    |
| Fatal accidents in Canada          | 33   | 44   | 34   | 38   | 38   | 34   | 36   | 35   | 42   | 36   |
| Fatal Accidents in Yukon           | 0    | 0    | 1    | 1    | 1    | 1    | 0    | 1    | 1    | 0    |
| Fatalities in Canada               | 57   | 69   | 55   | 56   | 64   | 71   | 70   | 67   | 63   | 63   |
| Fatalities in Yukon                | 0    | 0    | 1    | 1    | 1    | 1    | 0    | 1    | 1    | 0    |

Source: Transport Safety Board 2014 a.

### 3.3.2.6 Infectious Disease

Respiratory and gastrointestinal (enteric, food, and waterborne) diseases can spread quickly in close living quarters, such as those experienced in a work camp. Giardiasis, commonly referred to as “Beaver Fever” is the most commonly reported gastrointestinal infection, with reporting rates of 29.4 to 53.1 per 100,000 from 2007 to 2012 (**Table 3.3-19**). Campylobacteriosis, salmonellosis, and cryptosporidiosis have also been observed in Yukon, in addition to *E.Coli* and Hepatitis A (**Table 3.3-19**). In addition, Yukon commonly experiences outbreaks of norovirus (HSS 2016).

In Yukon, laboratory-confirmed influenza rates reached a high of 497.1 per 100,000 in 2009 for the reporting period 2007 to 2012 (**Table 3.3-19**). Tuberculosis (TB) rates declined in 2012 to 2.9 per 100,000 from a peak of 24.2 cases per 100,000 in 2008 (YG 2013). Most often reported in First Nations patients in Yukon, TB affects people living in remote communities who have limited access to timely and consistent TB care, laboratory resources, and available TB expertise and staff (Government of Canada 2012).

An influx of mobile workers can be associated with increased rates of sexually transmitted infections (STIs). For example, the in-migration of young, predominantly male oil and gas workers in northern British Columbia corresponded with increased chlamydia rates which were 22% higher than the provincial average rate (Goldenberg et al 2008).

Reported chlamydia rates are higher in Yukon than in southern Canada (PHAC 2008), but steadily decreased from 2007 to 2012 (YG 2013). Similarly, hepatitis C rates also decreased in this period. Syphilis was reported in Yukon in 2009 and 2012 (**Table 3.3-19**).



**Table 3.3-19 Infectious Diseases, Yukon**

| Rate per 100,000                       | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  |
|--|-------|-------|-------|-------|-------|-------|
| <b>Respiratory</b>                     |       |       |       |       |       |       |
| Influenza (laboratory confirmed)       | 121.9 | 90.9  | 497.1 | 2.9   | 31.4  | 285.7 |
| Tuberculosis                           | 9.4   | 24.2  | 11.8  | 17.1  | 11.4  | 2.9   |
| <b>Gastrointestinal</b>                |       |       |       |       |       |       |
| Campylobacteriosis                     | 12.5  | 6.1   | 17.6  | 11.4  | 28.6  | 5.7   |
| Cryptosporidiosis                      | 12.5  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Giardiasis                             | 53.1  | 39.4  | 29.4  | 34.3  | 34.3  | 22.9  |
| Hepatitis A                            | 0.0   | 0.0   | 2.9   | 0.0   | 0.0   | 0.0   |
| Salmonellosis                          | 6.3   | 15.2  | 8.8   | 5.7   | 0.0   | 8.6   |
| Shigellosis                            | 0.0   | 6.1   | 0.0   | 2.9   | 5.7   | 0.0   |
| E.Coli 0157:H8                         | 3.1   | 3.0   | 5.9   | 2.9   | 2.9   | 0.0   |
| <b>Sexually Transmitted Infections</b> |       |       |       |       |       |       |
| Chlamydia                              | 740.6 | 703.0 | 632.4 | 654.3 | 600.0 | 502.9 |
| Gonorrhoea                             | 53.1  | 51.5  | 44.1  | 88.6  | 20.0  | 25.7  |
| Syphilis                               | 0.0   | 0.0   | 8.8   | 0.0   | 0.0   | 5.7   |
| Human Immunodeficiency Virus (HIV)     | 0.0   | 6.1   | 8.8   | 2.9   | 2.9   | 2.9   |
| Hepatitis C                            | 128.1 | 87.9  | 94.1  | 60.0  | 62.9  | 60.0  |

Source: HSS 2013a.

### 3.3.2.7 Non-infectious Disease

Shift work is known to adversely affect health, and may be linked to an increased risk of accidents due to disruption of hormonal rhythms and metabolism (Boivin and Boudreau 2014, Kim et al 2015, Uihôa et al 2015). Long work hours are associated with poor health outcomes, such as cardiovascular disease, diabetes, anxiety and depression (van der Hulst 2003, Bannai and Tamakoshi 2014). Working more than 60 hours per week is attributed to substantially worse self-rated health as compared to working a 40-hour week (Song et al 2014).

Based on responses to the Canadian Community Health Survey, Yukon rates of diabetes appear to be lower than the overall Canadian rate in all years since 2003 where data are available, except in 2012 (Statistics Canada 2016b); however, these findings must be interpreted carefully due to the small sample size involved in the data analysis (Table 3.3-20). Obesity rates for Yukon appear to be similar to those for Canada; the average obesity rate from 2003 to 2013 was 17.4% for Canada as a whole, while the rate in Yukon was 19.8% for the same period. Obese adults are more likely to have diabetes (PHAC 2011).

**Table 3.3-20 Chronic Diseases**

|        |              | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------|--------------|------|------|------|------|------|------|------|------|------|------|------|
| Canada | Diabetes (%) | 4.6  | N/A  | 4.9  | N/A  | 5.8  | 5.9  | 6    | 6.4  | 6.1  | 6.5  | 6.6  |
|        | Obese (%)    | 15.3 | N/A  | 15.8 | N/A  | 16.8 | 17.2 | 17.9 | 18.1 | 18.3 | 18.4 | 18.8 |
| Yukon  | Diabetes (%) | 3.7  | N/A  | 4.3* | N/A  | 4.6* | 2.7* | 4.2* | 5.5* | 4.5* | 8.6* | 5.0* |
|        | Obese (%)    | 21.3 | N/A  | 18.2 | N/A  | 26   | 17.6 | 22.1 | 16   | 18.7 | 18.4 | 20.2 |

**Source:** Statistics Canada 2016b. N/A: Information not available.

**Note:** \*Use with caution.

Despite having rates of cancer incidence lower than the overall Canadian rate, the age-standardized mortality rates for cancer are higher in Yukon (**Table 3.3-21, Table 3.3-22**) (Statistics Canada 2016c). For the period 2009 to 2012, Yukon incidence rate per 100,000 for all primary cancer sites was 357.7 on average, compared to the Canadian rate of 509.1 (**Table 3.3-21**). Age-standardized mortality per 100,000 for the same period was 217.7 in Yukon versus 156.6 in Canada overall (**Table 3.8-3**). From 2002 to 2012, cancer mortality rates have been decreasing in Canada and Yukon (**Table 3.3-22**). However, Yukon has received a grade of D– from the Conference Board of Canada for its cancer mortality rates, which rank Yukon below the worst-performing comparator country of Denmark (Conference Board of Canada 2016a).

**Table 3.3-21 New Cases of Primary Cancer, Canada and Yukon**

| Geography                | Primary Types of Cancer (ICD-03)                 | 2009  | 2010  | 2011  | 2012  | 2013  |
|--------------------------|--|-------|-------|-------|-------|-------|
| Canada, rate per 100,000 | Total, all primary sites of cancer               | 507.3 | 505.8 | 515   | 508.4 | 516.6 |
|                          | Colon and rectum [C18.0-C18.9 C19.9 C20.9 C26.0] | 63.7  | 62.4  | 63.1  | 63.1  | 63.2  |
|                          | Lung and bronchus [C34.0-C34.9]                  | 71.1  | 69.6  | 69.3  | 70.6  | 69.8  |
|                          | Breast [C50.0-C50.9]                             | 66.3  | 67.4  | 68.2  | 66.8  | 67.1  |
|                          | Prostate [C61.9]                                 | 66.7  | 65.5  | 67.9  | 60.6  | 56.3  |
| Yukon, rate per 100,000  | Total, all primary sites of cancer               | 385.4 | 346.9 | 353.1 | 345.4 | 329.4 |
|                          | Colon and rectum [C18.0-C18.9 C19.9 C20.9 C26.0] | 29.6  | 43.4  | 42.4  | 55.3  | 41.2  |
|                          | Lung and bronchus [C34.0-C34.9]                  | 74.1  | 43.4  | 28.2  | 55.3  | 41.2  |
|                          | Breast [C50.0-C50.9]                             | 59.3  | 57.8  | 56.5  | 55.3  | 54.9  |
|                          | Prostate [C61.9]                                 | 44.5  | 57.8  | 56.5  | 27.6  | 41.2  |

**Source:** Statistics Canada 2016c.

**Table 3.3-22 Mortality from Cancers, Age-standardized Mortality Rate per 100,000 Population**

| Place of Residence |   | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  |
|--------------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Canada             | All cancers [C00-C97]                           | 178.2 | 175.6 | 173.7 | 170.3 | 166.5 | 165.8 | 163.6 | 160.3 | 157.2 | 154.6 | 154.1 |
|                    | Cancers of colon, rectum and anus [C18-C21]     | 19.1  | 18.3  | 18.7  | 18.6  | 17.5  | 18    | 17.9  | 17.3  | 16.8  | 17.1  | 16.5  |
|                    | Cancers of trachea, bronchus and lung [C33-C34] | 47.8  | 47    | 46.6  | 46.2  | 45.7  | 45.1  | 44.2  | 43.9  | 43.1  | 41.8  | 41.5  |
|                    | Breast cancer[C50]                              | 13.5  | 13.3  | 12.8  | 12.5  | 11.9  | 11.9  | 11.5  | 11.2  | 10.8  | 10.6  | 10.4  |
|                    | Prostate cancer [C61]                           | 9.8   | 9.4   | 9.1   | 8.6   | 8.3   | 8.2   | 8.1   | 7.9   | 7.8   | 7.4   | 7.2   |
| Yukon              | All cancers [C00-C97]                           | 247.4 | 243.4 | 206   | 246.5 | 264.8 | 252.5 | 240.9 | 217.1 | 260.7 | 203.1 | 190   |
|                    | Cancers of colon, rectum and anus [C18-C21]     | 33.7  | 26.5  | 13    | 21.1  | 22.2  | 39    | 28.3  | 21.4  | 21.4  | 44.2  | 20.9  |
|                    | Cancers of trachea, bronchus and lung [C33-C34] | 71.3  | 97.2  | 61.3  | 88.3  | 61.2  | 36.3  | 51.5  | 62.7  | 93.4  | 55.2  | 58    |
|                    | Breast cancer[C50]                              | 14.2  | 16.9  | 11.2  | 0     | 12.8  | 6.3   | 6.3   | 16.9  | 15    | 11    | 17.6  |
|                    | Prostate cancer [C61]                           | 5.6   | 8.3   | 19    | 11.4  | 20.8  | 19.7  | 4.5   | 11.4  | 19.4  | 7.5   | 11.4  |

Source: Statistics Canada 2015c.

### 3.3.2.8 Mental Health and Wellness

Perceived health, mental health, and life stress levels are important indicators of wellness and quality of life. Overall, Yukoners report high rates of community belonging and life satisfaction, although perceived mental health has been decreasing over the past decade (**Table 3.3-23**). Perceived life stress has remained relatively consistent over the reporting period, varying from 18% (2010) to 22.9% (2008). The vast majority of Yukoners reported having a sense of community belonging, ranging from 70.6% (2005) to 82% (2010). Similarly, life satisfaction rates were high, ranging from 88.2% (2003) to 94.7% (2011) (Statistics Canada 2014).

Reported rates of mood disorders also appear lower in Yukon than Canada as a whole, but these statistics are to be used with caution due to response rate. It is generally understood that about one in five Canadians will experience a mental health issue in any given year (CMHA 2016).

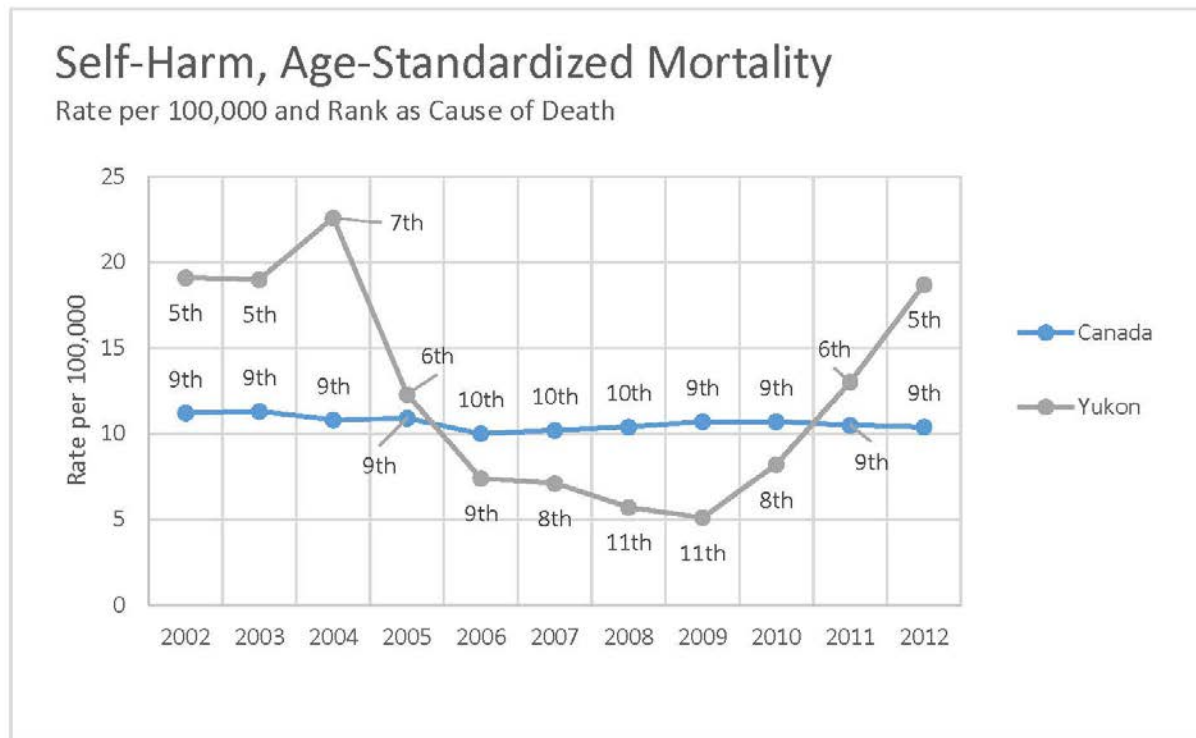
**Table 3.3-23 Mental Health and Wellness Indicators, Yukon**

| Characteristic                                      | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009  | 2010 | 2011  | 2012  | 2013 |
|---|------|------|------|------|------|------|-------|------|-------|-------|------|
| Perceived health; very good or excellent (%)        | 55.1 | N/A  | 56.8 | N/A  | 56.5 | 60.7 | 59.1  | 56.9 | 59.1  | 55.3  | 57.9 |
| Perceived health; fair or poor (%)                  | 10.8 | N/A  | 9.5  | N/A  | 10.8 | 9.7* | 11*   | 12.8 | 11.8* | 11.7* | 10.7 |
| Perceived mental health; very good or excellent (%) | 75.5 | N/A  | 74.9 | N/A  | 73   | 72.6 | 74.7  | 71.6 | 64.6  | 71.6  | 65.5 |
| Perceived mental health; fair or poor (%)           | 4.1* | N/A  | 4.4* | N/A  | 3.4* | 7*   | 5.5*  | 6.1* | 6.4*  | 4.5*  | 7.3  |
| Perceived life stress (%)                           | 18.2 | N/A  | 21.9 | N/A  | 21.4 | 22.9 | 20.5  | 18   | 22.7  | 21.6  | 20.3 |
| Sense of community belonging (%)                    | 72   | N/A  | 70.6 | N/A  | 72.1 | 75.3 | 72.1  | 82   | 78.6  | 73.3  | 73.1 |
| Life satisfaction; satisfied or very satisfied (%)  | 88.2 | N/A  | 90.8 | N/A  | 91.3 | 89   | 91    | 93.6 | 94.7  | 93    | 90.9 |
| Mood disorder (%)                                   | 4.4* | N/A  | 6.1  | N/A  | 7.1* | 8.5* | 10.6* | 11.2 | 10.7* | 5.7*  | 8.2* |

**Note:** \* Use with caution. N/A: Survey information not available.

**Source:** Statistics Canada 2014.

Intentional self-harm was the eleventh leading cause of death in 2008 with a rate of 5.7 per 100,000, below the national rate of 10.4 per 100,000, but rates of intentional self-harm have been showing an increasing trend in Yukon since 2009 (**Figure 3.3-6**). In 2012, the rate of intentional self-harm had increased to become the fifth leading cause of death, with a rate of 18.7 per 100,000, exceeding the national average of 10.4. Over the corresponding period of time, the national rate remained relatively steady, fluctuating between 10.4 and 10.7 per 100,000.



Source: Statistics Canada 2015f.

**Figure 3.3-6 Intentional Self-harm Rate, Canada and Yukon**

Mental health is an important issue in Yukon and Dawson, and was frequently mentioned as an issue of concern (Interview 9, Personal Communication 2016; Interview 16, Personal Communication 2016). Many Rivers offers mental health services in Dawson, with one visiting counsellor. One mental health nurse serves Dawson, as well as Pelly Crossing and Mayo. Yukon is served by two full-time psychiatrists based in Whitehorse, although based on population, four to five psychiatrists are needed (Joannou 2016).

Consultation with community representatives found that access to mental health services was a concern. Because Many Rivers currently has a male counsellor in Dawson, it was thought that some women, particularly those who had experienced an assault or abuse from a man, may not be comfortable receiving support from a male counsellor (Interview 16, Personal Communication 2016). It was also mentioned that the mental health nurse is only in Dawson part-time and, due to limitations of time, can only provide services to those with more severe and persistent mental illness (Interview 16, Personal Communication 2016). The ospital has a secure space for people who might pose a risk to themselves or others, but it is not appropriate for longer-term care (Interview 3, Personal Communication 2016; Interview 16, Personal Communication 2016). The issue of confidentiality was also raised as a challenge of receiving mental health services in a small community (Interview 16, Personal Communication 2016).

While specific details are not available, consultation feedback has indicated that connection to the land is an important element for mental health for all Yukoners, and for First Nations people in particular. Effects on the land from activities such as mining have been noted to have consequences on mental health for both individuals and communities (Interview 31, Personal Communication 2015; TH TWG March 22, 2016).

### ***Workplace Mental Health***

Stress affects health, both directly and indirectly, by contributing to the use of coping mechanisms such as alcohol and drug use (Goh et al 2015). Work-related stress is associated with absenteeism from work, accidents and injuries, and under-performance (Samra et al. 2012). Approximately 20% of Canadians experience mental health problems each year, often having an adverse effect on their work. In addition, workplace bullying has been associated with having poorer health and fewer personal and social resources (MacIntosh et al 2014).

A psychologically healthy and safe workplace actively works to prevent harm to employee psychological health and promotes psychological well-being. Promoting mental health has several positive effects for employers, including greater employee engagement, lower turnover, decreased disability and injury rates, and higher performance (Standards Council of Canada 2013). Both employers and employees have responsibilities in creating and sustaining a psychologically healthy workplace.

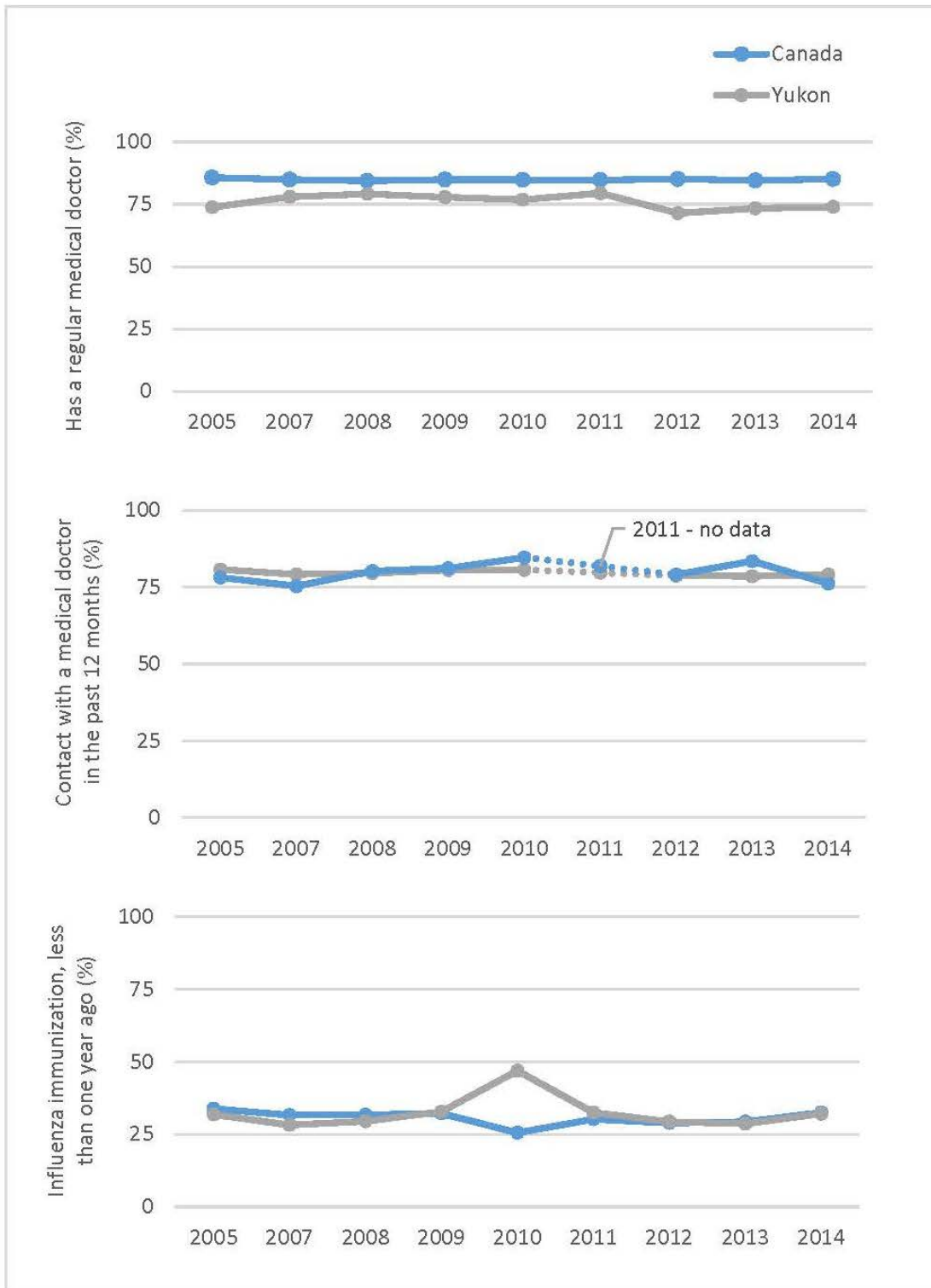
Shift work and FIFO work schedules provide certain advantages for employees, such as facilitating longer periods of time at home. However, prolonged absences can also be stressful for workers and their families. Generally speaking, work-family conflict is associated with increased physical and mental health outcomes (Goh et al 2015). Mobile workers can experience exhaustion, loneliness, stress, and anxiety, and may delay taking care of their mental health while at work (Angel 2014). FIFO work is also associated with mental health issues such as depression and anxiety (Meredith et al. 2014).

### **3.3.2.9 Health Services Structure and Capacity**

#### ***Access to Medical Care***

For the period of 2005 to 2014, an average of 84.9% of Canadians reported having access to a regular family physician, as compared to 75.9% of people in Yukon (**Figure 3.3-7**). For the same period, 79.6% of Canadians and 79.7% of people in Yukon reported having contact with a medical doctor over the past 12 months (**Figure 3.3-7**). This suggests that despite not having the same access to a regular family physician, Yukoners are receiving care similar to other parts of Canada. Those without a regular family doctor in Yukon may be using the emergency room or drop-in clinics to fill the gap.

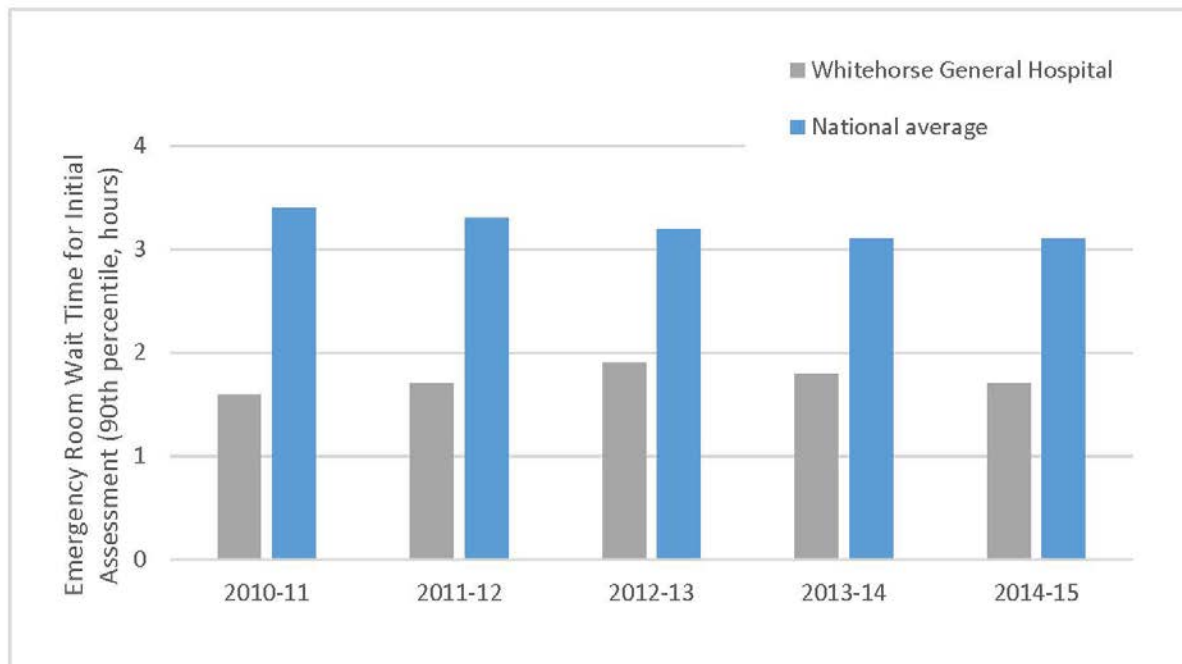
As an indication of access to general medical care, an average of 32.4% of people in Yukon, comparable to an average of 30.6% of Canadians, reported receipt of an influenza vaccination from 2005 to 2014 (**Figure 3.3-7**).



Source: Statistics Canada 2016b.

**Figure 3.3-7 Access to Medical Care**

The average amount of time spent waiting for treatment in emergency waiting areas and rates of hospital admissions are also indicate of access to medical care. Reports of emergency wait times were available for Whitehorse General Hospital. The average wait, based on the 90th percentile, was 1.7 hours as compared to 3.2 hours nationally (Figure 3.3-8). (CIHI 2016). Similar data were not available for the Dawson City Community Hospital.



Source: CIHI 2016.

**Figure 3.3-8 Emergency Wait Times for Physician Initial Assessment, Whitehorse General Hospital (Hours, 90th Percentile)**

Hospital admissions for Whitehorse General Hospital (WGH) increased by approximately 4.6% between 2014 and 2015, while admissions for Dawson City Community Hospital (DCCH) decreased by 13%; note that measures for DCCH are affected by small numbers (Table 3.3-24). For the same time period, WGH imaging and lab visits increased by 2.0% and 8.3% respectively, while DCCH x-ray and lab visits increased by 19.9% and 5.5% (Table 3.3-24).



**Table 3.3-24 Hospital Service Utilization, Whitehorse General Hospital and Dawson City Community Hospital**

| Hospital Services                        | 2014   | 2015   |
|--|--------|--------|
| <b>Admissions (Jan. – Nov.)</b>          |        |        |
| WGH                                      | 2,834  | 2,964  |
| DCCH                                     | 81     | 70     |
| <b>Outpatient Services (Jan. – Nov.)</b> |        |        |
| WGH Imaging                              | 15,986 | 16,311 |
| WGH Lab                                  | 23,693 | 25,648 |
| WGH Chemotherapy                         | 563    | 687    |
| WGH Visiting Specialist Visits           | 7,903  | 8,377  |
| DCCH X-rays                              | 438    | 525    |
| DCCH Lab                                 | 1,865  | 1,967  |
| Births (WGH) (Jan- Nov)                  | 351    | 362    |
| MRI (WGH) (Jan- Nov)                     | -      | 1,708  |

Source: CBC News 2016a.

Note: MRI data for 2014 not available.

Health services in Dawson and Yukon are described in detail in **Section 22.0 Community Services and Infrastructure Assessment**. Local health services in Dawson and the surrounding area are provided at the new Dawson City Community Hospital, which opened in late 2013 and as of March 31, 2015 had a staff of 28 people. The hospital’s emergency room provides 24-hour acute care, x-ray and laboratory services, and a retail pharmacy (Yukon Hospitals 2016). There were six licensed physicians in Dawson in 2014–2015 (Yukon Medical Council 2015). The hospital building also houses the Dawson Medical Clinic, which provides primary care services, and the Dawson Community Health Centre, which provides public health and home care programs and services. An extended care facility opened in 2016. In Dawson, there are two full-time Emergency Medical Responders supplemented by trained volunteers (Interview 1, Personal Communication 2016). The hospital does not provide maternity care. Expectant mothers travel to Whitehorse for low-risk pregnancies; for high-risk pregnancies, expectant mothers travel to British Columbia or Alberta.

## 4.0 ASSESSMENT OF PROJECT-RELATED EFFECTS

This section includes analysis of the potential Project-related interactions with Community Health and Well-being, and the potential effects of the plausible interactions. Mitigation measures are further discussed that will limit or eliminate the potential for a Project-related effect on Community Health and Well-being. Finally, potential residual effects are identified and their significance determined.

### 4.1 POTENTIAL PROJECT-RELATED INTERACTIONS WITH COMMUNITY HEALTH AND WELL-BEING

Interactions may occur between Project-related activities and Community Health and Well-being during the Project’s Construction, Operation, Reclamation and Closure, and Post-closure Phases. This section focuses the assessment on those interactions that may interact adversely with Community Health and Well-being by identifying the potential for interactions between Project activities and this VC. Potential interactions are rated using the interaction criteria, classified as no interaction, negligible interaction, or potential interaction, as presented in **Table 4.1-1**.

**Table 4.1-1 Potential Interaction between Community Health and Well-being Subcomponents and the Project**

| Term                   | Definition   |
|------------------------|--|
| No Interaction         | Project activity will not interact with the VC.  |
| Negligible Interaction | Interaction with the Project activity will not have a substantive influence on the short or long-term integrity of the VC (i.e., not measurable / not detectable using the identified indicator).  |
| Potential Interaction  | Interaction between the Project activity and the VC may have a substantive influence on the short- or long-term integrity of the VC (i.e., measurable or detectable using the identified indicator). The potential effect(s) of the interaction is considered further in the effects assessment. |

Potential Project interactions with Community Health and Well-being are presented in **Table 4.1-2**. The specific Project activities during each of the Construction, Operation, Reclamation and Closure, or Post-closure Phases have not been itemized in the table. Rather, the Project phase in general is evaluated as the basis for interactions, given that the majority of activities proposed for each phase can interact with Community Health and Well-being. Mining, including the Construction and Reclamation and Closure Phases, invariably involves a large amount of earth works that necessarily involve extensive use of diesel-powered heavy equipment and haul trucks, which in turn generate dust, emit various criterion air contaminants (CACs) and organic contaminations, and generate noise. It is the collective influence of the broader suite of activities on air quality, dust fall, and noise that may interact with Community Health and Well-being. Similarly, the collective influence of specific activities during each of the four phases will result in changes in workforce, accidents and injuries, the population structure of the communities of interest, and the capacity to address various health and wellness issues with community resources.

**Table 4.1-2 High-level Screening of Potential Project Interactions with Community Health and Well-being**

| Project Component  | Interaction Rating     | Nature of Interaction and Potential Effect   |
|--|------------------------|--|
| Overall Construction Phase<br>Overall Operation Phase<br>Overall Reclamation and Closure Phase | Potential Interaction  | The Project will likely result in changes to: <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Noise</li> <li>• Country food quality</li> <li>• Social Determinants of Health</li> <li>• Health-related Behaviours</li> <li>• Food Security</li> <li>• Accidental Injuries</li> <li>• Infectious Disease</li> <li>• Mental Health and Wellness</li> <li>• Health Services Structure and Capacity</li> </ul> |
| Overall Post-closure Phase   | Potential Interaction  | Potential localized influence of waste rock deposits on soil quality and trace element uptake into plants, related to country food quality.  |
|  | Negligible Interaction | Project employment and activities may result in limited local hiring and Project spending on goods and services, although these changes will not likely be detectable.   |

**4.2 POTENTIAL PROJECT-RELATED EFFECTS**

The potential effects of the Project on Community Health and Well-being were identified based on Project-related interactions identified in **Table 4.1-1** and **Table 4.1-2**, respectively. The potential effects are discussed below, as they relate to the indicators listed in **Table 1.3-2**. Environmental quality indicators that were formally evaluated in the HHRA are addressed first, followed by socio-economic factors. Details of the HHRA for potential Project-related effects are provided in **Appendix 18-B**.

**4.2.1 POTENTIAL HEALTH EFFECTS RELATED TO CHANGES IN AIR QUALITY**

The Project will likely influence air quality in two possible ways. The first of these is via the generation of dust in Open Pits, waste rock and ore stockpiling, or deposition areas via ore crushing and conveyance; exposure of stripped areas and mine wastes to wind is another potential influence. Dust generation may result in exposures of the public to suspended particulates in air in areas adjacent to the mine. The associated dust fall may also affect trace element concentrations in soil and plants at or around the Mine Site area, which in turn may increase human exposures to those trace elements that occur at atypically high concentrations in Coffee mine ore and waste rock.

The second potential influence on air quality is with emissions from internal combustion engines (gasoline or diesel) used in support of mining as well as garbage incineration. This includes diesel power generation, domestic garbage incineration, and various types of mining and transportation equipment. The primary air

quality contaminants of potential concern (COPCs) include CACs for which Yukon Ambient Air Quality Objectives (AQO) exist, including carbon monoxide, nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide, fine particulate matter, and total suspended particulates. Internal combustion engines also emit a large variety of volatile and semi-volatile organic contaminants such as benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene, and other polycyclic aromatic hydrocarbons such as benzo[a]pyrene.

A detailed evaluation of emissions sources based on the Project Description (**Section 2.0**) for each of Construction and Operation Phases indicates that the potential for both dust generation or dust fall and emissions from internal combustion engines (or the incinerator) is far greater for the peak Operational year than during the Construction Phase. The HHRA, therefore, is based on air quality predictions (**Section 9.0 Air Quality and Greenhouse Gas Emissions Analysis**) based on source emissions and dispersion modelling for the peak operational year (Year 6).

The potential for adverse health effects was evaluated by comparing the predicted airborne concentrations of various COPCs to authoritative health effects thresholds such as the Yukon Ambient AQO (AAQO), or the lowest credible health effects threshold developed by the WHO, U.S. Environmental Protection Agency, U.S. Agency for Toxic Substances and Disease Registry, California Office of Environmental Health Hazard Assessment, and the Texas Commission on Environmental Quality.

A maximum 1-hour average concentration of NO<sub>2</sub> greater than the Yukon AAQO of 400 µg/m<sup>3</sup> was approached for focal areas of interest SA-03 and SA-07. Both location are on the river, near the proposed Mine Site). The 99th percentile concentration at SA-06, however, was only 15 µg/m<sup>3</sup>: a value that is more than an order of magnitude lower than the 1-hour Yukon AAQO for NO<sub>2</sub>. This, along with the fact that NO<sub>2</sub> concentrations have been over-estimated in the air quality dispersion modelling based on an assumption that all NO<sub>x</sub> is NO<sub>2</sub>, suggests that health risks are acceptably low based on acute exposure potential.

The major conclusions based on completion of the HHRA for air quality were as follows:

- None of the CACs are likely to exceed their respective Yukon AAQO for areas where the public might be exposed.
- None of the volatile to semi-volatile organic contaminants that are a priority for health concerns are likely to exceed or approach relevant health-based thresholds of effects.

The HHRA indicates that human health risks associated with air quality during the peak Operational period, in areas around the Mine Site where people might focus their activities, will be acceptably low.

The maximum shorter duration concentrations of NO<sub>2</sub> and both shorter term (24-hour) and annual average concentrations of airborne particulates (PM<sub>2.5</sub>, TSP) are predicted to exceed their respective Yukon AAQO outdoors in the area of the mine camp, dining hall and recreational complex, mine dry and office complex, assay lab and truck shop warehouse. The predicted concentrations, however, will not exceed maximum permissible levels for NO<sub>2</sub> or dust as defined in the *Yukon Occupational Health Regulations*.

Additionally, mitigation measures related to air quality are provided in a **Dust Management Plan**, which is summarized in **Section 31.0 Environmental and Socio-economic Management Program**.

Since no potential effects to human health are likely to result from changes to air quality, this effect is not considered further in this assessment.

#### **4.2.2 POTENTIAL HEALTH EFFECTS RELATED TO NOISE**

Noise generation will likely occur during Project Construction, Operation, and Reclamation and Closure as a result of heavy equipment use, rock drilling, blasting, hauling, crushing, conveyor operation, and diesel power generation. Modelled predictions of noise levels were completed for both Project Construction and Operation Phases. There will be no Project-related noise following Reclamation and Closure, and this interaction was ruled out without further assessment. Reclamation and closure activities will generate noise; however, the amount of activity – and thus the amount of noise generated – will likely be less than for the Operation Phase. The potential effects for the Operation Phase, therefore, will likely adequately predict the effects potential for the Reclamation and Closure Phase.

The assessment of potential health effects from Project-related noise relies on baseline noise monitoring and noise transmission predictions as described in **Section 10.0 Noise Analysis**. The noise component of in the HHRA is based on continuous noise metrics over the daytime period, night-time period, or over a 24-hour day-night period for those aspects of Construction and Operation that will likely result in ongoing noise generation over extended durations (such as ore crushing, haul truck operations, or diesel power generation).

Noise health risks associated with human noise exposures while on the Mine Site (i.e. for focal areas of interest including the Camp Site, Mine Dry and Office Complex, and Truck Shop) are not quantified in the HHRA since members of the public will generally not be present in these areas for extended periods. Health risks from occupational noise exposures will be managed in compliance with Yukon regulations.

Outdoor noise levels are predicted for focal areas of interest adjacent to (i.e., outside of) the Mine Site, including the adjacent Yukon River, campsites used by outfitters and others, the mouth of Coffee Creek, the confluence of Coffee and Latte Creeks, and the upper slopes of mountains immediately across the river from the proposed Mine Site). Predicted outdoor noise levels during peak activity periods were evaluated based on whether the magnitude of change relative to the current existing wilderness-type noise levels will likely be greater than 3 decibels as A-weighted sound (dBA). An increase in continuous noise levels of less than 3 dBA is likely to be imperceptible to most humans, in part depending on the tonal characteristics of any new noise.

Predicted outdoor noise levels were further compared to threshold of health effects levels from the WHO, United States (U.S.) Federal Transit Administration, Health Canada, and other agencies, as listed in **Table 4.2-1**. For all areas beyond the Mine Site (i.e., as represented by focal areas of interest), noise levels associated with Construction or Operational activities will likely be lower than the existing measured background noise levels, and thus will not be easily distinguishable from the background wilderness-type noise environment. In addition, noise at all modelled locations will be far lower than authoritative health effect thresholds relating to sleep disturbance or speech interference.

For example, the highest predicted continuous sound level offsite was 28 dBA during peak operations at a location near the centre of the Yukon River, approximately 10 km downriver from the mouth of Coffee Creek (Focal Area of Interest SA-07). It is conceivable that people will be able to faintly detect noise from mine operations when the ambient noise levels are very low (infrequent periods where sound levels are less than 25 dBA, for example, during low wind conditions and in the absence of wildlife or personal sounds). Mining related sound at SA-07 or closer to the mine noise sources, in the absence of natural topographic or vegetative sound barriers and attenuation, could conceivably be detected given the different frequency and tonal characteristics than natural sounds. Nonetheless, the potential Project-related noise levels for all areas adjacent to the proposed Mine Site are far lower than levels associated with high annoyance (and stress), or with sleep disturbance or speech interference. The Project is not likely to result in any noise-related human health risks for all areas adjacent to the proposed Mine Site.

**Table 4.2-1 Threshold of Effects Levels for the Noise Subcomponent**

| Noise Health Indicator           | Threshold of Health Effect                              | Reference                                 | Maximum Predicted Exposure Level from Project – Non-occupational <sup>[1]</sup> |
|----------------------------------|---|---|---|
| Socio-economic Baseline          | 3 dBA   | various                                   | Up to 6 dBA   |
| Percent highly annoyed           | 6.5-point increase in %HA                               | U.S. FTA (2006);<br>Michaud et al, (2008) | Negligible increase in %HA off-site   |
| Sleep disturbance                | 40 dBA outdoors (lowest observed adverse effects level) | WHO (2009)                                | ≤ 28 dBA  |
|                                  | 55 dBA outdoors   |   |   |
| Speech and learning interference | 55 dBA  | WHO (1999)                                | ≤ 28 dBA  |

**Notes:** ≤ - less than or equal to; HA – highly annoyed;

[1] “Non-occupational” exposure refers to potential exposures for people other than workers at the mine site.

A Noise Management Plan (**Section 31.0**) will provide direction for further reductions in noise exposure relative to the modelled predictions that underpin this assessment. Since no potential effects to human health are identified from changes to noise, this effect is not considered further in this assessment.

#### **4.2.3 POTENTIAL HEALTH EFFECTS RELATED TO COUNTRY FOOD QUALITY**

Changes in soil quality from mining-related dust deposition, and the associated direct deposition of dust to plant surfaces, may result in increased human exposures to those trace elements that occur at much higher concentrations in mining-related dust than generally occur in the existing forested area surface soils. This is particularly important in light of the traditional and ongoing importance of local and regional country food and medicinal plant resources used by First Nations people and others.

In addition, areas with altered soil quality or water quality may result in altered trace metal uptake into edible forest and stream resources. While the focus of this report is on the evaluation of potential for contaminant uptake via dietary intake, the HHRA also assessed the exposures and risks for people while hunting and gathering in mining-affected areas through direct exposures from incidental soil ingestion.

As discussed in **Section 24.0 – Land and Resource Use**, commonly used edible plants in the Coffee Creek area and along the NAR include raspberries, blueberries, blackberries, salmonberries, high-bush cranberries, lowbush cranberries, blueberries, kinnikinnik (bearberries), browberry, bear root, and Labrador tea. Morel mushrooms are routinely harvested in the spring in coniferous forest areas that experienced a summer wildfire in the preceding year. Historical or current hunting efforts have focused on the Fortymile woodland caribou, moose, wolves, bears, thinhorn sheep, porcupines, beavers, muskrats, rabbits, ptarmigans, grouse, ducks, and geese.

Trapping provides meat resources as well as furs. The animals that are often trapped include lynx, foxes, wolverines, minks, martens, and snowshoe hares. The ridges surrounding Coffee Creek and the northern bank of the Yukon River across from Coffee Creek have been important trapping areas, and some of the earliest registered traplines are documented in that area. In addition, Coffee Creek is well known for being an important fishing location that was used in the past when TH, SFN, and WRFN people travelled to Coffee Creek to fish. Several fish species are targeted in the Coffee Creek area, including chinook and chum salmon, whitefish, and Arctic grayling (**Section 24.0 Land and Resource Use Assessment**).

Based on a detailed evaluation of the chemical composition of representative samples of ore, host rock (which will be deposited as waste rock) and candidate borrow sources along the NAR, it was concluded that only arsenic in ore or waste rock exhibits an average concentration greater than either background soil concentrations. This conclusion is based on the documented upper crustal abundances of trace elements or generic soil screening levels derived to protect human health based on direct exposure scenarios. The list of candidate COPCs, therefore, includes only arsenic, while other trace elements were discounted as not being of concern.

Based on the documented chemical composition of candidate borrow source samples, the use of borrow materials in road construction and top-dressing, and the mobilization of dust followed by dust fall in adjacent areas, the chemical composition of forest soils or plants will not be appreciably altered; therefore, no health risks from dust fall associated with transportation activities along the NAR are likely.

For dust fall arising from the blasting, hauling, and deposition of waste rock and ore, or the crushing and conveyance of ore, the potential concentrations of arsenic based on cumulative loading to soils over the entire operational mine life was estimated to amount to only 0.7% of the average observed arsenic concentrations in native soils pre-mining, and less than or equal to 0.01% of observed arsenic concentrations in native soils in any focal area of interest beyond the Mine Site proper. As such, there are not likely to be detectable changes in arsenic levels in forest soils and biota as a result of dust fall; therefore, the Project is not likely to cause increased human exposures or risks.

Human exposures to arsenic were also estimated during the Post-closure Phase for people who may spend time harvesting plants and animals or participating in other land-based activities in areas covered with waste rock. This estimate is based on the assumption that no clean cover will be placed on the deposits. Human health exposure and risks were quantified in terms of daily and lifetime-average contaminant intake doses (milligrams (mg) per kilogram (kg) per /day)) for the routes of exposure deemed to be potentially viable, including incidental soil or rock dust ingestion and inhalation, dermal exposure, and uptake into country foods via uptake from soil into plants. The total exposures from all pathways were predicted for each of granitic, gneiss, and schist waste rock, based on mid-range estimates for arsenic; this was to determine whether different risk management strategies may be necessary for the different rock types.

Screening-level risk calculations suggest that waste rock arsenic contamination may indirectly pose adverse risk to human health, largely attributed to ingestion of country foods (plants, berries, small mammals, etc.) growing on or foraging in uncovered waste rock disposal areas. Waste rock arsenic concentrations may lead to marginally higher exposure levels than acceptable for cancer risk potential based on the observed arsenic concentrations in granite waste rock, but not the other two rock types. Risk management of granitic waste rock will be required, based on placement during Project Operation, or during Reclamation and Closure; this is discussed further in the mitigation **Section 4.2**. No other health risks in relation to arsenic exposure from granitic waste rock are associated with the Project. As a result of the above analysis, only the potential for arsenic effects on country food quality is carried forward for further assessment.



#### **4.2.4 POTENTIAL HEALTH EFFECTS RELATED TO SOCIAL DETERMINANTS OF HEALTH**

This section presents potential effects to and possible mitigation measures for social determinants of health, including potential effects on children and youth, and the potential for changes in crime incidents. Potential Project-related effects on community health and well-being that are specifically related to employment, housing and children in care are not identified and are not carried forward for further assessment. However, it is recognized that these socio-economic factors may interact with other factors to contribute to effects on community health and well-being.

##### **4.2.4.1 *Potential Effects on Children and Youth***

Children and youth are considered to be most vulnerable in terms of reflecting social determinants of health through demand for services. A potential adverse effect in terms of decreased community well-being may occur based on increased demand for services for young children as a result of the Project, such as availability of day care and supportive programming, which could overwhelm current resources and reduce access to services.

An increase in population and changes in employment patterns due to the shift rotation of the Project are likely to increase demand for resources for children and their families. Families new to town who have not had an opportunity to develop support networks may be more vulnerable (Interview 9, Personal Communication 2016). Previous experience of the Ekati Diamond Mine in NWT found that a substantial proportion of employees believed their job had an adverse effect on their children, particularly those employees with children under nine years old (Rescan 2012).

Using the largest hypothetical scenario of 15% of the Project workforce relocating to Dawson during the highest population prediction trend, a 4% increase in the population of Dawson could occur as a result of the Project. In this scenario, increased demand on services is likely. Given that many current resources are operating at or near capacity, there is the potential for a Project-related effect that families of young children will have a decreased ability to access resources when needed.

##### **4.2.4.2 *Potential Effects as a Result of Increased Crime***

The assessment considered the potential for an adverse effect on community well-being may occur based on alcohol- and drug-related crimes resulting from an influx of workers. However, previous experience during the exploration boom in Dawson in 2011 did not generate a measurable effect on crime (Interview 26, Personal Communication 2016). Additionally, should an increase in call volumes be experienced, the Royal Canadian Mounted Police (RCMP) has the ability to increase staffing in response (Interview 26, Personal Communication 2016).

As a result of the overall analysis of social determinants of health, potential health effects are carried forward for further assessment.

#### **4.2.5 POTENTIAL HEALTH EFFECTS RELATED TO HEALTH-RELATED BEHAVIOURS**

Camp employees may experience an adverse effect on health-related behaviours while at camp, due to factors including stress and the proposed 12-hour daily shift length. Potential adverse health effects may include an increase in smoking and changes in eating patterns (for example, eating greater quantities of food in a cafeteria than at home). In addition, camp employees may experience reduced activity levels due to physical fatigue and time constraints resulting from long shifts and shift rotations.

##### **4.2.5.1 Potential Effects as a Result of Increased Smoking**

As indicated in **Section 3.3.2.3**, rates of smoking could potentially increase among company staff and their families related to a variety of factors such as stress, isolation, and boredom. An increase in smoking rates would increase the risk of adverse effects both for individuals and for communities due to factors such as secondhand smoke.

##### **4.2.5.2 Potential Effects Resulting from Increased Substance Use**

The Project will run a dry camp with a zero-tolerance substance use policy; however, potential adverse effects on health could occur if employees increase their alcohol use during the two weeks they spend at home. Based on input from community members, some workers will likely increase alcohol consumption as a result of having increased income. With respect to the Ekati Diamond Mine in Northwest Territories, although almost 92% of employees based in Yellowknife and 71% of employees from small local communities reported drinking alcohol during their time away from the mine, only 7% of Yellowknife employees and no employees from small local communities reported drinking more often (Rescan 2012). Nevertheless, some individuals may use alcohol as a coping mechanism in the absence of their usual support systems. Further, an increase in substance use also may cause increased incidence of violence against women and family members, which may increase the need for shelter.

Responsibility for substance use is held by individuals; however, workplaces can be structured to provide an environment that supports employee health and wellness and therefore reduces the likelihood of substance abuse.

##### **4.2.5.3 Potential Effects as a Result of Changes to Nutrition**

There is a potential for adverse effects on employee in terms of reduced nutrition due to changes in eating patterns for workers in camp; for example, eating less nutritious foods or eating larger quantities due to increased food availability. The primary mitigation measure for this effect is to provide healthy food choices on-site. Enhancements to further improve nutrition on for camp employees are also recommended.

#### **4.2.5.4 Potential Effects Resulting from Reduced Physical activity**

Potential adverse effects may occur due to a reduction in physical activity related to physical fatigue from factors a 12-hour shift length and may also be connected to other factors such as mental health and wellness.

Based on the analysis summarized above, potential health effects related to health-related behaviours are carried forward for further assessment.

#### **4.2.6 POTENTIAL HEALTH EFFECTS RELATED TO FOOD SECURITY**

Food security may be adversely affected based on society's perception of traditional foods being contaminated, which may in turn prevent people from consuming those foods in the Project area. This perception persists in spite of the true health risks associated with contaminants, as discussed in **Section 4.2.3**. Concerns about the integrity of country foods can be an impediment to harvesting and consuming country foods, especially in and around industrialized areas and areas that have experienced intensive human development. However, the area of the proposed mine site is not an area relied upon for harvesting due to its relatively remote location and lack of road access, and alternative harvesting areas are available. The potential for the Project to result in the contamination of country foods, and result in health risks, is directly addressed in **Section 4.2.3**.

The Land and Resources section of the assessment (**Appendix 24-A**) explores the potential effects of the Project on traditional land and resource use, and considers that the Project may have a positive effect on the pursuit of traditional land and resource use activities through various enhancement measures including cultural awareness training and encouraging traditional land and resource use activities by Project employees, through various initiatives (refer to **Appendix 24-A** for further detail).

Possible adverse effects to food security may also be based on a decrease in community members' ability to buy food or changes in access to traditional food sources or harvesting areas. However, it is considered that the Project will likely have a positive effect on food security by providing increased employment and income, which will subsequently improve the purchasing power of employees and potentially lead to increased food security for employees and their families. Increased spending power may also lead to purchase of more locally produced food, where and when available.

Based on the analysis related to country food quality (**Section 4.2.3**), the potential for arsenic exposure effects from the Project on food security is considered to be adequately addressed by the potential adverse effect carried forward for country foods quality. The potential positive effect on food security is carried forward for further assessment.

#### 4.2.7 POTENTIAL HEALTH EFFECTS RELATED TO ACCIDENTAL INJURIES

Potential effects related to accidents and injuries consist of:

- Workplace accidents and injuries for Project employees
- Project related transportation accidents and injuries
- Project workplace safety.

There is a potential effect of workplace accidents and injuries based on Project-related activities during the Construction, Operation, and Reclamation and Closure Phases because workplace activities will be carried out during those phases including Project-related traffic travelling on the NAR during this time.

Though possible health effects related to the NAR include an increase in collision-related injuries due to increased commercial truck traffic, collision rates involving commercial traffic are generally lower than overall rates. Project-related traffic volumes will experience a large increase relative to current traffic numbers on the NAR but will be low in absolute numbers, averaging approximately eight trucks per day, and lower during Construction (**Appendix 18-A Socio-economic Baseline Report** Section 7.4.4 describes existing traffic conditions). Staff will be flown to and from the Project to improve safety, and improvements made during road upgrading, such as improved surfacing and lines of sight, will improve safety.

Workplace injury is a potential direct adverse health effect of the proposed Project. Preventing injuries has a direct benefit on worker health, and contributes to improved productivity and reduced lost time. Injury rates for mining are higher than those for other industries, and have a high potential severity due to such incidents as crush injuries and effects of hazardous materials. The risk of industrial accidents is also affected by factors including increased risk-taking to meet production timelines and fatigue due to shift scheduling. Consequently, the potential for effects related to accidents and injuries is carried forward for further assessment.

#### 4.2.8 POTENTIAL HEALTH EFFECTS RELATED TO INFECTIOUS DISEASE

The Project may increase infectious disease rates, specifically STIs, in the communities where Project workers live and recreate. An increase in the incidence of gastrointestinal disease outbreaks may also occur, arising from the close living quarters of the Project Camp Site.

Infectious diseases are an important consideration in camps where a large number of people are working in close quarters, as well as to the residents of communities in the Project's Local Study Area. Outbreaks of communicable diseases such as respiratory and gastrointestinal illnesses can have serious consequences for worker health and productivity, and can adversely affect the community as a whole.

Potential adverse health effects may occur related to increased STI rates in the community and the possibility of gastrointestinal and respiratory disease outbreaks. Most infections are treatable and short-term, and treatment resources are available. As a result of this analysis, the potential effects of the Project related to infectious disease is carried forward for further assessment.

#### **4.2.9 POTENTIAL FOR INCREASE OF NON-INFECTIOUS DISEASES**

Shift work is linked to increased rates of diabetes due to sleep disruption. Weight gain is also associated with an increased risk of diabetes; the lifestyle in camp may contribute to weight gain for some individuals, depending on diet and activity levels. Potential adverse health effects are considered minor because sleep disruptions will be discontinuous due to the two-week-on, two-week-off rotation; workers will also have opportunities to eat healthy food and exercise, which can mitigate the risk of obesity and diabetes.

Non-infectious diseases can best be addressed through health promotion strategies as outlined in **Section 4.3**. As a result of this analysis, the potential for effects as a result of the Project on non-infectious diseases is not carried forward for further assessment.

#### **4.2.10 POTENTIAL HEALTH EFFECTS ON MENTAL HEALTH AND WELLNESS**

There is a potential adverse effect of the Project on mental health and wellness in potentially affected communities, particularly Dawson, where effects related to stress on workers and their families can increase due to shift rotations and various other changes in lifestyle. There is also a potential adverse effect for on-site workers related to workplace stress, isolation, and shift structure. However, potential positive health effects may result due to the increased availability of time to spend on the land or with friends and family during the two weeks between shifts.

Enhancement measures associated with the current traditional land and resource use subcomponent are intended to support the local values and potential benefits that the Project can contribute to the potentially affected First Nations through all Phases of the Project. The Proponent will describe the traditional land and resource use in the Introduction and Overview of the Project Area component of its onboarding presentation to all new mine employees. The Proponent will encourage employees to pursue traditional land and resource use activities by providing a two-week-on/two-week-off schedule. The enhancement measures associated with the traditional land and resource use subcomponent will be implemented in conjunction with other human environment mitigation for potential adverse effects, such as the development and implementation of Project's Engagement Plan and cultural awareness training, among others.

Potential Project-related adverse health effects may occur associated with stressors due to the shift rotation (e.g., length of shift, duration of shift rotation, and time away from home) and possible increase in drug and alcohol use in the community. A sense of disconnection from the land has also been raised as a concern, particularly for First Nation workers. As a result the potential for effects as a result of the Project on mental health and wellness is carried forward for further assessment.

#### 4.2.11 POTENTIAL EFFECTS ON HEALTH SERVICES STRUCTURE AND CAPACITY

Possible Project-related adverse effects may occur due to increased demand on the existing health care system, which may consequently contribute to adverse health outcomes. The existing capacity of acute and primary care resources in Dawson is currently considered adequate, and resources can be increased as needed. Dawson is well served with sufficient resident community family care physicians and a medical clinic with care providers that enable walk-in visits (Interview 3, Personal Communication 2016). A sufficient increase in population may justify additional recruitment of physicians at the level of YG (Interview 3, Personal Communication. 2016). An increase in the number of physicians in the community may be associated with a corresponding reduction in the call schedule (with more physicians available to take calls). In addition, the community may become self-locuming which will enhance physician recruitment and retention (Interview 3, Personal Communication 2016). Given that the potential influx of workers and families to communities within the LAA could place additional pressure beyond service structure and capacity, the potential for an effect from the Project on health services structure and capacity is carried forward for further assessment.

#### 4.3 MITIGATION AND ENHANCEMENT MEASURES

This section describes mitigation for the potential adverse effects to Community Health and Well-being. Mitigation measures comprise any practical means taken to manage potential adverse effects, and may include the application of relevant standards, guidelines, and best management practices supported by specific guidance documents (e.g., *Engaging with Yukon First Nations and Communities, A Quick Reference Guide to Effective and Respectful Engagement Practices* (FNNND, TH, and Yukon Chamber of Mines 2012)). The mitigation measures are described below and **Table 4.3-1** summarizes those measures.

Some potential Project-related effects on Community Health and Well-being will be beneficial or neutral, and in those cases measures are described that will be used to enhance the potential beneficial effects of the Project. In some cases, measures described below as enhancements may also be proposed in other VC sections as mitigation measures to address potential adverse effects that may result from the Project on those VCs.

This section of the report describes mitigation measures to be implemented during the identified Project phase. Certain mitigation measures may relate to a specific Project component (e.g., Mine Site, NAR).

##### 4.3.1 PROJECT DESIGN

Potential adverse effects to Community Health and Well-being will be eliminated or reduced to the extent possible through Project design; however, since not all effects can be confidently addressed through design, additional mitigation measures are proposed and described below.

#### 4.3.2 MITIGATION MEASURES FOR COUNTRY FOOD QUALITY

A potential health risk was identified for gathering and consuming plants growing on waste rock deposits Post-closure, to the extent that the surficial materials in the waste rock deposits exhibit arsenic concentrations in a similar range to those observed for granitic host rock samples obtained during exploratory drilling (50<sup>th</sup>-percentile arsenic concentration of approximately 120 mg/kg; 95<sup>th</sup>-percentile concentration of approximately 2,500 mg/kg). The cancer risk associated with this scenario was 2.3 incremental lifetime cancer incidents in a 100,000 hypothetical population, which is only slightly higher than the level deemed acceptable by Health Canada and other agencies of 1 in 100,000.

To mitigate against unacceptable health risks from arsenic exposures in association with country food gathering and consumption:

- Waste rock will be managed such that materials within the upper one metre of deposits will not exhibit an arsenic concentration that is greater than 60 mg/kg on average. Where this is not practical, review alternative means of deterring human traffic and prolonged use of facilities in closure (e.g., signage).

Samples collected from candidate borrow sources for the NAR contained a small number of samples of schist that exhibited arsenic concentrations greater than 100 mg/kg (**Appendix 18-B Human Health Risk Assessment**). To mitigate against any human or ecological risks associated with the placement of high-arsenic materials, these materials will not be used in a manner that creates an exposure potential, regardless of their status as non-acid generating.

#### 4.3.3 MITIGATION AND ENHANCEMENT MEASURES FOR SOCIAL DETERMINANTS OF HEALTH– CHILDREN AND YOUTH

It is proposed that adverse effects may be mitigated through an increase in resources to support young families, through an increase in funding or other resources to existing programming, or through the provision of additional supports.

- Engagement between the Proponent and the Government of Yukon to discuss the needs of employees and their families, including providing information about the communities of residence of employees.
- Supporting community programs via the Community Investment Protocol to be able to support Project-related increases in population.

Potential enhancement measures may include:

- Providing meaningful work experiences for young adults, in accordance with applicable laws regulations, such as co-op and summer work programs.
- Increasing capacity (e.g., frequency, scope) of community activities and events by providing sponsorship, including providing resources to increase recreational opportunities for children and youth.

#### **4.3.4 MITIGATION MEASURES FOR SOCIAL DETERMINANTS OF HEALTH – INCREASED CRIME**

Currently, calls to the police about crime in Dawson are predominantly property- or alcohol-related; therefore, mitigation measures for substance use are proposed to address possible Project-related health effects related to crime. Potential mitigation strategies include the following:

- Implementation of a drug and alcohol policy that prohibits the use of alcohol or drugs while on the Mine Site property or using company vehicles.
- Implementation of an Employee Assistance Program that provides additional support to employees experiencing difficulties with alcohol or substance use.
- Creation of a Visiting Elders program, where Elders from First Nations provide mentorship and support for First Nations and non-First Nations employees.
- Making space available for people to hold Alcoholics Anonymous or Narcotics Anonymous meetings at site.
- Supporting a campaign to prevent family violence.
- Implement policies for behavioural issues such as workplace harassment.

#### **4.3.5 MITIGATION MEASURES FOR HEALTH-RELATED BEHAVIOURS – INCREASED SMOKING**

The Proponent will implement mitigation measures specific to changes to increased smoking, which include the following:

- Implementation of a smoking cessation program for employees and their families, to complement the existing program available through Yukon Health and Social Services.
- Restriction of locations where smoking is permitted, and prohibition of smoking in vehicles.

#### **4.3.6 MITIGATION MEASURES FOR HEALTH-RELATED BEHAVIOURS – INCREASED SUBSTANCE USE**

The Proponent will implement mitigation measures specific to changes to increased substance use, which include the following:

- Implementation of a drug and alcohol policy that prohibits the use of alcohol or drugs while on the mine site or using company vehicles.
- Offering an Employee and Family Assistance Program that provides additional support to employees experiencing difficulties with alcohol or substance use.
- Creation of a Visiting Elders program, where Elders from Yukon First Nations to provide mentorship and support for First Nations and Non-First Nations employees.
- Cultivation of a non-drinking environment by providing fun, social environments that do not involve drinking, so people can disassociate drinking from socialization (Interview 31, Personal Communication 2015).
- Making space available for Project staff to create their own recreational opportunities during non-working hours on site for example, by teaching a skill they have (from fly tying to a craft or sport) .
- Making space available for people to hold Alcoholics Anonymous or Narcotics Anonymous meetings at site.



#### 4.3.7 MITIGATION MEASURES FOR HEALTH-RELATED BEHAVIOURS – CHANGES TO NUTRITION

The Proponent will implement mitigation measures specific to changes to nutrition, which include the following:

- Support healthy eating by providing a variety of healthy foods in the Project’s cafeteria, including whole grains, fruits, and vegetables, and with fewer fried and processed foods.
- Provide information to employees on healthy eating through general awareness campaigns and through information available as part of an Employee and Family Assistance Program.
- Support healthier choices by providing scalable portions, making water readily available, and providing spices to replace salt (Hartley-Foltz and Blackman 2015).

#### 4.3.8 MITIGATION MEASURES FOR HEALTH-RELATED BEHAVIOURS – REDUCED PHYSICAL ACTIVITY

The Proponent will implement mitigation measures specific to reduced physical activity, which include the following:

- Having an on-site a fitness centre for employee use.
- Developing hiking trails that may also be used for cross-country skiing and snowshoeing in the winter, providing the opportunity for year-round activity during daylight hours and in acceptable weather conditions. Appropriate precautions should be taken to safeguard employees from wildlife and other hazards, such as providing bear spray, radios and training.

#### 4.3.9 MITIGATION AND ENHANCEMENT MEASURES FOR FOOD SECURITY

A formal analysis of potential contaminant risks associated with country food gathering and consumption indicates that the Project is not likely to result in residual adverse health effects, after mitigation against any potential higher arsenic exposures on waste rock deposits (**Appendix 18-B Human Health Risk Assessment**). Mitigation measures for Country Food Quality (**Section 4.3.2**) are similarly applicable to Food Security, and no additional mitigation measures are proposed for potential adverse effects to food security to changes in food quality.

Project enhancement measures for food security due include the following:

- Create a Visiting Elders program, where Elders from Yukon First Nations to provide mentorship and support for First Nations and Non-First Nations employees.
- Providing information to employees and their families about strategies to increase food security; for example, through an adult educator or visiting speakers.

#### 4.3.10 MITIGATION MEASURES FOR ACCIDENTS AND INJURIES

The following mitigation measures are proposed for accidents and injuries.

##### ***Northern Access Route***

- Transport staff to and from site will generally occur by air to improve safety.
- Develop road improvements strategies in consultation with First Nations, regulators, and other stakeholders. Potential NAR improvements include:
  - Improving blind corners to reduce collisions with animals and vehicles
  - Improving problem areas (e.g., locations of frequent flooding or wash-out)
  - Developing communication and traffic management protocols and means of communication for Project drivers
  - Imposing speed restrictions.

##### ***Mine Activities (Construction, Operation)***

The Proponent will implement specific mitigation measures, including the following:

- Adhere to all applicable workplace safety regulations and guidelines, and regularly engage with Yukon Workers' Compensation Health and Safety Board to verify best practices are followed.
- Adhere to industry standards, such as the Mining Association of Canada *Towards Sustainable Mining* protocols, and the International Cyanide Management Code.
- Adhere to Proponent's internal health and safety programs and initiatives.
- Adopt a workplace safety program and foster a culture with leadership from the top that directly engages workers and fosters a culture of safety, which may include:
  - Hosting safety meetings at the beginning of each shift
  - Developing and implementing fatigue management guidelines and structuring shifts to minimize fatigue (e.g., less frequent changes from day to night shifts)
  - Providing training specific to the workplace environment (e.g., fall prevention; helicopter safety; Yukon Mine Rescue Training (Surface)), and utilizing the courses that are offered via the Northern Safety Network and private providers. On-site refresher courses will be provided as needed.
  - Requiring site supervisors to have First Line Supervisor Certificates.
  - Ensuring contractors are following a functional safety program.
- Develop and implement an Emergency Response Plan in collaboration with first responders including emergency medical services, fire department, and RCMP. This plan should include strategies to:
  - Provide on-site medical clinic staffed by a full-time health professional (emergency medical responder, nurse, or nurse practitioner) with an emergency medical responder on site 24 hours a day to provide emergent care.
  - Provide first-aid stations at various locations on site.

- Ensure that first-aid training and refresher courses are provided to all supervisors and, when appropriate, other staff.
- Collaboratively develop medical transport and care plans with Yukon health care providers.
- Ensure that emergency response supplies are appropriate for Yukon operations.
- Ensure that one or more medivac-equipped operator is available as a backup should the primary medivac operator is unavailable.
- Ensure buildings have adequate ventilation, especially when they have changed purposes.
- Develop Mine Site traffic management protocols.
- Ensuring preventative maintenance is carried out on equipment to prevent injuries and fatalities.

#### **4.3.11 MITIGATION MEASURES FOR INFECTIOUS DISEASES**

The Proponent will implement specific mitigation measures, which include the following:

- Ensuring that on-site drinking water meets or exceeds applicable drinking water standards
- Encouraging hand washing by posting signs in site washrooms
- Providing clinical services for infectious diseases through on-site medical services
- Coordinating with Yukon Health and Social Services to offer on-site influenza vaccination clinics
- Monitoring for gastroenteritis outbreak (three or more cases in a four-day period), and implementing an outbreak management strategy should gastroenteritis cases manifest
- Providing free condoms at camp.

#### **4.3.12 MITIGATION MEASURES FOR MENTAL HEALTH AND WELLNESS**

The Proponent will implement mitigation measures specific to Mental Health and Wellness, which include the following:

- Provide a comfortable environment for Project staff when off-shift; e.g., provide quiet spaces for relaxation, such as a lounge that can then be stocked with games, magazines, musical instruments, and comfortable chairs.
- Plan shifts in blocks (i.e., a block of daytime shifts followed by a block of night shifts); reducing the number of transitions helps to reduce stress.
- Develop a workplace wellness strategy in consultation with employees and health professionals.
- Implement policies to mitigate potential behavioral issues such as workplace harassment.
- Invite visiting Elders to provide support for First Nations staff as well as improve cultural awareness through visits and workshops (e.g., teaching traditional activities such as berry picking and medicine making). Elders may focus on groups that might be more vulnerable; e.g., young First Nations Women.
- Partner with local and regional organizations to facilitate mental health support to Project staff when off-shift.
- Offer support where feasible to reduce the potential for harm.

The Land and Resources section (**Appendix 24-A**) provides enhancement measures intended to support the local values and potential benefits of the Project of local affected First Nations with respect to traditional land and resource use. These measures may enhance the quality of intangible cultural and spiritual resources, which may have a positive secondary effect on mental health and wellness. The enhancement measures are:

- The Proponent will describe the traditional land and resource use in the Introduction and Overview of the Project Area component of its onboarding presentation to all new mine employees.
- The Proponent will encourage employees to pursue traditional land and resource use activities by providing a two-week-on/two-week-off schedule.

As a result of these enhancement measures, the potential positive effect on mental health is considered to be adequately addressed in **Appendix 24-A** and is not considered further in this section.

#### **4.3.13 MITIGATION MEASURES FOR HEALTH SERVICES STRUCTURE AND CAPACITY**

The Proponent will implement mitigation measures specific to Health Services Structure and Capacity, which include the following:

- The Proponent will communicate with Yukon HSS regarding anticipated numbers of employees and communities of residence.
- The Proponent will develop an Emergency Response Plan, which will include about on-site emergency response services, and will update this plan as needed, sharing it with hospitals in Dawson and Whitehorse, as well as with emergency services.
- The Proponent will provide on-site health and clinic services for workers with general health concerns.

#### **4.3.14 SUMMARY OF MITIGATION AND ENHANCEMENT MEASURES**

The mitigation measures for each potential effect and the subsequent presence of a detectable or measurable residual effect are summarized in **Table 4.3-1**.

**Table 4.3-1 Summary of Potential Residual Effects and Mitigation and Enhancement Measures for Community Health and Well-being**

| Summary of Potential Effect                     | Project Components     | Contributing Project Activities     | Proposed Mitigation or Enhancement Measure   | Detectable / Measurable Residual Effect (Yes / No) |
|---|------------------------|-------------------------------------|--|--|
| <b>Construction Phase</b>                       |                        |                                     |  |  |
| Health effects related to country foods quality | Mine Site Construction | Mine Site activities and conditions | Mitigation measures for Country Food Quality   | No   |
|   | NAR Construction       | Workforce Increased access          |  | No   |
| Adverse effects on children and youth           | Mine Site Construction | Workforce                           | Mitigation and enhancement measures for Social Determinants of Health – Children and Youth   | No   |
|   | NAR Construction       | Workforce Increased access          |  | No   |
| Increase in crime                               | Mine Site Construction | Workforce                           | Mitigation measures for Social Determinants of Health – Increased Crime  | Yes  |
|   | NAR Construction       | Workforce Increased access          |  | Yes  |
| Changes to health-related behaviours            | NAR Construction       | Workforce Increased access          | Mitigation measures for Health-related Behaviours – Increased Smoking  | No   |
|   | NAR Construction       | Workforce Increased access          | Mitigation measures for Health-related Behaviours – Increased Substance Use<br>Mitigation measures for Health-related Behaviours – Changes to Nutrition<br>Mitigation measures for Health-related Behaviours – Reduced Physical Activity | No   |
| Change in food security                         | NAR Construction       | Workforce Increased access          | Mitigation and enhancement measures for Food Security  | Yes - Beneficial                                   |
|   | NAR Construction       | Workforce Increased access          |  | Yes – Beneficial                                   |
| Change in accidents and injuries                | Mine Site Construction | Workforce                           | Mitigation measures for Accidents and Injuries   | No   |
|   | NAR Construction       | Road infrastructure and traffic     |  | No   |
| Increase in infectious disease rates            | Project Construction   | Workforce                           | Mitigation measures for Infectious Diseases  | Yes  |

| Summary of Potential Effect                                  | Project Components   | Contributing Project Activities     | Proposed Mitigation or Enhancement Measure  | Detectable / Measurable Residual Effect (Yes / No) |
|--|----------------------|-------------------------------------|---|--|
| Adverse effects on mental health and wellness                | Project Construction | Workforce                           | Mitigation measures for Mental Health and Wellness  | Yes  |
| Increased pressure on health services structure and capacity | Project Construction | Workforce                           | Mitigation measures for Health Services Structure and Capacity  | Yes  |
| <b>Operation Phase</b>                                       |                      |                                     |   |  |
| Health effects related to country foods quality              | Mine Site Operation  | Mine Site activities and conditions | Mitigation measures for Country Food Quality  | No   |
|  | NAR Operation        | Workforce<br>Increased access       |   | No   |
| Adverse effects on children and youth                        | Mine Site Operation  | Workforce                           | Mitigation measures for Social Determinants of Health – Children and Youth  | No   |
|  | NAR Operation        | Workforce<br>Increased access       |   | No   |
| Increase in crime  | Mine Site Operation  | Workforce                           | Mitigation measures for Social Determinants of Health – Increased Crime   | Yes  |
|  | NAR Operation        | Workforce<br>Increased access       |   | Yes  |
| Changes to health-related behaviours                         | Mine Site Operation  | Workforce                           | Mitigation measures for Health-related Behaviours – Increased Smoking<br>Mitigation measures for Health-related Behaviours – Increased Substance Use<br>Mitigation measures for Health-related Behaviours – Changes to Nutrition<br>Mitigation measures for Health-related Behaviours – Reduced Physical Activity | No   |
|  | NAR Operation        | Workforce<br>Increased access       |   | No   |
| Change in food security                                      | Mine Site Operation  | Mine Site activities and conditions | Mitigation and enhancement measures for Food Security   | Yes - Beneficial                                   |
|  | NAR Operation        | Increased access                    |   | Yes Beneficial                                     |
| Change in accidents and injuries                             | Mine Site Operation  | Workforce                           | Mitigation measures for Accidents and Injuries  | No   |
|  | NAR Operation        | Road infrastructure and traffic     |   | No   |

| Summary of Potential Effect                                  | Project Components                           | Contributing Project Activities     | Proposed Mitigation or Enhancement Measure   | Detectable / Measurable Residual Effect (Yes / No) |
|--|--|-------------------------------------|--|--|
| Increase in infectious disease rates                         | Mine Site Operation                          | Workforce                           | Mitigation measures for Infectious Diseases  | Yes  |
| Adverse effects on mental health and wellness                | Mine Site Operation                          | Workforce                           | Mitigation measures for Mental Health and Wellness   | Yes  |
| Increased pressure on health services structure and capacity | Mine Site Operation                          | Workforce                           | Mitigation measures for Health Services Structure and Capacity   | Yes  |
| <b>Reclamation and Closure Phase</b>                         |  |                                     |  |  |
| Health effects related to country foods quality              | Mine Site Reclamation and Closure Activities | Mine Site activities and conditions | Mitigation measures for Country Food Quality   | No   |
|  | NAR Operation                                | Workforce<br>Increased access       |  | No   |
| Adverse effects on children and youth                        | Mine Site Reclamation and Closure Activities | Workforce                           | Mitigation measures for Social Determinants of Health – Children and Youth   | No   |
|  | NAR Operation                                | Workforce<br>Increased access       |  | No   |
| Increase in crime  | Mine Site Reclamation and Closure Activities | Workforce                           | Mitigation measures for Social Determinants of Health – Increased Crime  | No   |
|  | NAR Operation                                | Workforce<br>Increased access       |  | No   |
| Changes to health-related behaviours                         | Mine Site Reclamation and Closure Activities | Workforce                           | Mitigation measures for Health-related Behaviours – Increased Smoking  | No   |
|  | NAR Operation                                | Workforce<br>Increased access       | Mitigation measures for Health-related Behaviours – Increased Substance Use<br>Mitigation measures for Health-related Behaviours – Changes to Nutrition<br>Mitigation measures for Health-related Behaviours – Reduced Physical Activity | No   |

| Summary of Potential Effect                                  | Project Components  | Contributing Project Activities   | Proposed Mitigation or Enhancement Measure                     | Detectable / Measurable Residual Effect (Yes / No) |
|--|---|---|--|--|
| Change in food security                                      | Mine Site Reclamation and Closure Activities                                      | Mine Site activities and conditions   | Mitigation measures for Food Security                          | No   |
|  | NAR Operation   | Increased access  |  | No   |
| Change in accidents and injuries                             | Mine Site Reclamation and Closure Activities                                      | Workforce   | Mitigation measures for Accidents and Injuries                 | No   |
|  | NAR Reclamation and Closure Activities  | Road infrastructure and traffic   |  | No   |
| Increase in infectious disease rates                         | Mine Site Reclamation and Closure Activities                                      | Workforce   | Mitigation measures for Infectious Diseases                    | No   |
| Adverse effects on mental health and wellness                | Mine Site Reclamation and Closure Activities                                      | Workforce   | Mitigation measures for Mental Health and Wellness             | No   |
| Increased pressure on health services structure and capacity | Mine Site Reclamation and Closure Activities                                      | Workforce   | Mitigation measures for Health Services Structure and Capacity | No   |
| <b>Post-closure Phase</b>                                    |   |   |  |  |
| Changes in country food quality                              | Waste rock management and deposition during Operation and Reclamation and Closure | Placement of granitic waste rock at the surface with concentrations of arsenic greater than approximately 100 mg/kg | Mitigation measures for Country Food Quality                   | No   |



**4.4 RESIDUAL EFFECTS AND THEIR SIGNIFICANCE**

This section presents the determination of significance of residual effects to Community Health and Well-being that may occur due to interactions with the Project. This section discusses the significance of each residual effect for Community Health and Well-being, as well as the likelihood of the residual effect, and the level of confidence associated with the determinations of significance and probability. The determination of significance for the potential residual effects on the VC is based on a consideration of the residual effects characteristics and socio-economic context of Community Health and Well-being subcomponents.

After the implementation of mitigation measures, the following adverse residual effects are likely to result from the Project:

- Increase in crime during Construction and Operation due to an influx of workers and an increase in income for local employees and contractors in LAA communities
- Increase in infectious disease rates resulting from STIs and other infectious diseases during Construction and Operation due to an influx of workers into LAA communities
- Positive effect on food security during Construction and Operation by providing increased employment and income, which will subsequently improve purchasing power.
- Adverse effect to mental health and wellness for some workers in LAA communities during Construction and Operation due to change in worker lifestyles toward shift work and the associated time away from family and community members
- Adverse effect to mental health services in LAA communities during Construction and Operation due to insufficient services available to support the population increase in LAA communities.

**4.4.1 RESIDUAL EFFECTS CHARACTERISTICS**

Definitions for ratings applied to residual effects characteristics developed with specific reference to the Community Health and Well-being VC are presented in **Table 4.4-1**.

**Table 4.4-1 Effect Characteristics Considered When Determining the Significance of Residual Effects to Community Health and Well-being**

| Residual Effect Characteristic | Definition   | Rating  |
|--------------------------------|--|---|
| Direction                      | Identifies whether the residual effect will be adverse or positive | <ul style="list-style-type: none"> <li>• Adverse – The trend of the effect is considered undesirable or worsening from baseline conditions.</li> <li>• Neutral – The trend of the effect is considered neither a worsening nor improvement from baseline conditions.</li> <li>• Positive – The trend of the effect is considered desirable or an improvement from baseline conditions.</li> </ul> |

| Residual Effect Characteristic | Definition   | Rating   |
|--------------------------------|--|--|
| Magnitude                      | Size or severity of the residual effect – generally measured in terms of the proportion of the VC affected within the LAA, relative to the range of historic variation   | <ul style="list-style-type: none"> <li>• Negligible – No effect is detectable from baseline conditions, or is in the normal range of socio-economic variability.</li> <li>• Low – Effect is detectable, but is not likely to be experienced at the community-wide level. The effect is limited to an inconvenience or nuisance, and is compatible with existing available policy guidance.</li> <li>• Moderate – Effect will result in demonstrable change and is possible at the community-wide level, but remains within historic norms and does not present a management challenge.</li> <li>• High – Effect will result in changes beyond historic norms, and presents a management challenge</li> </ul> |
| Geographic Extent              | Spatial scale over which the residual effect will likely occur   | <ul style="list-style-type: none"> <li>• Local (limited to LAA).</li> <li>• Regional (limited to RAA or beyond RAA).</li> </ul>  |
| Timing                         | Occurrence of the residual effect with respect a temporal attribute important to the VC (e.g., time of day, season, stage in life cycle, etc.)   | <ul style="list-style-type: none"> <li>• Shift – Generally limited to when employees are on-site during their shifts.</li> <li>• Seasonal – Limited to one or two seasons on an annual basis.</li> <li>• Phase – Expected to occur over the length of one or more Project phases.</li> </ul>   |
| Frequency                      | How often the residual effect will likely occur  | <ul style="list-style-type: none"> <li>• Infrequent – Occurs once.</li> <li>• Frequent – Occurs at irregular intervals.</li> <li>• Continuous – Occurs on a regular basis and at regular intervals.</li> </ul>   |
| Duration                       | Length of time over which the residual effect will likely persist  | <ul style="list-style-type: none"> <li>• Short-term – Occurs during the Construction Phase.</li> <li>• Long-term – Occurs throughout the Operation and Reclamation and Closure Phases.</li> <li>• Permanent – Occurs during the Post-closure Phase and beyond.</li> </ul>  |
| Reversibility                  | Whether or not the residual effect can be reversed once the activity causing the residual effect ceases. Irreversible effects are considered to be permanent   | <ul style="list-style-type: none"> <li>• Reversible – Effect can be reversed to baseline or equivalent conditions, considering non-Project-related change to socio-economics.</li> <li>• Partially reversible – Effect can be reversed partially to baseline or equivalent conditions.</li> <li>• Irreversible – Effect is permanent.</li> </ul>   |
| Probability of occurrence      | Likelihood that the potential residual effect will occur   | <ul style="list-style-type: none"> <li>• Likely – past experience indicates that the effect will likely occur as a result of the Project.</li> <li>• Unlikely – past experience indicates that the effect will not likely occur as a result of the Project.</li> </ul>   |
| Context                        | The extent to which the VC has been affected by past and present socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience) | <ul style="list-style-type: none"> <li>• Low – limited ability of communities to respond to disturbances</li> <li>• Moderate – moderate ability of communities to respond to disturbances</li> <li>• High – strong ability of communities to respond to disturbances.</li> </ul>   |

#### 4.4.2 SIGNIFICANCE DEFINITION

The significance of potential residual effects was determined based on the residual effect characteristic rating, a review of secondary data sources, consultation with government agencies, feedback obtained through primary data collection, and professional judgement. The level of each residual effect has been rated as Not Significant, or Significant, as follows:

**Not Significant** Effects determined to be not significant are those that are greater than negligible but that do not meet the definition of significant. Residual effects that are determined to be not significant are carried forward to the cumulative effects assessment (CEA).

**Significant** Effects determined to be significant are those characterized as high magnitude, any geographic extent, continuous frequency, long-term duration, and likely to occur. Context, and in particular low resiliency, is also considered. Significant adverse residual effects are carried forward to the CEA.

The levels of confidence (i.e., low, moderate, high) for each potential Project-related effect is discussed to characterize the level of uncertainty associated with significance determinations. The level of confidence is typically based on expert judgement and is characterized as follows:

- **Low** – Judgement is hampered by an incomplete understanding of the cause-effect relationship, or a lack of data or primary data feedback on a specific topic.
- **Moderate** – Reasonable understanding of the cause-effect relationship exists, and adequate data are available; however, outcomes may be influenced by external influences, preferences, and choices.
- **High** – There is a good understanding of the cause-effect relationship and ample data, including regular feedback during primary data collection.

Predications regarding the characterization of residual effects on Community Health and Well-being as a result of the Project carry an element of uncertainty due to the dynamic nature of socio-economics, the multifactorial nature of health and well-being, and the influence of historical experiences and conditions.

For socio-economic VCs, standards, guidelines, objectives, and thresholds are not well defined, understood, nor agreed-upon (YESAB 2005). As discussed above, the context and resiliency of the communities in the LAA and RAA play an important role in characterizing the significance of residual effects. In terms of community health resiliency, the context in the LAA and RAA will likely shape the way residual effects materialize in the different communities. The community resiliency in the LAA and RAA is generally similar for each subcomponent and residual effect. The context for Whitehorse will likely be high, as the community's large population and diverse community services will likely be resilient to change. The context for the smaller LAA will likely be low to moderate, as the smaller population sizes of these communities and their relative limited community services are less resilient to change.

### 4.4.3 RESIDUAL EFFECTS

#### 4.4.3.1 Increase in Crime

Despite mitigation measures aimed at supporting employees in reducing harm from substance use, the Project will likely result in a residual adverse effect to crime during Construction and Operation due to an increase in indirect and induced employment in LAA communities and an increase in income for local employees and contractors in LAA communities. Increased access along the NAR may also lead to an increase in property crime.

An increase in crime indicators, including overall crime rate, violent crime, property crime, and federal statute crime, were observed in NWT in correlation with increased mining activity (GNWT 2015). The mitigation measures identified above, together with the ability of the RCMP to increase staffing in response to an increased number of calls, are proposed to reduce the potential adverse effect on health from increased crime in the LAA or in accessible areas along the NAR. Some uncertainty exists around the degree to which the mitigation can be effective, however.

The residual effect is likely to be low in magnitude as crime rates in Yukon are already among the highest in Canada, and the additional effects from the Project area will likely be relatively low in magnitude. The timing of the effect will likely reflect current crime rates, which peak in the summer. The residual effect will likely be infrequent and short-term due to the isolated nature of incidents of crime, and is fully reversible after completion of the Project Operation Phase. Based on similar experience with other projects (GNWT 2015) and based on the above characterization, this residual adverse effect is not significant as a result of the Project. The confidence is moderate, due to uncertainty in the effectiveness of mitigation measures.

**Table 4.4-2 Residual Effect Characteristic Ratings for Increase in Crime**

| Residual Effect Characteristic | Definition | Rating  |
|--------------------------------|------------|---|
| Direction                      | Adverse    | An increase in crime would have an adverse effect on Community Health and Well-being.   |
| Magnitude                      | Low        | Crime rates in the north exceed Canadian averages, and the relative increase in crime to the Project is likely to be relatively low in magnitude. |
| Geographic Extent              | LAA        | The effect is likely to occur in LAA communities, as well as along the NAR.   |
| Timing                         | Seasonal   | Possible increase in summer months, consistent with current trends.   |
| Frequency                      | Infrequent | Any incidents of crime will likely be isolated.   |
| Duration                       | Short-term | Any incidents of crime will likely be isolated.   |
| Reversibility                  | Reversible | Any increase in crime would likely be related to an increase in population related to Project activity.   |
| Probability of Occurrence      | Likely     | It is likely there will be an increase in substance-related crime related to an increase in income.   |

**4.4.3.2 Increase in Infectious Disease Rates**

Despite mitigation measures aimed at on-site infectious disease management, the Project is likely to result in an increase in infectious disease rates resulting from STIs and other infectious diseases during Construction and Operation due to an influx of workers into LAA communities. This residual effect is likely to be adverse in direction, although low in magnitude as mitigation measures are likely to be effective, and the most common infectious diseases, including STIs, are treatable. The effect would be focused on the Mine Site and Camp Site, where employees will live and work in close proximity, although the effect may extend to all LAA communities. As the effect is tied to the presence of a workforce during Construction and Operation, the effect is likely to be shift-based, continuous, long-term, and fully reversible. The probability of occurrence is likely, based on experience in other jurisdictions (GNWT 2015). Based on this characterization, this effect not significant. The confidence in this assessment is high, based on the effectiveness of mitigation measures and the experience of other jurisdictions. **Table 4.4-3** presents the characteristics of Project-related effects on infectious disease within the LAA.

**Table 4.4-3 Residual Effect Characteristic Ratings for Increase in Infectious Disease Rates**

| Residual Effect Characteristic | Definition | Rating   |
|--------------------------------|------------|--|
| Direction                      | Adverse    | An increase in infectious disease rates will have an adverse effect on Community Health and Well-being.                  |
| Magnitude                      | Low        | Mitigation measures will likely to address infectious diseases.  |
| Geographic Extent              | LAA        | Concern is focused on the camp, although Dawson and Whitehorse residents may be affected by disease outbreak.            |
| Timing                         | Shift      | Connected to presence of workforce during Construction and Operation.  |
| Frequency                      | Continuous | Connected to presence of workforce during Construction and Operation.  |
| Duration                       | Long-term  | Connected to presence of workforce during Construction and Operation.  |
| Reversibility                  | Reversible | Connected to presence of workforce during Construction and Operation. Risk will cease at the end of the Operation Phase. |
| Probability of Occurrence      | Likely     | STI rates are known to rise with the presence of migratory workers.  |

**4.4.3.3 Positive Effect on Food Security**

During Construction and Operation, the Project is considered likely to have a positive effect on food security by providing increased employment and income, which will subsequently improve purchasing power to buy nutritious foods. Potential secondary effects from these positive effects are also possible for other indicators, including social determinants of health (e.g., positive effects on children and youth), health-related behaviours (e.g., nutrition) and mental health and wellness. No effects on food security are anticipated due to changes in access to traditional food sources or harvesting areas. The area of the

proposed mine site is not an area relied upon for harvesting due to its relatively remote location and lack of road access, and alternative harvesting areas are available.

The magnitude of this effect is low, since the effect may be detectable at the community-wide level. This effect will occur in the LAA, in the communities where employees live, and will be continuous, long-term, and reversible, since it will likely last only through the Construction and Operation Phases.

Based on this characterization, the Project is not likely to result in a significant residual effect on food security. This confidence in this assessment is moderate as the actions of Project employees due to increased income depends largely on individual of family preferences and personal situation. **Table 4.4-4** presents the residual effects characteristics, rating and rationale.

**Table 4.4-4 Residual Effect Characteristic Ratings for Positive Effects on Food Security**

| Residual Effect Characteristic | Definition | Rating  |
|--------------------------------|------------|---|
| Direction                      | Positive   | An increase in purchasing power due to Project employment will have a positive effect on Community Health and Well-being.                                 |
| Magnitude                      | Low        | The effect may be detectable at the community-wide level.   |
| Geographic Extent              | LAA        | The effect will be focused on workers and their families.   |
| Timing                         | Phase      | Connected to presence of workforce during Construction and Operation.   |
| Frequency                      | Continuous | Connected to presence of workforce during Construction and Operation.   |
| Duration                       | Long-term  | Connected to presence of workforce during Construction and Operation.   |
| Reversibility                  | Reversible | Connected to presence of workforce during Construction and Operation.   |
| Probability of Occurrence      | Likely     | An increase in income is positively related to an increase in purchasing power and is considered to have a positive effect on workers and their families. |

**4.4.3.4 Adverse Effects on Mental Health and Wellness**

Despite mitigation measures aimed at on-site mental health support, an adverse Project-related residual effect to mental health and wellness is likely to occur during the Construction and Operation Phase due to a change in worker lifestyle because of shift work, and from potential increased substance abuse from stress or increased income. While not all workers will experience this, some workers will experience increased stress due to being away from families and community members for an extended period of time. The magnitude of this effect is low, due to the effectiveness of mitigation measures based experience with other Projects. For example, the Proponent will run a dry camp with a zero-tolerance substance use policy. Experience with the Ekati Mine in NWT found that most employees (92% from Yellowknife and 71% from small local communities) reported drinking alcohol in their time away from the mine, but very few employees reported drinking more often (7% from Yellowknife and 0% from small local communities) (Rescan 2012).

This effect will occur in the LAA, in the communities where employees live, and will be continuous, long-term, and reversible, since it will likely last only through the Construction and Operation Phases.

Based on this characterization, the Project is not likely to result in a significant residual effect on mental health and wellness. This confidence in this assessment is moderate as the number of proportion of employees affected this way by the Project is unknown. **Table 4.4-5** presents the residual effects characteristics, rating and rationale.

**Table 4.4-5 Residual Effect Characteristic Ratings for Adverse Effects on Mental Health and Wellness**

| Residual Effect Characteristic | Definition | Rating  |
|--------------------------------|------------|---|
| Direction                      | Adverse    | An increase in stress and substance use will have an adverse effect on Community Health and Well-being. |
| Magnitude                      | Low        | Mitigation measures will likely address any adverse effects on mental health and wellness.              |
| Geographic Extent              | LAA        | Concern is focused on workers and their families.   |
| Timing                         | Phase      | Connected to presence of workforce during Construction and Operation.                                   |
| Frequency                      | Continuous | Connected to presence of workforce during Construction and Operation.                                   |
| Duration                       | Long-term  | Connected to presence of workforce during Construction and Operation.                                   |
| Reversibility                  | Reversible | Connected to presence of workforce during Construction and Operation.                                   |
| Probability of Occurrence      | Likely     | Substance abuse is often linked to an increase with an increase in income.                              |

**4.4.3.5 Increased Pressure on Health Services Structure and Capacity**

An adverse effect to mental health services in LAA communities during Construction and Operation due to insufficient services available to support the population increase in LAA communities is predicted to occur as a result of the Project. Health services in the larger LAA communities of Dawson and Whitehorse are currently generally sufficient to meet the needs of the existing population, however, there is concern that mental health services in the smaller LAA communities of Beaver Creek, Mayo, and Pelly Crossing are not **(Section 22.0 Community Services and Infrastructure Assessment)**. The effect is predicted to be of low magnitude, since existing infrastructure may have sufficient capacity to absorb some increased need. The effect will be continuous, long-term, and fully reversible in duration as it is linked to the Project Construction and Operation workforce. The effect is likely to occur.

Consequently, based on the factors outlined below it is likely that the Project will result in a not significant residual adverse effect on health services structure and capacity. The confidence in this assessment is high due to the understanding of the limitations in the mental health service capacity of LAA communities.

**Table 4.4-6 Residual Effect Characteristic Ratings for Increased Pressure on Health Services Structure and Capacity**

| Residual Effect Characteristic | Definition | Rating   |
|--------------------------------|------------|--|
| Direction                      | Adverse    | An increase in demand for services may have an adverse effect on Community Health and Well-being; however, given the existing capacity for health services, an increase in volumes may actually improve health outcomes. Demand on mental health services may exceed current capacity. |
| Magnitude                      | Low        | Existing capacity can likely absorb some increases in need.  |
| Geographic Extent              | LAA        | Effect will be more pronounced in Dawson, Pelly Crossing, Mayo, and Beaver Creek based on their small populations.   |
| Timing                         | Phase      | Connected to presence of workforce during Construction and Operation.  |
| Frequency                      | Continuous | Connected to presence of workforce during Construction and Operation.  |
| Duration                       | Long-term  | Connected to presence of workforce during Construction and Operation.  |
| Reversibility                  | Reversible | Connected to presence of workforce during Construction and Operation. Effect will cease at the end of the Project life.  |
| Probability of Occurrence      | Likely     | Project employees and their families are likely to require health services.  |

**4.4.4 SUMMARY OF PROJECT-RELATED RESIDUAL ADVERSE EFFECTS AND SIGNIFICANCE**

The potential residual adverse effects discussed in **Section 4.4.2** through **Section 4.4.5** are further summarized in **Table 4.4-7**.



**Table 4.4-7 Summary of Potential Residual Adverse Effects for Community Health and Well-being**

| Potential Residual Effects                                   | Contributing Project Activities | Proposed Mitigation Measures                                   | Residual Effects Characterization<br>(see Notes for details) |           |                   |        |           |          |               |            |         |              |                     |
|--|---------------------------------|--|--|-----------|-------------------|--------|-----------|----------|---------------|------------|---------|--------------|---------------------|
|  |                                 |  | Direction  | Magnitude | Geographic Extent | Timing | Frequency | Duration | Reversibility | Likelihood | Context | Significance | Level of Confidence |
| <b>Construction Phase</b>                                    |                                 |  |  |           |                   |        |           |          |               |            |         |              |                     |
| Increase in Crime  | Workforce                       | Mitigation measures for Crime                                  | A  | LM        | LAA               | S      | IF        | ST       | R             | L          | M/H     | NS           | M                   |
| Increase in Infectious Disease Rates                         | Workforce                       | Mitigation measures for Infectious Diseases                    | A  | LM        | LAA               | Sh     | CF        | LT       | R             | L          | M/H     | NS           | H                   |
| Positive effect on food security                             | Workforce                       | Enhancement measures for Food Security                         | P  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | M                   |
| Adverse Effects on Mental Health and Wellness                | Workforce                       | Mitigation measures for Infectious Diseases                    | A  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | M                   |
| Increased Pressure on Health Services Structure and Capacity | Workforce                       | Mitigation measures for Health Services Structure and Capacity | A  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | H                   |
| <b>Operation Phase</b>                                       |                                 |  |  |           |                   |        |           |          |               |            |         |              |                     |
| Increase in Crime  | Workforce                       | Mitigation measures for Crime                                  | A  | LM        | LAA               | S      | IF        | ST       | R             | L          | M/H     | NS           | M                   |
| Increase in Infectious Disease                               | Workforce                       | Mitigation measures for Infectious Diseases                    | A  | LM        | LAA               | Sh     | CF        | LT       | R             | L          | M/H     | NS           | H                   |

| Potential Residual Effects                                   | Contributing Project Activities | Proposed Mitigation Measures                                   | Residual Effects Characterization<br>(see Notes for details) |           |                   |        |           |          |               |            |         |              |                     |
|--|---------------------------------|--|--|-----------|-------------------|--------|-----------|----------|---------------|------------|---------|--------------|---------------------|
|  |                                 |  | Direction  | Magnitude | Geographic Extent | Timing | Frequency | Duration | Reversibility | Likelihood | Context | Significance | Level of Confidence |
| Positive effect on food security                             | Workforce                       | Enhancement measures for Food Security                         | P  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | M                   |
| Adverse effects on Mental Health and Wellness                | Workforce                       | Mitigation measures for Infectious Diseases                    | A  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | M                   |
| Increased Pressure on Health Services Structure and Capacity | Workforce                       | Mitigation measures for Health Services Structure and Capacity | A  | LM        | LAA               | P      | CF        | LT       | R             | L          | M/H     | NS           | H                   |

**Notes:**

Direction: Adverse (A), Neutral (N), Positive (P)  
 Magnitude: NM = Negligible, LM = Low magnitude, MM = Moderate magnitude, HM = High magnitude  
 Geographic Extent: No = none, Site = negligible, LAA = local, RAA = regional, T = territorial  
 Timing: S = Seasonal, Sh = Shift, P = Phase  
 Frequency: CF = Continuous, FF = Frequent, IF = Infrequent  
 Duration: PT = Permanent, LT = Long-term, ST = Short-term  
 Reversibility: R = Reversible, I = Irreversible, P = Partially reversible  
 Context: L=Low, M=Moderate, H=High  
 Likelihood: L=Likely, U=Unlikely  
 Context: L=Low, M=Moderate, H=High  
 Significance: NS = Not-Significant, S = Significant  
 Level of Confidence: L=Low, M=Moderate, H=High

## 5.0 CUMULATIVE EFFECTS ASSESSMENT

This section presents an assessment of potential cumulative adverse effects to Community Health and Well-being. Cumulative effects can potentially result from interactions between Project-related changes and the incremental effects of other past, present, and future projects and activities. These projects and activities are identified in **Appendix 5-B Project and Activity Inclusion List**. Potential cumulative effects may occur within the LAA and RAA for any Project-related residual adverse effects, though the residual adverse effects that are likely from the Project may not be significant when evaluated in isolation from other reasonably foreseeable projects and activities.

### 5.1 PROJECT-RELATED RESIDUAL EFFECTS

Project-related residual effects on Community Health and Well-being, and rationale for their inclusion in or exclusion from the CEA are provided in **Table 5.1-1**. As discussed in **Section 4.0**, the Project is likely to result in residual adverse effects on Community Health and Well-being related to crime, infectious disease, mental health and wellness, and health services structure and capacity (**Table 4.4-7**).

**Table 5.1-1 Project-related Residual Effects Considered in the Cumulative Effects Assessment**

| Project-related Residual Effect                              | Included in Cumulative Effects Assessment | Rationale  |
|--|---|--|
| Increase in Crime Rate                                       | Yes                                       | While residual adverse effects in terms of in crime rates will likely be minimal (and manageable) as a result of the Project, additional pressures on especially Dawson-based on population turnover or greater seasonal transience may affect crime rates.  |
| Increase in Infectious Disease Rates                         | Yes                                       | Introductions to LAA and RAA communities and populations of infectious disease can increase with the flux of people through an area; further, the Project interactions with other reasonably foreseeable projects and activities may increase the influx and through-flux of people, and hence increase disease transmission rates.  |
| Adverse Effects on Mental Health and Wellness                | Yes                                       | To the extent that mental health in LAA communities and the RAA overall is influenced by rates and magnitude of change in community dynamics and lifestyles, the Project interactions with other reasonably foreseeable projects and activities may adversely affect mental health in proportion to the overall magnitude of change. |
| Increased Pressure on Health Services Structure and Capacity | Yes                                       | Subsidiary cumulative changes, especially in rates of infectious disease or mental illness, may have a cumulative effect on the adequacy of existing and planned health services capacity.   |

### 5.1.1 CUMULATIVE EFFECTS BASELINE INFORMATION

Primary data collection activities and TK were used to inform the Community Health and Well-being VC. Other baseline information used to inform the CEA is provided in **Section 1**, **Section 2**, **Section 3**, **Appendix 18-A Socio-economic Baseline Report**, and **Appendix 18-B Human Health Risk Assessment**.

### 5.2 SPATIAL AND TEMPORAL SCOPE OF THE CUMULATIVE EFFECTS ASSESSMENT

The spatial scope of this CEA for Community Health and Well-being is described as an area inclusive of active and proposed mine projects in Yukon, that may result in a change of to community health and well-being within the LSA and RSA, as discussed in **Section 1.4**

The temporal scope includes the period from the initiation of Construction of the Project to approximately a decade after the completion of mine Reclamation and Closure. It is highly unlikely that any possible adverse influence of the Project on crime rates, infectious disease, mental health and wellness, or health services structure and capacity will persist beyond this time because such changes would arise based on the presence of Project workers.

### 5.3 EFFECTS DUE TO OTHER PROJECTS AND ACTIVITIES

Other relevant projects and activities within the spatial and temporal scope of the CEA that may result in residual adverse effects to Community Health and Well-being and that interact with the Project-related residual adverse effects are identified in **Table 5.3-1**. An overview description of each of these projects and activities is provided, along with relevant potential residual effects on Community Health and Well-being. The reasonably foreseeable projects and activities that may interact with residual effects of the Project on Community Health and Well-being are listed in the Project Proposal in **Appendix 5-A Project Interactions Matrix**.

The following definitions were used to classify the status of projects and activities that may interact with the Project:

- Past – projects and land use activities that occurred in the past and are no longer active
- Present – existing and active projects and land use activities; all projects or land use activities that applied for approval or permitting prior to 2015 are assumed to be present projects or land use activities
- Future – reasonably foreseeable future projects or land use activities for which proposals have been submitted under YESAA (subsection 50(1)), or have entered into a formal approval or permitting process; applications submitted in 2015 and 2016 are assumed to be future projects or land use activities.

By design, the evaluation of Project-related effects on the various subcomponents of Community Health and Well-being included consideration of the cumulative influence of past and existing activities and conditions. The focus of the overall assessment on community resilience in the face of changes in health determinants requires adequate understanding of the existing health and well-being status in the community, and vulnerability to further change, as a major basis for understanding the potential effects of the Project. The effects of past and present projects and activities have been captured in the description of existing conditions (**Section 3.0**), and therefore the CEA will focus on interactions with reasonably foreseeable future projects and activities.

Mineral exploration and placer mining projects have occurred in, and are likely to continue to occur in, the Project region. Although the claim blocks can be very extensive and numerous, actual works are likely to be limited to a few focal areas for either a short period of time, or seasonally for many years, as is the case for several quartz claims in the area. Projects in each category summarized in **Table 5.3-1** were assessed in relation to the type of disturbance and potential interaction with each subcomponent.

**Table 5.3-1 Potential Residual Adverse Effects of Other Projects and Activities on Community Health and Well-being**

| Other Project / Activity Category | Description   | Potential Residual Effects  |
|-----------------------------------|---|---|
| Settlements                       | Residential and commercial land use, community infrastructure, and historic sites                                   | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Utilities                         | Water supply wells, wastewater treatment, and on-site sewage disposal systems                                       | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Transportation                    | Access roads construction and upgrades, bridges, and culverts   | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Energy                            | Air emissions permits and electric power transmission lines   | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Agriculture                       | Soil-based agricultural land applications and livestock grazing land applications                                   | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Forestry                          | Timber harvesting activities for commercial purposes or clearing of forest resources incidental to other activities | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |
| Industrial                        | Installation and upgrade of oil and solid fuel burning appliances and fuel oil storage tanks                        | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity. |

| Other Project / Activity Category | Description   | Potential Residual Effects   |
|-----------------------------------|---|--|
| Placer projects                   | Mining of alluvial deposits for minerals; activities include placer exploration and placer mining | No – The overall level of placer mining along the NAR is not likely to change appreciably from the existing conditions; therefore, future measurable change in crime rates, infectious disease characteristics or rates, rates and types of mental illnesses, or health service structure and capacity are not likely. |
| Wildlife                          | Registered trapping concession areas and guide outfitter concession areas                         | No – Not likely to substantially affect in-migration to the RAA and communities of the LAA, and therefore will be unlikely to measurably affect crime rates, infectious disease, or health services structure and capacity.  |
| Quartz projects                   | Hard rock mining of ore bodies; activities include quartz exploration and quartz mining           | Yes – Potential residual effects from other quartz projects to Community Health and Well-being are likely to be similar to those from the proposed Project.  |

Some types of incremental activities that may occur do not involve effects to natural environments, such as utilities repair, replacement and upgrades, or transportation infrastructural upgrades, or in association with trapping concessions, and thus will not likely have an adverse effect on Community Health and Well-being. Additionally, such activities are reasonably foreseeable as large land use activities and endeavours that occur routinely both within the CEA area and throughout the settled world. Such activities are generally undertaken based on the positive benefits to the larger population, including safety, convenience, and economic gain.

The projects or activities that will likely have an interaction were included in the CEA on Community Health and Well-being subcomponents. Consistent with **Appendix 16-B Wildlife and Wildlife Habitat Valued Component Assessment**, the CEAs for Community Health and Well-being VC subcomponents used the same assumptions about the spatial and temporal boundaries, and timing, of other projects and activities:

- **Quartz Exploration:** All past, present, and future quartz exploration projects were assumed to be active throughout the life of this Project. Each project was assumed to have a 10-ha footprint around the project centre. Quartz exploration is seasonal in the summer.
- **Quartz mining** (past and present): Footprints for operating mines (Minto) and past mines (Mt Nansen, Clinton Creek) are based on the existing disturbance footprints visible in satellite imagery. Mining activity for operating projects was assumed to occur year-round for the life of this Project.
- **Quartz mining** (future): Reasonably foreseeable future mines considered include Casino, Eagle Gold, Kudz Ze Kayah, and MacTung Tungsten. Where available (Casino, Carmacks), proposed mine footprints from YESAB submissions have been used to define likely disturbance areas. Where proposed footprints were not available, a probable disturbance area has been inferred.

#### 5.4 POTENTIAL CUMULATIVE EFFECTS

This section identifies and discusses the potential interactions between Project-related residual effects on Community Health and Well-being subcomponents and effects associated with future development of quartz mines within the LAA and larger Yukon, as identified in **Table 5.4-1**. The potential adverse cumulative effects resulting from these interactions are also described.

The potential for interactions was determined by assessing the spatial and temporal overlap of the future foreseeable project with the RAA of each subcomponent. Projects and activities deemed to have potential for cumulative interactions with the Project were those that:

- Had comparable residual effects to community health and well-being use as the Project
- Could be reasonably characterized in terms of their spatial and temporal boundaries
- Had spatial overlap in residual effects with the Project
- Had temporal overlap in residual effects with the Project.

Potential projects and activities were considered not to have potential for cumulative interactions if:

- The available spatial and temporal information indicated there was overlap with another project or activity that had a larger footprint, therefore, the incremental effect was assumed to result from the larger footprint
- The spatial or temporal extent of a potential project or activity was deemed too small to have a significant interaction with the Project.

A number of quartz mining projects in Yukon may be advanced during the period for which cumulative effects contributions are plausible. The Casino Mine Project Proposal is currently in the review stage under YESAA. The proposed Casino mine site is located approximately 30 km from the proposed Project site. The proposed access road for the Casino Mine, however, is via an extension off the Freegold Road from Carmacks; thus, there is virtually no overlap potential for people who will use the Project's NAR and people or traffic along the Casino Mine access route. There is overlap of an effect on the Yukon highway system, however, particularly the Alaska Highway to the North Klondike Highway and the North Klondike Highway to Carmacks.

Other proposed (including exploration stage) and active major quartz mining projects may generate significant employment opportunities and consequently result in in-migration that may affect crime, infectious disease, and health service structure and capacity. In-migration for these projects is likely to take place in communities other than Dawson, however, and in-migration to Whitehorse will likely have a negligible effect due to the overall size of the city in comparison to employment. Current mining projects include Minto (Minto Explorations Ltd.). Proposed and future mining projects include Casino (Casino Mining Corp.), Eagle Gold (Stratagold Corporation), Kudz Ze Kayah (BMC Minerals); and MacTung Tungsten Mine (North American Tungsten Corp.). Additionally, mines in temporary closure, such as Wolverine Mine (Yukon Zinc Corp.) and Bellekeno (Alexco Keno Hill Mining Corporation) may generate demographic changes if they resume mining activities, but as above, are unlikely to affect Dawson, which is the community likely to be most sensitive to demographic changes.

**Table 5.4-1 Potential Cumulative Effects on Community Health and Well-being due to Interactions between the Project and Other Projects and Activities (Quartz)**

| Other Project / Activity                    | Description   | Potential Residual Adverse Effects  | Potential for Interaction Resulting in Cumulative Residual Adverse Effects and Rationale  |
|---|---|---|---|
| Bellekeno (Alexco Keno Hill Mining Corp.);  | The Bellekeno silver mine, commenced commercial production at the beginning of calendar year 2011 and was Canada's only operating primary silver mine from 2011 to 2013   | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | Low potential for interaction, since mine operations at Bellekeno are currently suspended. As it is unknown if/when operations will commence the Project will not likely result in a cumulative change to Community Health and Well-being.  |
| Brewery Creek (Alexco Resource Corp.)       | Brewery Creek is a gold mine located 55 km east of the Dawson. It was operated from 1997 to 2001, and is currently completing reclamation and closure.  | <ul style="list-style-type: none"> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul>  | Potential interaction based on effects to connection to the land and harvesting practices: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural and harvesting purposes. This mine is of particular interest in terms of cumulative effects based on its proximity to Dawson.  |
| Carmacks Copper (Copper North Mining Corp.) | Carmacks Copper is a copper, gold, and silver mine project located 38 km northwest of Carmacks and 192 km north of Whitehorse. The Project received its Quartz Mining Licence in 2009, but has been in a state of temporary closure since that time, Temporary closure will likely continue until 2020. | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | <p>Low potential for interaction based on employment-related population changes due to location of the Carmacks Project in relation to the Project and Dawson; specifically, population changes related to Carmack's activities are not likely to extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting practices: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p> |
| Casino (Casino Mining Corp.)                | Casino is a copper, gold, molybdenum, and silver mine project located 300 km northwest of Whitehorse. It is proposing a 22-year mine life. The Project was recently referred to a Panel Review.   | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | <p>Low potential for interaction based on employment-related population changes due to location of the Casino project in relation to the Project and Dawson; specifically, population changes related to Casino's activities are not likely to extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p>              |



| Other Project / Activity                        | Description   | Potential Residual Adverse Effects  | Potential for Interaction Resulting in Cumulative Residual Adverse Effects and Rationale   |
|---|---|---|--|
| Eagle Gold Project                              | Eagle Gold is a gold deposit project located 85 km by road northeast of Mayo.   | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | <p>Low potential for interaction based on employment-related population changes due to location of the Eagle Gold project in relation to the Project and Dawson; specifically, population changes related to Eagle Gold’s activities are not likely to extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p>                 |
| Kudz Ze Kayah (BMC Minerals)                    | The Kudz Ze Kayah Project is a proposed copper, lead, zinc project located in the northern Pelly Mountains, 135km south of Ross River in South Central Yukon.   | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | <p>Low potential for interaction based on employment-related population changes due to location of the Kudz Ze Kayah project in relation to the Project and Dawson; specifically, population changes related to Kudz Ze Kayah’s activities are not likely to extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting practices: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p> |
| MacTung Tungsten Mine (North American Tungsten) | <p>The Mactung property is located in Yukon in the Selwyn Mountain Range and covers the area around Mt. Allan, approximately eight kilometers northwest of MacMillan Pass. The nearest settlement accessible by road, Ross River, is 250 km away to the southwest.</p> <p>The project is currently under screening pursuant to YESAA.</p> | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> </ul>                                 | <p>Low potential for interaction based on employment-related population changes due to location of the MacTung Project in relation to the Project and Dawson; specifically, population changes related to MacTung’s activities will not likely extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting practices: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p>               |

| Other Project / Activity      | Description   | Potential Residual Adverse Effects  | Potential for Interaction Resulting in Cumulative Residual Adverse Effects and Rationale   |
|-------------------------------|---|---|--|
| Minto (Capstone Mining Corp.) | Minto is an open pit copper mine located 240 km north of Whitehorse. As of 2016, the mine has seven years of operating life remaining. The Project currently employees 307 staff, including contract employees. | <ul style="list-style-type: none"> <li>• Employment-related population changes</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul>                           | <p>Low potential for interaction based on employment-related population changes due to location of the Minto project in relation to the Project and Dawson; specifically, population changes related to Minto's activities are not likely to extend to Dawson.</p> <p>Potential interaction based on effects to connection to the land and harvesting practices: cumulative effect of multiple projects affecting access to and use of land for recreational, cultural, and harvesting purposes.</p> |
| Wolverine (Yukon Zinc Corp.)  | Yukon Zinc's Wolverine Mine is a high grade zinc-silver-copper-lead-gold underground mine located approximately 280 km north east of Whitehorse   | <ul style="list-style-type: none"> <li>• Employment-related population changes if mine resumes operation</li> <li>• Effect on connection to the land</li> <li>• Effect on harvesting</li> </ul> | <p>Low potential for interaction, since mine operations at Wolverine are currently suspended. As it is unknown if/when operations will commence the Project will not likely result in a cumulative change to Community Health and Well-being.</p>  |

Projects in each category summarized in **Table 5.4-1** were assessed in relation to the type of disturbance and potential interaction with each subcomponent (**Table 5.4-2**).

**Table 5.4-2 Potential Cumulative Effects on Community Health and Well-being**

| Other Project / Activity    | Potential Residual Adverse Effect                            | Potential for Interaction Resulting in Cumulative Effect and Rationale  |
|-----------------------------|--|---|
| Additional new quartz mines | Increase in crime rates                                      | No – Major staging routes or active Project phases will likely not significantly overlap based on the relative locations of the projects.<br>Post-closure mine conditions will likely not influence crime rates given the limited workforce (if any) engaged in post-closure activities.  |
|                             | Increase in infectious disease rates                         | No – Major staging routes or active Project phases will not likely significantly overlap based on the relative locations of the projects.<br>Therefore, transient working or associated population will not likely interactive with each other or a common set of community members.<br>Post-closure mine conditions are will not likely influence crime rates given the limited workforce (if any) engaged in Post-closure activities  |
|                             | Adverse effects on mental health and well-being              | Yes – There is a potential effect on mental health and wellness based on a possible sense of disconnect from the land due to numerous development projects.   |
|                             | Increased pressure on health services structure and capacity | No – Timing and location of Project execution is unlikely to align sufficiently within a specific community of interest to place health services capacity under pressure, based on the relative locations of the projects.<br>Most of the demand for health services capacity for the Project will occur within Dawson and Whitehorse. Primary influences of other major resource development projects on health services capacity or other resources are likely to be experienced in Whitehorse and other communities (e.g., Carmacks for Casino, Mayo for Eagle Gold), and far less so in Dawson. |

**Note:** **No** – no interaction or not likely to interact cumulatively; **Yes** – potential for cumulative effect

Overall, it is concluded that there is a potential for interactions between residual adverse effects of the Project and other reasonably foreseeable projects and activities on mental health and wellness. Residual adverse effects may occur to the same subcomponent from other future quartz mine projects if they proceed to active mining during the Project's Construction, Operation, and Reclamation and Closure Phases.

## **5.5 MITIGATION MEASURES FOR CUMULATIVE EFFECTS**

The health determinants of interest (crime, infectious disease, mental health and wellness, health service structure and capacity) are all amenable to additional mitigation strategies if the need arises in the future; however, mental health and wellness requires specific mitigation strategies to address anticipated cumulative effects. For all of these subcomponents, a major aspect of any mitigation strategy is adequate resourcing.

The Proponent will work with local communities and governments to participate in implementation of mitigation strategies and programs. Specific projects and initiatives will be determined by local communities and governments in coordination with the Proponent.

## **5.6 RESIDUAL CUMULATIVE EFFECTS AND SIGNIFICANCE OF RESIDUAL CUMULATIVE EFFECTS**

Adequate funding and resourcing for programming as described above will likely mitigate residual cumulative effects for Community Health and Well-being, based on previous experience with other resource extraction projects in northern Canada and elsewhere, and on community resilience and local capacity to adapt to major resource development projects. No or negligible residual cumulative effects are likely for Community Health and Well-being.

## 6.0 SUMMARY OF EFFECTS ASSESSMENT OF COMMUNITY HEALTH AND WELL-BEING

Potential interactions between the Project and Community Health and Well-being are likely to result from the Project during the Construction, Operation, Closure and Reclamation Phases. Potential Project interactions with Community Health and Well-being were assessed through subcomponents based on components identified in the HHRA and the health effect categories identified in the HIA. These include air quality; noise; country food quality; crime; food security; accidents and injuries; infectious disease; mental health and wellness; and health services structure and capacity.

The Project is likely to interact with subcomponents primarily due to the presence and influx of workers primarily during the Construction and Operation Phases.

The selection of mitigation and enhancement measures for Community Health and Well-being measures comprise practical means taken to manage potential adverse effects, and may include the application of relevant standards, guidelines, and best management practices supported by specific guidance documents (e.g., *Engaging with Yukon First Nations and Communities, A Quick Reference Guide to Effective and Respectful Engagement Practices* (FNNND, Tr'ondëk Hwëch'in, and Yukon Chamber of Mines 2012)).

With the application of mitigation and enhancement measures, the following residual effects are likely to result from the Project:

- Increase in crime during Construction and Operation due to an influx of workers and an increase in income for local employees and contractors in LAA communities.
- Increase in infectious disease rates resulting from STIs and other infectious diseases during Construction and Operation due to an influx of workers into LAA communities.
- Positive effect on food security during Construction and Operation by providing increased employment and income, which will subsequently improve purchasing power.
- An adverse effect to mental health and wellness for some workers in LAA communities during Construction and Operation due to change in worker lifestyles toward shift work and the associated time away from family and community members.
- An adverse effect to mental health services in LAA communities during Construction and Operation due to insufficient services available to support the population increase in LAA communities.

These effects are considered not significant, primarily due to the ability of the existing communities to absorb change, and the understood effectiveness of the mitigation measures. These residual effects were also considered under the cumulative effects assessment. No significant adverse residual cumulative effects are likely to result from the Project for the Community Health and Well-being VC

## 7.0 EFFECTS MONITORING AND ADAPTIVE MANAGEMENT

Due to the dynamic nature of socio-economics, the Proponent will develop a socio-economic monitoring program (under development) in order to 1) verify the accuracy of the residual effects predictions and the value of proposed mitigation measures; 2) assess the efficacy of proposed mitigation measures and the need for modifications to those measures to confirm the validity of effects predictions; 3) identify unexpected socio-economic outcomes or problems; and 4) implement additional mitigation measures as per the adaptive management plans developed for the Project.

Potential effects can be measured and monitored using available secondary data sources as well as primary data collection. A baseline report has been prepared describing the current status of Community Health and Well-being, which includes primary and secondary data.

It is possible to measure and monitor potential effects through several means, including, for example, the following:

- Assessments of Air Quality and dust fall
- Community-based monitoring of country foods through voluntary contributions of tissue samples
- Use of available secondary data for rates of infectious diseases of interest and health system indicators
- Primary data collection, including qualitative assessments of mental health and wellness and health services.

The socio-economic monitoring program will track and respond to various topics across the socio-economic VCs and IC, including Economic Conditions, as well as Social Economy, Community Infrastructure and Services, Education and Training, Land and Resource Use, Community Health and Well-being, and Demographics. The approach and methods, including data sources, will be developed in conjunction with the Governments of the LAA, and Yukon Government. The Proponent anticipates developing a socio-economic monitoring program with these parties as the Project proceeds.

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## **8.1 PERSONAL COMMUNICATIONS**

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Interview 2, February 8, 2016. Anonymous Contributor. Yukon College, Dawson City, Yukon.

Interview 3, February 8, 2016. Anonymous Contributor, Dawson City Community Hospital and Dawson Medical Clinic, City of Dawson, Yukon.



Interview 6, February 9, 2016. Anonymous Contributors, TH Health and Social Department, Dawson City, Yukon.

Interview 7, Olesh, M. February, 9 2016. Development Officer, Community Development and Planning Services, Dawson City, Yukon.

Interview 8, February 9, 2016. Anonymous Contributors, TH Housing and Infrastructure Department, Dawson City, Yukon.

Interview 9, Van Nostrand, A. February 10, 2016. Program Coordinator, Canada Prenatal Nutrition Program, City of Dawson, Yukon.

Interview 16, Diles, K. February 11, 2016. Assistant Director, Dawson Women's Shelter, City of Dawson, Yukon.

Interview 20, February 12, 2016. Anonymous Contributor. Klondike Development Organization (KDO), Dawson City, Yukon.

Interview 21, Thompson, A. February 17, 2016. Realtor, Coldwell Banker Redwood Realty, Dawson City, Yukon.

Interview 26, Morin, D. March 2, 2016. Sergeant, RCMP Dawson City Detachment, City of Dawson, Yukon.

Interview 28, Wickham, M. March 4, 2016. Project Manager, Klondike Development Organization (KDO), Dawson City, Yukon.

Interview 31, December 16, 2015, Anonymous Contributor, Yukon Women's Transition Homes, Whitehorse, Yukon.

Interview 32, Rob Rees, December 22, 2015, Manager, Occupational Hygiene Services, Yukon Workers Compensation Health and Safety Board, Whitehorse, Yukon.

Interview 33, John Mitchell, April 11, 2016, Canadian Rangers/Dawson Search and Rescue, Dawson City, Yukon.

Tr'ondëk Hwëch'in Technical Working Group (TWG), Mar 22, 2016.

Yu, X., March 6 2017, Socio-Economic Statistician, Yukon Bureau of Statistics, A-8C, A-8C, Whitehorse, Yukon.