

Resource Development Preparedness Strategy



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April 2016

Executive Summary

The storyline of many rural communities across North America is dominated by cycles of natural resource development and accompanying boom-bust economic and population growth. Since the Klondike gold rush and its establishment as a territory in 1898, the Yukon has experienced many boom-bust cycles. Each time, the territory and its capital were faced with rebuilding after periods of economic contraction and depopulation – growing in a “two steps forward, one step back” pattern.

The issue of boom-bust cycles and vulnerability to them emerged during the City of Whitehorse 2015 Economic Development Strategy, largely due to the significant pressures the community experienced during the most recent 2008-2012 growth period. The City of Whitehorse Resource Development Preparedness Strategy aimed to:

- Identify both the benefits and negative impacts experienced by the community of Whitehorse during the most recent period of growth and subsequent decline in the resource development sector;
- Provide a forecast for a future resource development growth period;
- Identify areas where the City has particular influence and/or jurisdiction with respect to resource development benefits and impacts;
- Create a scorecard and benchmark criteria to assist the City in monitoring the community’s relative readiness for resource development; and,
- Develop strategies for more effectively leveraging opportunities associated with resource development and mitigating and/or responding to negative impacts.

The strategy was undertaken over a three-month period from December 2015 to March 2016 and included the following tasks: primary and secondary research, interviews with a dozen stakeholders and experts in the mining sector, business community, and territorial and First Nation governments; an internal City survey; and analysis and discussion with City representatives.

Whitehorse has experienced numerous boom-bust cycles in the past, most notably the massive influx and subsequent exodus of people during and after the Klondike gold rush, but also less dramatic episodes tied to the Whitehorse Copper Belt from the early 1900s onwards. The construction of the Alaska Highway in 1945 ushered in a new boom era, bringing in thousands of military personnel and associated jobs and spending. The relocation of the territorial capital to Whitehorse in 1952 marked the beginning of the shift of the local economy towards an increased dependence on public sector activity, as the construction (and subsequent staffing) of new government administration buildings, hospitals, and educational facilities became an economic mainstay. To a large degree, the city’s economic fortunes were linked to rural mining developments from the mid-1960s into the mid-1980s.

Previous studies have attempted to predict and plan for resource development and accompanying population growth in the territory. The Carr Report of the late 1960s offered a low-growth scenario that entailed a steady increase in mining activity through the 1970s and a territorial population of 57,000 by 1985. The Foster report, commissioned almost a decade later, fell similarly short even with its intentionally conservative viewpoint. These studies were neither ill informed or conceived; rather, they reflected a historical tendency towards overoptimistic projection where the mining industry is concerned that is more easily discerned with the benefit of hindsight. In reality, the Yukon’s population growth curve has been a relatively slow and steady one, punctuated by slight upwards and downwards deviations tied to mining price cycles.

The Yukon’s economy is often envisioned as a “three-legged stool”, with tourism, mining, and the public sector each contributing to stability. The reality is markedly different: the public sector, particularly over

the past 10-15 years, contributes the lion's share to the territory's Gross Domestic Product, with mining contributing significantly during the high end of the commodity cycle and tourism contributing comparatively little. That said, it is critical to differentiate the job generating impacts of each industry: whereas \$1 million dollars of GDP in base metal mining creates 1.23 jobs, the same GDP output creates 5.63 jobs in residential construction, 5.75 jobs in public administration, and over 10 jobs in the retail sector. Not surprisingly, the public sector nearly rivals the private sector where Yukon employment distribution is concerned, accounting for 39% of the workforce in 2014, compared to 46% private sector employees and 14% for self-employed workers.

A Yukon-based discussion around resource development preparedness is essentially one about the mining industry, at least for the foreseeable future. Prospects for the Alaska Highway pipeline – technically still in the planning stage over three decades after its inception – remain slim. While there are proven reserves of oil and gas potential, particularly in the southeast Yukon, industry uptake on exploration opportunities has been fairly marginal to date and the high cost to bring the resource to market poses a serious disincentive in a highly depressed global energy market. The overall industry and government outlook for natural resource development across the north over the long-term could be described as “bullish”, with settled land claims and global warming lending themselves towards improved access and cost pictures for the industry. The short to medium-term prospects are somewhat uncertain, but there are grounds to expect that development could steadily increase over the long-term.

The mining industry is generally segmented into four levels of participants: prospectors, juniors, intermediates and seniors. Juniors tend to predominate in the Yukon mining industry, largely due to the Yukon's general orientation as a “frontier” jurisdiction with a free entry staking system. An overview of major Yukon mining prospects shows a suite of about a dozen or so properties in varying stages of the mining life cycle. Almost all are located in central or southeast-central Yukon, with those located closest to the capital still being several hundred kilometers away. The Yukon mining industry's relative emphasis on exploration – due to the territory's frontier aspects and global reputation for gold – lends itself to a sharper and shorter boom/bust cycle.

Like many industries, mining is a highly global and competitive in nature, with companies vying for an increasingly specialized and skilled labour force. Almost half of the Yukon's mining labour force is Fly-in/Fly-out (FIFO), the majority being residents of British Columbia who have previously worked in FIFO positions elsewhere. FIFO costs are high for the industry and hiring locally is a strong preference; however, the reality of labour force and skills shortages in the predominantly rural areas that host mining necessitates the continued use of non-resident workers and the offer of a FIFO schedule to recruit them. Impact benefit agreements with Yukon First Nations has placed a new onus on maximizing local employment for aboriginal Yukoners, particularly those living in rural areas. This modern context for the industry, coupled with its geographic distance from Whitehorse, means that mining – at least in the production phase – brings relatively few new workers to Whitehorse.

As the major regional service and supply center, Whitehorse plays a prominent role in catering to the mining industry's needs, which include groceries, equipment, repair services, environmental and engineering expertise, and transportation. Mining is closely interwoven with much of the private sector in Whitehorse, and the downward trajectory of mineral price cycles can have a pronounced impact. Businesses anticipate and respond to these fluctuations in a myriad of ways, such as renting versus buying equipment during peak demand and downsizing staff. The nature of the mining life cycle and regulatory environment means that some mining-oriented businesses – particularly ones focusing on long-term monitoring and maintenance - are relatively unaffected by downturns. While most mining-oriented Whitehorse businesses are focused on the Yukon market, there are examples of companies exporting their products and expertise into national and international markets. Studies have shown that mining companies are increasingly turning to local suppliers, but that considerable spending still occurs outside the territory, particularly where administrative and technical services are involved.

Commodity cycles are the inevitable response to a constantly fluctuating supply-demand relationship influenced by technology, the discovery of new deposits, the depletion of existing deposits, and global economic growth. Mineral price forecasts are vulnerable to this underlying fluctuation and are often inaccurate, even over the short-term. Bearing those limitations in mind, the most recent forecast for the

Yukon mining industry sees a moderate fluctuation in activity over the next few years before the value of mineral output returns to the \$300+ million dollar range by 2020 and increases to over \$1 billion dollars by 2030. While the forecast is promising, within days of its release, one of the major mines underpinning its assumptions announced a change in plans.

Given the complex array of factors that contribute to the viability of an individual mine, there is no one price threshold that applies to the Yukon mining sector as a whole, or even Yukon mines producing the same metal. On the exploration side, a sustained rise in mineral prices – particularly gold – is the likely pre-requisite to increased investor confidence and new capital for junior companies. The Minto mine is unlikely to re-open until copper prices return to the \$3.50 per pound level. New discoveries at the Bellekeno mine mean that \$18-20 dollar per ounce silver could be sufficient to re-open.

The most recent mining boom-bust cycle effectively started with the final closure of Faro in 1997 and Brewery Creek in 2001. During the 2005-2012 period, the value of mineral output increased tenfold from just over \$46 to \$485.6 million dollars with the opening of three major mines between 2007 and 2012. Mineral exploration expenditures fluctuated in the \$90-160 million dollar range between 2007 and 2010 before peaking at \$332 million dollars in 2011 and dropping back to \$233 million in 2012. After global commodity prices plummeted in 2012, exploration expenditures dropped to the \$100 million dollar level for several years and are currently forecast at just over \$50 million for 2016. The value of mineral production output stayed relatively high through until 2014 before dropping almost 50% to the \$250 million dollar range in 2015.

Consistent with most booms, Whitehorse's population grew steadily from 2008-2012, with the rate of increase being particularly high between 2008 and 2010. However, this trend is situated within a decade of sustained growth, and the post-2012 population remained relatively stable. There was a similar pattern in regards to Yukon business activity, with a steady rise in registered businesses and payrolls occurring from 2006 through to a 2013 peak, but only a minor decrease from 2013 onwards. The territory's GDP grew by a cumulative 47.4% from 2005 through 2012, buoyed in part by soaring mineral production but also by steady increases in government spending. Average weekly earnings increased in all sectors during that timeframe, with only minor fluctuations evident post-2012. Housing start-ups fluctuated in the 130-230 range between 2005 and 2010 before rising to the 340 mark in 2011 and 2012.

The Whitehorse housing market underwent a dramatic change during the 2005-2011 period, with the average price of single family dwellings more than doubling during that time. Median monthly rents increased throughout the same period, but continued to increase to \$900 in 2014 despite an accompanying increase in vacancies post-2012. Data shortages on the land supply side previous to 2008 prevent a complete longitudinal analysis, but there is a prevailing belief in the business community (echoed to some degree by City staff) that there was a shortage of building lots in the 2006-2008 period. There was relatively little impact to municipal infrastructure and services during the growth period, aside from the significantly increased demands on staff tasked with zoning approvals and building permits and inspections.

Given the deviation of Whitehorse's economic and population growth indicators from the traditional boom-bust pattern, it is difficult to precisely pinpoint inter-relationships between mining and Whitehorse's social and environmental sustainability. Increases in rates substance abuse, accidents, and mental health case loads in communities can accompany resource development cycles. The Yukon's baseline levels in these areas are generally higher than the national average; however, this is tempered by higher than average levels of physical activity and healthy eating. Crime levels stayed relatively stable from 2005-2014, although there was a noticeable increase in reported incidences of drunken and disorderly conduct. A well-publicized doctor shortage was in effect in the middle of the boom; however, the rate of licensed physicians had not increased at all since 2007. Increased income inequity and challenges for lower income families in meeting housing costs are borne out by territorial studies and the day-to-day observations of non-profit service providers in Whitehorse.

On the whole, both the statistical and anecdotal evidence do not conclusively point to Whitehorse having experienced a true resource boom-bust cycle. Where the peak 2008-2012 years of mineral exploration and production are concerned, there is almost certainly a degree of correlation with the range of benefits

and impacts experienced in the city. There is not, however, a convincing argument for causation – at least this time around. Unlike previous mining downturns, the most recent cycle was situated against a backdrop of settled First Nation land claims, sustained and pronounced increases in federal transfer payments, and sustained decreases in private sector participation. The political, social, and economic landscape has changed since the last downturn, and is poised to change further as Whitehorse-based First Nations assume a more prominent role in the land development arena in the coming years.

The mining industry remains a vital part of Whitehorse's economy, and the "cushion" provided by government – at least for now – should be viewed as a platform upon which to diversify and grow, rather than as grounds for complacency. Whitehorse's development as an urbane, highly liveable city with a quality of life comparable to much larger centres in the south is a comparative advantage that has not yet been properly marketed and promoted both to the mining labour force and other sectors. Its greatly improved transportation, communications, and research capacities provide a strong foundation upon which to reposition the city as an innovative hub serving mining clients both within the territory and further afield and maximizing its capture of Yukon-based industry opportunities. The city's many "pull" factors – chief among them wilderness and vibrant arts and culture – serve as important leverage points in attracting the innovators and knowledge sector professionals that will help diversify the local economy and remedy its imbalances over the long-term.

Most importantly, the experience of the most recent cycle points to the need for continual preparedness for population growth. The past one hundred years of history show that Whitehorse's population grows slowly and steadily over the long-term; the past decade illustrates how rapid, pronounced and impactful the exceptions to that rule can be. Ensuring an adequate land supply with a built-in margin of error to absorb periods of unexpectedly high growth is critical to avoiding future periods of housing affordability challenges and the range of negative community impacts that accompany social and economic inequity. Political leadership, medium and long-range planning, and greater collaboration with First Nations are integral to Whitehorse's ability to grow in a manner that provides a sustainable, equitable platform for economic and social wellbeing for all residents.

Recommendations arising from the 2016 Resource Development Preparedness Strategy include the following:

1. Maintain (or increase) funding for City key quality of life amenities that current (and prospective) residents value: parks, trails, downtown beautification, culture, protected green spaces.
2. Ensure an adequate supply of industrial land and granular sources are identified in the 2017 Official Community Plan review.
3. Maintain a minimum two-year supply of residential lots sufficient to accommodate a high population growth scenario.
4. Continue to actively partner on and promote affordable housing and homelessness initiatives.
5. Continue discussions with Kwänlin Dun First Nation, Ta'an Kwäch'an Council, and Government of Yukon aimed at developing a collaborative approach to land development planning in the City of Whitehorse.
6. Continue to provide incentives for residential densification.
7. Explore the feasibility of a pilot project with mining industry, Yukon Chamber of Mines and local businesses to promote Whitehorse to FIFO workers with a potential interest in relocation.
8. Explore avenues for co-learning and relationship and capacity building between the economic development and land/development planning functions of the City of Whitehorse and First Nation governments.
9. Ensure that medium-term (5-10 year) areas for future residential development are clearly identified in the 2017 Official Community Plan review.
10. Link to Government of Yukon and other recruitment/retention initiatives and champion development of a Whitehorse-specific investment/attraction campaign and website.

11. Facilitate/champion mining sector supply/service chain optimization with the Whitehorse business community and First Nations.
12. Champion entrepreneurial culture and innovation.
13. Maximize opportunities for local business in City procurement policy and practice.
14. Complete and implement a comprehensive Capital Asset Management Plan.
15. Ensure the pending updates to the Parks and Recreation and Trails master plans give due consideration to increasing third party/community stewardship and co-management opportunities.

The City should continue to monitor its own performance in key preparedness areas, as well as Whitehorse's preparedness overall, in the future. To this end, a resource development preparedness "scorecard" has been included in Appendix A.

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Bottom left and middle right – Government of Yukon

I.0 INTRODUCTION

I.1 Purpose and Scope

Dating back to the Klondike gold rush, mining has played an integral role in the Yukon's economy – and by extension, that of its capital city, Whitehorse. As with other predominantly rural resource-dependent jurisdictions, the Yukon's fortunes have historically been tied to the boom-bust cycles of mineral commodity prices. The most recent of those resource development booms occurred between 2008 and 2011 and ended rather abruptly with a significant drop in mineral prices in 2012. Whitehorse experienced a series of pressures during that timeframe, particularly related to the housing market. During the 2015 Community Economic Development Strategy, the City identified a need to better plan and prepare for the next growth cycle by retroactively examining what occurred during the 2008-2011 period and delineating inter-relationships between resource development, benefits, and impacts.

The City of Whitehorse Resource Development Preparedness Strategy aimed to:

- Identify both the benefits and negative impacts experienced by the community of Whitehorse during the most recent period of growth and subsequent decline in the resource development sector;
- Provide a forecast for a future resource development growth period;
- Identify areas where the City has particular influence and/or jurisdiction with respect to resource development benefits and impacts;
- Create a scorecard and benchmark criteria to assist the City in monitoring the community's relative readiness for resource development; and,
- Develop strategies for more effectively leveraging opportunities associated with resource development and mitigating and/or responding to negative impacts.

I.2 How the Strategy was Developed

The subject study was undertaken over a three month period from December 2015 to March 2016 and included the following tasks:

- Primary and secondary research into Whitehorse and Yukon social and economic baseline conditions and trends;
- Stakeholder and “expert” informant interviews with nine individuals/organizations involved with the mining sector, broader business community, or government;
- A survey of City department leads; and,
- Analysis, discussion and strategy formulation in consultation with City representatives.

The resulting strategy is intended to guide City actions over the short to medium term and help to inform priorities for public and City consideration and discussion during the pending 2017 review of the Official Community Plan.

2.0 RESOURCE DEVELOPMENT: THE YUKON CONTEXT

In order to understand the Yukon's most recent cycle of resource development growth and subsequent decline, it must be situated within the context of broader historical patterns and the Yukon's economic structure. The following chapter examines Whitehorse's past experience with boom-bust cycles, revisits the findings of previous preparedness exercises, and looks at the key drivers of Yukon's economy and the role of resource development within it.

2.1 Lessons from the Past

2.1.1 Previous "Boom-Bust" Cycles

The roots of modern-day Yukon can be traced back to one of the biggest resource development booms the world has ever seen: the Klondike gold rush. The year 1900 saw the completion of the White Pass and Yukon Route railway to Whitehorse and the community become a permanent entity versus a mere stop-over downstream of the two most significant navigational hazards along the route to the goldfields (i.e., Miles Canyon and Whitehorse Rapids). As the Yukon's main transportation hub, Whitehorse achieved a certain level of economic stability, although a significant portion of the population - particularly those working in the shipyards or at the many wood camps - remained highly transient and largely seasonal.

Copper was discovered and the first claims staked on the Whitehorse Copper Belt in 1898, with the first shipment of high-grade ore from the area following in 1900. The completion of the railway made mining at least marginally economic and underground copper mines nearby aided in the development of Whitehorse. Notes the Yukon Geological Survey:

*"Since the early part of the century, mining has continued in several episodes of boom and bust that were directly related to the world price of copper. High-grade ore was extracted from nine underground mines between 1909 and 1920, and transported by train and ship (from Skagway) to southern smelters mainly in southern British Columbia. Mining ceased after the First World War and resumed in the early sixties."*¹

The inter-war period from 1918 through 1939 marked a prolonged economic slump in the Yukon. Coates and Morrison write:

*"At the end of the First World War the Yukon was in a sorry state... Ignored by the federal government, with a transient population, it seemed to many Yukoners almost as if the gold rush had never happened. In 1921 there were only 4,157 people in the Yukon Territory, less than half the population of ten years earlier... Even Whitehorse, whose population usually grew in the summer months with the increase in transportation activity, held only 331 people in 1921, down from 727 in the last census. Close to fifteen hundred of the Yukoners were native people — the major constant in the region — who continued to live off the land..."*²

Whitehorse's fortunes shifted dramatically as the Second World War arrived in the north. The construction of the Alaska Highway remains the single largest project undertaken in the Yukon: a true "mega" project. It was undertaken with almost no advance planning and Whitehorse found itself at the center of a maelstrom. Coates and Morrison write:

"Whitehorse bore the full weight of the changes — both creative and destructive changes — accompanying the wartime construction project. Previously an isolated, seasonal community... Whitehorse had attracted little attention before the war...there were no expectations of growth..."

¹ Yukon Geological Survey. *The Whitehorse Copper Belt, Yukon.*

² Coates, Ken S. and William Morrison. 1988. *Land of the Midnight Sun: A History of the Yukon.* Hurtig Publishers. p.185

*The community was jolted into the twentieth century in June 1942, when more than three thousand soldiers of the United States Army Corps of Engineers camped west of the town. While many of these men moved on... others took their places and added to a growing chaos... Whitehorse quickly became a temporary home for thousands of administrators, maintenance workers, soldiers and construction workers... A year after construction started, Whitehorse had some ten thousand people, the vast majority of them from the United States.*³

From the beginning of the highway construction, many in the Yukon were already anticipating the almost inevitable bust to come. As Coates and Morrison explain:

*“Even though the army provided its own messing facilities, and brought in most of its supplies, they still purchased large quantities from local retailers. [In 1942] American government spending in the town quadrupled from one month to the next. But local citizens began to wonder about what would happen when the Americans pulled out... The Americans left quickly and with little planning — much the same way as they had arrived. Millions of dollars’ worth of equipment and buildings were declared surplus...The Canadian government, which took over many of the buildings and maintenance facilities for its own uses, prevented an extensive sell-off of the American supplies, fearing a total collapse of the northern retail market. Tons of useable materials, everything from heavy equipment to office supplies, were simply dumped, burned, or abandoned.”*⁴

The construction of the Alaska Highway opened up Whitehorse to improved commerce and opportunity, but also left a legacy of housing and community infrastructure shortages. Nonetheless, the population continued to grow, prompting the decision from Ottawa to relocate the seat of government from Dawson (population 800) to Whitehorse (population 4000) in 1952 (Dobrowolsky and Johnson, 2014). Whitehorse assumed a new role in the Yukon economy, and investments such as the new federal building on Main Street Whitehorse General Hospital, and the first planned residential subdivision of Riverdale reflected its growing importance as a centre of both government and commerce. The groundwork was laid for the next boom, as Dobrowolsky and Johnson explain:

*“There was little time to lament the military departures, given the resource and construction boom overtaking Whitehorse in the mid-1960s. The long-standing dearth of jobs and taxation revenues evaporated in the excitement of successive announcements for new roads, buildings, mines and oil and gas exploration...”*⁵

Resource development was primarily occurring far away from the capital – Clinton Creek, the Elsa and Keno mines, establishment of the open pit mine and townsite in Faro in 1969, and construction of the Aishihik dam, to name a few – but Whitehorse benefited as the key service and supply centre. Mining returned to the Whitehorse area in the mid-1960s, with the establishment of first an open pit and then new underground Whitehorse Copper Mines in the current Mount Sima area by New Imperial Mines and Metals. The mine operated into the early 1980s, created more than 100 new jobs, and created the long-awaited platform for a diversified private sector economy (Dobrowolsky and Johnson, 2013).

Meanwhile, there were plans afoot for another Yukon megaproject, one that may have rivaled the building of the Alaska Highway. According to Coates and Morrison:

*“[In the late 1970s] the Yukon braced for another construction boom, one that promised to match the building of the Alaska Highway in intensity. Yukon businesses expanded operations in anticipation; the city of Whitehorse opened new lots and a new subdivision (now the Indian reserve) in expectation of a building boom.”*⁶

³ Coates and Morrison. pp. 246-247

⁴ Ibid. pp. 251 and 257

⁵ Dobrowolsky, H. and Johnson, L. 2013. Whitehorse: An Illustrated History. Figure 1 Publishing. Vancouver, BC, p. 261

⁶ Coates and Morrison. p. 295

The Alaska Highway natural gas pipeline can be considered a lesson in anticipating a megaproject that never comes. As recent as five years ago, there were personnel in the Yukon working on the pipeline in a planning capacity, over 30 years after the project's inception.

The 1980s brought very challenging economic times to the Yukon. The closure of the Faro and Whitehorse Copper mines in 1982, followed by the shutdown of the White Pass and Yukon Route railway, hit the territory hard and resulted in a recession and population loss. By the mid-1990s the population had largely recovered, but in part due to the influence of a new economic engine - federal transfer payments – which had embarked on a steady increase from the mid-1980s onwards. The mining sector still had a major role to play, but the fundamentals of the Yukon economy were shifting.

2.1.2 Plans, Studies and Predictions

Systematic efforts to plan for development needs in the Yukon — which by necessity included forecasts on likely mineral development — date back to the 1960s. The Carr Report (1968) marked a concerted effort by the federal government to develop a plan for the orderly economic development of the territory. Volume V of the report was an extensive analysis of the mining sector and included projections of mineral production and other developments out to 1995.

There were effectively two scenarios offered by Carr. The low growth scenario assumed no major improvements to infrastructure or other sources of the high costs faced by the industry in the Yukon. Carr writes, “A modest growth is projected under high cost conditions which favour the development of high grade deposits that can withstand temporary adverse conditions.”⁷ Even with these conservative assumptions, Carr forecast:

- The value of Yukon mineral production would rise 480% by 1975 from its 1967 base driven by the opening and ramping up of production from the Faro, Clinton Creek and New Imperial (Whitehorse copper) mines then in the process of opening;
- From 1975 through 1995, an ongoing “modest” compound growth rate of 3.5% annually in the value of mineral production from the predicted 1975 base through expansion of existing mines and the opening of more new production than the closing of existing production;
- The bottom line for the low-end scenario was a mining sector producing the equivalent of \$932 million in mineral production in 1995 in 1995 dollars; and
- The Yukon population expanding to 57,000 by 1985.

Actual 1995 production was \$196 million dollars, some \$736 million short of the forecast, and mineral production swung wildly up and down in the intervening years. The Yukon's population was less than half of Carr's forecast by 1986 (Halliday, 2016); indeed, even 30 years later, the population is about 30% less than even his conservative projection. (It is worth noting that Carr's high-growth scenario was far bolder, including 21 operating mines employing 8250 people, a rail link to Kitimat or Prince Rupert by 1980, commercial oil production beginning in 1990, a 300 MW coal fired power plant near Carmacks, and a total population of up to 150,000 people).

A pair of reports prepared for the Northern Canada Power Commission about a decade later (Foster, 1979 and 1980 show a similar tendency towards over-optimism. The 1979 Foster Report used the following mining base case:

- Faro would continue operating through at least 1998 with production expansion (the Grum deposit) beginning in 1983;
- The United Keno Hill mines at Elsa would close in 1988 and Whitehorse Copper would close in 1982;

⁷ Carr. *The Yukon Economy: Its Potential for Growth and Continuity. Volume V Reference Study on Minerals.* p. 10-3

- The Venus mine near Carcross would open by 1982;
- The Tom lead-zinc deposit and Mactung tungsten deposit at Macmillan Pass would be operating mines by 1985 and 1987, respectively; and,
- The Howard's Pass lead-zinc deposit (now known as Selwyn) would be operational by 1995.

In retrospect, the two predicted mine closures were the only reasonably accurate outcomes. None of the new mine openings occurred and Faro went through two shutdowns and re-openings over the period. However, at the time this base case was strongly critiqued by both industry and government as being far too conservative and Foster was forced to revise his findings upwards.

The Yukon 2000 initiative — a wide-ranging economic planning process carried out in the mid-1980s on the heels of the Faro mine closure — was considered a radical departure from the standard practices of the time. Yukon 2000 focused on alternatives, sustainability, and the economic roles of First Nation people, women, and the disabled among many other things. However, it too reflected the congenital optimism of the mining sector:

“At present mining activity is again increasing but not so much because of strengthening metal prices but because of a decrease in operating costs (Curragh’s Faro mine, and United Keno Hill Mines). Most new mines (or potential new mines) such as Mount Skukum are focusing on gold. With Skukum in operation and other possibilities in sight (Ketza River, Dawson Range) Yukon’s mining industry will be getting more diversified and stronger. The very recent strengthening of precious metal prices and the bringing of the Curragh Faro mine into full production should increase mineral production value in the coming years, again approaching the high levels of previous “boom” years.”⁸

While it is easy to dismiss historic forecasts such as the Carr and Foster reports in hindsight, doing so ignores the more salient point that these types of forecasts have a strong tendency towards optimism for a number of reasons. Much of the data and information underpinning them comes from the mining industry itself, where there is an obvious incentive for optimistic thinking. That optimism has a tendency to further influence those working with the industry, including consultants and even some bureaucrats. There is also the universal human tendency to assume that if things are going well, they will continue to go well - but if things are going badly, it's only temporary.

2.2 Role of Resource Development in the Yukon Economy

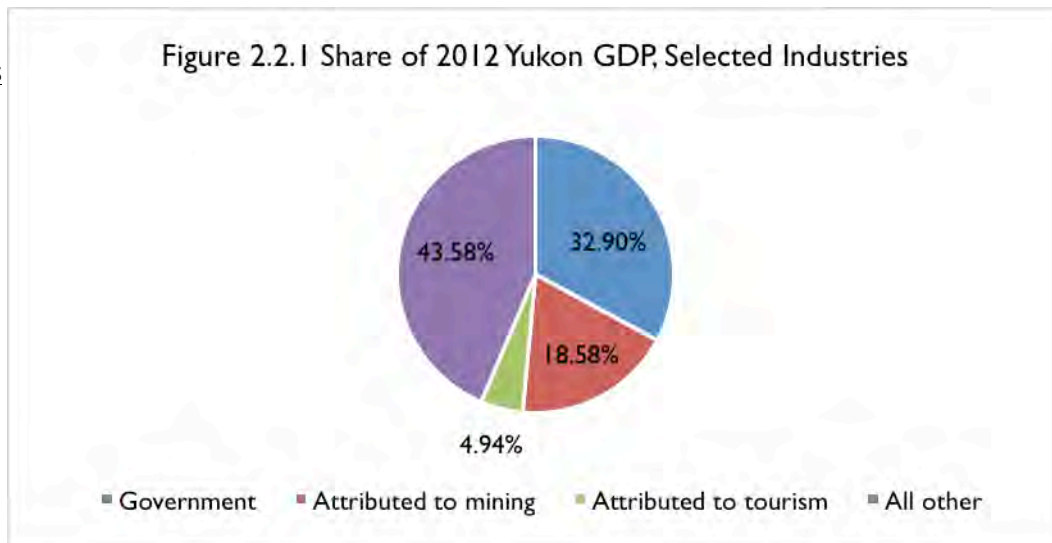
A survey of Whitehorse's history as an incorporated community reveals a heavy reliance on government for economic growth dating back to the early 1950s. Some 60 years later, little has changed. The Yukon is a large territory with a small population and the predominant role of government is typical of relatively remote jurisdictions across the circumpolar north.

Although the Yukon has a variety of economic and industrial sectors, government — largely financed through federal transfers — is the largest, contributing 33% of Yukon's Gross Domestic Product (GDP)⁹, compared to 5% for tourism and 19% for mining. “Other” industries – predominantly construction and retail trade – contribute to 44% of GDP; however, this contribution overlaps with government spending on capital projects and operations. In this sense, it could be said that Canadian sovereignty is the Yukon's largest export. Please refer to Figure 2.2.1 (and please note that “government” shown is technically the sum of Public Administration, Educational Services and Health Care & Social Assistance categories).

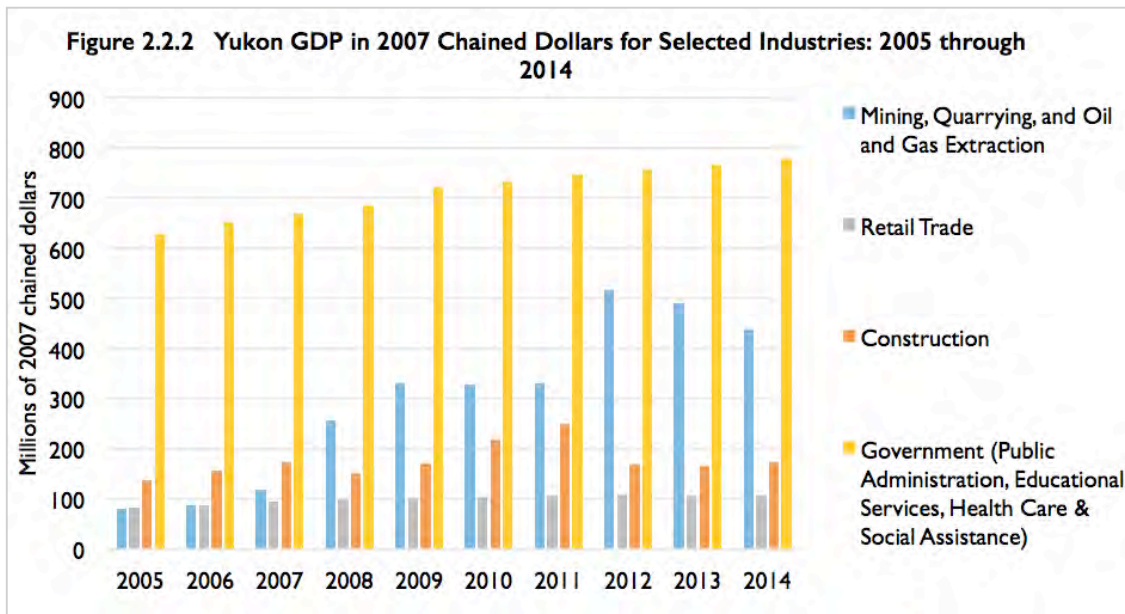
⁸ Government of Yukon. October 17, 1986. *Yukon 2000: Sectoral Review — Mining*.

⁹ Defined by the Yukon Bureau of Statistics as the total unduplicated value of the goods and services produced in the economic territory of a country or region during a given period. The GDP of an industry represents the value added by labour and capital in transforming inputs purchased from other industries into output.

Source: Yukon Bureau of Statistics 2013 Yukon Business Survey



A survey of Yukon GDP for selected industries between 2005 and 2014 reaffirms that government is by far the dominant industry in the territory and its contribution to the territorial GDP has grown steadily between 2005 and 2014. Until 2008, when the Minto mine entered full production, mining made a significantly smaller



contribution to the overall Yukon economy than the construction industry or even retail trade. Mining's contribution to GDP peaked in 2012 and has been declining since. Please refer to Figure 2.2.2.

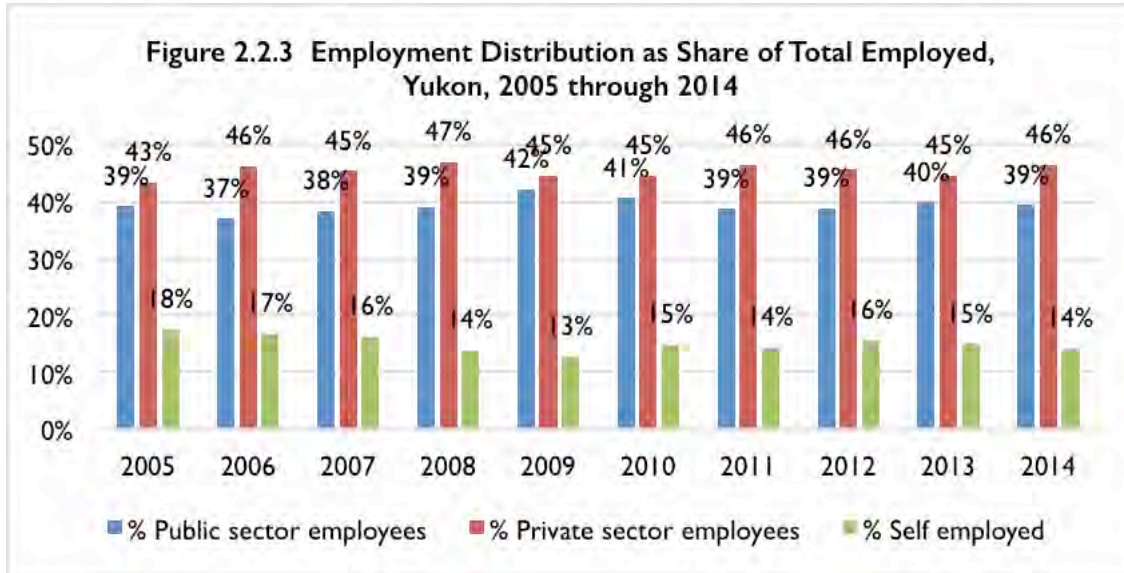
Source: Yukon Bureau of Statistics 2014 GDP

It is important to recognize that a discussion around the role and economic impacts of broader resource development is essentially one about the mining industry. While the Yukon is home to a range of resource-based industries – including forestry, agriculture, and oil and gas – these barely register in terms of economic contribution or employment. Agriculture, forestry, fishing and hunting (trapping) combined accounted for 0.1% of GDP in 2014. Manufacturing, at 0.6% of GDP, is also very small. (Note that while oil and gas extraction is combined with mining and quarrying for GDP calculation purposes, its contribution has been negligible in recent years).

One of the most significant roles that different sectors play in the economy is to provide jobs, and different industries provide these jobs to varying degrees. According to Statistics Canada's Inter-Provincial Input-Output model, base metal mining in the Yukon creates 1.23 jobs directly and indirectly (i.e. employment in

suppliers to the industry) per \$1.0 million in economic output. In comparison, residential construction creates 5.63 jobs, government 5.75 jobs, and different sectors of the retail trade industry more than 10 jobs per \$1.0 million in economic output, respectively.

The public sector closely rivals the private sector as an employer in the Yukon, with its share of total employed fluctuating in a narrow band between 43% and 47% of all those employed in the territory between 2005 and 2004. The private sector share peaked at 42% in 2009, and the self-employed has seen their share of total employed generally drift downward from 18% in 2005 to 14% in 2014. Please refer to Figure 2.2.3.



Source: Yukon Bureau of Statistics 2014 Annual Review

The Yukon’s strong public sector and its continued growth through increased federal government transfers has proved to be a double-edged sword — it has provided economic stability but has done little to generate private sector economic diversification and exports. However, the predominance of government, and partially mining, resulted in the Yukon having high average or median incomes, typically among the highest in Canada.

2.3 Potential for New Industry or “Mega Projects”

While the mining sector’s has historically dominated resource development landscape in the past, there are a suite of other resource-oriented industries and/or projects that could potentially impact the Yukon and/or Whitehorse. The following section provides a brief overview.

2.2.1 Oil and Gas Exploration and Production

Very recent news stories about oil and gas in the Yukon — including the large quantities of natural gas hosted in the Liard Basin and the controversies around Northern Cross Ltd.’s plans to drill exploration wells on Eagle Plains — have led to a resurgence of speculation in some circles that oil and gas will soon play a significant economic role in the Yukon. It is the consultant team’s opinion that this remains highly unlikely, at least over the next 10 to 20 years, for a number of reasons.

The Yukon is still very much a frontier jurisdiction in oil and gas with a nominal amount of industry infrastructure in place. There has been sporadic exploration drilling since 1958 with fewer than 100 wells drilled over the decades, four of them by Northern Cross in 2012 and 2013 (Yukon Energy, Mines and Resources, N.D.). Northern Cross Ltd.’s current plans are to drill up to 20 more wells in the Eagle Plains basin (pending regulatory approval), a very small play by industry standards. The Kotaneelee gas plant in the

far southeast corner of the Yukon operated between 1978 and 2012 with its gas being shipped to Fort Nelson via the Spectra Energy pipeline.

The Yukon has a number of basins that are known to contain oil and gas but the industry has not rushed to take up land made available for exploration. 24% of the Eagle Plains basin is held as active exploration land while 49% is available but has not been taken up (the remaining 27% is First Nation land or unavailable for oil and gas exploration for other reasons). A full 90% of the Kandik basin north of Dawson City is available for oil and gas exploration but has not been taken up (Ibid).

Lastly, low prices for both natural gas and oil have dramatically curtailed exploration around the globe, and the Yukon is highly unlikely to attract new industry players in this price environment. Proximity to natural gas infrastructure in northeast British Columbia makes the Liard region in the southeast Yukon the most likely candidate for significant industry development; however, the unsettled land claims and vocal opposition to hydraulic fracturing will continue to slow any further development in the region.

2.2.2 Alaska Highway Gas Pipeline

The Alaska Highway pipeline route, first envisioned in the 1970s, begins at Prudhoe Bay, Alaska and follows the Alaska Highway through the Yukon before connecting into the northeast British Columbia gas distribution grid. The project's future is primarily dictated by the political and economic interests of the North Slope oil and gas producers and State of Alaska. In 2012, the "big three" (ExxonMobil, ConocoPhillips, and British Petroleum), in conjunction with TransCanada Pipelines Ltd. (the pipeline proponent) agreed to a work plan focusing on the "all Alaska" option of constructing a much shorter pipeline to south-central Alaska and shipping gas to global markets as converted liquefied natural gas. The Minister responsible for the Northern Pipeline Agency amended the easement agreement to allow additional time for pipeline construction to begin (new expiry date of September 2022). With the global drop in energy markets, not to mention increasing political commitments and efforts on the climate change front, the prospect of the Alaska Highway gas pipeline route in the foreseeable future would appear to be slim at best.

2.2.3 Other

With respect to other resource development or "mega" projects that could potentially have an impact on the Yukon (and Whitehorse) economy, the consultant team offers the following:

- The Next Generation Hydro initiative being led by the Yukon Development Corporation has largely stalled in the face of First Nation opposition to the six primary candidate sites and there is a growing appetite for investing in a number of smaller, low-impact energy generation sites.
- The Alaska Canada Rail Link Project feasibility study was submitted to the governments of Alaska and Yukon about a decade ago. The Government of Yukon's recently conceived Yukon Resource Gateway Project signals strong interest in improving road, versus rail, connections to the central Yukon's mining resources.

While there appears to be few prospects for major non-mining development on the horizon, business pundits speak in bullish terms about the long-term prospects of economic development and population growth in the North, citing climate change and the resolution of most aboriginal land claims as enabling influences for increased shipping activity and natural resource exploration and extraction (Nelson, 2011; Smith, 2016). Exactly when, and how, these developments may unfold remains a larger, unanswered question.

3.0 MINING INDUSTRY OVERVIEW

Given that resource development in the Yukon essentially equates to the mining industry, at least for the foreseeable future, understanding the industry is essential to anticipating its benefits to and impacts on Whitehorse. The following chapter provides an overview of the structure of the mining industry, how it operates in the territory, and how - and to what extent - it intersects with Whitehorse. A discussion of mineral price cycles and potential “trigger” prices for industry activity in the territory is also included.

3.1 Industry Structure

The structure of the mining industry is in large part a function of the mining cycle itself, from grassroots exploration through mine closure and reclamation. The mining industry is usually broken down into the following categories:

- Prospectors;
- Junior companies;
- Intermediate companies; and,
- Senior companies.

Each category is briefly described in the sections following.

3.1.1 Prospectors

A prospector is usually defined as an individual, working either alone or as part of a very small team, looking for minerals using simple tools or portable detectors. When a showing is found it is staked and the prospector will usually try to convince a junior mining company to option the ground. Finding minerals isn't merely about luck. Prospectors determine where and how to look based on an understanding of geology, results of public geophysical and geochemical surveys, and historical reports and data. Although prospectors are often said to be a relic of the past, in a “frontier” mining jurisdiction with a free entry staking system like the Yukon's, they are still an integral part of the industry. The success of Shawn Ryan and Kathy Wood in discovering the White Gold district shows just how relevant prospectors continue to be here.



Photo credit: Government of Yukon

3.1.2 Juniors

Junior mining companies are usually defined as publicly traded companies that do not own operating mines, have no revenues, and are smaller in scale, with 5-30 employees and annual expenditures ranging from \$250,000 to \$5 million dollars. Management usually consists of a mix of people with financial and business experience and geology and mining backgrounds. Securing financing capital is the main job for a significant part of the management team. A junior mining company with a promising property is usually trying to do one of two things: sell the property to a bigger company, or develop the mine itself and become an intermediate company operating the mine. Much of the Yukon's mineral exploration work is carried out by juniors, and their ability to raise money is heavily dependent on mineral prices and accompanying levels of investor excitement. This predominance of juniors in the Yukon tends to exacerbate underlying price fluctuations, in effect creating bigger exploration booms and busts.

3.1.3 Intermediates

Intermediates are companies with at least one operating mine but with annual revenues of less than \$500 million dollars. They generally do not have the financial resources to develop a new mine on their own. In the Yukon, examples of intermediate companies include Capstone, owner of the still-operating Minto mine and Alexco, owner of the now-closed Bellekeno mine. Running an intermediate mining company is similar to running companies of similar size in other sectors, the main objective being producing and selling the product while managing the workforce, controlling costs, and meeting financial and legal obligations. However, there is one key difference: because the product is non-renewable, intermediate mining companies do need to find more ore to mine by either extending their existing mine life or buying new properties.

3.1.4 Seniors

Senior mining companies (or the “majors”) typically have multiple operating mines, annual revenues over \$500 million dollars and the financial strength to develop a new mine alone. The seniors have not played a major role in the Yukon’s mining sector to date. Kinross bought the White Gold project in 2010 and is a significant shareholder in Victoria Gold, and Teck Resources has some active exploration projects and holds some inactive properties in the territory; however, there are no seniors actually operating mines in the territory. Due to their size and ownership of multiple properties and mines, the majors are not as driven as juniors and intermediates to try to develop any particular property into a mine. In some cases, they may even postpone bringing more production on-stream so as not to compete with their other mines.

3.1.5 Other

A relatively recent arrival on the Yukon mining scene – one that could alternately be labeled a intermediate or senior by standard definitions - is the privately held companies owned by different arms of the Chinese government (state-owned enterprises). One recent example is Yukon Zinc. Although a Canadian corporation and an intermediate by the usual measures (as the operator of the Wolverine mine until its abrupt shutdown), the company has been privately held since 2008 with JDC, a publicly traded state-owned mining enterprise based in Shaanxi, as the majority owner. Companies like Yukon Zinc do not necessarily have the same sets of incentives as publicly traded companies and they often appear to have better access to capital. Because they are not required to publish the same financial data as publicly traded companies, it is very difficult to know if state-owned mines are making a profit.

3.2 The Mining Sequence

The set of activities that encompass the different stages of mining is called the mining sequence. Each stage presents different demands on the labour force, communities and the environment. The general sequence is as follows (Ontario Nature, N.D.):

Prospecting and staking – Claims are usually staked on the ground using claim posts and by blazing lines on trees and the ground. In some jurisdictions, staking is also done virtually with online systems.

Exploration – Once a claim has been staked, exploration begins. Exploration determines whether there is enough quality ore to warrant mine development. Preliminary exploration includes ground surveys, airborne surveys, limited stripping and trenching, limited bulk sampling, drilling, and trail, road and water crossing construction. Advanced exploration involves essentially the same activities, but carried out at a higher level of intensity. Underground tunnels may also be constructed, and more permanent access routes and substantial buildings/camps may happen.



Photo credit: Government of Yukon

Mine development and operation –

This stage involves mine construction (also known as pre-production), development of new roads and power corridors, stripping/storing of soil and vegetation overburden, ore extraction, crushing/grinding of ore, flotation or chemical concentration of ore, mine and surface water treatment, and storage of waste rock and tailings. The milling process used to extract valuable minerals from the ore can require use of large amounts of toxic substances such as sodium cyanide and sulphuric acid. The remnants of milling – a sludge of crushed water, rock and chemicals known as “tailings” – represent the most significant long-term environmental liability created by mining and need to be contained and

kept on site. Tailings storage often requires more land than the rest of the mine operations combined.

Mine closure and reclamation – At some point, all mines will eventually stop producing. Government regulations generally require that a mine site, as much as possible, is returned to a safe, environmentally sound state through such practices as removing structures and roads, recontouring waste rock, and revegetating the area.

Monitoring and maintenance – Virtually all mines require ongoing monitoring, maintenance and/or water treatment. Monitoring assesses how well reclamation measures are working and identifies where intervention may be required. Reporting to regulatory agencies is typically a long-term obligation of mining companies.

3.3 Current and Recent Prospects in Yukon

The Yukon has a variety of high potential mining properties involved in various stages of the mining sequence and held predominantly by junior mining companies. Less than half are constructed mines; most are in the early permitting and development phases. Virtually all properties are located in the central and/or southeast Yukon, the closest properties to Whitehorse being approximately 200 kilometres away. Please refer to Table 3.3 for an overview.

3.4 Labour Force Requirements and Residency

Like most industries, minimizing costs and maximizing efficiencies are core management tenets of the mining sector. Labour force requirements fluctuate throughout the mining sequence, with the highest demand for workers typically occurring in the mine pre-production and production phases, and the smallest demand occurring during the exploration and monitoring/maintenance phases. Derome and Associates (2012) found that the Yukon mining industry employed 930 workers in 2012, of which 53% were Yukon residents and 40% were aboriginal. 25% of Yukon mining workers in 2013 were employed in support services, versus 39% in exploration and 36% in extraction (Mining Industry Human Resources Council, 2015). Similarly, the number of businesses with office address located outside the Yukon was highest for the industry sector to which mining belongs – 80 businesses encompassing 226 workers (Yukon Bureau of Statistics, 2015).

The predominantly rural nature of mining and corresponding challenges in accessing skilled labour workforces have necessitated major changes in the mining industry. Gone are the company towns of the past: the development of industrial camps - ranging from tent camps and recreational vehicles to large camps with permanent or semi-permanent trailers, kitchen, and leisure spaces - is the modern alternative to building communities. Gone too is the long-term job security: many jobs are now contract-based and companies are accessing a global, specialized labour pool (Maxwell, 2001). The use of Fly-In/Fly-Out (FIFO) workers – non-residents who commute for shifts of 2-3 weeks in duration – is now the industry norm around the world.

A recent study into the Yukon's FIFO mining sector workers found that about 80% of survey respondents were residing in British Columbia and were aged 45 or older (EcoFor, 2013). 63% had previously worked in FIFO camps, most were married or in a long-term relationship, and just over half had children, predominantly 19 and older. The primary benefit to FIFO employment cited was the time off, followed by having costs covered while in camp. 35% claimed that there were no incentives that could attract them to relocate to the Yukon; those who indicated interest preferred travel allowances, housing allowances, and tax incentives. High housing prices were the predominant deterrent to relocation, followed by weather and distance from larger centers. Reinforcing these study findings, one mining industry executive commented that FIFO-based flexibility has become so entrenched in the mining workforce that the offer of a benefit package equivalent to the cash costs of FIFO transportation on the condition of relocation to the Yukon could disadvantage a company in attracting their target labour force (Thrall, pers. comm, 2016).

While FIFO is an established trend, the general preference of mining companies is to hire local labour on the basis of both cost-savings and social license. The growing expectations around corporate social responsibility – particularly with respect to relationships between industry and First Nations – places an additional onus on Yukon mining companies to hire locally. Initiatives such as Yukon College's Centre for Northern Innovation in Mining are designed to increase both the rates and nature (i.e., skilled versus unskilled) of participation in mining employment and help to meet the projected long-term demands for 2310 positions by 2024 (Mining Industry Human Resources Council, 2015). While CNIM is a highly important development, it is likely that some degree of labour (and/or skills) shortage gap will persist. The need for Yukon-based mining companies to competitively recruit workers to bridge that gap, and the predominance of FIFO as the industry norm, dictates that this practice is likely to persist for the foreseeable future.

While the FIFO factor is a major influence on the Yukon mining industry and virtually all mining activity takes place in rural areas, mining development can attract new residents and families to Yukon communities. During the operation of the Brewery Creek mine near Dawson, about 10-15% of the 140-person workforce resided in Dawson, many of them relocating their families to the town (Thrall, pers. comm, 2016). The Minto mine, employing about 290 people at peak production, reportedly attracted 12 workers and their families to Whitehorse (Leslie, pers. comm, 2016). Assuming the 2011 census average Canadian family size of 2.9 residents, that amounts to approximately 36 new residents to Whitehorse. It's important to note that Brewery Creek was situated within commuting distance of an established community with amenities (schools, housing, recreation, etc.) – the pre-requisites to a standard 5 day/week work schedule and relocation of spouses and children. In regards to most Yukon mining activity, those pre-requisites do not apply.

While direct labour participation in mining production may not be Whitehorse-based per se, employment in the sectors that service and support the industry throughout the other phases of the life cycle offer a different story. Geologists working in Whitehorse for exploration companies in the early 2000s can recount exponential increases in Whitehorse staffing numbers over a 3-5 year period and report that many of those personnel stayed through the subsequent boom and bust and continue to reside in the community (Sack and Casselman, pers. comm, 2016). There are also instances in which mining industry professionals recruited to Whitehorse for local mining employment manage the downturns by commuting from the Yukon to other mining jobs in the Northwest Territories and other jurisdictions (Ibid). In the pronounced peaks – such as that witnessed in 2010 and 2011 exploration seasons – the exploration side of the industry is more representative of the “fly-over” dynamic of modern mining, with many crews based outside the Yukon working in the territory for a limited time and returning to their places of residence elsewhere.

Table 3.3 Overview of Key Yukon Mining Properties

| Company | Property | Nearest Community | Description | Status |
|-------------------------|---------------------|----------------------------|--|--|
| Alexco Resources | Bellekeno | Keno/Elsa | Underground silver mine that began production in late 2011. Initial mine life was projected at 4 years. Shut down in 2013 due to silver prices. | The company continues to drill/explore in the Keno Hill Silver District. No moves afoot to reopen in the immediate future. |
| Capstone Mining | Minto | Pelly Crossing | Open pit and underground copper mine with approximately 6-7 year mine life remaining. About 280 wage/contract employees. | In January 2016 announced underground mining would be paused in Q1 2016, surface mining would cease in August 2016 and milling of ore stockpiles expected to continue to end of Q1 2017. The mine to go into temporary closure mid-2017. |
| Copper North | Carmacks Copper | Carmacks | Planned open pit copper-gold-silver mine with an estimated life of 7 years. Initially proposed to use sulphuric acid heap leach technique, which local First Nation and others protested. Estimated 180 jobs at full production. | Conditionally approved by YESAB and issued mining license by YTG in 2008/09 but refused water license by Water Board. Lost court proceedings against Water Board and has now re-engineered the project to address concerns. In permitting/engineering phase. |
| Kaminak Resources | Coffee | Dawson | Planned open pit gold mine using cyanide heap leach technology. Initial capital cost of \$317m and operate with all in cash cost of under \$700/oz. 435 jobs predicted over 10 year mine life. | Currently entering the environmental assessment phase. Widely considered to be the Yukon's most promising prospect for an operating mine in the medium term. |
| North American Tungsten | Cantung/ Mactung | Watson Lake/ Ross River | Both are underground tungsten properties. Cantung has operated off and on since the 1960s while Mactung is in permitting phase. The deposits hold about 15% of the world's known tungsten. | Bankrupt and under court protection as of June 2015. Cantung (in NWT) is shut down and managed by the federal government. GNWT bought the Mactung property (mostly in Yukon) in late 2015. |
| Selwyn Chihong | Howard's Pass | Watson Lake | Open pit lead-zinc mine with life of over 10 years. The project will create about 1500 jobs during construction and about 750 during operation. | In February 2016 the company announced it would not be moving the project forward into the review and permitting process for at least one year. The Kaska have suspended a vote on the negotiated Socio-Economic Participation Agreement. |
| Victoria Gold | Eagle Gold | Mayo | Fully permitted and shovel ready open pit heap leach gold mine with 10-year mine life. 350-400 jobs are predicted. Predicted all in sustaining cost of operations at US\$279/oz. | Needs about \$420 million to build but has not yet found financing. Predicted investment payback period of 3 years at a gold price of US \$1325 per ounce. |
| Wellgreen Platinum | Wellgreen | Burwash Landing | Nickel and platinum open pit (with some underground) mine with 25-year life. \$586m construction cost with 200 jobs in production. | Company is searching for investment partners. Not yet in the environmental assessment stage. |
| Western Copper and Gold | Casino | Carmacks | Planned massive copper/gold open pit mine (10 times bigger than Faro) with estimated \$2.5 billion cost for a 22-year mine life. 51,373 FTEs forecast. | In the YESAA assessment stage and is the first project ever to be referred to the highest possible level of review by YESAB due to concerns about huge tailings dam. |
| Yukon Zinc | Wolverine | Ross River | Underground zinc mine that went into full production in 2013 with 300 jobs. Mine life estimated at 9.5 years. | Company under court protection going through bankruptcy reorganization. Creditors accepted repayment plan in 2015, Property is on care and maintenance but underground has been flooding. |

The nature of employment in the sector is also important to note. The Mining, Quarrying and Oil and Gas Extraction sector's percentage of full-time employees can be significantly higher than the cross-industry average in the Yukon. From 2009 to 2015, the sector's performance in providing full-time jobs outstripped the figure for all industries by about 18-20% (Yukon Bureau of Statistics, 2015).

3.5 Supply and Service Chain

In the 2013 Yukon Mining Sector Profile¹⁰, Research Northwest defined a supply chain as:

"...the necessary flow of products and services to the end user. In the mining context this is often thought of as suppliers to an operating mine but the industry-wide supply chain is much more complex; ranging from contractors providing staking services to exploration companies to wholesale fuel distributors bringing in the fuel for actual operations. Along the way is a complex web of consultants, service providers, wholesalers and retailers. In the resource industries there has been a general shift away from bringing and keeping activities in-house (vertical integration) within a company and toward outsourcing all manner of services and activities to separate, specialized firms."

In 2009, Yukon Economic Development commissioned an effort to provide a systematic analysis of the Yukon's mineral supply chain¹¹. The Yukon Mineral Sector Supply Chain Gap Analysis was based on a primary research effort that involved surveying four mining projects at different stages in the mining sequence:

- Minto mine (only operating Yukon mine at the time);
- Cantung mine (as a proxy for a Yukon mine of similar size and type);
- Wolverine project (then under construction); and,
- Carmacks Copper project (then in the permitting process).

In addition, 18 companies conducting exploration drilling on their properties were surveyed (although only four responded).

In general, the authors of the analysis warn that the very small sample size on the producer side, coupled with the low response rate on the exploration side, limits their observations to a high level analysis only and that the results cannot be reasonably extended to other Yukon mine operations. With those caveats, the analysis offers the following insights on the mining production side:

- Mining companies are beginning to make public and firm commitments on the use of local suppliers to support mining during both pre-production and production;
- Spending on administrative and technical services tends to occur outside the Yukon;
- Spending on mining, milling and transport show mixed results with no particular pattern; and,
- Price and value appear to be the driving factors in establishing supplier relationships.

On the mineral exploration side, the study concluded the following:

- The largest components of mineral exploration spending are drilling, labour, transportation, camp operations, and assays & analysis;
- Mineral exploration is a largely local endeavour. Most supply chain items are purchased in Yukon from Yukon suppliers;
- As with operating mines, most administrative spending occurs outside Yukon; and,

¹⁰ Available at: <http://economics.gov.yk.ca/publications.htm>

¹¹ Vector Research. June 2009. *Yukon Mineral Sector Supply Chain Gap Analysis*.

- Most of the spending on technical services occurs outside of the Yukon.¹²

A more recent and detailed analysis of the Yukon's mining supply chain was undertaken for Yukon Economic Development; however, the 2015 study has not yet been released for public use.

Industry experts interviewed for this study spoke to the significant influence that mining sector spending has on Whitehorse as the key service, supply, and transportation centre of the territory. Technical and professional services such as analytical labs and engineering and environmental consulting firms are almost exclusively based out of Whitehorse, with employees conducting fieldwork in remote and/or rural areas as needed. Other services such as expediting and transportation, and supplies such as equipment, groceries and fuel, are similarly based in Whitehorse – the “hub” for the web of businesses that support mining – with some of those needs also met in larger rural communities such as Watson Lake and Dawson City. Where mining companies elect to spend in the Yukon, they are often spending those dollars in Whitehorse.

The long-term nature of the mining life cycle, and ongoing regulatory requirements to monitor in the post-closure phase, create a baseline of service needs from the industry that are less susceptible to the boom-bust phase. One large Whitehorse-based consulting firm reported that it had experienced only one lay-off in 20 years of operation, largely due to its focus on the pre-production permitting and post-closure monitoring and reporting requirements of the industry (Keesey, pers. comm, 2016).

3.6 Factors Influencing Economic Viability

There are many factors that influence the economic viability of any particular ore deposit. The market price of what is being mined and the grade of the ore are the two most significant factors. But there are many others, including:

- **Type of mining** - It is almost always significantly less expensive to open pit mine rather than to mine underground.
- **Orientation of the deposit** – A major determinant of open pit mining cost is the strip ratio - how much waste rock must be moved in proportion to the amount of ore being mined. A narrow deposit that dips steeply down will have a very high strip ratio the deeper the pit goes (this is why many mines begin with a pit and then go underground from the pit bottom).
- **Type of rock** - When mining underground, the nature of the rock has a big influence on cost. Less stable or heavily fractured rock creates much higher costs and safety risks.
- **Milling techniques** – Techniques for milling the ore are dictated by the ore type and metal(s) it contains, with variations on conventional flotation mills being the most common in the Yukon (Minto, Faro, Wolverine). Some ores can be processed using a heap leach pad, where the ore is placed in layers (lifts) and then soaked with a cyanide solution to liberate the metal, usually gold. This approach has been successfully used in the Yukon at Brewery Creek and will be used at both Eagle Gold and at the Coffee project. Heap leaches are generally significantly less expensive than conventional mills.
- **Recovery rates** - The percentage of the metal in the ore that is actually extracted is another key determinant of economic viability and is influenced by many factors:
 - In a flotation mill, recovery rates usually vary with the size of the ore particles. If the ore is ground too coarsely it will usually have a low percentage of metal liberation as the particles will not float well. However, too fine a grind will result in a high percentage of metal being liberated from the ore but poor recovery from the resulting “slimes”. Fine tuning the process to variations in ores is key to recovery rates.

¹² Adapted from Research Northwest 2013 Yukon Mining Sector Profile.

- The presence (or absence) of different chemical elements in the ore can also heavily influence economic viability. For example, selenium in a concentrate can result in either a smelter penalty (the smelter pays less for the concentrate) or a bonus, depending on the market for selenium in effect at the time.
- The recovery rates from heap leaches can also vary significantly. For example, at Brewery Creek the ore could be ground coarsely enough that the lifts were built up using trucks and a bulldozer on the heap itself. This is significantly less costly than needing to grind the ore so finely that it must be placed using conveyor systems to avoid compacting it and reducing recoveries.
- **Closure and reclamation** - Another factor that heavily influences economic viability is the anticipated cost of closure and reclamation. If the mine results in acid-generating rock or tailings being left exposed the long-term risks and costs of closure and reclamation will be significantly higher.

3.7 Governance and Management Context

3.7.1 Legislation

In the Yukon, mining claims are issued under the authority of the *Quartz Mining Act* and the *Placer Mining Act*. The Government of Yukon Mineral Resources Branch issues all rights, permits and licenses relating to any interest in minerals. Depending on the nature of the mining activity, other legislation may be “triggered” – including the *Waters Act*, *Lands Act*, and *Environment Act*. Most mining-related activities trigger an assessment under the *Yukon Environmental and Socioeconomic Assessment Act* (YESAA). Just recently, the Yukon Environmental and Socioeconomic Assessment Board announced that the Casino project will be the first Yukon mining project to be delegated to the highest level of scrutiny and review under YESAA: a panel review.

3.7.2 Royalty and Staking Regime

The Yukon has a free entry system for allocating mineral rights that originates in the mining laws that prevailed as customary law in the tin producing areas of England and coal fields of Germany in medieval times. Under these laws, miners had the right to enter onto land and to mine it irrespective of who owned the surface rights. A fundamental premise of the free entry system is that mining is the best (and often only) possible use for large areas of land.

In the Yukon, anyone over the age of 18 years has the right to enter, prospect, and claim minerals on unoccupied Crown lands. No licence or permission of any kind is required. The process of staking and registering a claim confers on the staker a set of exclusive rights to any minerals on that claim. In the Yukon the holder of a recorded mineral claim has the exclusive right to all minerals within the claimed area together with the right to enter onto and occupy his claim for the efficient and miner-like operation of the mines and minerals contained within the claim. The initial term of the claim is one year with an absolute right of renewal from year-to-year, subject to the performance of work. The up-front fees or charges for acquiring mineral rights are nominal. The major expenses to the prospective miner consist of the staking process itself and the ongoing assessment work requirements. The Yukon requires that \$100 worth of work be done per quartz claim (51 acres) per year or that the same amount be paid in lieu of work to maintain the claim in good standing.

Royalties are what a miner pays to the owner of the minerals for the right to mine them. Where the minerals are owned by governments (as is the case in the Yukon), the royalty is often viewed and discussed as just another tax. Where the sub-surface rights are held privately, however, the miner must negotiate a royalty with the private owner. In this context, a royalty is not a tax, but rather a payment intended to reflect the value of the mineral in the ground – in effect its economic rent.

For a private owner of mineral rights, the simple objective is to maximize the rent or royalty collected. However, governments typically have more complex incentives and objectives, including encouraging the mining sector to invest in its jurisdiction. The two most common approaches to collecting mineral rents are to take a fixed percentage of the value of the metal produced (usually in the form of a net smelter return or NSR) or to set the rent in relation to the profit being made by the miner. NSRs are straightforward and the owner is guaranteed to collect his or her rents from the beginning to the end of production at the mine. NSRs are almost universally used by private sector owners of mineral rights. It is common in the Yukon for the holder of mineral claims (who now has an ownership right layered on top of the government's underlying ownership) to option those claims to a mining company. Those option agreements always include the provision that the claim owner will be paid a NSR (usually 2-4%) if any minerals are produced.

The Yukon government collects its royalties via a sliding percentage on the calculated profit made by the mine, that profit being the annual revenue generated less allowable expenses. The allowable expenses calculations are complex and include operations costs, development costs of the mine, and most expenses related to community economic assistance or support (e.g. corporate donations). A glance at the annual royalties paid by the Minto mine show how variable this form of royalty is compared with a NSR. Minto's royalties went from a low of \$200,000 in 2008 (first full year of production) up to a high of \$9.3 million in 2010 and then back down to \$1.3 million in 2012, while averaging \$3.1 million from 2008 through 2014.

3.7.3 Role of Municipalities

A prohibition order on quartz mineral staking was issued by the Government of Yukon in July 2012 for approximately 74% of all land contained within the City of Whitehorse for a period of 5 years. However, there are significant existing claims within the City that were staked prior to either the creation of the municipality, successive boundary expansions, or the aforementioned prohibition. These include claims in highly valued recreational areas such as the Whitehorse Cross Country Ski Club trail network at Mount McIntyre. As long as the claims are in good standing, they can remain in effect with all the rights. If the claims lapse, they cannot be re-staked or granted. The 26% of the municipal area not included under the staking prohibition are those areas identified in the Official Community Plan (OCP) for future industrial development and/or resource extraction.

The rights issued under the mining acts do not have precedence over the planning and zoning of a municipal government. The *Quartz Mining Act*, *Placer Mining Act* and the *Municipal Act* are all Yukon law. Any obligations and rights issued through any of these pieces of legislation must respect the jurisdiction of other Yukon legislation. All land use activities, including mining, are subject to municipal zoning regulations, development regulations and land use planning through the OCP. Municipalities, including the City of Whitehorse, review projects and issues development permits, and terms and conditions may be applied based on the current planning and zoning and to mitigate negative impacts. There are limitations, however. The municipality may not prohibit mining of existing claims, as it constitutes a "grandfathered" non-conforming use.

3.8 Economic Forecasts: What's on the Horizon

3.8.1 Mineral Price Cycles

Mineral prices are set by a combination of demand for a particular metal and its supply. People have to want or need a mineral before anyone will look for it or mine it. Pre-contact Yukon First Nation people valued placer copper, as it was in demand for different uses and for trade. At the time, placer gold did not carry the same value and little effort was made to find more of it in the creeks.

Some minerals have only been recognized as having value, and uses developed for them, relatively recently. For example, zinc was only recognized and used as a stand-alone metal within the last two hundred years or so. The development of technology can also create demand for a mineral where none existed, such as in the case of demand for rare earth minerals (e.g., gadolinium) for use in computer semiconductors. Changes in technology can also greatly increase or decrease the demand for a mineral: in 1998, 31% of silver mined was used to develop photos. Now less than 7% is.

Where there is demand, someone will find a way to supply. Development of different technologies, along with an improved understanding of geology, has increased the supply of minerals. For example, in ancient Greece and Rome, sulphide ores could be smelted but oxide ores couldn't be. Now we can use both. The development of the heavy equipment that carries out large-scale open pit mining has played a major role in increasing the supply (or potential supply) of minerals.

Price resides at the intersection of demand and supply. If there is more demand than can be supplied, the price will rise until the higher price reduces demand or in turn stimulates more supply. If there is more supply than demand, the price will fall. Mineral prices are highly cyclical, and swings in nominal prices can be large and abrupt. The economic literature is not entirely clear on how the long-term real (adjusted for inflation) prices move, and why. It has generally been thought that price cycles have been situated against a backdrop of either stagnant or downward trending real prices as large-scale extraction has become much more economically efficient. However, this idea has been strongly challenged recently with new analysis such as that provided by David Jacks (2013).

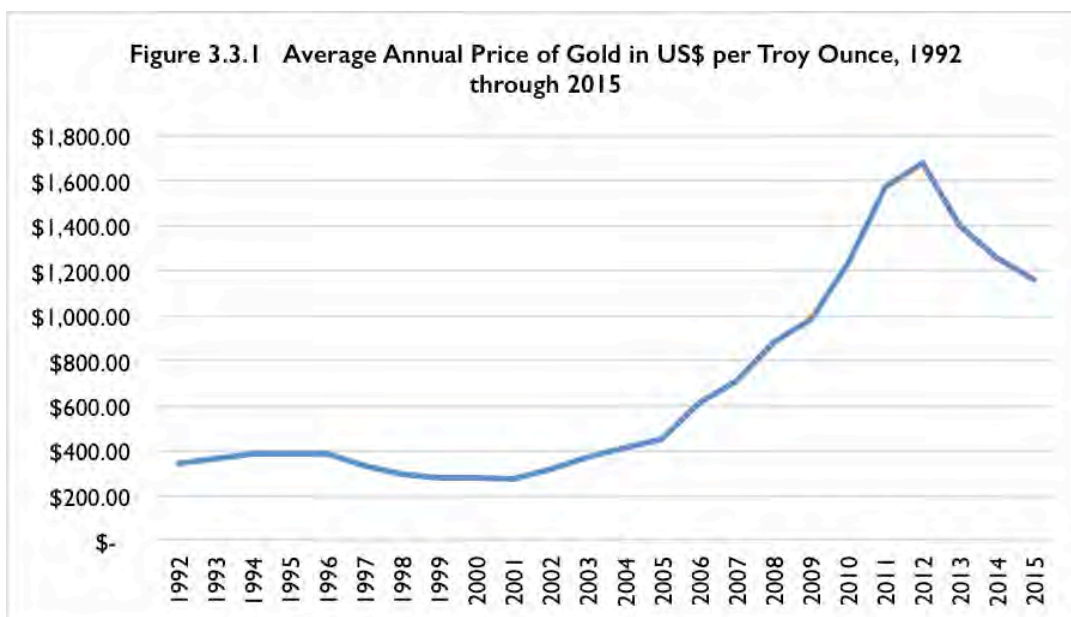
David Jacks' work shows that:

- Gold and silver have gained significantly in real price terms between 1900 and 2011;
- Zinc has seen significant decreases in real price over the same period;
- Lead has shown effectively no upward or downward trend since 1975; and,
- Copper was in real decline between 1900 and 1950 but was on an overall upward trend between 1950 and 2011.

When looking at long-term mineral prices only three things are certain:

- Long-run trends in supply, demand and price are not fixed, but rather shift in response to new technology, economic growth and other underlying determinants.
- Mineral prices over the long term will reflect the on-going tug of war between deposit depletion, deposit discovery, and technological change.
- There is no reason to expect that the current balance between exploration, deposit depletion and technological change will remain constant (Tilton, 2002).

While long-term real mineral price cycles help provide a big picture view of the industry, it is the current price in today's dollars that actually drives investment. The Yukon is still a frontier for the mining industry, with junior mining companies doing much of the exploration and development work on deposits and any mines generally being operated by intermediate companies. Although there are currently no operating hard rock gold mines in the Yukon, it is still the search for gold that drives most of the exploration activity in the territory, with between 60% and 70% of mineral exploration expenditures aimed at the metal between 2012 and 2015 (Yukon Geological Survey, 2015). The quadrupling of gold prices between the early 2000s to the peak in 2012 has been a major contributing factor. Please refer to Figure 3.3.1.



Source: London Metals Exchange as presented in Yukon Bureau of Statistics Annual Reports

3.8.2 Global Forecasts (and Their Limitations)

Prices are the most important variable in looking at future opportunities and risks in the mining industry; however, demand and price forecasts - even over the short and medium term - are fraught with uncertainty. Furthermore, the institutions providing the forecasting tend to revise their projections frequently as circumstances change in the present.

It's challenging to try and forecast 10 to 12 years ahead, particularly in the case of the dramatic price increases witnessed during the recent global commodities "supercycle":

- In 2000 the price of gold was US\$279 per ounce; in 2012 it was US\$1,670.
- In 2000 the price of silver was US\$4.95 per ounce; in 2012 it was US\$31.14.
- In 2000 the price of copper was US\$0.82 per pound; in 2012 it was US\$3.61.

It is safe to say that no one came close to predicting this massive upswing in prices; however, once the upswing was well underway, there was much talk in the mining and financial industries that the world had entered into a new and different era where prices would continue to rise due to ever-increasing demand. The refrain was that "this time was different" from all the other price cycles in the past. However, it proved not to be different "this time". It's never different "this time".

The World Bank looks furthest ahead with its 10-year forecasts¹³ but, despite being a highly reputable organization, its long-term forecasts are not highly reliable. Their performance shows that forecasting prices even less than a year ahead is problematic, especially when prices are moving strongly, as is illustrated by the example of 2013 metal prices. Mineral prices were dropping much more steeply than expected in 2013 but even with the benefit of knowing the price for the first 9 months of the year, the World Bank had trouble predicting the average price for the year in its October forecast. Please refer to Table 3.8.2.

¹³ Available at: <http://www.worldbank.org/prospects/commodities>

Table 3.8.2 2013 World Bank Mineral Price Forecasts Versus Actual

| | Jan. 2013 forecast for 2013 price | Oct. 2013 forecast for 2013 price | Actual 2013 price | % difference from Jan. forecast | % difference from Oct. forecast |
|------------------|---|---|-------------------------|------------------------------------|------------------------------------|
| Gold (\$US/oz) | \$1,600 | \$1,380 | \$1,412 | -11.8% | +2.3% |
| Silver (\$US/oz) | \$31.00 | \$21.25 | \$23.84 | -23.1% | +12.2% |
| Copper (\$US/lb) | \$3.54 | \$3.22 | \$3.33 | -5.9% | +3.4% |
| Zinc (\$US/lb) | \$0.95 | \$0.86 | \$0.87 | -8.4% | +1.2% |

3.8.3 Yukon Forecasts (and Their Limitations)

The Yukon Department of Economic Development produced its latest *Yukon Economic Outlook* in October 2015, which predicted the following:

1. While remaining below recent record highs, exploration spending is forecast to increase for a second consecutive year in 2015.
2. Development expenditures in 2015 are expected to be about \$40 million, down from approximately \$50 million in 2014.
3. The suspension of operations at the Wolverine mine will contribute to a substantial decline in the value of mineral production in 2015. Increased Minto production is expected to contribute to gains in the value of mineral production in 2016.¹⁴

The Yukon government contracts the Center for Spatial Economics¹⁵ to provide economic forecasting services and the Center can and does provide various scenarios based on changes to the mining sector.

A second regularly published forecast for the Yukon is the *Territorial Outlook: Economic Forecast* produced by the Conference Board of Canada. The latest territorial outlook (Winter 2016) became available in February 2016 but much of the data was prepared in the fall of 2015. The Conference Board predicts the value output of the mining sector (measured in constant 2007 dollars) to decline to a low of \$314 million in 2015. Annual fluctuations are then anticipated through to a \$324 million figure in 2020. From 2021 through to 2030 the real value of mineral production is forecast to rise at a torrid pace, reaching \$1.167 billion by 2030. This forecast assumes that Kaminak will open in 2021, Selwyn Chihong in 2024 and Eagle Gold in the mid-2020s.

The Conference Board’s forecasts suffer from the major weakness that all of the long-term forecasts share: things can change fast in the mining sector. Indeed, just as the Board was publishing its forecast in February, Selwyn Chihong announced that it would not be advancing the project into the regulatory process as previously planned.

3.8.4 “Trigger” Prices

Given the considerable advance planning and development time required to bring a mine on-stream – not to mention the very preliminary status of Yukon’s larger mining properties and the predominance of exploration as a source of economic activity – it is prudent to link considerations of preparedness with “trigger” prices for turn-key mining operations, as well as exploration in general.

¹⁴ http://economics.gov.yk.ca/Files/2015/YukonEconomicOutlook_October2015.pdf p.15

¹⁵ <http://www.c4se.com/>

The Minto mine is in the process of a staged shutdown. It has ceased underground mining and announced that it will stop open pit mining by late August 2016 and cease milling stockpiled ore in early 2017. For 2015 the company reported that its cash costs at Minto were US\$2.57 per pound of copper produced (Capstone, 2015). Its all-in costs were US\$3.32 per pound. The spot price of copper has been below the US\$2.60 mark since mid-2015 and the US\$3.30 mark has not been sustained since early 2013 (Ibid). For Capstone to reverse its decision to close the Minto mine, the price would need to be significantly higher than the current US\$2.25, particularly given that the process of shut-down creates an additional cost barrier to resuming production. Unless the price of copper rises quickly to about US\$3.50 per pound, it appears unlikely that mining will continue at Minto past the planned shut down date.

Alexco operated its silver mine at Keno from late 2010 through late 2013. During its full years of production in 2011 and 2012, the price of silver was over US\$30.00 per ounce. In early 2013, the price was holding at around US\$30.00 per ounce but then began dropping steadily. In July 2013 the company announced it would cease operations for the winter due to the lower silver price, then around US\$20.00 per ounce. That temporary shut down has continued since as the price of silver drifted lower to a 2015 average price of US\$15.68 per ounce. For Alexco to reopen the Keno mill and begin mining new deposits such as Flame and Moth, the price of silver will likely need to rebound to the US\$18.00-\$20.00 range (Thrall, pers. comm, 2016).

Victoria Gold's Eagle project is fully permitted and ready for construction, and judging by the company's reports, would appear to be economically viable mine at today's gold prices. Why then is it not being built? The answer lies in the company's efforts to secure the \$400 million plus in financing needed to build the mine. The owners and management team do not want to "give away" the mine simply to get it built while those with the money to build apparently want a greater potential return to compensate for risking their money. Obviously a higher gold price will help bridge that gap but where the tipping point might be is not clear.

The majority of mineral exploration in the Yukon focuses on gold and the soaring gold price between 2006 and 2012 did much to create the recent exploration boom in the territory. With that falling price, much of the high-risk retail investment that junior mining companies rely on for financing has dried up. The prerequisite appetite for risk will likely be rejuvenated if and when the gold price enters into another sustained upswing. Only then is it likely that many of the juniors will be back in the Yukon looking for gold. However, there is no single trigger price that will restore exploration spending to its 2008-2011 levels; only a sustained rise is likely to generate the excitement needed. During the peak, many in the industry were citing \$1500 gold as the threshold for a significant increase in activity at, or viability of, various Yukon mining properties. However, some feel that the "gold wave" may have "washed over" the Yukon to some extent, and the mineral's percentage contribution to exploration spending could decrease in coming years.

It is also important to note that some companies are not reliant on the stock markets to finance their exploration programs. BMC, a privately held company financed by British equity, is currently one of the biggest exploration spenders in the Yukon as it moves its Kudzu Ze Kayah lead-zinc-silver-copper property forward.

4.0 RESOURCE DEVELOPMENT BENEFITS & IMPACTS

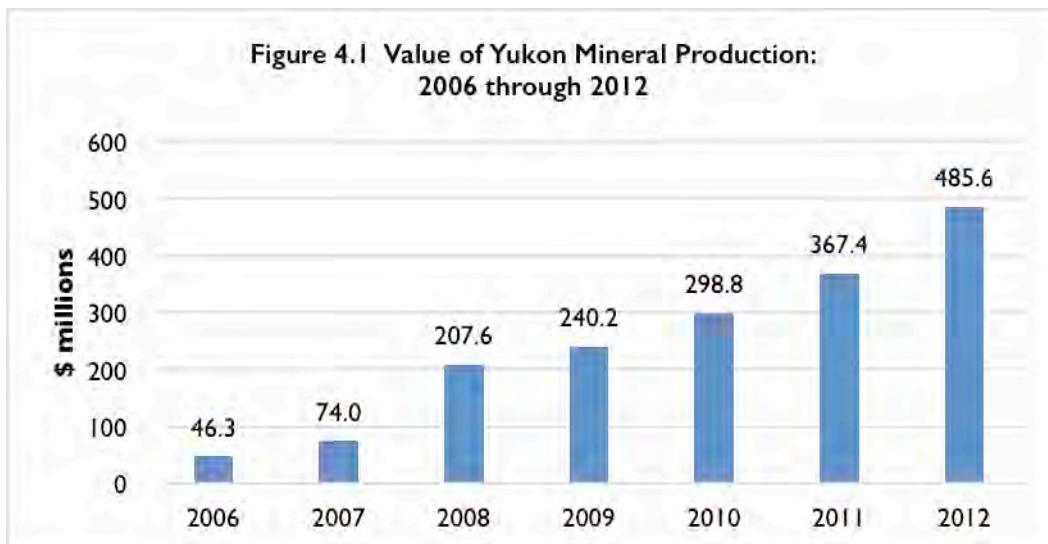
A community's preparedness for resource development is a function of its ability to anticipate the range of benefits and impacts likely to ensue and respond as needed. The following section provides an overview of the typical benefits and impacts experienced in boom-bust communities, examines what actually occurred in Whitehorse during the 2008-2011 resource development growth period, and draws preliminary conclusions about inter-relationships between the mining sector and the economic and social status of Yukon's capital city. The themes explored in this section, along with City-specific functions outlined in Section 5.0, form the basis for a resource development preparedness "scorecard", found in Appendix A.

4.1 Yukon's 2001-2012 Cycle: Setting the Stage

The Yukon's mining industry entered into a prolonged slump following the closure of the Faro lead-zinc mine in January of 1998. By 2002, there were no operating hard-rock mines in Yukon, mineral exploration spending had steeply declined, and even placer gold production had fallen to a 23-year low. The total value of mineral production in the territory fell from \$225 million in 1997 to \$82 million in 2003.

Starting with the closure of the Brewery Creek mine in 2001, Yukon entered a six-year period where it had no operating hardrock mines. Just over a decade later, the Yukon had three operating mines: the Minto copper gold mine that reached commercial production in the fall of 2007, Alexco's Bellekeno silver mine that achieved full production in the fall of 2010, and Yukon Zinc's Wolverine lead zinc mine that reached commercial production in the first quarter of 2012. In addition, the Cantung tungsten mine, which is located just over the border in the Northwest Territories but is accessed and supplied from the Yukon, resumed production in October 2010.

With the three mines coming online and increasing production beginning in late 2007, the total value of Yukon's mineral production increased more than ten-fold between 2006 and 2012, as is shown in Figure 4.1.



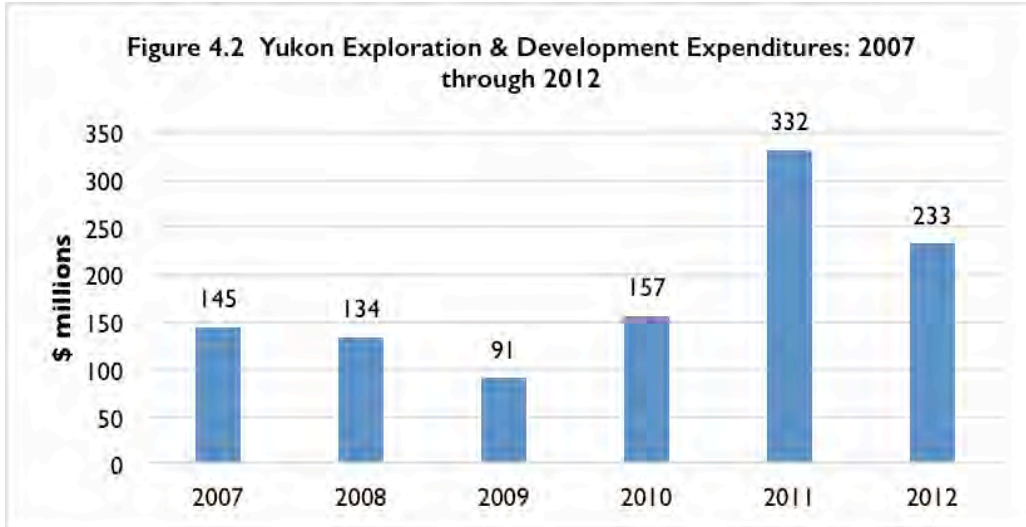
Source: Natural Resources Canada Mineral Production of Canada Annual Statistics

Despite placer mining's overwhelming historical importance to Yukon's economy — it is estimated that Yukon has produced over 518 tonnes of placer gold valued at over \$12 billion at current prices¹⁶ — the economic contributions of this segment of the mining sector continued to decrease, even as gold prices soared from US\$279 an ounce in 2000 to US\$1,670 an ounce in 2012. In fact, since peaking at 165,571 crude

¹⁶ LeBarge, William. Yukon Geological Survey. Personal communication.

ounces in 1989, Yukon placer gold production has been steadily declining. 2012 production, at 61,679 crude ounces, was only 31% of 1989 production.

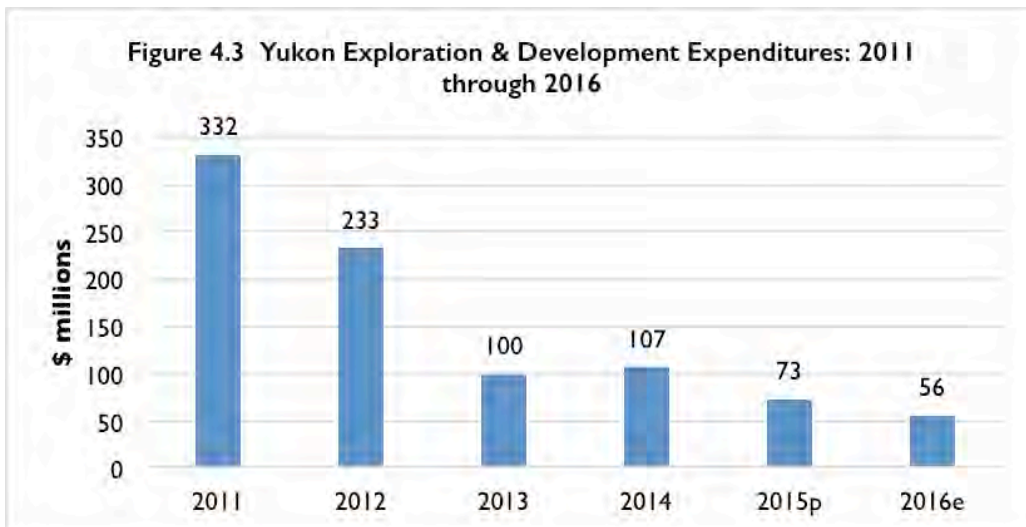
The Yukon’s mineral exploration boom, when measured by expenditure, was short and sharp. After a few moderate years in 2007 and 2008, exploration spending soared between 2009 and 2011 from \$91 million to \$332 million before the decline began in 2012. Please refer to Figure 4.2.



Source: Natural Resources Canada. Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

Note: Includes on-mine-site and off-mine-site activities; field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs. Exploration and deposit appraisal activities include only the search for and appraisal of deposits and do not include work for extensions of known reserves.

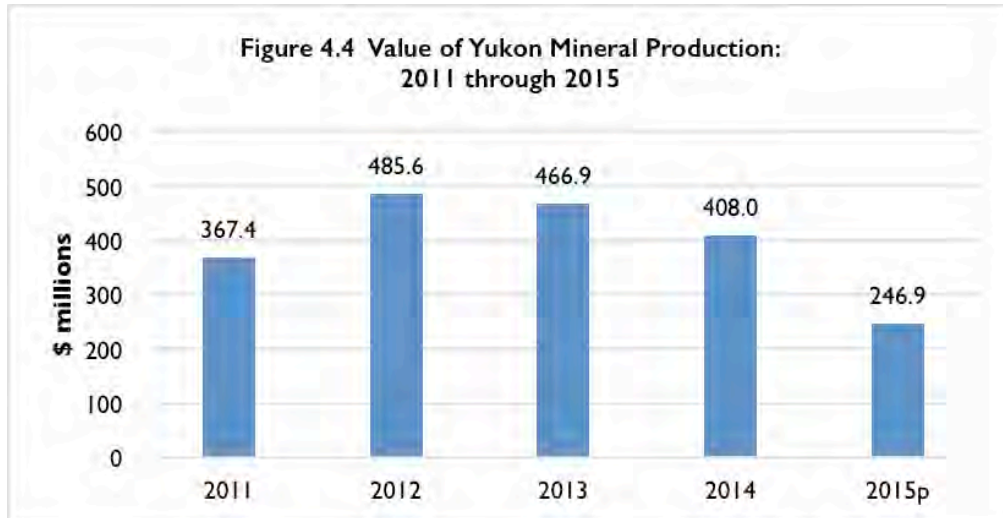
The upswing in the Yukon’s mining sector peaked in 2011 for exploration and 2012 for mineral production. Mineral prices (especially gold) began to fall in 2011 and money for exploration became almost immediately scarce. Preliminary 2015 levels of exploration expenditures are down by over \$250 million from the 2012 peak, and projections for 2016 are just over \$50 million dollars total. The view from the “other side” of the exploration boom can be seen in Figure 4.3.



Source: Natural Resources Canada. Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures. Note: Please see Figure 4.2 above.

With respect to the operating mines, Alexco ceased production at Bellekeno mine in late 2013. Yukon Zinc, which had achieved full production at its Wolverine mine in early 2012, cut back to between 60% and 75% of

production in 2013 and announced it had ceased production in January 2015. The Minto mine, although it has remained open through to the present (with plans to cease mining in 2016 and milling in 2017) was producing only half as much copper in 2013 and 2014 as it had in 2011 and 2012. Please refer to Figure 4.4.



Source: Natural Resources Canada. Mineral Production of Canada Annual Statistics

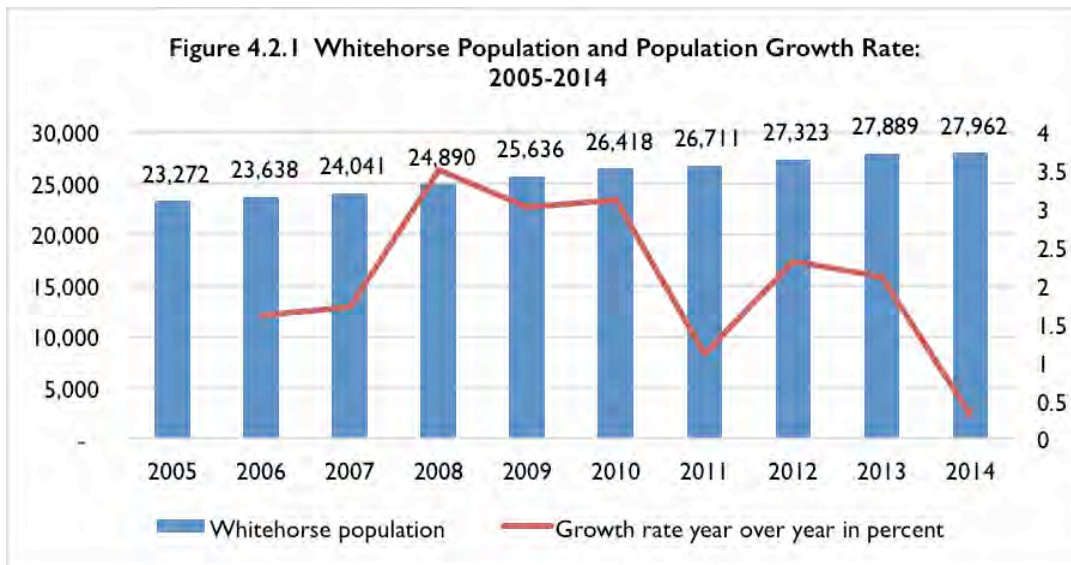
On the exploration side, it's important to note that the mid-2000s, and post-boom 2015-16 levels of expenditures, were still quite healthy in comparison to the late 1990s and early 2000s, when exploration spending was as low as \$5 million dollars (Sack and Casselman, pers. comm, 2016).

4.2 Economic Growth and Productivity

4.2.1 Population Growth

Population growth typically goes hand-in-hand with resource development booms, with new residents arriving in an area to take advantage of new employment opportunities either directly in mining itself or in the sectors that supply and service it. When the inevitable resource development bust occurs, the conventional response is rapid and pronounced depopulation of the host community. British Columbia's last mining "company town", Tumbler Ridge, grew from 1200 people in 1981 to 4800 in 1991, and then plummeted to about 1900 in 2003 after the last mine closed (Halseth, 2003). Faro's population plummeted from 2000 in 1981 to about 100 in 1985 after the first major closure (Pembina Institute, 2014).

According to Yukon Bureau of Statistics, the population of Whitehorse increased by 4,690 people from 2005 through 2014. There was population growth in every year during that time period, although the rate of increase varied significantly. Interestingly, the most pronounced increase in the growth rate occurred from 2007 to 2008, pre-dating the resource development boom by one to two years. The declining trend in the rate of population growth from 2011 through 2014 lines up with the peak in exploration in 2011 and in mine production in 2012. However, the population continued to grow afterwards, albeit at a slower rate. Please refer to Figure 4.2.1.



Source: Yukon Bureau of Statistics 2014 Annual Review

The Yukon did report a decrease in population in the first quarter of 2016 (Halliday, 2016) but it was less than 100 people, hardly on the scale of the substantial population losses witnessed in the post-Faro closure era. The pending closure of Minto could nudge this emigration statistic upwards by the end of 2016.

4.2.2 Business Growth and Employment

Business and employment growth can occur as a result of both direct participation in mining itself, as well as the industries that support it. Research has shown that, while the emigration of unemployed resource development workers can lead to a sudden and precipitous drop in the local population and employment rates, there can be a delay of one or two years before the full effects take shape in the sectors that serve and supply both the resource development activity itself and the broader community (Rural Development Institute, 2008).

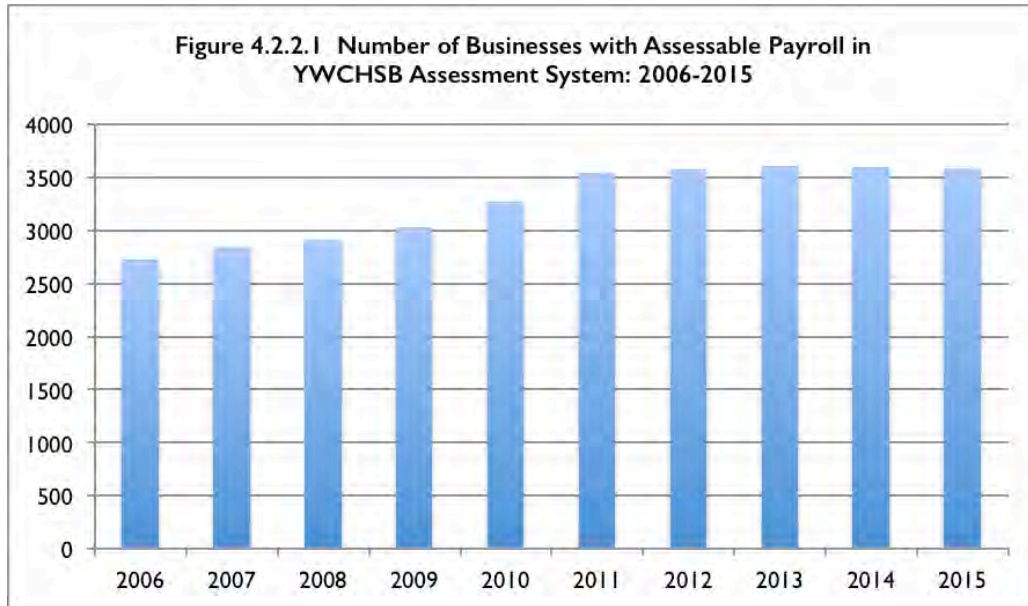
Looking at business-related statistics for both Whitehorse and the Yukon leading up to and following the most recent growth period, it is difficult to discern any distinct pattern. For example, the number of business licenses fluctuated between 2006 and 2014, growing from a low of 2040 in 2006, reaching a peak of 2866 in 2008, and increasing and decreasing by about 400 licenses from 2010 to 2014. Given the relative lack of enforcement of business license requirements and the very high rate of home-based businesses in the Yukon, it's possible that the irregular pattern is as much a function of compliance as it is actual business creation and/or closure. Please see Table 4.2.2.

| Table 4.2.2.1 Number of City of Whitehorse Business Licenses 2006-2014 | | | | | |
|--|------|------|------|------|------|
| | 2006 | 2008 | 2010 | 2012 | 2014 |
| # of licenses | 2040 | 2866 | 2419 | 2864 | 2407 |

Source: City of Whitehorse Annual Reports

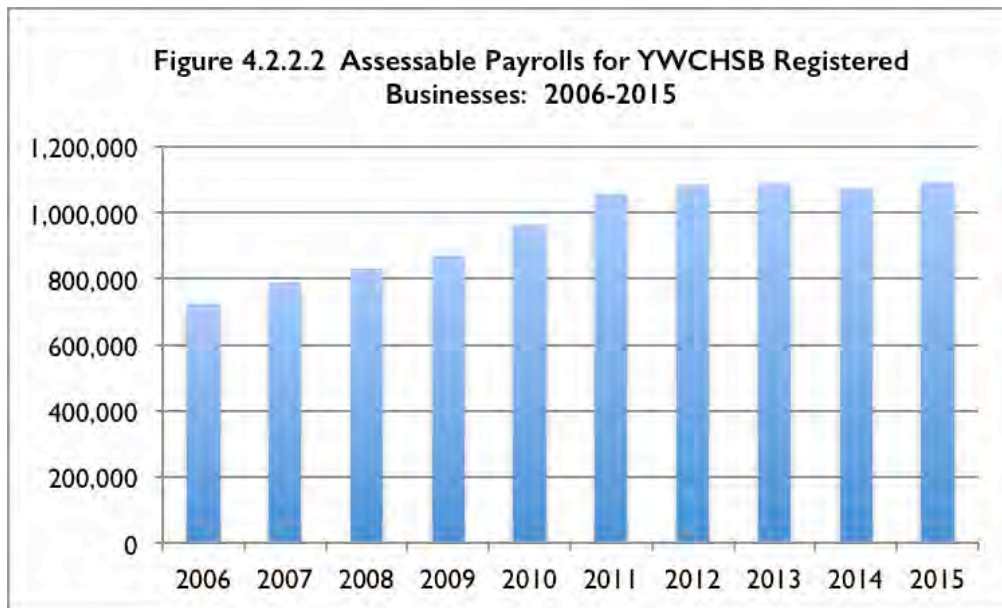
A survey of the Yukon Workers Compensation Health and Safety Board's (YWCHSB) number of registered businesses with assessable payroll between 2005 and 2015 shows a much more consistent pattern than the City of Whitehorse data. Assuming the data can be used as a proxy for Whitehorse business growth, the data shows a steady increase up to 2013, reaching a high of 3601 businesses from the 2005 low of 2600. Interestingly, the post-boom 2014 and 2015 figures are still higher than that of any of the mid-boom (2009-12) years. It should be noted that this data captures the full range of businesses conducting for-profit activity

in the territory, including Yukon-based firms, firms entirely based outside of the Yukon, and firms predominantly based outside with a small Yukon-based staff. Please refer to Figure 4.2.1 below.



Source: Yukon Worker's Compensation Health and Safety Board

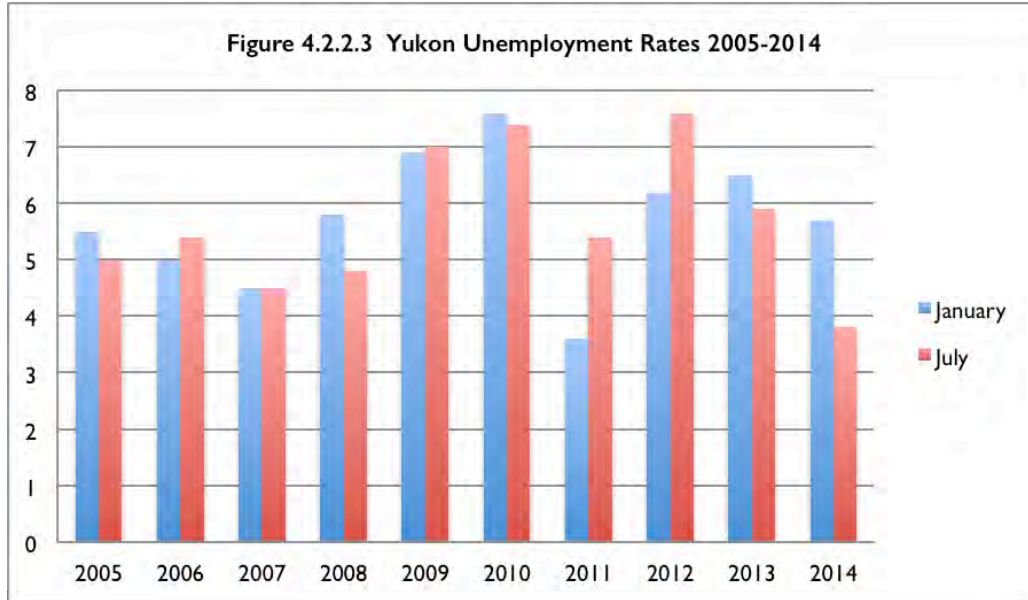
A similar, but somewhat distinct, pattern emerges looking at the actual assessable payroll and coverage of businesses registered in the Yukon with YWCHSB. Again, there is a steady increase moving forward from 2005. However, 2015 shows the highest assessable payroll of \$1,091,809, despite the slight decrease in the number of businesses registered that year. Theoretically speaking, the highest assessable payrolls might have been expected in the 2011-12 period, right in the middle of the resource development boom. Please see Figure 4.2.2.1.



Source: Yukon Worker's Compensation Health and Safety Board

Employment statistics for the same period exhibit a more sporadic trend, with unemployment rates actually increasing between 2008-2010 period before dropping markedly in 2011. 2012 saw an increase in

unemployment again, but rates dropped again in 2013 and 2014, returning to levels seen in the 2005-2008 period. The increased rates of unemployment pre-2011 seemingly contradict the steady growth patterns exhibited with respect to businesses or GDP side, potentially indicating that employment opportunities were insufficient to accommodate the population growth, or there was some other shift affecting participation in the workforce. Please refer to Figure 4.2.2.3.



Source: Yukon Bureau of Statistics Yukon Employment Historical Data 2005-2014

The fact that business activity and employment do not appear to have been adversely affected post-2012 does not necessarily mean that the downturn in mining has not had a noticeable impact on the local business community. The percentage of workers participating in the Mining, Quarrying, and Oil and Gas Extraction sector (of which mining companies are a major constituent) decreased from 8.8% in 2013 to 5.4% in 2015 – although this figure is still higher than either 2008 or 2009. Please refer to Table 4.2.2.2.

| | 2007 | 2008 | 2009 | 2010 | 2013 | 2015 |
|---|------|------|------|------|------|------|
| Mining, Quarrying, Oil & Gas Extraction | 3.3% | 5.3% | 4.5% | 6.5% | 8.8% | 5.4% |

Source: 2015 Yukon Business Survey, Yukon Bureau of Statistics

Similarly, gross revenues reported by the Mining, Quarrying and Oil and Gas Extraction sector decreased from 2013 for over 25% of businesses, compared to over 15% for all industries. Surprisingly, a majority of businesses (60.6%) in the sector reported no change in their gross revenues compared to 2013.

Negative impacts are also reflected in the revenue growth projections of the mining industry. Only 11% and 10% of businesses in the Mining, Quarrying and Oil and Gas Extraction sector reported expecting growth in 2015 and 2016, respectively, compared to almost 18% and 13% of all industries. Expectations of revenues remaining consistent were also noticeably lower. Interestingly, only a slightly higher percentage of mining businesses anticipated lower revenues as compared to all industries. Please refer to Table 4.2.2.3.

Mining businesses are not the only ones affected, either. Interviewees spoke to the fact that certain sectors of the business community have been affected, chief among them mining-related support services such as helicopter and small aircraft charter companies, industrial suppliers, etc. Interestingly, even certain sectors that could be considered somewhat recession-proof due to the stability of public sector employment in Whitehorse are reportedly struggling: fine dining was singled out as one example. Some companies such as transportation providers have reportedly downsized their staff (Sack, pers. comm, 2016).

Table 4.2.2.3 Gross Revenues Compared to Previous Business Survey – Mining, Quarrying and Oil and Gas Extraction

| | 2007 | 2008 | 2009 | 2010 | 2013 | 2015 |
|--|-------|-------|-------|-------|-------|-------|
| Mining, Quarrying, Oil & Gas Extraction | | | | | | |
| <i>Lower</i> | 12.8% | 12.5% | 4.2% | 24.7% | 11% | 25.8% |
| <i>No change</i> | 59% | 75% | 78.9% | 69.9% | 53.4% | 60.6% |
| <i>Higher</i> | 28.2% | 12.5% | 16.9% | 5.5% | 35.6% | 13.6% |
| All Industries | | | | | | |
| <i>Lower</i> | 9.6% | 14.7% | 9.6% | 13.1% | 11.3% | 15.6% |
| <i>No change</i> | 65.6% | 73.1% | 78% | 74.1% | 69.2% | 70.5% |
| <i>Higher</i> | 24.7% | 12.2% | 12.3% | 12.7% | 19.5% | 13.9% |

Source: 2015 Yukon Business Survey, Yukon Bureau of Statistics

Table 4.2.2.4 Future Business Expectations: Revenue Growth

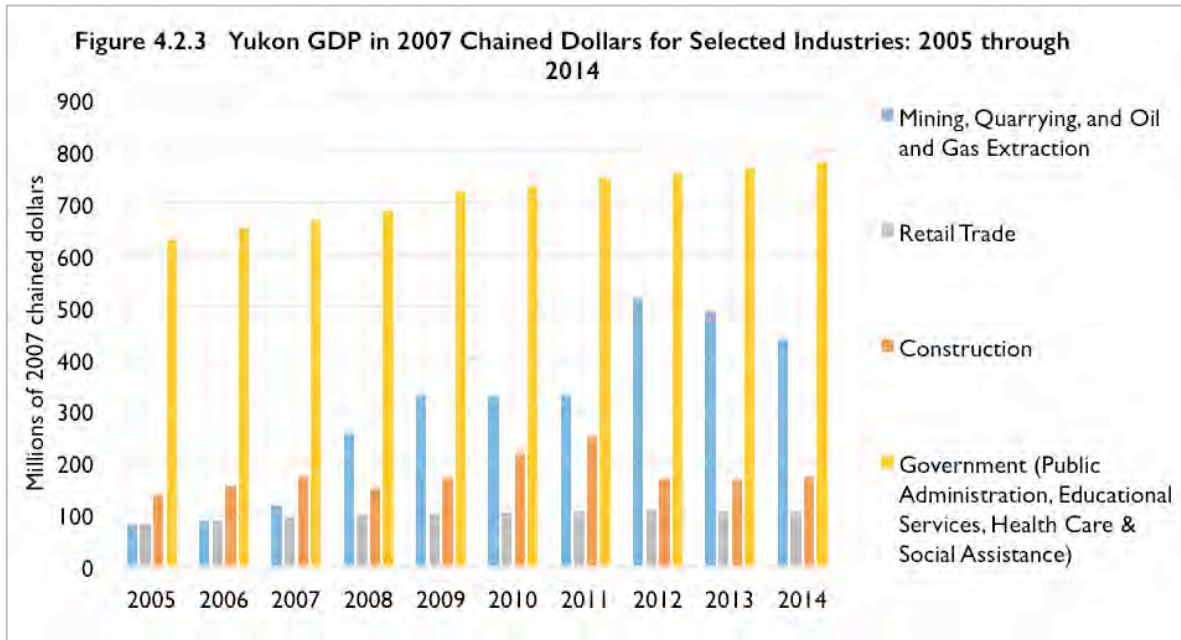
| | Expect growth | | Stay the same | | Expect decline | | Don't know/refuse | |
|--|---------------|-------|---------------|-------|----------------|------|-------------------|-------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| Mining, Quarrying, Oil & Gas Extraction | 11% | 10% | 41.5% | 32.5% | 10.5% | 1.5% | 37% | 56% |
| All Industries | 17.9% | 12.9% | 49% | 45% | 9.9% | 2.5% | 23.2% | 39.6% |

Source: 2015 Yukon Business Survey, Yukon Bureau of Statistics

Despite these impacts, there were very few business closures mentioned. In fact, several businesses that work closely with the mining industry reported being relatively unaffected by the downturn, likely due to their involvement with the professional and technical services required in the development and post-closure phases of the industry life cycle (Keesey, pers. comm, 2016). This is somewhat reflected in revenue data collected from Yukon businesses in 2015.

4.2.3 Gross Domestic Product

The Yukon's total GDP grew strongly from 2005 through 2012, increasing by a cumulative 47.4% over the period. An important factor in that growth was a rejuvenated mining industry, whose contribution to GDP increased from \$81 million to \$517 million over the same period. However, government (the sum of the Public Administration, Educational Services, Health Care & Social Assistance industries) increased from \$629 million to \$757 million between 2005 and 2012. Construction also showed significant growth from \$138 million in 2005 to a peak of \$249 million in 2011. From the 2012 peak the Yukon's GDP began drifting downward, largely due to a 15% decline in mining output. Government, however, continued to grow from \$757 million to \$779 million in 2014. Please refer to Figure 4.2.3.



Source: Yukon Bureau of Statistics 2014 Annual Review

4.2.4 Household Incomes

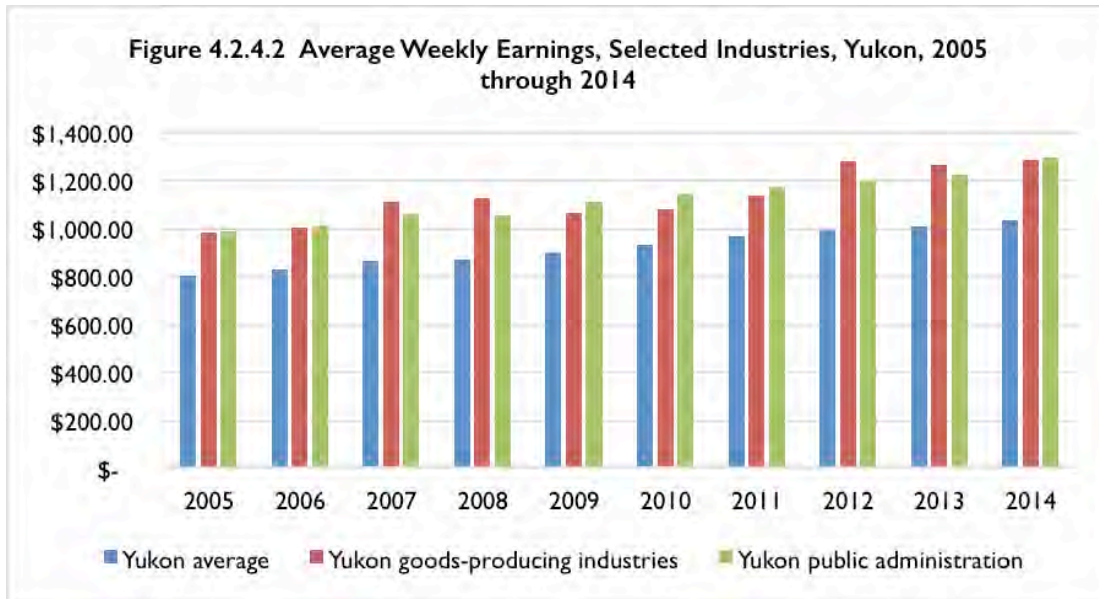
Household incomes can be a useful indicator of the overall economic health of a community. Whitehorse-specific statistics were not available, but Yukon-wide data can be used as a proxy again. The data shows a 43% increase in average total income per Yukon tax filer during the 2002 to 2011 (the last year for which Revenue Canada data is available) period, from \$35,485 to \$50,707. Please refer to Figure 4.2.4.1.



Source: Yukon Bureau of Statistics 2014 Annual Review

Average weekly earnings show a similar pattern, and the available data extends past 2011 into 2014. The category of goods-producing industries includes not only mining but construction, utilities and manufacturing. When mining is down in the Yukon, the average weekly earnings figures are dominated by workers in

construction and utilities. The significant increase in earnings for goods-producing industries between 2009 and 2012 (a 20% rise over 3 years) is almost certainly due to the upswing in mining. However, there has been no significant decline since 2012; rather the trend shows stability on the side of goods-producing industries and continuing increases for public sector employees. Please refer to Figure 4.2.4.2.



Source: Yukon Bureau of Statistics 2014 Annual Review

4.2.5 Taxes and Other Municipal Revenues

For municipal governments, one of the greatest benefits from resource development can be an increased property and corporate tax base. In fact, the City of Whitehorse expanded its municipal boundary in the 1970s to include Imperial Mines' Whitehorse Copper Mines site and collect the corporate taxes. Conversely, a development bust and the typical accompanying population decrease can result in a reduced municipal tax base, leaving a smaller population behind to pay for services. Often, a self-perpetuating downward spiral develops as the availability and quality of services and infrastructure declines in response to the reduced tax base, prompting the continued relocation of residents and hampering efforts to recruit new residents (Federation of Canadian Municipalities, 2015). The glut of housing sales reduces market prices and over time, declining property values further erode the tax base and dictate the necessity of further reductions in local services.

In Whitehorse, property taxes are calculated based on the value of residential and/or commercial properties and the municipal tax rate. Municipal finances are generally immune to fluctuations in territorial revenues from corporate taxes and/or royalties, The Comprehensive Municipal Grant (CMG) is the primary vehicle for territorial base funding to the City, and its formula was renegotiated between the Government of Yukon and Yukon municipalities in 2012. The CMG is calculated on an annual basis factoring a base grant applicable to all Yukon communities, a community population factor, the number of taxable properties, community capital assets, and the local tax base. The new arrangement is such that if the CMG calculation results in a CMG increase, the municipality will receive the full increase in the next fiscal year. Conversely, decreases in municipal CMBC payments are to be apportioned over 5 years such that the CMG will not decrease more than 20% from year-to-year. The City of Whitehorse received \$6,695,588 in CMG in 2014. The Government of Yukon has committed to maintain the CMG at 2012 levels until a review in 2017.

On the whole, the City's major revenue sources - property taxes, user fees and grants and other revenues - did steadily increase during the 2008-2011 period, as well as the periods preceding and following it. Property taxes increased by 69%, from just over \$20 million dollars in 2006 to almost \$34 million dollars in 2014. User fees increased by 65% to almost \$15 million dollars in 2014. Other revenues almost doubled to \$6.1 million

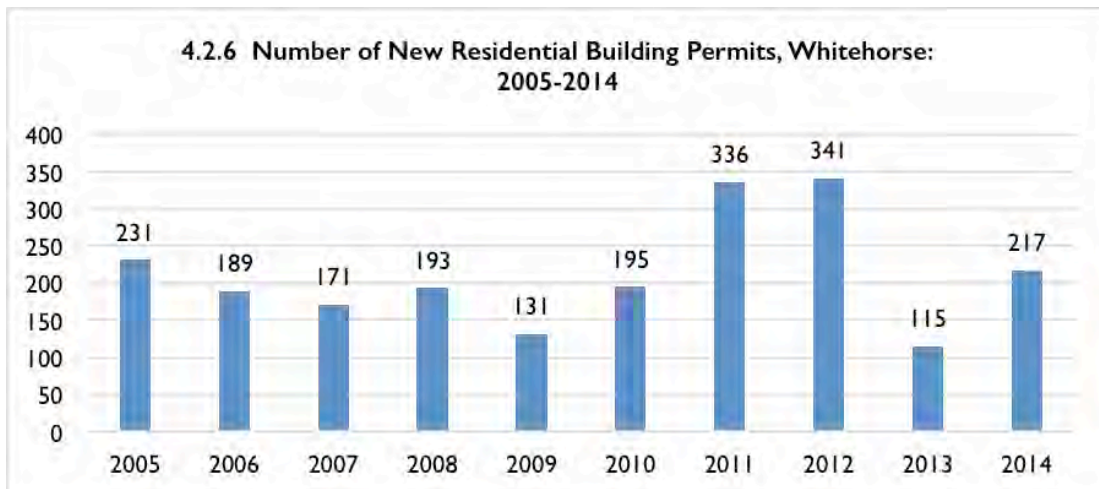
dollars in 2014 (it should be noted that the significant increase between 2010 and 2011 was due to the insurance payout for the fire at the Canada Games Centre and \$2.6 million in land sales for Whistle Bend). Please refer to Table 4.2.2.

| Table 4.2.2 Trends in City of Whitehorse Key Revenue Sources 2006-2014 | | | | | | |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | 2006 | 2008 | 2010 | 2011 | 2012 | 2014 |
| Property taxes | 20,006,403 | 23,119,023 | 26,219,850 | 28,051,329 | 30,191,241 | 33,864,432 |
| User Fees | 9,026,316 | 9,932,743 | 12,128,532 | 12,542,391 | 13,284,807 | 14,915,285 |
| Other | 3,805,240 | 4,536,803 | 10,674,331 | 19,855,823 | 8,777,898 | 6,120,962 |
| Total | 32,837,959 | 37,588,569 | 49,022,713 | 60,449,543 | 52,253,946 | 54,900,679 |

Source: City of Whitehorse Annual Reports

4.2.6 Housing Start-Ups

Rapid acceleration of residential construction almost invariably accompanies resource development booms. The number of building permits issued by the City of Whitehorse for new residential construction soared in 2011 and 2012 before coming back into line with levels that had been the norm in the 2005 through 2010 period. This building boom appears to be a reaction to the population growth rates of over 3% in the City over the previous three years. It also correlates with the peaks in mining exploration spending (2011) and value of mineral production (2012). However, it is crucial to recognize that correlation does not necessarily mean causation. Please refer to Figure 4.2.6.



Source: Yukon Bureau of Statistics 2014 Annual Review

The value of residential and non-residential construction experienced a similar peak in 2011 and 2012. Non-residential construction shows a slightly different pattern, however, with 2006 values exceeding those of the “boom” years – and coinciding with new commercial developments in Downtown Whitehorse – and 2014 values actually increasing over those posted between 2010 and 2012. Please refer to Table 4.2.6.

| Table 4.2.6 Value of Residential and Non-Residential Construction 2006-2014 | | | | | | |
|---|--------|--------|--------|--------|--------|--------|
| | 2006 | 2008 | 2010 | 2011 | 2012 | 2014 |
| Residential | 27,999 | 29,374 | 27,603 | 52,503 | 50,808 | 31,562 |
| Non-Residential | 48,827 | 19,568 | 41,302 | 45,233 | 22,788 | 48,427 |

Source: City of Whitehorse Annual Reports

4.3 Community Infrastructure and Services

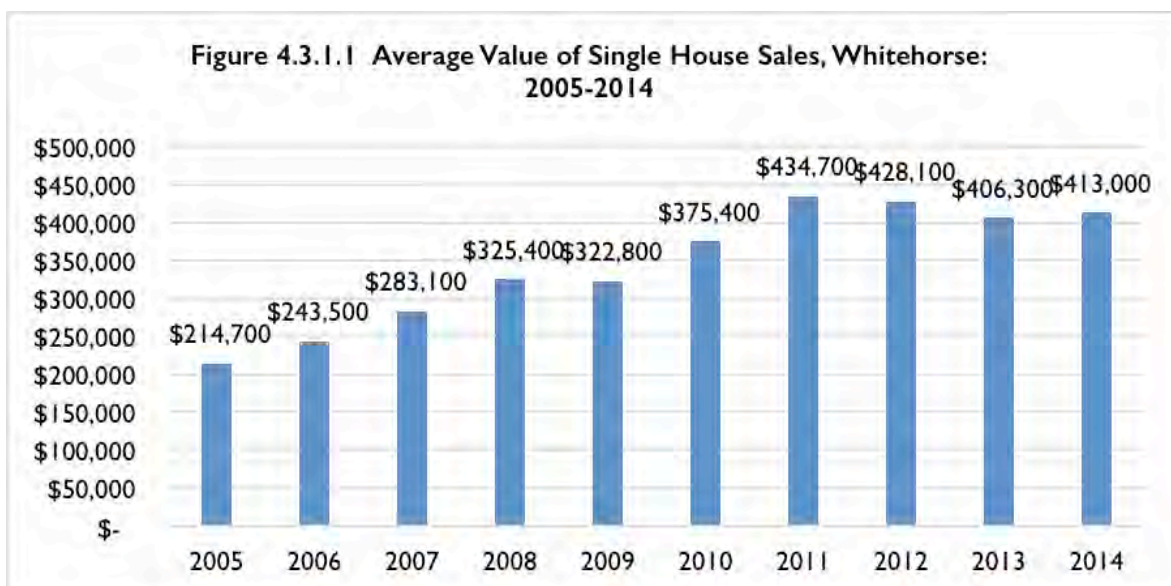
Sudden population increases associated with resource development booms can place a myriad of pressures on the infrastructure and services available in a community. The following section is not intended to be a comprehensive accounting of those pressures; rather, it attempts to provide a snapshot of trends in key areas.

4.3.1 Housing Costs, Property Values and Land Availability

The conventional “flipside” of the increase in population, employment, and business activity associated with resource development is corresponding pressure on the local housing market. The experience of some “boom” communities has been that the rate of new construction can’t keep pace with rising demand from new residents and the competitive wages of the mining industry exacerbate the building trades labour shortage (Australian Housing and Urban Research Institute, 2009), creating a lag in supply that rapidly drives up housing prices. 2009 saw Fort McMurray housing prices exceed those of Canada’s most notoriously expensive housing market, Vancouver, with the average price of a single family home in 2013 reaching \$761,200 (Wood Buffalo, N.D.).

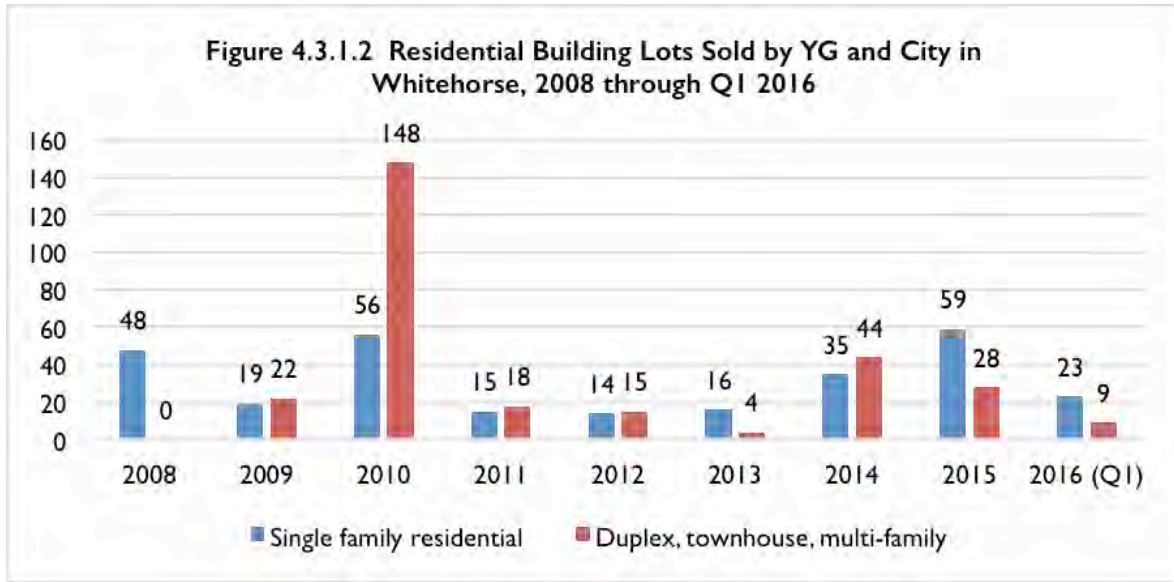
Housing shortages create inevitable pressures on the rental housing market in boomtowns, with high-wage resource workers driving up rents for all. In towns such as Fort McMurray, the inevitable result was a significant gap between market and social housing in which even mid-income professionals such as teachers and police could not afford either rents or a mortgage for entry-level market housing (Ball, 2015). Conversely, the inevitable downturns in resource development activity and the ensuing economic losses inevitably lead to a reduction in housing values and severe difficulty selling homes. November 2015 marked a year-over-year decrease in average sale prices of 19% in Fort McMurray (Black, 2016). The traditional pattern sees an exodus of younger residents, with older residents – particularly those with significant equity in their homes – being left with little choice but to stay behind (Pittis, 2016).

Whitehorse’s housing market during the 2008-2011 period exhibited many of those boomtown characteristics, with the average value of single homes more than doubling between 2005 and 2011. Prices peaked in 2011 at just under \$435,000 and have since decreased only slightly to \$413,000 in 2014. It is important to note that rates of increase were highest pre-dating the 2008 boom, however. Prices increased by 52% between 2005 and 2008, versus a 36% increase between 2008 and 2011 – a pattern that corresponds with the rates of population increase during the same time periods. Please refer to Figure



Source: Yukon Bureau of Statistics 2014 Annual Review

On the land supply side, data is more limited. Anecdotally, 2008 and 2009 sales appear to be predominantly country residential lots in Whitehorse Copper and Stan McGowan area infill lots. The significant increase in 2010 coincides with infill lots in Takhini North and the new neighbourhood of Ingram. 2011 marks the beginning of Whistle Bend construction, which starts off slow but begins to increase noticeably in 2014, a trend that is expected to continue, if not increase (Dolphin, 2016). Peak housing prices do correspond with years of relatively low lot supply in 2011 and 2012. Aside from the significant increase in 2010, total residential sales between 2008 and 2016 ranged from a low of 20 to high of 87 in 2015. Please refer to Figure 4.3.1.2.

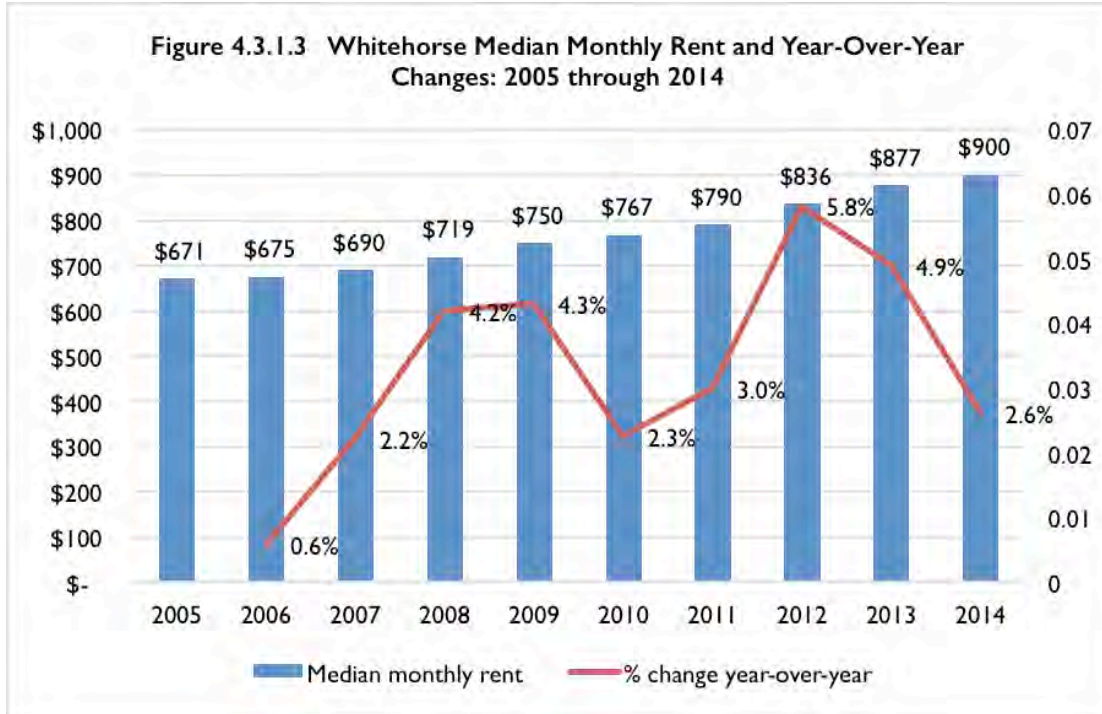


Source: Yukon Community Services and City of Whitehorse

The housing market is complex and it's best to view these numbers in combination with the other factors informing supply and demand. Land lotteries held in Whistle Bend in 2012 and 2013 attracted very little interest, for example, potentially due to the psychological barrier of moving into an uninhabited neighbourhood – a barrier that eases once there is a critical mass of resident population. It is also important to note that the price of raw land was likely to have been a contributing factor to soaring housing prices from the mid-2000s onwards. The land cost as percentage of single detached home prices increased from below 25% in 2002 to almost 40% in 2012 (Zanasi et al, 2013).

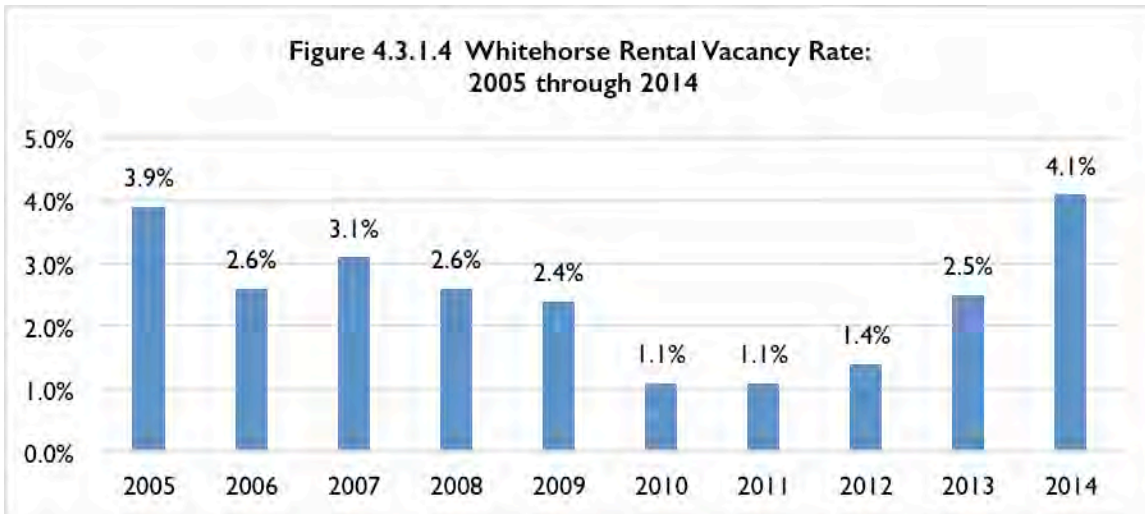
The consultant team wanted to compare year-over-year housing prices with lot supply to inform the analysis; however, the required data was not available for the 2005-2007 timeframe. Without access to year-over-year data prior to 2008, the consultant team is unable to provide a quantitative picture of conditions preceding the 2008-2011 boom. However, City staff, interviewees and even media reports at the time (Waddell, 2008) indicate that there was a lot shortage in effect in 2008, and possibly for the two years prior, that may have contributed to some of the housing pressure. Again, this timeframe doesn't necessarily correlate with natural resource development activity but rather population growth and increases in public sector spending.

Compared to housing prices, monthly rents follow a more gradual growth curve over the same timeframe, with rents increasing by 34% between 2005 and 2014 from \$671 to \$900. Interestingly, the rates of increase are highest again during the 2006-2008 period in addition to the peak 2011-2012 years. Post-2012, rents continue to climb, albeit at a reduced rate of increase. Vacancy rates in the rental housing market tell a similar story, with rates decreasing somewhat between the 2006-2008 period (compared to 2005) and then bottoming out for 2010 and 2011 at 1.1%. 2012 saw a slight recovery to 1.4%, and by 2014, vacancy rates had rebounded to just over that of 2005 levels. Please refer to Figures 4.3.1.3 and 4.3.1.4.



Source: Yukon Bureau of Statistics 2014 Annual Review

Demand for social housing is another potential indicator of what is happening at the intersection of the economy and housing market. Limited data was available, but the numbers indicate that 2011 was a year of peak demand (and limited supply) for social housing, with the number of families on the waitlist registering at 36% of available dwelling units. 2012 saw a rapid decrease in the waitlist, however, even as the rental market had achieved only a minor recovery in vacancies. The current waitlist is relatively similar to 2006 levels. Please refer to Table 4.3.1.



Source: Yukon Bureau of Statistics 2014 Annual Review

| Year | Senior | Non-Senior | Total Waitlist | Total Housing Units | Waitlist as % of Total Units |
|------|--------|------------|----------------|---------------------|------------------------------|
| 2006 | 22 | 52 | 74 | 334 | 22% |
| 2011 | 52 | 96 | 148 | 415 | 36% |
| 2012 | 38 | 51 | 89 | 446 | 20% |
| 2016 | 63 | 54 | 117 | 529 | 22% |

Source: Yukon Housing Corporation Annual Reports and staff
 Note: numbers do not incorporate any data for social housing provided by Kwanlin Dün First Nation or Ta'an Kwäch'än Council

4.3.2 Municipal Infrastructure and Services

Both industry and government often refer to an infrastructure deficit where natural resource development and the north are concerned, one that contributes to significantly higher operating and production costs (PDAC, 2015). In the case of smaller rural communities, local infrastructure can experience significant pressure from the demands of nearby industrial uses and increased population, including the following (Infrastructure Canada, 2005):

Roads – Local roads and road networks can experience overcrowding and deterioration from industrial uses, increased residential traffic, etc.

Granular resources – The local granular material inventory can be depleted from industrial uses, new residential and commercial construction.

Developable land – Demands for both residential and industrial land may outstrip the supply of appropriately zoned and readily developable land.

Solid waste facilities – Industrial uses and increased residential populations result in increased levels of use, changes in use, and a decreased lifespan at solid waste disposal sites. The introduction of industrial and hazardous wastes can be particularly challenging (and expensive) to manage.

Sewer and water – Both water and sewer treatment and distribution networks may be inadequate to accommodate sudden population increases.

Community facilities – An influx of new residents can place significant pressure on community facilities such as recreation complexes and parks.

In the modern era of resource development booms, many municipalities have struggled with the challenge of “shadow” (i.e., non-resident) populations that do not contribute to the local tax base but utilize municipal infrastructure and services. The rural municipalities of Northern Alberta calculated a shadow population of 26,298 in 2005, approximately 26% of the resident population of the combined communities (Aylward, 2006). Because these individuals are generally not included in the local census or calculations of per capita funding from the provincial and/or territorial governments, such shadow populations can be a significant financial liability for communities.

To ascertain impacts on the City of Whitehorse from the 2008 - 2012 growth period, the consultant team surveyed staff responsible for the provision of key infrastructure and services about the experiences of their department. The following is a summary of responses:

- There was no noticeable increased pressure on the City’s solid waste facilities, road network, or other infrastructure.
- Attendance rates at the Canada Games Centre steadily increased during that timeframe, but also did in the years preceding and following it. In fact, usage has not begun to level off.

- There was considerable pressure on the City’s Engineering and Planning departments as a result of the increase in residential and commercial construction and accompanying demand for development permits, zoning approvals, etc. The Engineering department noted that the lot shortage resulted in a suite of design and construction challenges as well, as City staff worked simultaneously to plan the next major development (Whistle Bend) while turning around infill lots as quickly as possible to ease some of the housing pressure.

With respect to transit, the consultant team notes that a recent report to Council noted that usage increased 72% between 2010 and 2014, largely due to partnerships with Yukon College and the Yukon Department of Education and a revamped schedule and routes. (CBC, 2016). Even with these significant increases, the transit system is understood to still be functioning well under capacity.

4.4 Social and Environmental Sustainability

The findings of the previous section suggest a set of factors were at play with respect to community benefits and impacts experienced in Whitehorse between 2008 and 2011 that does not neatly correspond with conventional patterns seen in boom-bust jurisdictions. In the absence of a clear causal relationship, the consultant team presents an overview of social and environmental aspects of the boom-bust cycle primarily as background context and examines recent trends in Whitehorse for the purposes of “rounding out the picture”. The intention is not to draw conclusions about causes and effects, but rather to comment in general terms about boom-bust patterns and Whitehorse’s current status in key areas.

4.4.1 Individual and Community Health

There has been an increasing volume of academic literature exploring the impacts of resource development on community health and wellness in recent years. A study by the New Brunswick Chief Medical Officer (2012) into potential effects of a hydraulic fracturing industry concluded that there was no evidence to support the assumption that increased economic gains correlated with an indirect positive benefit to health status. It refers to a “Boomtown Effect” in which rapid change in population, industrialization and economic prosperity emerges in concert with a host of social “ills” including increased rates of crime, drug and alcohol abuse, sexually transmitted diseases and domestic violence, mental health and social services case loads, and hospital admissions.

Mining communities such as Tumbler Ridge have documented increases in pregnancies, depression and anxiety, and mine related injuries, as well as high rates of family stress, violence towards women, and addiction issues (British Columbia Northern Health, 2013). While the Fort St. John region contributed over 20% of the province’s Gross Domestic Product via oil and gas development, community health survey data showed that the local population demonstrated poor health status indicators and that they had a 30% change of dying earlier than their peers in other parts of the province (Ibid). Unhealthy work practices, lack of community integration, family stresses and increases in motor vehicle accidents were cited as contributing factors. Both the change in health status for local residents, as well as the influx of “shadow” or new resident populations, can overwhelm health care providers in the region. One study of small mining communities in Queensland found that non-residents, mostly Fly-in/Fly-out workers, accounted for between 25-30% of all health service presentations (Crikey, 2013). Hospital waiting times and access to family physicians can be adversely impacted (Shandro et al., 2011).

The Yukon is by no means immune to these problems. About one quarter of mining jobs in the communities of Watson Lake and Dawson City are reportedly lost due to substance abuse (CBC News, 2014). The extent to which mining-related substance abuse issues impact Whitehorse – and whether they are symptomatic of the industry or representative of broader societal behaviour - is uncertain, however. The Yukon Chief Medical Officer (2012) notes the Yukon has higher than average rates of mood and anxiety disorders, injury, and high-risk behaviour such as binge drinking, along with an accident mortality rate over double that of Canada overall. The Yukon Social Inclusion Framework (Yukon Health and Social Services, 2010) noted that the number of alcohol-related emergency room visits was on the rise at Whitehorse General Hospital

(although there is no attribution of causes). However, the Health Status Report also found that Yukoners were generally consistent with (and some cases, outperforming) national averages in such areas as diet and physical activity, life satisfaction, and stress.

One of the more publicized community pressures in effect during the boom was a shortage of family doctors. The Government of Yukon administered an Unattached Patient Registry from December 2012 until 2013 that identified 1850 people as lacking a permanent family physician (Choquette, pers. comm, 2016). It bears mentioning that the number of physicians licensed to practice in the Yukon remained consistent between 2007 and 2011, despite an increase of some 3000 residents during that timeframe. Between 2011 and 2015, the number of licensed physicians¹⁷ increased by 52%, presumably addressing some that demand, although the current number of Yukoners lacking a dedicated family physician is unknown. The consultant team was further unable to access information around hospital wait times. Please refer to Table 4.4.1.

| Year | # Physicians |
|------|--------------|
| 2007 | 193 |
| 2011 | 192 |
| 2015 | 292 |

Source: Yukon Medical Council

4.4.2 Safety and Security

Crime is often prevalent in discussions about negative community impacts from resource development. The increased population and high-risk behaviour believed to be more prevalent among non-resident shift workers can result in increased criminal activity (Trenwith, 2010). In the Bakken region, with its shale oil boom, increases in alcohol-related offenses, illicit drugs, and growing number of traffic accidents including driving under the influence and hit and run offenses were observed (Ruddell et al, 2014). Fort McMurray had a crime rate approximately double the national average several years ago (Ibid).

The Yukon Social Inclusion Indicator Framework (Yukon Health and Social Services, 2010) noted that the Yukon crime rate was several times higher than the national rate, and the Crime Severity Index for the territory was twice as high as Canada's. However, crime levels generally held steady during the 2008-2012 period. In fact, between 2004 and 2014, property crimes decreased from just over 120 per 1000 residents to just over 85, coming in at the second lowest in the country in 2013. Total violent crime violations dropped after 2004 and rebounded to 2004 levels in 2014. The most significant increase was seen in "other" code violations – 68% of which included disturbing the peace (typically disorderly conduct or public intoxication). Whitehorse-specific statistics were not available. Please refer to Figure 4.4.2.

| | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 |
|--------------------------------|--------|-------|-------|-------|-------|--------|
| Total Violent Crime Violations | 41.41 | 28.39 | 30.37 | 33.05 | 32.87 | 38.27 |
| Total Property Crime | 120.41 | 92.65 | 85.46 | 77.56 | 79.64 | 85.04 |
| Total Other Code Violations | 71.27 | 50.89 | 73.84 | 73.28 | 79.97 | 104.86 |

Source: Yukon Bureau of Statistics Police-reported Crime Statistics 2013 and 2014 and 2014 Annual Review

The 2010 Yukon Social Inclusion Household Survey found that 99% of Yukon residents feel very safe or reasonably safe from crime when walking during the neighbourhoods during the day, compared to 87% at night (Yukon Health and Social Services, 2010). The neighbourhood problems most commonly cited were drug dealing, public drunkenness or "rowdiness", garbage/litter, vandalism, and noisy neighbours/loud parties.

¹⁷ Licensed physicians include locums and specialists providing temporary medical services in the territory.

4.4.3 Community Identity, Social Inclusion/Cohesion, and Resilience

Community and cultural identity and social inclusion/cohesion are increasingly recognized as the building blocks of resilient communities that can respond and adapt to changing economic and social circumstances successfully. The maintenance of these parameters is closely interconnected with individual and community health. Community identity, or “culture”, is comprised of multiple elements, including community identity, attachment to place, social attachments, and attachment to local geography (Stefanick, N.D.). Social inclusion and cohesion are also increasingly recognized as pre-determinants of individual and community health.

Mining can indirectly affect social cohesion in cases where an upsurge of workers with different value systems can create or amplify problems as substance abuse. The loss of social norms and structures regulating people’s behaviour is attributed to the speed and extent of instability and pace of change (Rodon et al, 2013). Mining can also increase intra- and intergenerational inequalities. The very real threats to community well-being when mine closure leads to financial and emotional struggles who lose both employment and hope for the future (Ibid). Research has also shown that a community with a high shadow population relative to permanent residents is at risk for increasing social problems such as crime rates and substance abuse due to deteriorated social cohesion. Home ownership, especially in rural areas, has been found to be a primary determinant of social cohesion (Skeard, 2015).

The Government of Yukon’s Social Inclusion Framework (2010) drew from a wide range of indicators linked to personal and community assets and access to necessities and participation in society (seen as the end results of social inclusion). The study pointed to lone-parent family incomes, housing costs, and relatively high rates of food insecurity (21%) as causes for concern. The Yukon Chief Medical Officer’s Health Status Report (2012) also highlighted income inequality as a serious issue, noting in particular higher than average rates of single parent households with significantly lower median incomes than couple families. These conclusions are reinforced by the day-to-day experience of organizations such as the Whitehorse Food Bank. The Whitehorse Food Bank has reported a steady increase in clients in recent years, with 640 families documented using the service as of March 2014. Staff reported that nearly half of its clients live in private market rental units and 11% are employed, with rent costs simply eroding available income for food (CBC, 2014). A shortage of affordable market housing was a priority issue identified by not-for-profit client service groups during the development of the 2015 Housing Action Plan.



Photo credit: Government of Yukon

The City of Whitehorse’s survey for the 2015 Community Economic Development Strategy provides some useful insights into the question of social cohesion and community identity. 88% of survey respondents indicated being happy or very happy living in Whitehorse, and 84% indicated they are much or somewhat better off living in Whitehorse than elsewhere. 91% of residents felt that they “can be who they want to be”, and 88% said that fellow residents are friendly or very friendly. Respondents noted a strong sense of community with many opportunities to be involved, as well as a sense of pride. However, high cost of living – in particular, housing – was a commonly cited issue, and disparity in employment opportunity and wages between public and private sectors was mentioned numerous times. Most notably, numerous respondents pointed to homelessness and substance abuse as prevalent challenges in the community.

4.4.4 Environmental Impacts

Degradation of the local environment is generally recognized as the most significant negative impact associated with the mining industry. Environment impacts can include the following:

- Loss and/or fragmentation of plant and wildlife habitat due to exploration and active mining, including associated roads and corridors;
- Disturbance of wildlife populations and increased hunting pressure;
- Sedimentation of watercourses from soil disturbance, vegetation removal, and road construction;
- Contamination of soil and watercourses from fuel, hydraulic fluids, garbage and sewage, and mining waste;
- Increased acidity/toxicity of surface waters due to acid mine drainage;
- Decrease in freshwater supply from industrial demands; and,
- Noise pollution.

Environmental quality can have a direct effect on individual and community health, and even its ability to attract new residents. Long after mining has ceased, actual or perceived contamination can act as a deterrent to retaining and attracting new residents (Halseth, 2003).

Given that mining has effectively been absent from the Whitehorse area since the closure of Whitehorse Copper Mines in 1982, the environmental impacts from the 2008-2012 mining boom are deemed to be negligible. In fact, the argument could be made that environmental quality in the City improved during that timeframe due to decisions such as the designation of approximately 30% of its municipal land area for regional parks in the 2010 Official Community Plan, the overhaul of the transit system, and investments in parks and trails. Whitehorse's "Wilderness City" brand would not appear to be adversely impacted by the territory's mining sector.

4.4.5 Other

The mining industry interacts with Whitehorse in a number of ways that may not be readily obvious, but have an impact nonetheless. The role of corporate donations in the Yukon's highly active not-for-profit (NFP) sector is perhaps the most significant of these "other" interactions. Corporate donations, both by mining companies as well as the service/supply companies they support, fund a broad range of quality of life amenities in the Yukon's capital, among them arts and cultural programming and performances, community events, and health care infrastructure.¹⁸ (This of course is in addition to corporate social responsibility activities undertaken for rural Yukon communities more closely geographically linked to mining). The relative health of the mining industry at any given time has a significant impact on the overall sponsorship climate in Whitehorse (Leslie, pers. comm, 2016).

Mining also intersects with higher learning opportunities, with the industry helping to fund a number of research and development initiatives in partnership with Yukon College and outside institutions. A well-funded research community creates other spin-off benefits, including the attraction of academics and technical professionals to Whitehorse. These in turn support long-term objectives such as the transition of Yukon College to university status (Ibid).

¹⁸ One interviewee noted that mining companies contributed in the neighbourhood of 40-50% towards the purchase of diagnostic equipment at Whitehorse General Hospital over the past decade or so.

4.5 Conclusion

A retrospective look at the 2008-2011 period in Whitehorse reveals a number of trends – business growth, housing shortages, etc. - that correlate with significant increases in mining exploration and production activity during that time. However, extending the time horizon of investigation to 2-3 years either before and/or after the “boom” reveals a different, more nuanced, story – one of a steady trend of population growth at least partially attributable to year-over-year growth in government expenditures, a Downtown building boom, and land supply constraints. On the whole, both the statistical and anecdotal evidence do not appear to be indicative of a true resource boom-bust cycle. Where the peak 2008-2012 years of mineral exploration and production are concerned, there is almost certainly a degree of correlation with the range of benefits and impacts experienced in Whitehorse. There is not, however, a convincing argument for causation – at least where the most recent growth period was concerned.

This is not to say that previous boom-bust cycles in the territory were exaggerated, or that the importance of mining to the Whitehorse economy has decreased. Indeed, economic modeling conducted for the territory using the 1997-2002 downturn as a baseline found that not only were the direct impacts of mine closures significant, but the extended consequences – specifically demographic shifts towards aging and depopulation and corresponding changes in consumption leading to weakened diversified and knowledge-based industries and services - were equally so (Canadian Polar Commission, 2014). Given that the Yukon’s last operating mine has yet to completely close, it is entirely possible that some element of bust dynamics yet awaits. It is also possible that the “delay effect” previously observed in the broader service sector of other mining communities (Rural Development Institute, 2008) accounts for some of the post-2012 stability and that another year or two in a commodities downturn could see a very different economic picture in Whitehorse emerge.

The mining sector of 2016 is a different entity than the mining sector of the late 1990s, with an increasing reliance on technology and mobile workforces to achieve lean, cost-effective operations. However, accompanying political changes and increased emphasis on local hire and sustainability via Impact Benefit Agreements have further changed the nature of the industry in the Yukon. That said, the cycle itself remains unchanged. A typical boom-bust commodity price cycle was very much in effect in the Yukon, moreover worldwide, during the 2008-2012 period. However, other extenuating economic circumstances – specifically a sustained period of growth in federal transfer payments and public sector spending – appears to have diverted the Yukon, and Whitehorse, slightly off the well-worn trajectory of bust-induced economic impacts. Mining and its requisite ups and downs may still be the Yukon’s proverbial “game”, but the playing field itself changed over the past decade.

Regardless of causes, there is no disputing that Whitehorse experienced a period of sustained growth over the past decade, and a new reality of significantly higher housing prices and increased proportion of public sector employment has set in. The role of federal transfer payments in feeding that growth cycle can not be minimized: transfer payments drive more spending and employment, attracting more people to reside here, and in turn contributing to increased transfer payments. If and when mining is in an upswing, the accompanying increased demand for supplies and services in Whitehorse accentuates both the benefits and impacts of continual population growth.

In this current Yukon economic and mining industry context, the cyclical nature of the mining industry effectively reduced the margin for error on the Whitehorse growth curve, contributing to boom-like pressures in a community that was less than fully prepared to accommodate even a moderate growth scenario. Conversely, the other economic drivers present in Whitehorse helped to buffer the community from a pronounced bust. Whether or not these broader economic conditions, specifically the increased prevalence of the public sector, will prevail through the next commodities cycle is an unknown. Regardless, the 2008-2012 period presents many lessons that can and should be applied to the future management of growth in Whitehorse.

5.0 CITY OF WHITEHORSE PREPAREDNESS

While Whitehorse's rapid growth period over the past decade may not conclusively be attributed to resource development alone, this need not pre-empt the consideration of the City's ability to accommodate similar population growth patterns in the future – regardless of causal factors. The following section provides a brief overview of City preparedness in key infrastructure and service delivery areas. These areas – along with many of the themes discussed in Section 4.0, have been compiled into a resource development preparedness “scorecard”, found in Appendix A.

5.1 Municipal Infrastructure and Services

Roads/Transportation – City staff noted that a population increase would invariably result in pressures on the transportation network and political pressure from the public to expand car-oriented infrastructure (i.e., lanes, parking space, etc.). The City completed a Transportation Demand Management Plan in 2014 and is committed to reducing the share of single occupancy vehicles in the travel mode to 50% of trips over 25 years and making accompanying increases in active transportation, ridesharing, and transit use. Staff felt that a population increase would place more pressure on Mayor and Council to increase investments in roads and felt that it was important the City “stay the course” that these plans have set out. City staff noted that a comprehensive municipal Capital Asset Management Plan is under development but not yet complete.

Solid Waste – The City updated its Solid Waste Action Plan in 2013 and is focused on its goal of Zero Waste by 2050 and a more immediate goal of 50% diversion via partnerships, municipal composting, and recycling. The Environmental Sustainability Department noted that 90% of the City's waste is generated by the commercial sector and that the existing landfill could not accommodate a significant increase in volumes. Staff predicted that a major population increase would result in public pressure to expand the landfill and – similar to road infrastructure – a corresponding municipal focus on short-term solutions at the expense of long-term sustainability.

Water Supply – The 20-year water supply and distribution system design population is estimated at 32,177 residents (about 8000 residents less than the current service population). The capacity of existing wells is sufficient to meet that demand, and the development of some system redundancy may occur over the next decade. As Whitehorse approaches the design population, additional wells will be required for back-up in case of failure and to accommodate system maintenance, or if there are water quality issues identified by Yukon Environmental Health Services. The City is looking at possible efficiencies and cost-sharing opportunities to develop a new well in conjunction with the construction (and heating) of the new francophone new high school on the former FH Collins school site.

Sewer – The estimated number of Whitehorse residents currently serviced with municipal water and sewer is 23,819. The design population serviced by the Livingstone Trail Environmental Facility is estimated at 36,112. Effluent quality is well below regulatory standards and no system improvements are foreseeable; however, if additional treatment was necessary in the future, some expansion of the treatment cells could be undertaken and there is adequate space to do so. Future development within Whistle Bend may require the development of new piping to connect to the lagoon; this system improvement is anticipated for the ultimate build-out of the subdivision.

Transit – The City experienced a 72% increase in ridership between 2010 and 2014. This impressive growth is attributed to a variety of factors, including a system-wide route overhaul, ramped up marketing and communications, partnerships with the Department of Education and Yukon College, and the addition of new routes and evening service. Transit Branch staff report that the transit routes into Riverdale are operating at peak capacity and an overflow bus is in use. While there is capacity on the other transit routes, it isn't significant. A population boom – assuming ridership rates remain stable or continue to increase – would undoubtedly require investments in an expanded transit fleet. Such scenarios are already being considered internally, particularly with regards to potential growth in high school student ridership and the possibility of Yukon College gaining university status. Transit hopes to increase its emphasis on group transit pass programs

and business community partnerships as long-term strategies that will continue to increase transit use and help the City meet the goals set out in the Transportation Demand Management Plan (2014).

Recreation Facilities and Programs – City staff noted that a rapid increase in population would heavily impact the operations of recreation facilities and service delivery and likely result in waitlists, space demands, line-ups, etc. The City is already experiencing capacity challenges, with numerous user groups competing for limited space and camp programs with waitlists. The Recreation and Facility Services Branch reported that it can adjust fairly quickly to changes in user demand by modifying programs and services and could innovate over the short-term until sufficient resources were in place to accommodate increased demand in a sustainable manner. The Branch also noted the age of facilities such as the Mount McIntyre Recreation Centre and Takhini Arena (35+ years) and that replacement will need to be planned over the long-term. The timeframe for the Parks and Recreation Master Plan is almost complete and a new plan is expected to be developed in 2017.

Parks and Trails – The creation of landscaping, parks, trails and recreation infrastructure such as playgrounds and skating rinks is a standard component of new residential subdivision development. The Parks and Trails Branch only recently received a slight increase in staffing despite Whistle Bend and other new areas having come online in recent years. The high value that the public places on parks-related amenities in Whitehorse creates a corresponding high level of expectation for service delivery, and Parks and Trails staff report that there is more demand than available capacity. There has been a “slow, gradual creep upwards” in regards to the Branch’s workload, and seemingly minor commitments – such as new garbage cans – can cumulatively become significant over time. There has been an increase in requests for in-kind staffing support for special events in particular. The growing diversity of interests in the community means that robust two-way communication between the City and its residents is critical to on-target service delivery.

There has been a strong trend towards stewardship and partnerships with neighbourhood and non-profit groups both in Whitehorse and elsewhere, and the City should look at formalizing and streamlining the process around third-party partnerships to ensure municipal resources stay focused on initiatives with broad benefit. However, the spontaneous and informal nature of parks and trail use – coupled with their extensive geographic coverage – means that a well-planned park, trail, and green space network can accommodate increased population with only minor impacts on user experience. The timeframe for both the Trail Plan and Parks and Recreation Master Plan is almost complete and new plans are slated for development in 2017.

Zoning and Building Inspections – City staff reported that Planning and Building Services was under considerable strain processing development and zoning applications and inspections during the past decade’s building boom. Four new positions were subsequently created to handle the high volumes of applications during the Downtown building boom. Staff report that the workload is now manageable and most zoning applications can be processed and approved in about six weeks.

5.2 Long-Term Planning

Strong governance and long-term outlook have been cited as key determinants of a city’s resilience to boom-bust cycles (Skeard, 2015). The City of Whitehorse has initiated a number of long-term, sustainability-oriented plans in recent years, such as the Official Community Plan (OCP), Strategic Sustainability Plan, Solid Waste Action Plan, Transportation Demand Management Plan and various parks and recreation master plans. One current gap is a comprehensive Capital Asset Management Plan, which is underway.

Another critical aspect of long-term planning is land availability for future population growth. Whistle Bend Phases 3-7 will supply lots for the foreseeable future, but the question of “where next?” has yet to be answered. Two parallel studies currently underway are investigating the development feasibility of the areas located south of Copper Ridge/north of Canyon Crescent and north/east/west of Long Lake in preparation for the 2017 OCP review. Both areas are likely to involve trade-offs; however, these trade-offs will need to be carefully weighed against the downsides of developing elsewhere – particularly outside of the Urban Containment Boundary - and risking a land shortage if difficult decisions are deferred and a post-Whistle Bend strategy isn’t in place in the 5-7 year pre-development timeframe required.

6.0 KEY ISSUES & OPPORTUNITIES

The following section provides a synthesis of the key issues and opportunities that the consultant team considers most pertinent to the City of Whitehorse and its role vis-à-vis resource development preparedness. In some cases, the City may have a lead role to play; in others, particularly those with a strong reliance on private sector involvement – it will be more appropriate for the City to play a supporting, or advisory, role.

6.1 Recruitment and Retention of Mining Labour

In a jurisdiction where almost half of the labour force directly employed in mining is non-resident, recruitment and retention are logical areas for improvement. Stakeholders emphasized the strategic importance of Whitehorse in this regard; whereas the likelihood of recruiting highly mobile professionals to relocate to rural areas of the Yukon is considered low, Whitehorse is viewed as having a significantly stronger “pull” factor due to its high quality of life, access to retail and services, arts and culture, and transportation linkages. Numerous stakeholders emphasized that “quality of life” is Whitehorse’s strongest competitive advantage in recruiting and retaining mining sector labour. However, several also felt that recruitment efforts would be best focused on personnel occupying professional and management positions in the Yukon mining industry versus less skilled positions.

Stakeholders singled out two specific areas in which the City could play a lead role: marketing and orientation tours. Regarding the former, a website was strongly suggested – one that would better serve the interests of prospective residents and investors than the existing City of Whitehorse or Yukon Tourism websites and provide a window into the many “perks” of living in Whitehorse. Regarding the latter, the idea of a City – Chamber – private sector partnership aimed at orienting mobile mining industry workers to Whitehorse was supported. This could involve incentives to spend the “Fly-out” portion of the work cycle in the capital city with a suite of activities and experiences organized, ideally in conjunction with spouses/partners. Several interviewees felt strongly that the City needed to fulfill a “welcome wagon” function.

The “welcome wagon” concept may seem simplistic, but is nonetheless proven. One interviewee shared a real-life example of a recruitment campaign in which a nationwide call for in-demand professionals to relocate to Whitehorse was issued. Eight prospective residents expressed interest and were toured around the City and connected with realtors. The result: all eight relocated to the territory.

The issue of recruitment and retention is not isolated to the mining industry. Yukon as a whole is wrestling with challenges such as increased competition for workers, an aging workforce, a diversity of needs across Yukon economic sectors. The Yukon Employee Recruitment and Retention Strategy was undertaken as a collaborative, cross-sector approach to addressing these challenges. The Strategy commits to a number of actions to recruit new residents to the territory and to promote the Yukon as an attractive place to live and work through until 2017. The City currently participates on the Strategy’s implementation committee; ideally, there could be an opportunity for the City and Government of Yukon to support one another around the achievement of marketing-oriented objectives.

6.2 Housing Affordability and Land Availability

Housing affordability is a significant issue affecting both the retention/recruitment of mining sector workers and the broader growth of the private sector economy of Whitehorse. Housing affordability affects the private sector on multiple levels: it acts as a disincentive for new residents (i.e., customers, employees, and entrepreneurs) to relocate to Whitehorse, consumes disposable income that could otherwise be directed at local businesses, and indirectly promotes the pursuit of stable, (often) higher-paying public sector employment over the private sector. Fly-in/Fly-out mining sector workers rank housing affordability as the greatest

deterrent to relocation. Mining companies have also indicated that housing costs are a major constraint to the provision of staff accommodation in the capital as well as their own recruitment efforts.

Affordability, or lack thereof, creates a ripple effect across the housing continuum. The experience of other boom-bust jurisdictions is that affordable, entry-level market housing – both owned and rented – becomes the scarcest resource. Studies have noted a disproportionately low percentage of rental housing starts in the capital over the past decade, attributed to high development costs and inability to achieve adequate returns with low to moderate rents (Zanasi et al, 2013). Rental unit shortages in the lower and higher ends of the rental market create a “mismatch” in which lower income households are spending too much on housing, and renters who can afford more occupy less expensive housing due to lack of choice. A number of initiatives are currently underway to address needs across the housing continuum, including the territorial Housing Action Plan and a partnership between the City of Whitehorse and Kwanlin Dün First Nation aimed at tackling homelessness. Without question, the City needs to maintain a leadership role on the housing affordability front through zoning and continued development incentives for residential densification, as well as the steady release of residential lands through both mid and long-range subdivision planning. It also needs to actively

support initiatives addressing issues of economic and social inclusion and equity that will support the aims of a healthy, vibrant community.

Housing affordability is of course closely linked with land availability. Rightly or wrongly, there is a strong belief among stakeholders that the housing boom of the past decade was not caused by the upswing in mining activity. Rather, they attribute the phenomenon to a lot shortage that pre-dated the boom and coincided with the build-out of Copper Ridge in the early



to mid-2000s. Despite efforts made to the contrary, the predominant sentiment is that both the City and Yukon Government failed to plan adequately for the population increase. The Government of Yukon and City have previously committed to maintaining a two-year supply of residential land; on closer examination, however, it would appear that this commitment is rather vaguely defined and not monitored jointly.

According to City staff, a total of 1321 residential units were developed between 2011 and 2015, including 840 multi-family, 342 single family, 44 duplex, 69 secondary/caretaker, and 26 for supportive housing. This averages out to about 265 units per year, a slight increase over the average 240 units constructed per year between 2006 and 2012 (Zanasi et al, 2013). The City’s Official Community Plan projects the average number of homes required per year at 450, 225, and 50 under high (3.5%), medium (2.0%), and low (0.5%) population growth rates, respectively.

Using housing starts as a proxy for land availability, and further assuming there is a correlation between land availability and housing prices, the 2005-2012 period of housing price data provides an opportunity to test those OCP assumptions. The sustained increase of housing prices during both medium and high growth rates while housing starts were in the 195-231 range is indicative of a shortfall in new units. At a medium growth rate in 2012, 341 housing starts is followed up by a 6% decrease in housing prices in 2013, suggesting a modest oversupply of housing. The consultant team has not analyzed these inter-relationships in any depth;

Table 5.2 Population Growth, Housing Starts, and Housing Prices

| Year | Population Growth Rate | Number of Housing Starts | Single House Sale Price Rate of Increase |
|------|------------------------|--------------------------|--|
| 2005 | | 231 | |
| 2006 | 1.6% | 189 | 13% |
| 2007 | 1.7% | 171 | 16% |
| 2008 | 3.5% | 193 | 15% |
| 2009 | 3.0% | 131 | -1% |
| 2010 | 3.1% | 195 | 16% |
| 2011 | 1.1% | 336 | 16% |
| 2012 | 2.3% | 341 | -1.5% |
| 2013 | 2.1% | 115 | -6% |
| 2014 | 0.3% | 217 | 1.6% |

however, a cursory glance would suggest both that the OCP’s targets are within a realistic range, and that Whitehorse’s housing starts fell significantly short during the growth period.

City staff acknowledge that a “catch-up” scenario was in effect in the mid-to-latter 2000s as Whistle Bend was in the planning stage and attempts were made to meet rising demand with much smaller infill developments in Porter Creek, Takhini North, and other areas. The

City’s recent initiation of a pre-feasibility study for residential development in the Long Lake and McLean Lake areas of the Urban Containment Boundary will help with long-range planning, but – assuming feasibility – a 10-15-year lead time for subdivision planning, permitting, site servicing, and actual development is realistic. In a high growth scenario, Whistle Bend lots could potentially be developed and absorbed within a 7-10-year timeframe. If Conference Board of Canada predictions are even partially on target and mining activity significantly picks up, the City could find itself in another land “crunch”. The upcoming review of the OCP in 2017 marks an excellent opportunity to have an in-depth public (and political) conversation about what areas will be slated to provide continuous supply between the build out of Whistle Bend and next large-scale residential development.

6.3 Perceptions of the Mining Industry and Private Sector Culture

Virtually all private sector stakeholders the consultant team interviewed for the study spoke to a perceived lack of entrepreneurial culture and leadership as an overarching constraint to the creation of a diversified, boom-bust resistant economy in Whitehorse. They expressed frustration over a perceived disconnect between predominantly public sector employees residing in Whitehorse who disregard or outright oppose mining. Given the inexorable influence Whitehorse residents have in the Yukon’s political sphere, this disconnect has a significant potential to influence the industry via policy decisions.

Some demonstrable steps are being made to raise awareness of the mining industry’s contributions and bridge the perceived divide. The “Our Yukon” campaign recently launched by the Yukon Chamber of Mines aims to increase’s the public’s understanding of the industry’s role in the day-to-day life of Yukoners and contributions to quality of life in the territory.

The City has little control over the ups and downs of the commodity cycle. Where it can and should exercise influence is via a demonstrable commitment to private sector strength and diversity. The City of Whitehorse needs to champion the interests of the private sector, starting with the consideration of how it can maximize its local purchase and procurement and the communication of any relevant guidelines. This issue is addressed in the workplan of the CEDS and deserves priority attention.

6.4 Maximizing Capture of Mining Sector Benefits

Anticipating and avoiding the negative impacts of mining downturns is only one part of the equation: equally important is the ability to leverage the benefits of mining when it is in an upswing. Stakeholders spoke to the need for a coordinated and focused approach to ensuring the Whitehorse business community is positioned to participate at every possible step along the industry’s supply and service chain. Some felt that this represented a significant untapped opportunity, but that to date, capacity and leadership has been lacking to pursue it. Whitehorse’s geographic orientation and reasonably diverse service and supply sector lend themselves to a re-positioning of the city as a hub serving not only the Yukon mining industry, but also the industry in Alaska (particularly southeast) and northern British Columbia.

Some cited the example of several Yukon companies (Icefield Instruments and Kluane Drilling specifically) that have made the leap from serving the local mining industry to exporting their services to regional, national, and even international markets. The Yukon Research Centre and its emphasis on northern research and technology are highly supportive of this direction.



Photo credit: Government of Yukon

Research has shown that the capture of benefits by communities in a boom is higher for larger communities and communities located within predominantly urban regions, and the impacts of bust become more dramatic as one moves from larger communities to the smaller communities (Rural Development Institute, 2008). The degree of specialization in a community workforce is associated with a lower community population growth in subsequent periods, whereas the level and degree of educational attainment also positively correlates with higher community population growth post-boom (Ibid).

Whitehorse's predominantly urban orientation and high levels of educational attainment are supportive of higher rates of capture by the business sector. Whitehorse plays a vital, albeit somewhat indirect, role in regards to the capture of benefits by rural Yukon communities as well. As home to the Yukon's major educational and training institution, Whitehorse also serves as a temporary home to many pursuing training in hopes of returning home to better employment opportunities – potentially in the mining sector. Amenities such as a well-functioning transit system and affordable housing are integral to these students' ability to access higher education.

6.5 First Nation Agency and Involvement

While settled land claims have been in effect for over 10 years in the Whitehorse area, there has been relatively little impact on the broader land development picture within the City of Whitehorse. Over the medium to long-term, this is likely to change significantly. Kwanlin Dün First Nation and Ta'an Kwäch'än Council are the first and second largest land holders in the City of Whitehorse, and will accordingly be subject to some of its highest tax burdens as the taxation exemptions "sunset" on many of its settlement parcels (a process already underway). There is a strong economic incentive to enter into the land development arena and collect both lease payments and income taxes from lessees occupying First Nation lands for residential and/or commercial purposes.

The development of First Nation lands for residential purposes has been stalled to date by the absence of a mechanism to register said lands, in effect hampering the ability for prospective homeowners to raise title and secure financing to build. The 2015 amendment to the *Lands Act* has addressed this legislative gap and regulations are currently in the drafting stage. The era for First Nation residential leases as a housing option is rapidly approaching. It is reasonable to expect that the roll-out of First Nation leases could be met with some uncertainty and trepidation among prospective homeowners accustomed to the freehold model of land tenure. The success of the first developments will rely on many factors, including attention to urban-residential design best practices, the relative abundance (or scarcity) of alternatives, education and marketing to dispel commonly held misconceptions, and the degree to which Yukoners can be subscribed into a

paradigm shift. Where the land and housing supply side is concerned, the City has considerable influence. It also exercises influence in the realms of public perception and the shifting of societal norms.

It is possible that First Nations will introduce a new model of real estate development to Whitehorse – one that sees private developers partnering to bring housing to market and providing property management and even utilities to their planned communities – in effect, assuming municipal-like functions on their settlement lands in the city where the scale of development lends itself to economies of scale being achieved.

Those interviewed for the study stressed the need for the City to view them as partners in the pursuit of medium and long-term solutions to the challenge of residential land supply. There was a feeling that both the City and Government of Yukon are embedded in the old ways of thinking and doing, and that a fundamental shift of mindset is required to work together collaboratively. This “shift” would be reflected both in day-to-day administrative actions – such as a commitment from City staff to assist (versus impede) First Nation development corporations in the building process – as well as broader government-to-government joint planning, capacity building, and outreach. Capacity was acknowledged as being an ongoing challenge, and resident land development expertise in both the City and Yukon governments could help bridge the gap. In turn, establishing a closer working relationship with the development corporations and lands staff of both First Nations governments will help to build awareness and understanding of their roles and interests.

6.6 Economic Diversification

Research has shown that the key factors influencing the ability of a resource-dependent community to recover from the “bust” end of the cycle include the availability of other economic opportunities, local amenities and services, proximity to other communities, and year-round transportation access (Economic Development Association of Canada, 2009). Recovery in small Canadian towns is also influenced by the maintenance of a diverse demographic profile. Because smaller communities are generally more affordable, they may become attractive to knowledge-based industries; however, access to transportation and communication networks still prevails as key determinants of future economic viability (Halseth, 2003).



Whitehorse poses an interesting case in this regard: to some extent, this most recent cycle shows that it has achieved the requisite level of economic diversification to withstand the ups and downs of the resource development cycle. However, federal transfer payments and public sector spending are the sole reason. Whitehorse’s economic vulnerability stems not solely from a reliance on mining, but an over-reliance on external government funding.

Certainly, there are positive signs of progress towards the goal of economic diversification. Whether it’s larger companies such as Air North, or the burgeoning community of independent businesses providing “Yukon-made” products ranging from crafts to beer, or cutting-edge research supported by the Yukon Research Centre, there are many real-life examples of innovation present in the Yukon. Previous studies of knowledge workers in the Yukon have illustrated the importance of so-called “lifestyle” amenities to their decision to relocate to and stay in Whitehorse (Voswinkel, 2012). Economic diversification is a complex objective that lends itself to ongoing City participation and support; where the matter of creating a liveable community is concerned, the City is positioned to lead.

6.7 Influence of Government Policy

Recent decisions made by the Yukon Environmental and Socioeconomic Assessment Board (YESAB) to require Northern Cross to submit additional caribou studies and refer the Casino project to panel review have set off alarm bells within industry circles in the Yukon. One interviewee described the YESAA process as an “arms race” of ever increasing demands for highly technical studies and reviews. There are concerns that the Yukon’s standing as an attractive jurisdiction for the mining industry has been adversely impacted in recent years, evidenced by the Yukon’s ranking on the Fraser Institute’s Investment Attractiveness Index dropping from #1 in 2011 and 2012 to #12 in 2015 (Fraser Institute, 2015). A few interviewees also commented that, while these challenges are real, they have a tendency to become less prevalent when the overall investment climate is strong.

Adopting an advocacy role where matters of regulatory oversight of the mining industry is not a logical course of action for the City; however, it bears reminding that the industry is sensitive to the perception of excessive regulatory requirements. If and/or when industry assumes a more visible footprint in the city, City staff should endeavour to educate themselves about the unique needs of industry and provide assistance and information as needed. City procurement policies should be oriented towards local business (see 6.3). The City would ideally try to time their own larger capital projects to coincide with industry downturns; the upcoming Building Consolidation project should be well-timed in that regard.

6.8 Readiness for Industrial Activity

While Whitehorse has seen little to no mining activity within its boundaries for over three decades, there remains an ongoing need to adequately provide land for the lighter industrial uses that service and supply mining operations in rural Yukon. City staff have indicated that a reasonable supply of either developed or readily developable industrial zoned land exists in Kulan and the lower bench of McCrae. It will be important to ensure those uses are maintained during the upcoming review of the Official Community Plan.

Stakeholders also emphasized the importance of Whitehorse functioning well as a transportation and transition hub for the industry. The reconstruction of the Alaska Highway through Whitehorse, which includes the creation of service roads, will have a direct impact on the city’s ability to accommodate large trucks and trailers safely and efficiently. Kwanlin Dün First Nation’s long-term commercial development aspirations for parcel C-56 (across from Lodestar Lane south of the airport) could also factor into the more efficient servicing of mining workers in transit. The City will want to monitor these developments.

One specific industrial need that was raised during the course of the study was liquid natural gas (LNG) storage and distribution. Future mines are likely to rely on LNG to meet on-site energy needs during the production phase, and Whitehorse could potentially be used as a distribution hub.

7.0 CONCLUSIONS AND RECOMMENDATIONS

A look back at the 2008-2012 growth period in Whitehorse that correlates with the mineral commodity price boom reveals a number of benefits, such as business growth and increased wages, as well as negative impacts to housing affordability. Many of these benefits are typical of the experiences of resource-dependent communities. What is not necessarily typical, however, are the post-boom experiences of the community from 2012 to present. Whereas previous periods of price decreases and mining sector shutdown prompted precipitous drops in the territory's Gross Domestic Product, high unemployment, and emigration, the past three years have seen the Yukon economy and Whitehorse's population remain relatively stable. Social indicators are complex and difficult to accurately monitor, but again – the telltale signs of community pressures associated with mining-induced busts are difficult to discern.

A closer examination of the years preceding the boom reveals a steady trend of population growth at least partially attributable to year-over-year growth in government expenditures, a Downtown building boom, and inadequate land supply. To a large extent, the territory was already in the midst of a boom (albeit a different type) when commodity prices really began to soar. On the whole, both the statistical and anecdotal evidence do not conclusively point to a true resource boom-bust cycle. Where the peak 2008-2012 years of mineral exploration and production are concerned, there is almost certainly a degree of correlation with the range of benefits and impacts experienced in Whitehorse. There is not, however, a convincing argument for causation – at least this time around.

The mining industry has shifted in recent years, becoming an increasingly mechanized and globalized entity that relies on mobile workforces that commute long-distance from other jurisdictions to bridge the labour force gaps intrinsic to the rural areas in which it primarily operates. These factors, combined with the strength of Impact Benefit Agreements (i.e., local hire) with First Nations in the rural parts of the territory, implies that the population growth implications of direct employment in the mining industry (at least in the production phase) are not likely to be significant for Whitehorse. However, the employment opportunities in secondary and supporting industries do have a greater impact on local population. It is also important to recognize that mining activity in the Yukon creates a much lower number of jobs than either the public sector and/or retail industries. This is not to understate its importance to the local economy, but rather to put its relative demands on Whitehorse municipal infrastructure in perspective.

Regardless of causation, the past decade of growth has created a new reality of significantly higher housing prices and a historically high proportion of public sector employment. Whitehorse has evolved from a historic dependence on commodities to a modern dependence on government for its economic base and comparatively high standard of living. Previous mining downturns occurred in an era of significantly lower government spending, higher private sector participation, and unsettled First Nation land claims. In 2016, both governments (municipal, First Nation, and territorial) and the private sector have a changed political, societal, and economic landscape through which to navigate and make policy decisions, one that is set to further shift as Whitehorse-based First Nations enter the land development arena in the coming years.

This changed context should not promote complacency where the mining industry is concerned: rather, it should inform the selection of new approaches, interventions, and attitudes. Whitehorse's development as an urbane, highly liveable city with a quality of life comparable to much larger centres in the south is a comparative advantage that has yet to be properly marketed and promoted both to the mining labour force and other sectors. Its greatly improved transportation, communications, and research capacities provide a strong foundation upon which to reposition the city as an innovative hub serving mining clients both within the territory and further afield and is able to maximize its capture of Yukon-based industry opportunities. The city's many "pull" factors – chief among them wilderness and vibrant arts and culture – serve as important leverage points in attracting the innovators and knowledge sector professionals that will help diversify the local economy and help to remedy its imbalances over the long-term.

Most importantly, the experiences of the most recent cycle provide a reminder of the need for preparedness for population growth. The past one hundred years of history show that Whitehorse's population grows slowly and steadily over the long-term; the past decade illustrates how rapid, pronounced and impactful the

exceptions to that rule can be. The City is generally pro-active with respect to long-term community and sustainability planning, and key municipal infrastructure has additional capacity. However, the minimum 5-7 year timeframe required for major new residential development means that the “what next?” should be attended to, even when lots are available for the foreseeable future. Ensuring an adequate land supply with a built-in margin of error to absorb periods of unexpectedly high growth is critical to avoiding future periods of soaring house prices, housing unaffordability, and the range of negative community impacts that accompany social and economic inequity. Political leadership, medium and long-range planning, and greater collaboration with First Nations are integral to Whitehorse’s ability to grow in a manner that provides a sustainable, equitable platform for economic and social wellbeing for all residents.

Based on its findings, the consultant team offers the following recommendations for City consideration and implementation:

1. Maintain (or increase) funding for City key quality of life amenities that current (and prospective) residents value: parks, trails, downtown beautification, culture, protected green spaces.
2. Ensure an adequate supply of industrial land and granular sources are identified in the 2017 Official Community Plan review.
3. Maintain a minimum two-year supply of residential lots sufficient to accommodate a high population growth scenario.
4. Continue to actively partner on and promote affordable housing and homelessness initiatives.
5. Continue discussions with Kwänlin Dun First Nation, Ta’an Kwäch’an Council, and Government of Yukon aimed at developing a collaborative approach to land development planning in the City of Whitehorse.
6. Continue to provide incentives for residential densification.
7. Explore the feasibility of a pilot project with mining industry, Yukon Chamber of Mines and local businesses to promote Whitehorse to FIFO workers with a potential interest in relocation.
8. Explore avenues for co-learning and relationship and capacity building between the economic development and land/development planning functions of the City of Whitehorse and First Nation governments.
9. Ensure that medium-term (5-10 year) areas for future residential development are clearly identified in the 2017 Official Community Plan review.
10. Link to Government of Yukon and other recruitment/retention initiatives and champion development of a Whitehorse-specific investment/attraction campaign and website.
11. Facilitate/champion mining sector supply/service chain optimization with the Whitehorse business community and First Nations.
12. Champion entrepreneurial culture and innovation.
13. Maximize opportunities for local business in City procurement policy and practice.
14. Complete and implement a comprehensive Capital Asset Management Plan.
15. Ensure the pending updates to the Parks and Recreation and Trails master plans give due consideration to increasing third party/community stewardship and co-management opportunities.

The City should continue to monitor its own performance in key preparedness areas, as well as Whitehorse’s preparedness overall, in the future. To this end, a resource development preparedness “scorecard” has been included in Appendix A.

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KEY CONTACTS

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| | |
|---------------------|---|
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| Stephanie Choquette | Yukon Department of Health and Social Services |
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APPENDIX A.
Resource Development Preparedness:
The “Scorecard”

| Preparedness Parameter | City Influence | Responsible Department | Rationale | Relevant Plans, Programs* | Key Indicators |
|--|----------------|--|---|--|---|
| MUNICIPAL INFRASTRUCTURE AND SERVICES | | | | | |
| Water and Sewer | High | Engineering/ Public Works | Influences City's ability to absorb population growth and maintain high levels of service in a fiscally and environmentally sustainable manner | • Capital Asset Management Plan (in progress) | <ul style="list-style-type: none"> • Incidences of critical system failures/repairs • Achievement of Capital Asset Mgmt Plan • Reported levels of satisfaction for residents • Excess capacity in system |
| Roads | High | | | | |
| Transit | High | Transit | | • Transportation Demand Management Plan (2014) | <ul style="list-style-type: none"> • Ridership rates • Achievement of relevant TDM Plan goals, etc. • Excess capacity in system |
| Solid Waste | High | Sustainability | | • Solid Waste Action Plan (2013) | • Achievement of relevant SWAP goals, etc. |
| Active Transportation | High | | <ul style="list-style-type: none"> • Transportation Demand Management Plan (2014) • AT Commuter Network Improvements | <ul style="list-style-type: none"> • Achievement of relevant TDM Plan goals, etc. • Active commuting participation • Achievement of desired network improvements | |
| Parks and Recreation | High | Parks and Community Development | Access to recreation and wilderness are key factors in attracting new residents and retaining existing ones | <ul style="list-style-type: none"> • Parks and Recreation Master Plan (2007) • Trail Plan (2007) • Regional Parks Plan (2014) | <ul style="list-style-type: none"> • Adequate staffing levels • Number of third party partnerships • Rates of participation in recreational activities • Access to trail networks and other low/no-cost open spaces • Achievement of Plan goals, etc. • Levels of satisfaction for City residents |
| HOUSING AND LAND AVAILABILITY | | | | | |
| Affordable Rental Housing | Low-medium | Planning Services and Economic Development | Key factors influencing recruitment of new residents for economic diversification, retention of younger residents, and recruitment of non-resident resource workers | <ul style="list-style-type: none"> • Housing Action Plan (2014) – Government of Yukon • Various City policies/incentives to increase rental housing stock and densification | <ul style="list-style-type: none"> • Average monthly rental rates • Vacancy and homelessness rates • % of household incomes spent on housing |
| Affordable Home Ownership | Low-medium | | | | <ul style="list-style-type: none"> • Average Real Estate Price for dwelling types • Average monthly rental rates • % of household incomes spent on housing |
| Residential Land Availability | High | | Contributes to a stable housing market and prices during population growth periods | <ul style="list-style-type: none"> • Official Community Plan (2010) • Short, medium and long range residential area planning | <ul style="list-style-type: none"> • Sufficient lots to accommodate construction of 300 units/year • Medium and long-range planning underway • % of household incomes spent on housing |
| BUSINESS COMMUNITY AND LABOUR FORCE READINESS | | | | | |
| Labour Force Readiness | Low | Economic Development | Key determinants of Whitehorse's ability to moderate the "bust" part of the commodity cycle as well as leverage opportunities associated with the "boom" | <ul style="list-style-type: none"> • Yukon Labour Market Framework (2007) – Government of Yukon • Yukon Centre for Innovation in Mining (Yukon College) • Community Economic Development Strategy | <ul style="list-style-type: none"> • % of resident workers in resource sector • % of resident workers in higher skill positions • Availability of/participation rates in industry-oriented training • Rates of educational attainment (high school, post-secondary) |
| Economic Diversification | Low-medium | | | | <ul style="list-style-type: none"> • # of City business licenses • Diversity and innovation of businesses • % of businesses exporting goods and services |

*Plans and programs are City of Whitehorse led unless otherwise indicated

| Preparedness Parameter | City Influence | Responsible Department | Rationale | Relevant Plans, Programs* | Key Indicators |
|---|----------------|---------------------------------|--|--|--|
| BUSINESS COMMUNITY AND LABOUR FORCE READINESS | | | | | |
| Supply Chain Optimization | Low | Economic Development | Key determinant of Whitehorse's ability to leverage opportunities associated with the "boom" | N/A | <ul style="list-style-type: none"> • Yukon-based resource industry expenditures as % of total • # of industry partnerships and contracts |
| COMMUNITY RESILIENCE | | | | | |
| Individual and Community Health | Low-medium | All | Key determinants of Whitehorse residents' ability to benefit from economic growth and successfully adjust to economic downturns, their desire to stay in the community, and their capacity to contribute to community life | <ul style="list-style-type: none"> • Parks and Recreation Master Plan (2007) • Trail Plan (2007) • Regional Parks Plan (2014) • Mental Wellness Strategy (2016) – Government of Yukon • Various Government of Yukon Health and Social Services programs | <ul style="list-style-type: none"> • Availability of family physicians • Accident and accident mortality rates • Life expectancy • Rates of drug and alcohol use • Rates of chronic and acute illness |
| Community Identity, Social Inclusion/ Cohesion and Resilience | Low-medium | Parks and Community Development | | <ul style="list-style-type: none"> • Yukon Social Inclusion Framework (2007) • Various government, non-profit, and private sector activities | <ul style="list-style-type: none"> • Rates of volunteerism • Voter participation in municipal/territorial elections • Number of non-profit organizations • Reported levels of satisfaction for residents |
| Safety and Security | Low-medium | All | | <ul style="list-style-type: none"> • Various government, non-profit, and private sector activities | <ul style="list-style-type: none"> • Incidences of vandalism • Crime rates |

*Plans and programs are City of Whitehorse led unless otherwise indicated