Keeyask Generation Project

Socio-Economic Monitoring Plan

Socio-Economic Monitoring Report

SEMP-2019-01

KEEYASK

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KEEYASK GENERATION PROJECT

SOCIO-ECONOMIC MONITORING PLAN

REPORT #SEMP-2019-01

SOCIO-ECONOMIC MONITORING REPORT

APRIL 2018 TO MARCH 2019:

YEAR FOUR CONSTRUCTION

Prepared by

Manitoba Hydro

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SUMMARY

The Keeyask Generation Project ("the Project" or "KGP" or "Keeyask") Environmental Impact Statement (EIS), completed in June 2012, provides a description of the existing environment, summary of predicted effects and planned mitigation for the Project. Technical supporting information for the socio-economic environment, including a description of the existing environment, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Socio-economic Environment, Resource Use and Heritage Resources Supporting Volume (SE SV).*

The environmental assessment for the KGP used both technical science and Aboriginal Traditional Knowledge (ATK). Mitigation measures were carefully planned and designed to prevent or reduce (to the extent practical), adverse effects from the Project. However, there were uncertainties associated with predicted effects and the effectiveness of planned mitigation measures. To address these uncertainties, many of the predictions and mitigation measures identified in the KGP EIS are supported by monitoring to enable testing of the predictions and timely response when actual results differ from the predictions.

The KGP Socio-economic Monitoring Plan (SEMP) is a commitment made by the Keeyask Hydropower Limited Partnership (KHLP) in Chapter 8 of the KGP EIS. The SEMP is intended to monitor changes over time for certain socio-economic Valued Environmental Components (VECs). The SEMP focuses on key pathways of effect to, and components of, the socio-economic environment, including:

- Economy,
- Population, Infrastructure and Services, and
- Personal, Family and Community Life

This report focuses on SEMP monitoring activities for the Project to March 31, 2019. Key learning's of the SEMP Program over the 2018/19 period and next steps are presented below by monitoring topic area. Efforts will continue in the next year and beyond to implement monitoring activities identified under the SEMP.

EMPLOYMENT AND TRAINING:

- The KGP EIS predicted employment levels for the partner First Nations' members both at peak of construction and for the entire construction period. While a full comparison of person year outcomes cannot be made until the end of construction, total person years of employment to date are exceeding the range of what was predicted for the entire Project.
- Since the start of KGP construction to the end of March 2019, there were 19,260 hires on the Project. Total Manitoba hires represented 12,409 hires. Of this, 5,425 hires represented northern Manitoba (Indigenous and non-Indigenous) hires or 44% of total Manitoba hires.

- Since the start of KGP construction to the end of March 2019, the Project generated 11,347 person years of employment based on a 2000 hour person year[1]. Of this, 6,916 represented Manitoba person years, and 2,652 represented total northern Manitoba (Indigenous and non-Indigenous) person years (38% of total Manitoba person years).
- Since the start of KGP construction to the end of March 2019, the cumulative turnover rate for the Project was 32% of total hires, 44% of Indigenous hires and 24% of non-Indigenous hires.
- Over the reporting period the Keeyask Advisory Group on Employment (AGE) continued as a forum for addressing employment-related issues associated with construction of the KGP. Over the past year, efforts focused on community outreach, improving the pathways for skilled Northern Indigenous workers entering the workforce at Keeyask, filling open On-the-Job training opportunities for designated and non- designated trades, and maintaining the partner First Nations' peak employment numbers achieved in 2017.
- As of March 31, 2019, 1,738 Indigenous employees had training opportunities on the Project: 614 (35%) of these were filled by partner First Nation members.

BUSINESS OPPORTUNITIES:

- The KGP EIS predicted that Project construction would present direct and indirect business opportunities locally, regionally and across the province as a whole.
- Cumulatively, $4,175.1 million has been spent on goods and services for the KGP. Of this, $1,071.1 million were Manitoba purchases. Total northern Manitoba (Indigenous and non-Indigenous) purchases represent $675.2 million or 63% of total Manitoba purchases.
- As of the end of March 2019, 19 KGP Direct Negotiated Contracts (DNCs), ranging from camp services to heavy construction, have been awarded to partner First Nations' businesses with a total value exceeding $700 million. In addition, there have been four DNCs awarded for the Keeyask Transmission Project with a total value exceeding $80 million.
- Key Person Interviews (KPIs) have been undertaken in Thompson and Gillam to ascertain any indirect business opportunities that may have been generated as a result of the KGP. Efforts are underway between Manitoba Hydro and the partner First Nations to complete similar KPIs in the partner First Nations.
- KPIs are underway with key participants involved in the management of the KGP DNCs to understand the role of partner First Nations' businesses in implementation of the DNCs and how they contribute to building partner First Nations' business capacity.

[1] 7,565 person years of employment were generated based on a 3000 hour person year.

INCOME:

- Since the start of KGP construction to the end of March 2019, total labour income earned as a result of the KGP was approximately $1,176.1 million. Of this, Manitoba labour income represented $639.6 million.

EMPLOYEE RETENTION AND SUPPORT PROGRAMS:

- A worker and family survey has been undertaken to assess the experiences of a sample of partner First Nations' members employed on the Project and their families. The worker family survey was undertaken as a collaborative process. The survey instrument was developed through bilateral discussions between Manitoba Hydro and each of Tataskweyak Cree Nation (TCN), York Factory First Nation (YFFN), Fox Lake Cree Nation (FLCN), and War Lake First Nation (WLFN). Community researchers were engaged in each of the partner First Nations to conduct the surveys at site and in each of the communities.
- As survey results have become available, Manitoba Hydro and each of the partner First Nations have and will continue to work collaboratively to review findings and take any actions as may be needed.

CULTURE AND SPIRITUALITY:

- During this reporting period, there were twelve ceremonies held. One hundred fifty-five Indigenous awareness training workshops were held over this same period. Counseling services were available to employees on site on a voluntary basis. These efforts will continue throughout construction.
- On August 31, 2018 a ceremony was held at the Project site to recognize the diversion of the Nelson River through the Keeyask spillway. Held on the south shore of the river within sight of the spillway, the event honoured both Christian and Traditional beliefs by including scripture readings and gospel singers, a pipe ceremony and water ceremony, and a feast for over two hundred people in attendance.

WORKER INTERACTION:

- The KGP EIS anticipated that construction of the Project may result in adverse interactions between non-local construction workers and TCN members, FLCN members and Gillam residents.
- A Worker Interaction Subcommittee was established by Manitoba Hydro prior to the beginning of Keeyask construction as part of a corporate-wide initiative to address anticipated increases in the Gillam area workforce associated with a number of projects and activities.

- In the period from April 1, 2018 to March 31, 2019, the Worker Interaction Subcommittee met three times. Topics addressed in this forum included public safety, community infrastructure and services.

POPULATION:

- The KPG EIS predicted that population change and the related effect on physical infrastructure and services in the partner First Nations and Gillam would be minimal since workers would be hired through the Job Referral Service and cannot be hired physically at site. In addition, there is limited accommodation available in the region.
- Over this past reporting period, modest increases were observed in the WLFN population, and modest decreases were observed in the TCN, YFFN and FLCN populations. Data for the communities dating back to 2003 shows periods of moderate population growth and decline across years. The changes in total population observed from 2017 to 2018 are consistent with the trends observed over time.
- The population of Gillam experienced slight annual increases between 2008 and 2011, and, with the exception of a slight increase between 2012 and 2013, slight annual decreases between 2012 and 2017.

HOUSING, INFRASTRUCTURE AND SERVICES:

- One-time KPIs have been conducted to identify any apparent Project effects on housing, infrastructure and services in the partner First Nations' communities. The results of the YFFN interviews were reported in the 2017-2018 Year in Review. Over this past year, interviews were completed by FLCN, TCN and WLFN.
- The interviews completed by FLCN document that since 2012, filling open positions in the community and retaining skilled workers for community-based jobs has been a challenge due to the availability of higher wages elsewhere. It was observed that some members who are employed on the Project have chosen to move away from the community. The interviews also suggest that due to higher employment rates, fewer members now require social assistance, but that there has been an increase in the number of people accessing the services offered by Awasis[2]. There was no observed change to the demand for housing or education.
- The interviews completed by TCN document a number of challenges faced by service providers in Split Lake. A lack of funding was the main challenge shared by those providing childcare, recreational programming as well as water and sewer services. It was documented that there are currently higher rates of employment in the community (i.e., reduced unemployment), which has reduced overall usage of income assistance in the community. It was also observed that there is a continual need for enhanced counselling

[2] Awasis is the northern agency responsible for the provision of a wide range of services to children and families aimed towards health, well-being and balance within the family unit.

services. In addition, interviewees noted a need for more community activities and recreation facilities. While service providers interviewed indicated that the Project had not changed the way services are provided in the community, an increased presence of drugs and alcohol since the start of the Project has been noted. This increase has resulted in other social effects within families and the community as a whole. Discussions regarding many of the key findings of the interviews are underway within the community and in forums related to the Project.

- The interviews completed by WLFN indicate little change to in- and out-migration, with out-migration continuing to predominantly occur due to individuals and families accessing high school education or other postsecondary training opportunities. Members who leave the community to work on the Project maintain their residency and return. Although in-migration has not changed significantly, the demand for new housing has grown since 2012 with many members expressing interest in living in the community especially with in-community training becoming increasingly available. The most negative outcome identified through the interviews was an increase in drug consumption by members and youth due to greater access to a range of harmful drugs as a result of Project employment. Positive outcomes documented through the interviews include improvements to the wastewater treatment system and equipment purchases that are being funded in part from revenues generated from WLFN participation in the Project. The interviews also revealed the Keeyask experience has strengthened members' commitment to education and training to obtain employment opportunities in general. Discussions regarding many of the key findings of the interviews are underway within the community and in forums related to the Project.
- Discussions regarding many of the key findings of the interviews are underway at the community level and in forums related to the Project.

MERCURY AND HUMAN HEALTH:

- The KPG EIS predicted no effects of the Project during the construction phase in relation to mercury and human health. After impoundment of the reservoir, flooding of soils is expected to release mercury into the environment and food chain. Fish mercury levels are expected to increase especially in jackfish and pickerel in Gull Lake, and to a lesser extent in Stephens Lake, peak about three to seven years after impoundment, and then reduce gradually over 20-30 years.
- The KHLP has prepared a Mercury and Human Health Risk Management Plan in consultation with provincial and federal regulators. This reporting period's key activities included: distribution of communication materials, employment of a 'Mercury Community Coordinator' in each partner First Nation community, a "roll-out" session in each community, a "Know Your Number" campaign as well as monitoring for mercury of fish and in wildlife and plants in the Project area.

TRANSPORTATION INFRASTRUCTURE:

- While the KGP EIS predicted that existing transportation networks and plans for Provincial Road (PR) 280 upgrades would be able to accommodate the changes in road use associated with Project construction, community concerns remain regarding traffic safety and road conditions.
- In the period between April 2018 and March 2019, the PR 280 Joint Advisory Committee met once (in May of 2018).
- A number of mitigation measures have been adopted to reduce the impact of Project traffic on PR 280 including road reconstruction and increased maintenance efforts, operation of the Provincial Trunk Highway (PTH) 6 weigh station near Thompson, the construction and operation of a new temporary weigh station located near the junction of PR 391 and PR 280, and communicating driver expectations to contractors in an effort to promote appropriate driving behavior on PR 280.
- The segment of PR 280 with the highest traffic volumes is located between PR 391 and Split Lake. At this segment, from April 2018 to March 2019, the average traffic counts (northbound and southbound combined) were 347 vehicles per day. Of the 347 vehicles per day, 63 were large trucks.
- Collision rates along PR 280 and PR 290 have remained below the industry standard threshold of 1.50 MVKT. Spot grade improvements, localized design considerations, and other road safety improvements are being implemented to address ongoing concerns and to improve the driving experience for all road users.
- The Keeyask North Access Road connects PR 280 to the construction site. On average, 106 vehicles per day used the road between April 2018 and March 2019.
- The Keeyask South Access Road connects Gillam to the Keeyask construction site. On average, 95 vehicles per day used the road between April 2018 and March 2019. Data is reflective of all traffic types including daily construction activities such as hauling.
- Over the past year, traffic monitoring data indicate that Keeyask related construction traffic varied month to month accounting for between 48% to 87% of all traffic on PR 280 near the PR 280/Keeyask North Access Road intersection.

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1.0 INTRODUCTION

Manitoba Hydro, on behalf of the KHLP received regulatory approval to commence construction of the KGP in July 2014.

The KGP follows the Keeyask Infrastructure Project (KIP), which included a start-up camp and associated infrastructure, a 25 km all weather North Access Road, and the first phase of the KGP main camp.

The KGP SEMP is intended to monitor changes over time for certain VECs. The SEMP focuses on key pathways of effect to, and components of, the socio-economic environment including;

- Economy,
- Population, Infrastructure and Services, and
- Personal, Family and Community Life

The SEMP is part of an integrated and coordinated Environmental Protection Program that has been developed to facilitate an effective transition from planning and assessment to construction and operation of the KGP.

This report focuses on monitoring for the Project from the start of construction to March 31, 2019.

2.0 OVERVIEW OF PROJECT

The Keeyask Generation Project is a 695 megawatt (MW) hydroelectric generating station located approximately 180 km northeast of Thompson and 40 km southwest of Gillam at Gull Rapids on the lower Nelson River. The Project consists of four principal structures: a powerhouse complex, a spillway, dams, and dykes. A reservoir will be created upstream of the principal structures. Supporting infrastructure consists of temporary facilities required to construct the principal structures and permanent facilities required to construct and operate the Project. Temporary infrastructure consists of work areas, cofferdams, rock groins, and an ice boom. Permanent supporting infrastructure consists of North and South Access Roads, a transmission tower spur, communications tower, some borrow areas, excavated-material placement areas, boat launches, and a portage to enable river traffic to bypass the dam.

3.0 OVERALL OBJECTIVES AND APPROACH

The KGP EIS identified primary effects to the socio-economic VECs and defined the process, scope, methods, documentation and application of the socio-economic monitoring for the Project. Overall, the intent of Manitoba Hydro and the partner First Nations has been to reduce adverse effects of the Project and to enhance project benefits to the extent feasible and practical. Monitoring information is intended to assist in this management task. The SEMP for the Project is intended to monitor changes over time for certain VECs in order to, where applicable:

- Test predicted effects in the EIS;
- Identify unanticipated effects related to the Project;
- Monitor the effectiveness of mitigation measures;
- Determine if adaptive management is required; and
- Confirm compliance with regulatory requirements, including terms and conditions in Project approvals.

The SEMP focuses on key pathways of effect to, and components of, the socio-economic environment. The SEMP builds on the assessment studies conducted for the EIS using established methods for data collection and analysis.

4.0 OVERALL SCHEDULE

Monitoring activities associated with the SEMP are more intensive during construction of the Project, but will also occur during the operation phase:

- **Construction Phase** – SEMP monitoring during construction is related to employment and training opportunities; business opportunities; income; population changes; housing; infrastructure and services; transportation infrastructure; public safety and worker interaction; travel, access and safety; and culture and spirituality.
- **Operation Phase** – SEMP monitoring during operation is more limited, and is related to population change in Gillam during the first five years of operation; transportation infrastructure/travel safety at Split Lake; and mercury and human health.

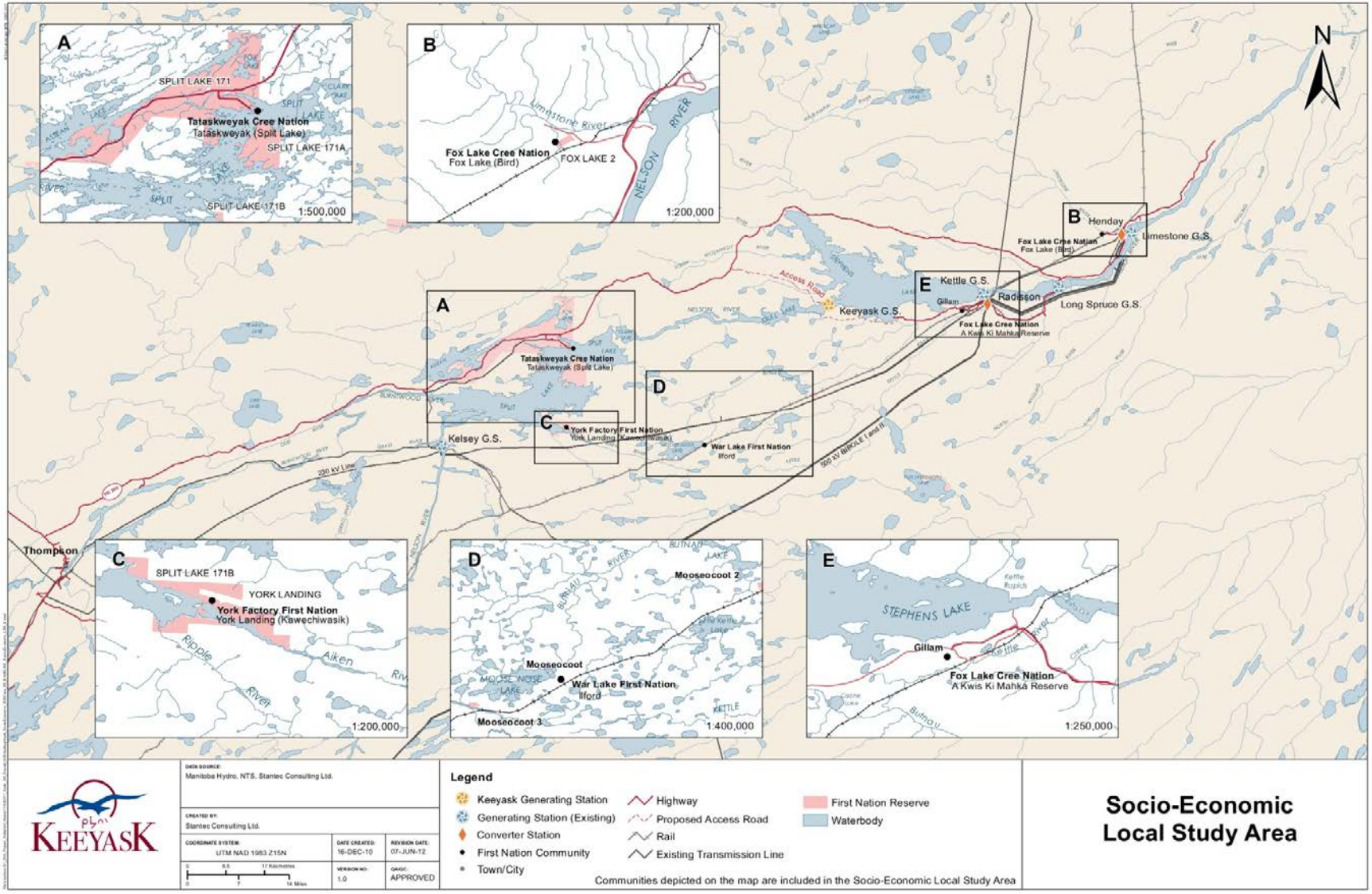
5.0 STUDY AREA

The Socio-Economic Local Study Area for the SEMP (see Map 1) incorporates the Project site, and includes the partner First Nations' communities of TCN at Split Lake, WLFN at Ilford, YFFN at York Landing and FLCN at Fox Lake/Gillam. The partner First Nations may be affected by the Project through the following pathways of effect:

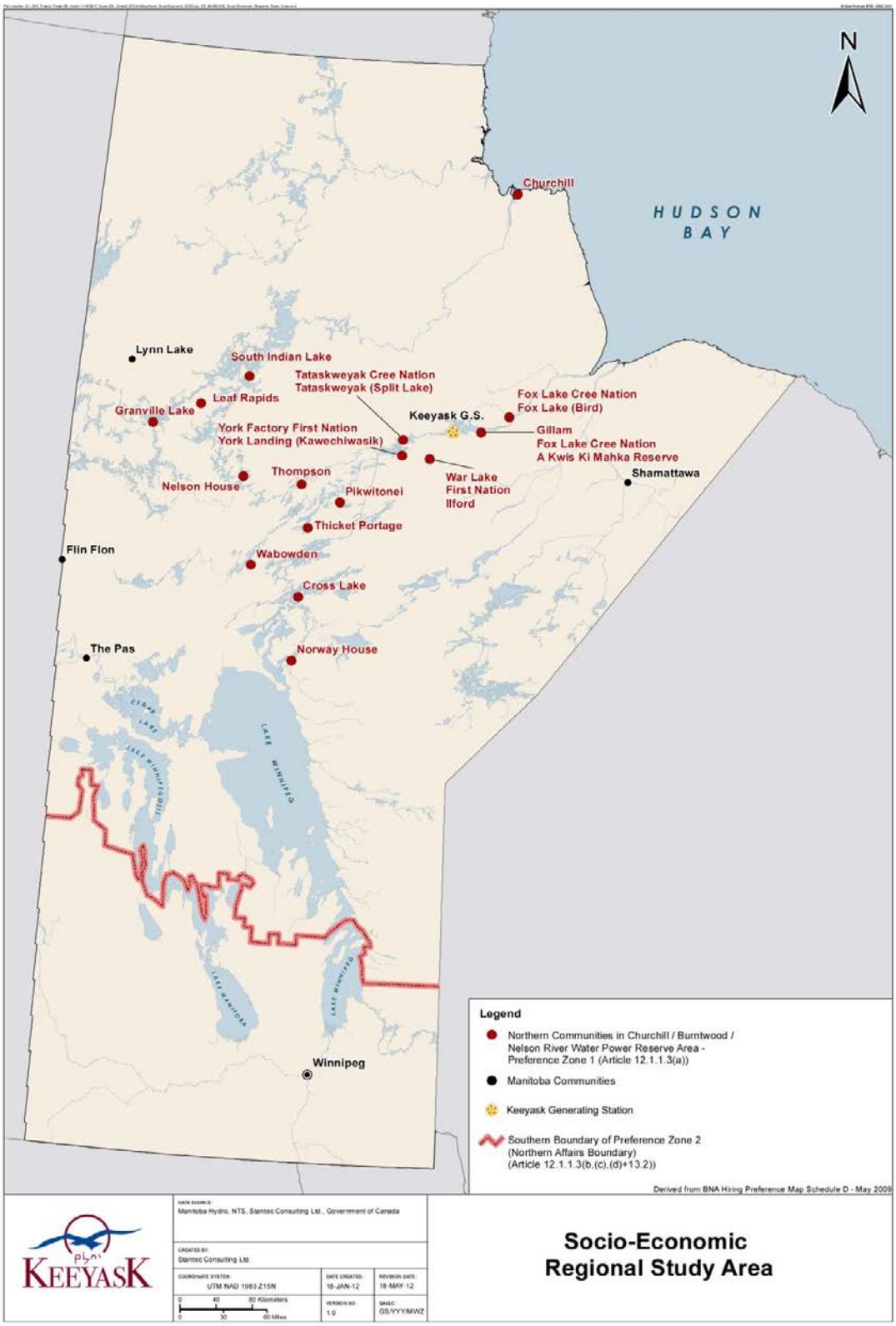
- Physical/biophysical changes to the way the landscape looks;
- Physical/biophysical effects on resource use/traditional use areas and heritage resources;
- Employment and business opportunities;
- Construction traffic;
- Interaction with non-local construction workers within the partner First Nations' home communities; and
- Investment income.

In addition to the partner First Nations' communities, the Town of Gillam and the City of Thompson are included in the Socio-Economic Local Study Area because of their proximity to the Project.

Certain Project effects, in particular preferential hiring of northern Indigenous and other northern workers for construction employment, will extend beyond the Socio-Economic Local Study Area to all of northern Manitoba. For this reason, the Socio-Economic Regional Study Area has been defined as the area pertaining to northern hiring preference and using the boundary identified under Schedule D of the Burntwood Nelson Agreement (BNA) (see Map 2). This includes the Churchill-Burntwood-Nelson (CBN) communities identified in the BNA as part of hiring preference Zone 1.



Map 1: Socio-Economic Local Study Area



Map 2: Socio-Economic Regional Study Area

6.0 ECONOMIC MONITORING

Economic monitoring includes monitoring of all employment, training, business and income outcomes associated with the Project. Monitoring is conducted using a consistent methodology that Manitoba Hydro has used for other major capital projects.

All information regarding economic monitoring is provided from the start of generating station project activities (2014) to the end of March 2019.

Economic impacts can be direct, indirect or induced. Direct impacts result from project expenditures and include employment, purchases, and income generated by the Project. Indirect impacts refer to the employment, purchases and income created in other industries as the effects of project expenditures work their way through the economy. For example, there are indirect impacts on businesses supplying materials and equipment to companies in the direct impact segment. Induced impacts are created by the spending of additional income and profits earned by workers and company owners associated with the Project directly or indirectly. This includes additional spending on food, housing, entertainment, transportation, and all of the other expenses that make up a typical household budget. Adding up the direct, indirect and induced impacts, results in the total economic impact of the Project.

6.1 EMPLOYMENT AND TRAINING

The Project EIS analyzed and provided employment estimates for partner First Nations, the Indigenous workforce in the CBN area and the Indigenous workforce in the Socio Economic Study Area as a whole (see SE SV Section 3.4.1) for the construction phase of the Project. The EIS also predicted that there would be northern participation in the operating jobs required to operate the facility.

Monitoring of employment and training is being undertaken, to determine the overall employment outcomes of the Project construction, with particular emphasis on Indigenous and northern resident participation. Monitoring is also intended to determine the extent to which recipients of Hydro Northern Training and Employment Initiative (HNTEI) pre-project training (PPT) participated in Keeyask construction jobs, and received on-the-job training. It was estimated that the levels of participation would be influenced by several factors, including timing of the opportunities and the level of interest by potential workers in pursuing those opportunities.

Monitoring of employment outcomes provides data on overall success in attracting and retaining partner First Nation members, Indigenous persons and Manitobans during Project construction.

As noted within the SEMP, the Project has an established AGE that is a forum to address employment-related issues related to the construction of the Project, and in particular Indigenous employment. The AGE is established to receive, review and find solutions to

concerns and issues and to monitor, report and make recommendations to the Project manager on employment-related matters, as required.

During construction, employment data is collected on site by contractors through an employee self-declaration form designed specifically for the Project. All completed forms are provided by on-site contractors to Manitoba Hydro and stored in a central database for the Project. Contractors also provide information to Manitoba Hydro on hours worked and labour income to enable calculations for person years and income during construction. Employment data is provided in the formats outlined below:

- Person years – When part-time and/or seasonal workers are used, it is useful to standardize the hires in terms of person years of employment. Person years of employment are defined as the amount of work that one worker could complete during twelve months of full-time employment. This usually means about 2,000 hours of work per year using a standard 40 hour work week in most industries; whereas for Keeyask construction work, a person-year of employment represents 3,000 hours of work per year. The person-years of employment presented below are shown both at 2,000 hours of work per year, for economic comparisons to other industries, as well as at 3,000 hours (identified in parentheses) of work per year.
- Hires - Refers to the number of times people were hired on the Project site for any duration.
- Employees - Refers to the number of individuals hired. The variance between Hires and Employees can be attributed to an individual being hired to the Project more than once.
- Type (job classifications) of work available.

Training data is collected by Manitoba Hydro through established methods utilizing contractor on-the-job reporting, and the completion of an employee self-declaration form. HNTEI PPTs are tracked by comparing self-declared Employee Report information to the Manitoba Hydro HNTEI database.

6.1.1 PERSON YEARS OF EMPLOYMENT

From the start of construction to March 31, 2019, direct employment on the Project totaled 11,347 (7,565) person-years. As shown below, 61%, or 6,916 (4,611) of these person-years, represent people already living in Manitoba.

Of the 61% of employees already living in Manitoba:

- Northern Manitobans represent 39%, or, 2,652 (1,768) person-years;
- Other Manitobans represent 62%, or 4,264 (2,843) person-years;
- Indigenous employment represents 51%, or 3,503 (2,335) person years; and
- Non-Indigenous employment represents 49%, or 3,413 (2,275) person-years.

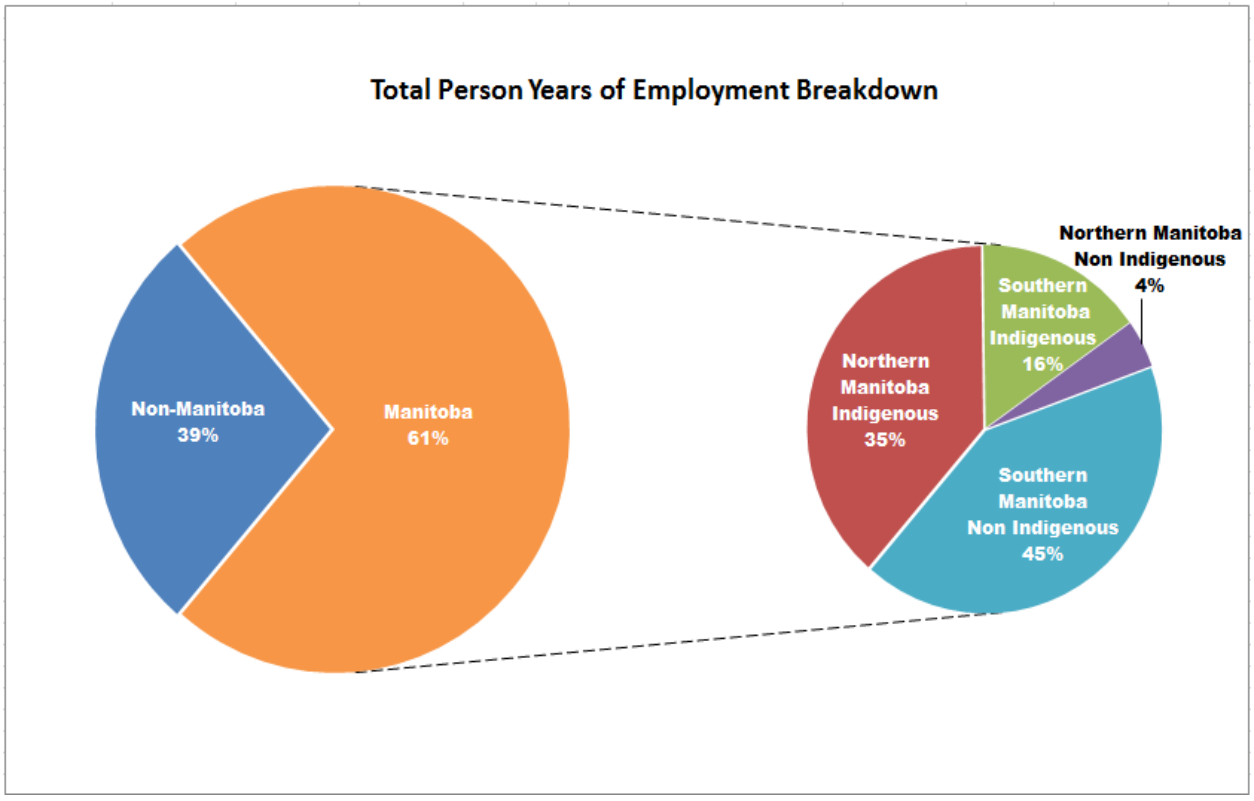


Figure 1: Person Years of Employment (Start of Construction to end of March 2019)

6.1.2 HIRES

From the start of construction to March 31, 2019, there were 19,260 hires on the work site. Of the total hires, 12,409 or approximately 64% were Manitobans:

- Total northern Manitoban hires represent 44% (5,425) of Manitoba hires;
- Indigenous hires represent 56% (6,920) of Manitoba hires; and
- Non-Indigenous hires represent approximately 44% (5,489) of Manitoba hires.

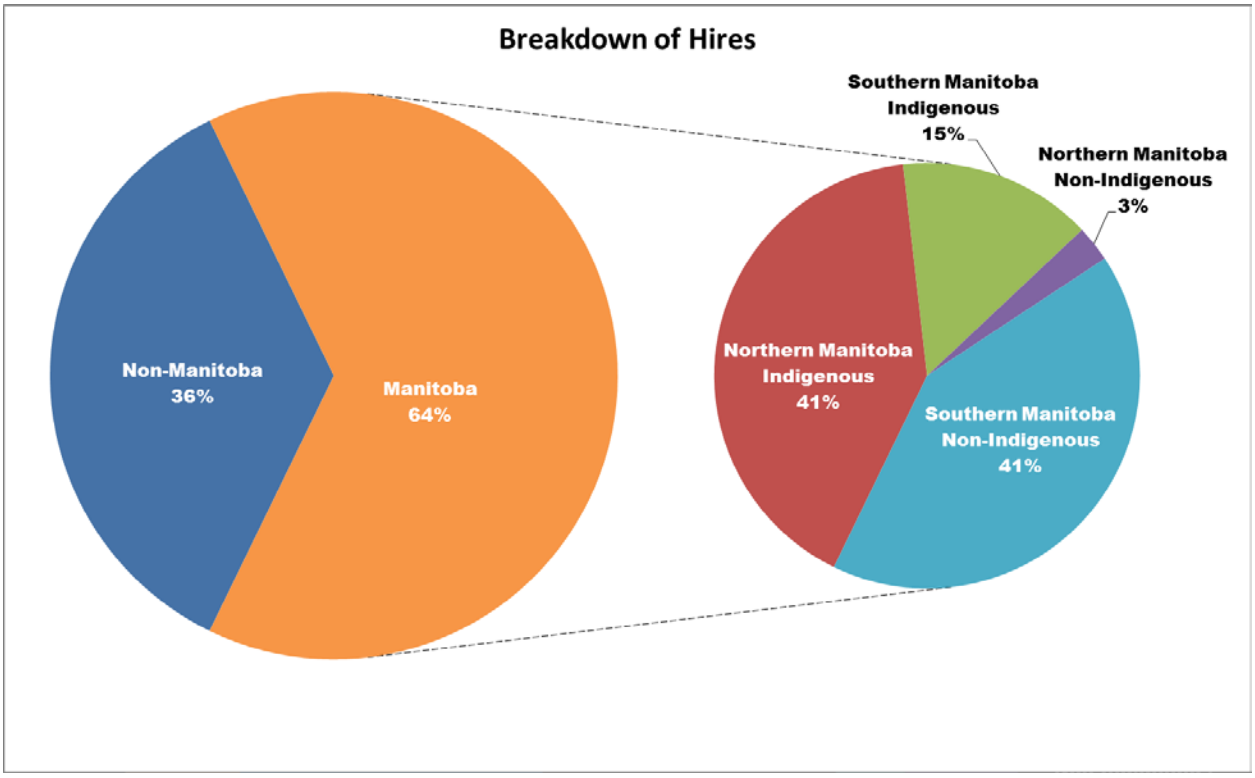


Figure 2: Number of Hires (Start of Construction to end of March 2019)

6.1.3 INDIVIDUAL EMPLOYEES

From the start of construction to March 31, 2019, a total of 9,598 individual employees were hired on the KGP. Of this, 58% (5,581 individual employee hires) were Manitobans:

- Total northern Manitoban employees represent 41% (2,294) of Manitoba hires;
- Indigenous employees represent 53% (2,946) of Manitoba employees; and
- Non-Indigenous employees represent approximately 47% (2,635) of Manitoba employees.

The total number of employees is less than the total number of hires (19,260) because the same individual may have been hired more than once. For example, an individual may have moved to work on a different contract or moved to a different job classification to improve their position. The difference of 9,662 identifies the number of re-hires at the Project site.

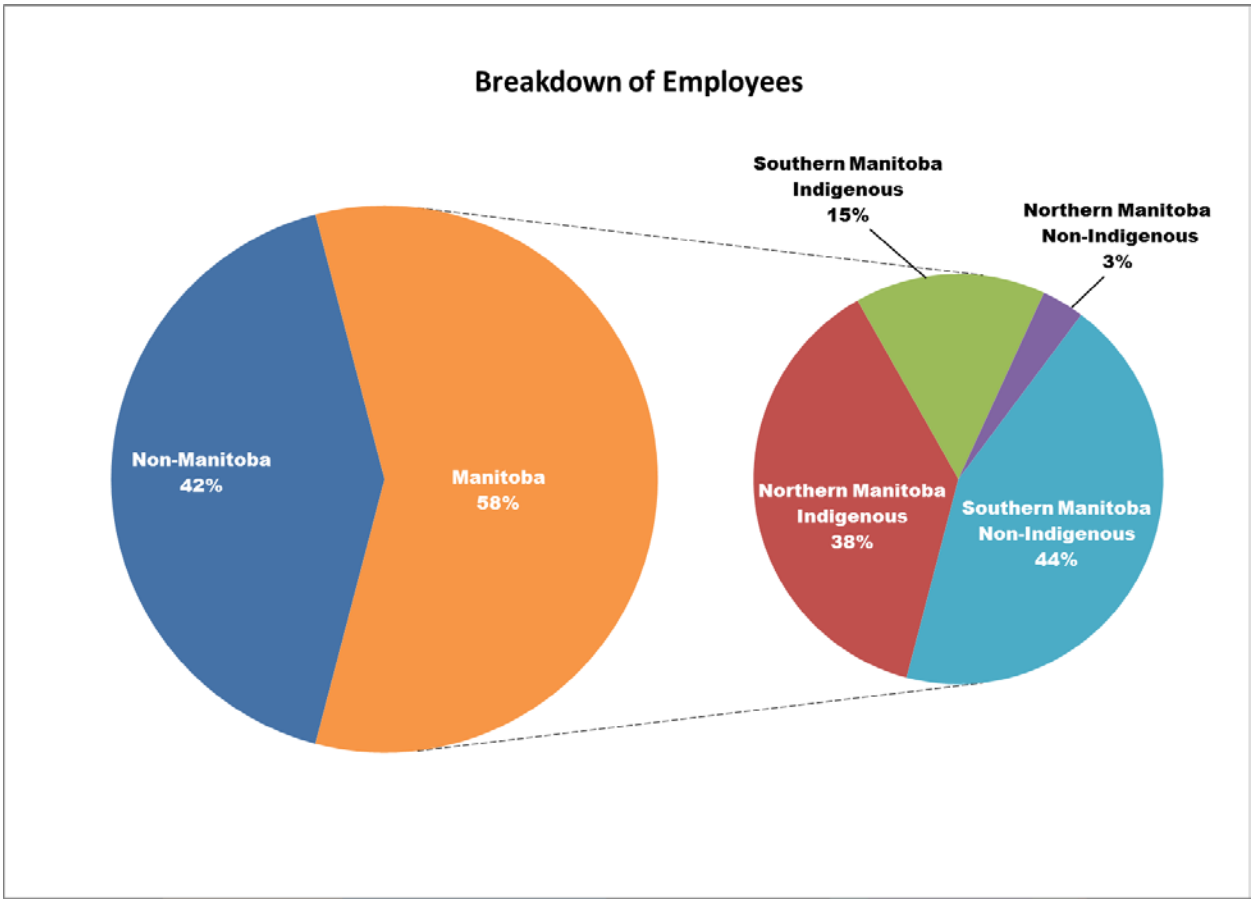


Figure 3: Total Individual Employees (Start of Construction to end of March 2019)

The number of individual employees to date does not reflect the number of employees on site at a given time. The number of employees on site at any given time varies depending on the work in progress and the time of year. The number of employees on site is usually highest during the period from late spring through early fall, which is typically the period with the highest level of construction activity and the largest workforce on site. The actual number of employees on site over the course of the year ultimately depends upon the work plans and schedules of the contractors for the various Project components, in conjunction with the provisions of the BNA, which is the collective bargaining agreement for the Project.

6.1.4 EMPLOYMENT IN THE PARTNER FIRST NATIONS

Construction of the KGP has resulted in the establishment of full and part time positions in each of the partner First Nations. While these positions have experienced vacancies, overall the number of positions filled over the last reporting period as a result of construction of the KGP has included:

- Nine full time and three part time positions at FLCN;

- Nine full time positions at TCN;
- One full time positions at WLFN; and
- Ten full time positions at YFFN.

These positions have been created on the basis of community specific work plans for the implementation of governance and other commitments in the JKDA.

The partner First Nations also have a total of five positions associated with the Job Referral Service (i.e., Job Seeker Manager staff) who work within their respective communities to assist community members in accessing Keeyask employment opportunities. Additionally, each partner First Nation has one Keeyask Site Representative whose employment is reported within the construction employment statistics because they work a portion of their time in the community and at the Keeyask Project site.

6.1.5 TYPE OF WORK (JOB CLASSIFICATION) AVAILABLE

The total cumulative hires by job classification (to the end of March 2019) are provided in the table below. For employee privacy and confidentiality reasons, the numbers of hires by community cannot be disclosed, as the numbers are low for some of the classifications listed.

Table 1: Total Hires by Job Classification (Start of Construction to end of March 2019)

Job Classification	Total Hires	% of Total Hires	CBN	Indigenous	Non-Indigenous	Northern MB	Other MB	Non-MB
Labourers	3271	17%	920	1726	1545	1312	1282	677
Security Guards	185	<1%	15	66	119	44	141	<5
Crane Operators	359	2%	8	49	310	21	212	126
Equipment Operators	1688	9%	237	541	1147	383	648	657
Teamsters	1542	8%	351	742	800	531	663	348
Carpenters	3380	18%	113	696	2684	302	694	2384
Millwrights	79	<1%	<5	9	70	<5	72	<5
Painters	25	<1%	<5	7	18	<5	17	7
Glass Workers	<5	<1%	<5	<5	<5	<5	<5	<5
Floor Covering Installers	9	<1%	<5	<5	9	<5	8	<5
Insulator Workers	100	<1%	<5	23	77	<5	86	12
Lathing and Drywall Workers	46	<1%	<5	8	38	<5	18	27
Cement Masons	340	2%	<5	43	297	6	112	222
Bricklayers	24	1%	<5	<5	22	<5	24	<5
Sheet Metal Workers	24	<1%	<5	5	19	<5	21	<5
Roofers	35	<1%	<5	5	30	<5	32	<5
Sheeters, Deckers and Cladders	69	<1%	<5	13	56	<5	47	20
Boilermakers	38	<1%	<5	<5	35	<5	35	<5
Iron Workers	1016	5%	19	261	755	62	437	517
Rodmen	273	1%	<5	46	227	<5	39	231
Electrical Workers	441	2%	46	114	327	90	328	23
Plumbers and Pipefitters	349	2%	21	81	268	33	274	42
Refrigeration Workers	32	<1%	<5	15	17	<5	22	7
Sprinkler System Installers	6	<1%	<5	<5	5	<5	6	<5
Office and Professional Employees	1477	8%	199	521	956	348	786	343
Caterers	2212	11%	1497	2140	72	2081	88	43
Elevator Constructors	9	<1%	<5	<5	9	<5	9	<5
Other*	2229	12%	130	312	1917	194	881	1154
Total Hires	**19260**	**100%**	**3565**	**7429**	**11831**	**5425**	**6984**	**6851**

*The "Other" category refers to hires in job classifications not covered by the BNA, i.e. "out of scope" positions. This would include managerial and supervisory staff (both Contractor and Manitoba Hydro), other Manitoba Hydro on-site staff and certain technical staff (engineers and technicians).

6.1.6 RATES OF TURNOVER

The cumulative rate of turnover is calculated as total incidents of separation, for discharges and resignations, divided by hires[3] from the start of construction to a given point in time. The cumulative rate of turnover does not include layoffs or transfers to other positions or contracts.

From the start of construction to March 31, 2019, the cumulative turnover rate for the Project is 32% for total hires, 44% for Indigenous hires and 24% for non-Indigenous hires.

[3] Hires for calculating turnover has been modified to exclude Contract 016125 (Emergency Medical Services), Contract 16180 (Nurse Practitioners) and all environmental monitoring contracts as hiring and work scheduling practices for these contracts can misrepresent the true turnover rate.*

Table 2: Turnover

	Total Discharges	Total Resignations	Total Separations	Rate of Turnover
CBN	215	1595	1810	53%
Indigenous	377	2770	3147	44%
Non-Indigenous	324	2323	2647	24%
Northern Manitoba Indigenous	267	2188	2455	50%
Northern Manitoba Non-Indigenous	17	85	102	30%
Manitoba	537	3650	4187	37%
Non-Manitoba	164	1443	1607	24%

Note: Figures above are not additive

There have been instances where individuals have been discharged or resigned, but later returned to work on the Project. This occurred 1,999 times, approximately 38% of the total discharges and resignations.

It is also useful to look at the amount of turnover within certain time periods throughout the life of the Project. When looking at a specific period within the life of the Project, turnover is expressed as total incidents of separation (for discharges and resignations), divided by hires working on site within that specific time period. Since the start of construction, and as shown in the Figure 4 below, the amount of turnover within a given quarter has ranged from 5.9% to 16.4%. Of this, turnover among Indigenous employees has ranged from 9.3% to 23.6% and among non-Indigenous employees from 4.6% to 12.4%. While there has been variation in the amount of turnover across each quarter, overall the amount of turnover for the workforce in Q1, 2019 is lower than in Q3, 2014. Among Indigenous workers the amount of turnover is higher than the Q1 turnover in 2018, but lower than the Q1 turnover in previous years.

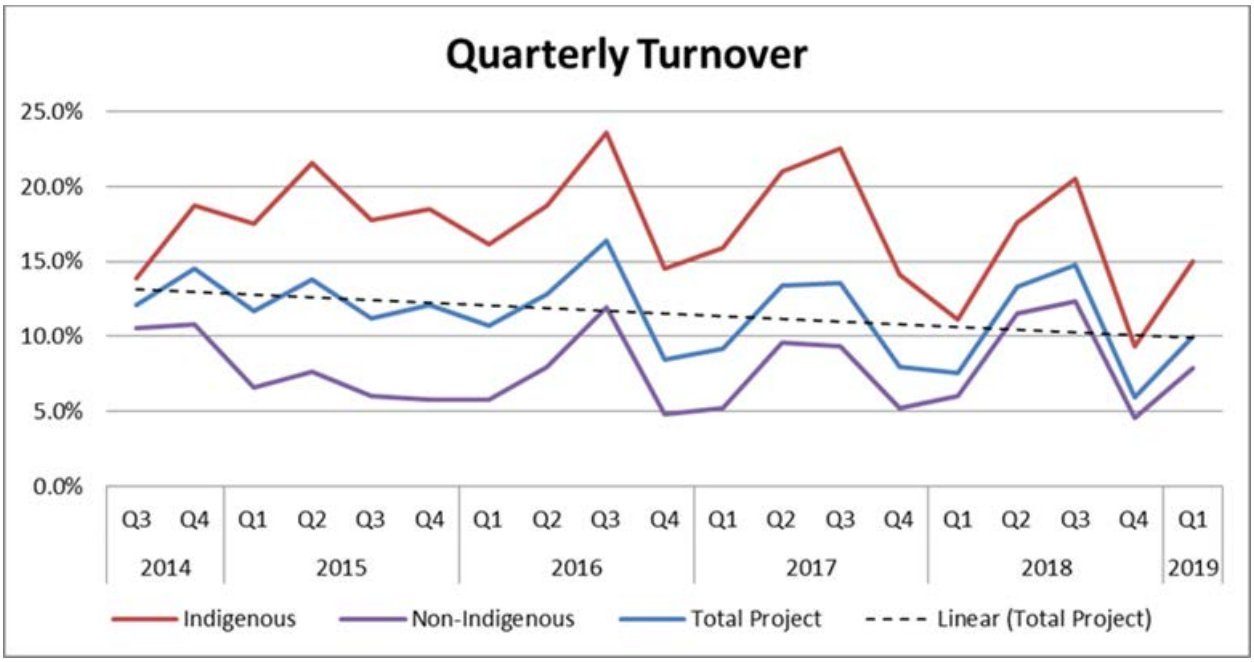


Figure 4: Quarterly Turnover (Start of Construction to end of March 2019)

6.1.7 EMPLOYMENT MITIGATION

6.1.7.1 THE ADVISORY GROUP ON EMPLOYMENT

The AGE is a forum for addressing employment-related issues, in particular Indigenous employment, related to the construction of the Project. The committee includes representatives from the Province of Manitoba, contractors, Manitoba Hydro, Hydro Projects Management Association, Allied Hydro Council and the partner First Nations.

Since the start of KGS Construction, an emphasis has been placed on reaching skilled Indigenous workers in the partner First Nations, reducing the obstacles for northern Indigenous workers to enter apprenticeships and to fill open on-the-job training opportunities. The goal is to maintain the partner First Nations' peak employment numbers during the construction season and to have more Indigenous workers trained for future job opportunities beyond Keeyask. The AGE committee has created a collaborative environment for interaction, fact finding, and developing solutions to issues that are raised.

Job Seeker Managers (JSMs) are based in each of the four partner First Nations and are supported by the Province of Manitoba, Thompson Job Referral Service (JRS) team and Manitoba Hydro. Each JSM is responsible for developing an annual community employment plan. Each plan is unique to the community, but all plans have common goals including improving the ability for employers to make contact with members and ensuring that members' Job Seeker profiles are up to date. In addition, partner First Nation site reps support the

JSMs, and help contact community members referred for jobs or for an open training opportunity.

The JSM's and Province, with support from Manitoba Hydro, continue to work on what the AGE committee has identified as a key factor to increasing the partner First Nation workforce on the Project: reducing the number of job seekers who cannot be contacted. Several strategies are being used to ensure registration contact information is up to date such as: career counseling, community based employment sessions and assisting with updating candidate profiles. Additional methods of contacting candidates have been used including: emails; phone calls during weekends, holidays and the time preferred by job seekers; Facebook postings; and cellular text messages.

In February 2019, partner First Nation job seekers, who had not previously worked at Keeyask, attended a Site Orientation session. Attendees had the opportunity to experience the Project first-hand, learned more about employment and training opportunities from the contractors, and saw first-hand what it is like to live and work at Keeyask. Attending community members showed great interest in learning more about Keeyask and becoming employed on the Project.

The Province of Manitoba, with community JSMs, continued to deliver career counseling, through the Keeyask Employment Project (KEP) Referral List. The KEP list identifies an individual's current trade and level as well as preferred trade(s) or area of interest, and is used by contractors following the direct hire provisions under LOA 44 for on-the-job training opportunities. The KEP Referral List is distributed regularly to contractors who direct hire individuals into training and apprenticeship opportunities prior to posting a job order through the JRS. Use of the KEP Referral List continues to receive positive reviews from both contractors and job seekers and has proven to be successful in identifying and filling training and apprenticeship positions in an expeditious manner.The Keeyask Workplace Essential Skills Training (KWEST) Centre, continued to operate throughout the year, and has been onsite since August 2016. The goal of KWEST is to provide new and existing workers access to skill development support, to enhance their capacity to participate in on-the-job training, to carry out workplace tasks effectively and efficiently, and to prepare for advanced training and employment opportunities. Essential skills assessment, administered by Workplace Education Manitoba, establishes the candidate's development plan for the trade they are in or are interested in pursuing. The tool allows the trainer and student to address skill gaps through tutorials and small group sessions which are provided at the KWEST Centre. Contactors are also using the service to deliver targeted training in support of skill development program for their workforce. Since its inception, KWEST has provided services to nearly 270 clients.

Community engagement sessions were also held to inform job seekers about the various opportunities at Keeyask and for attracting potential workers into open on-the-job opportunities. The events include Keeyask contractors who share company and job information, representatives from the JRS, Workplace Education Manitoba, and Apprenticeship Manitoba. Engagement sessions were held throughout February 2019 in the partner First Nation communities of WLFN, FLCN and YFFN communities. Job seekers were able to learn about

employment and training opportunities at Keeyask, register with the JRS, participate in career planning, sign-up for essential skills upgrading, and speak with various contractor representatives about what it means to work at Keeyask or be in the apprenticeship program.

6.1.8 TRAINING

On-the-job training programs were developed at site to hire individuals as trainees and apprentices and to enhance their qualifications for further career development. The programs offered during the last year were in the following areas:

- Catering, janitorial services and housekeeping
- Maintenance services
- Emergency medical and ambulance services
- General civil contract
- Spillway and intake gates, guides and hoists

As of March 31, 2019, 1,738 Indigenous employees had participated in training opportunities on the Project (301 in on-the-job programs): 614 of these were filled by partner First Nations' members (174 in on-the-job programs). Apprenticeship opportunities were available in trade classifications such as Mobile Crane Operators, Mechanics, Carpenters, Millwrights, Iron Workers, Plumbers & Pipefitters, Cement Masons, Electricians, Refrigeration Workers, Dozer Operator, Loader and Rock Truck Drivers, Fitness Leaders, Hospitality Management and Red Seal Cooks.

In addition to the Project's on-the-job programs, Manitoba Hydro also hosted partner First Nation summer students at the Keeyask site this year. This has been done annually for the last three seasons. In the summer of 2018, there were two groups of students at site for two weeks each. Group one ran from July 2 to July 22 and included four students from TCN. The second group ran from July 16 to July 27 and included three students: two from YFFN and one from TCN. The students worked with the following Manitoba Hydro groups:

- Environment
- Camp Operations
- Earthworks and Excavations
- Mechanical/Electrical
- Surveys

Three hundred and fifty-two (352) individuals employed on the Project site were participants of the past HNTEI PPT Program. HNTEI PPT Program trainees have gained employment in craft trade positions as labourers, security guards, crane and equipment operators, teamsters, carpenters, iron workers, rodmen, electrical workers, plumbers and pipefitters, office and

professional employees, caterers, cement masons, millwrights and painters. They have also gained employment in out-of-scope positions such as safety and environmental staff, employee retention and support staff and as trade supervisors. Of the 352 individuals, 82 remain active on the Project as of March 31, 2019.

6.2 BUSINESS OPPORTUNITIES

Project construction will present direct and indirect business opportunities locally, regionally and across the province as a whole. Business outcomes of Project construction are being tracked, with a particular focus on Indigenous and northern Manitoba business participation.

Direct impacts result from Project expenditures and include employment, purchases, and income generated by the Project. Indirect impacts refer to the employment, purchases and income created in other industries as the effects of Project expenditures work their way through the economy. For example, there are indirect impacts on businesses supplying materials and equipment to companies in the direct impact segment.

6.2.1 DIRECT PROJECT EXPENDITURES

There was $4,175.1 million spent on goods and services for the Project. Of this, $1,071.1 million were Manitoba purchases. Total northern Manitoba (Indigenous and non-Indigenous) purchases represent $675.3 million or 63% of the total Manitoba purchases. This information reflects direct purchases of the Project for contractors and services. Indirect purchases made by contractors, in turn, would include purchases of goods and services from Manitoba based businesses. Figure 5 summarized the breakdown of total purchases to date.

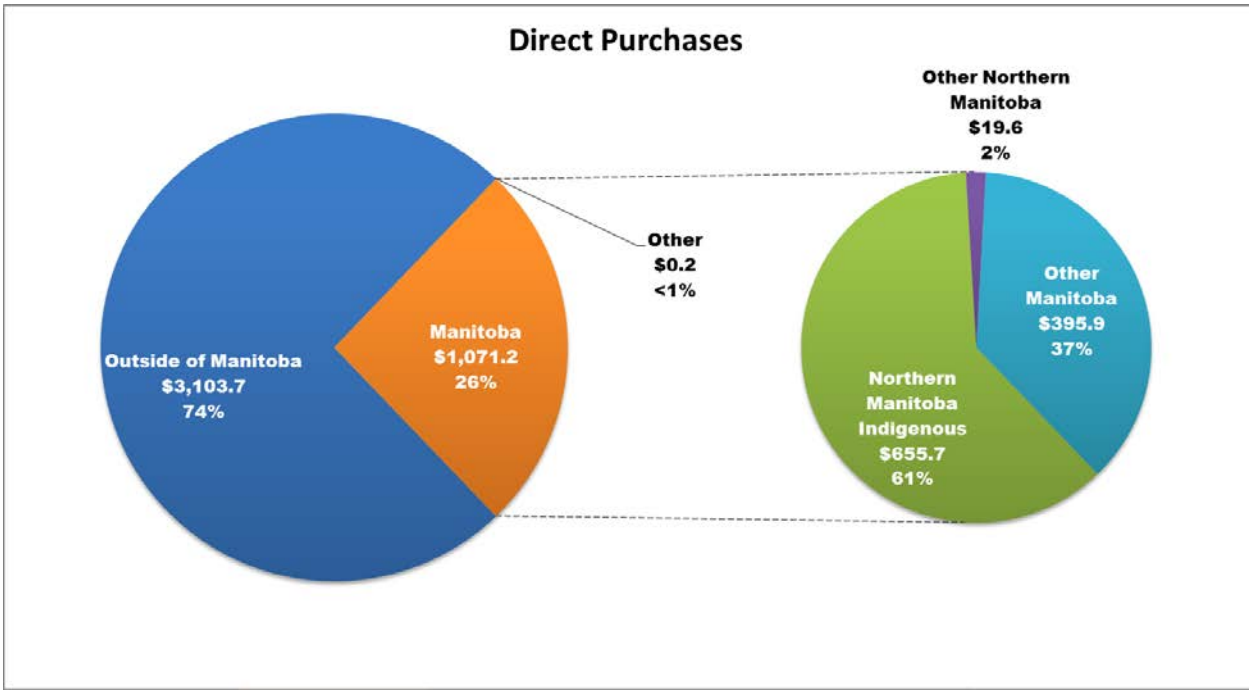


Figure 5: Direct Purchases

6.2.2 INDIRECT AND INDUCED BUSINESS SURVEY

A KPI program to understand the indirect business opportunities generated as a result of Project-related expenditures in Thompson, Gillam and the partner First Nation communities was initiated in 2018. Twenty-eight and ten interviews were competed in Thompson and Gillam, respectively, in 2018. Interviews in the partner First Nations' communities have begun and are anticipated to be completed in 2019.

The results from the Thompson interviews suggest that the Keeyask Project has had a generally positive impact on the Thompson business community. Key findings include:

- Approximately 75% of respondents indicated producing goods and services attributable to the Project.
- Approximately 68% saw Keeyask as having a positive impact on their business with 20% indicating that Keeyask had not impacted their business and 12% uncertain as to any impact.
- Of those businesses indicating a positive impact 43% saw the change as modest, 50% saw the change as moderate and 7% as extreme.
- The majority of businesses positively impacted by Keeyask attributed the benefits to spending by project contractors and, to a lesser degree, spending by construction workers and their families.

- When asked whether the Project had affected employment levels at their business, approximately 33% of respondents indicated yes, 63% indicated no and 4% were unsure.
- The majority (83%) of participating businesses indicated that the pool of available workers in Thompson had not generally been impacted due to the Project.

The results from the Gillam interviews suggest generally positive impacts or a neutral perspective on the Project. Key findings include:

- Approximately 90% of respondents indicated their business had provided goods and services they could attribute directly to the Project. However, only 50% of respondents indicated that their businesses had been impacted positively by the Project, while 30% indicated Keeyask had impacted them negatively and 20% indicated that Keeyask had not impacted them or they were uncertain as to its impact.
- Of those businesses indicating that they had been impacted by Keeyask, 25% described the change as modest, 63% as moderate and 16% as extreme. All businesses positively impacted by Keeyask attributed the impact to spending by project contractors and to a lesser degree by construction workers and their families.
- Negative impacts on businesses related to Keeyask identified in the survey included community members being away from the community while working at site, and a related general change in demand for goods and services in the community.
- Only one survey respondent indicated that Keeyask had impacted the availability of skilled and/or qualified workers in the community.
- Only 1 respondent indicated that Keeyask has had an effect on employment levels while the remaining respondents indicated it had not.

The full Thompson and Gillam Indirect and Induced Business Survey Report is included as Appendix 1.

6.2.3 DIRECT NEGOTIATED CONTRACTS

As part of the JKDA, Manitoba Hydro and the partner First Nations committed to negotiate a series of business opportunities for the Project as DNCs with partner First Nation businesses.

As of the end of March 2019, 19 DNCs for the Keeyask Project had been awarded to the partner First Nations, with a total value of exceeding $700 million. DNCs awarded to partner First Nations included work undertaken on the following components of the Project:

Services (throughout Infrastructure and Generation projects)

- Catering & janitorial services

- Security services
- Camp maintenance services
- Employee retention & support services
- Emergency medical services

Supporting Infrastructure

- PR 280
- North Access Road (Part A & B)
- Start-up camp and work areas site preparation
- Looking Back Creek bridge
- Work areas site development

Generation Station

- Southside containment dykes
- South Access Road
- Reservoir clearing
- Upstream and downstream boat launches
- Reservoir spawning shoals
- Ellis Esker Winter Trail

In addition, there have been four DNCs awarded to TCN for the Keeyask Transmission Project with a total value exceeding $80 million. The DNCs have been highly successful in providing significant employment opportunities for members of the partner First Nations.

The KGP EIS predicted that Project construction will provide direct and local business opportunities with DNCs, among other mechanisms, encouraging participation of northern Aboriginal businesses. To better understand the role of partner First Nations' businesses in implementing the DNCs and how the DNCs contribute to building partner First Nation business capacity, a KPI program was identified to occur at peak construction and again at the end of construction. Between January 2018 and February 2019, the first set of these KPIs were completed by both Manitoba Hydro staff and partner First Nations' researchers. Interviewees were chosen by the partner First Nations and included Chief and Council representatives as well as senior First Nation staff who have had involvement in negotiating and/or managing KGP DNCs. In total, five people from three of the partner First Nations were interviewed. Input from TCN is expected in the coming year. The SEMP indicates that the results of these interviews will be reported to the KHLP. At a high level, with one exception, interviewees described the Keeyask DNCs as a positive initiative for their respective communities. While not without their

challenges, the DNCs were opportunities for members to advance their personal skills and employment experience. The DNCs were also described as providing substantial community benefit through the revenues received which are being used differently depending on the community.

6.3 INCOME

Project construction has generated income from a number of sources including employment, business opportunities and payment of taxes. Partner First Nations' income has originated mainly from employment and to a lesser extent from business opportunities resulting from construction. During the operation phase, the partner First Nations will receive equity income as a result of being partners in the Project.

Labour income is an important indicator of the economic impact of a project. It is the sum of wages and salaries earned by workers.

6.3.1 LABOUR INCOME[4]

From July of 2014 to March 2019, the KGP has generated $1,176.1 million in total labour income. Of this, Manitoba labour income represented $639.6 million or approximately 54% of total labour income. Of total Manitoba labour income, Indigenous labour income represented approximately $282.5 million (44%), northern Manitoba Indigenous labour income represented approximately $173.2 million (27%), northern Manitoba non-Indigenous labour income represented approximately $25.3 million (4%), and non-Indigenous labour income represented $357.1 million (56%). Partner First Nations' labour income represented approximately $96.4 million (13% of total Manitoba labour income).

[4] Labour income is calculated based on information provided by contractors and Manitoba Hydro.

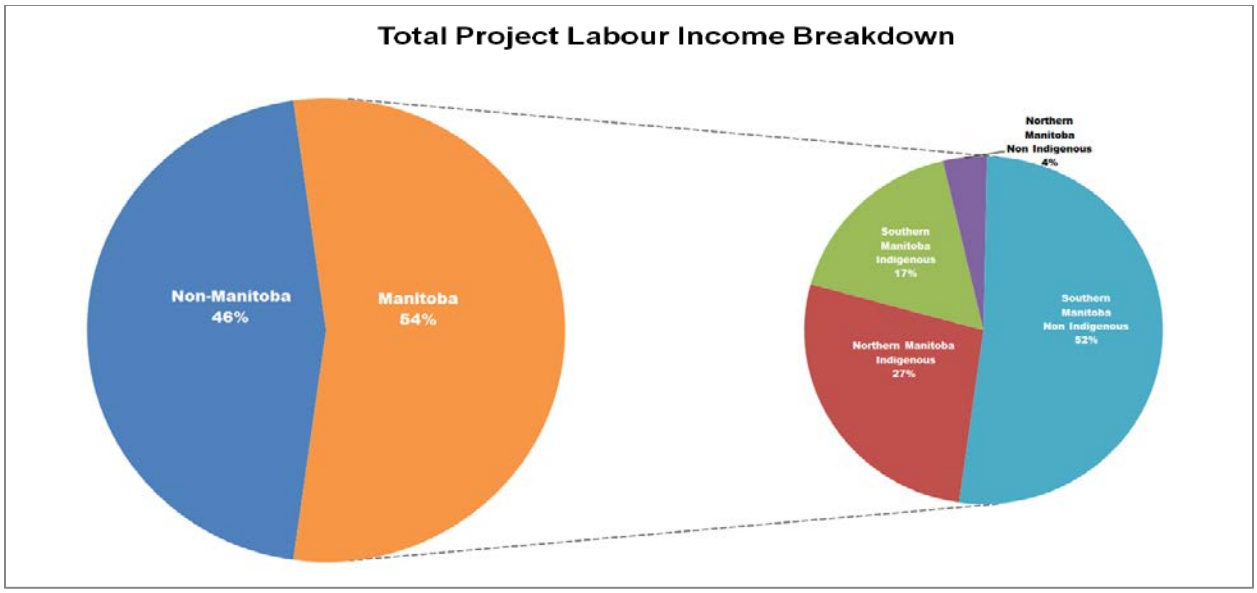


Figure 6: Labour Income

7.0 SOCIAL MONITORING

7.1 KEEYASK WORKPLACE CULTURE

As predicted in the KGP EIS, construction of the Project has required a large temporary workforce comprised of both local and non-local workers. The Keeyask workforce includes individuals from other parts of Manitoba, Canada and other countries, with diverse cultures, perspectives and experiences. The KHLP is committed to creating a respectful workplace culture for all employees at the Project site. A Harassment and Discrimination Free Standard has been implemented at the Project site. The Standard describes a strong vision for a workplace free from discrimination and harassment and emphasizes the importance of being respectful of different cultures. Achieving this goal is the responsibility of everyone involved in the Project.

In the fall of 2016, in response to concerns raised by the partner First Nations and their members working on site, a consultant was contracted by the KHLP to independently review the Project site's workplace culture. The independent Keeyask Workplace Culture Assessment (KWCA) confirmed that discrimination and harassment exist at the Project site and emphasized that all parties need to implement measures to create a more respectful, positive work environment. The KWCA included 64 recommendations aimed towards improving workplace culture at the Project site and to reduce incidents of discrimination and harassment. All of these recommendations have now been reviewed and addressed.

Efforts to foster a positive workplace environment at the Project site are continuous and ongoing, and did not stop with completion of the KWCA. Manitoba Hydro and the partner First Nations are continuing to work together at many levels to develop strategies to drive a positive work environment at the Project site. Forums where this work is occurring include:

- The KHLP Board;
- An Issues Sub-Committee of the Board: a committee with representation from the partner First Nations and Manitoba Hydro. The mandate of this committee is to discuss and take action on concerns raised by the partner First Nations regarding drugs and alcohol and harassment and discrimination;
- The Keeyask Project Diversity and Inclusion Committee: a site based committee with representation from the partner First Nations Site Representatives from Manitoba Hydro, site contractors, Employee Retentions Services and labour relations. The mandate of this committee is to develop a Diversity and Inclusion Strategy for the Project. The committee also reviews past investigations involving complaints of harassment and discrimination, violence in the workplace, personal conduct cases, and any other significant events, to

identify trends that could be addressed through diversity and inclusion initiatives and actions; and

- A Harassment and Discrimination Free Workplace Implementation Task Force (HDFWIT): an advisory group to the Site Support Manager with representation from the partner First Nations, Manitoba Hydro, the Allied Hydro Council and Employee Retention Services. The HDFWIT's mandate is to understand and make recommendations on the investigation process and course of action for workplace complaints under the Harassment and Discrimination Free Standard. This includes the process for receiving, investigating and taking action on workplace complaints under the Standard.

Efforts over this past year have been focused on site policies and processes and ensuring that they are applied consistently and in a timely manner. The HDFWIT has undertaken an extensive review of the process for receiving complaints under the Harassment and Discrimination Free Standard, and how the investigation and follow-up processes occur. The review has resulted in actions to increase communication and transparency for individuals filing complaints under the Standard, and to heal relationships after a complaint has been investigated.

On-site training in conflict resolution and workplace investigations is being provided to front line supervisors and others. A Respect Campaign at site is in its second year. The Diversity and Inclusion Committee has held monthly initiatives on site to honour and promote cultural diversity and an inclusive workplace, including activities around Orange Shirt (residential schools) Day, Stop Hunger Day and Pink Shirt (anti-bullying) Day. Efforts and initiatives that promote a respectful workplace culture at the Project site will continue throughout construction.

7.2 EMPLOYEE RETENTION AND SUPPORT PROGRAMS

Since the start of construction, various measures were put in place to support the retention of northern and Indigenous employees at the job site, and to ensure that sensitivity and respect for local culture are demonstrated throughout construction of the Project. These measures include establishing the Employment Retention and Support (ERS) Services contract where scope was developed jointly with the FLCN and YFFN Keeyask Joint Venture who endeavored to include all partner First Nations' interests. The ERS contractor began delivery of services during the KIP and continued into the KGP.

7.2.1 PARTNER FIRST NATIONS' MEMBERS ORIENTATION

The purpose of these orientation sessions is to prepare partner First Nations' members for the construction camp experience and enhance their prospects of achieving the benefits from employment on the Project. The focus is on key factors that affect the economy, culture and social conditions of each community. This includes the historical and ongoing effects of hydro development and relationships with Manitoba Hydro.

7.2.2 INDIGENOUS AWARENESS TRAINING

On-site training workshops are provided for staff working at the Keeyask site. As a result of the dedicated team effort between Site Liaisons, ERS & project contractors, and with an active workforce of over 3,870 in the peak months, the overall site has surpassed 99% compliance between April 2018 and March 2019. A total of 3,718 employees had completed AAT, and 155 training workshops were held. The purposes of training workshops are to:

- Increase understanding and appreciation of the cultural differences, beliefs and values of individuals within the various parties/communities working at the site;
- Enhance comfort in living, working and/or doing business in a culturally diverse environment;
- Identify barriers and issues between the various parties working at the site;
- Identify common goals;
- Develop strategies and action plans for addressing issues/barriers, reaching common goals and developing and maintaining long-term harmonious relationships;
- Increase participants' understanding of contemporary issues facing Indigenous peoples;
- Challenge participants to re-think their assumptions and personal biases about Indigenous peoples;
- Provide participants with information that will promote understanding and respect of Indigenous cultures, enabling participants to work effectively with Indigenous peoples; and
- Increase participants understanding of what a harassment free work environment means and what each individuals' responsibilities are to maintain a work environment that is safe for all.

7.2.3 ON-SITE COUNSELING

On-site counseling is available to help all employees, on a voluntary basis, to deal with any issues experienced while working on the Project. This could include: work adjustment problems, vocational/career issues, cultural adjustments, family stresses, money management, and alcohol and narcotics anonymous. The intent is to reduce attrition for all workers by assisting them in dealing with challenges directly affecting their work performance.

7.2.4 SITE LIAISON

The Site Liaison Team's main focus has been on engaging the partner First Nations on all KGP activities and functions. The team maintained its roster throughout the year and consisted of the Site Liaison Lead, two Liaison Officers and a Site Representative from each of the partner First

Nations. The Liaison Team continues to support local community stakeholder management including collaboration with the four partner First Nations and the site contractors with a high emphasis on employment and training opportunities, as well as cultural activities. The team works closely with the ERS team where the focus has been on providing support to all Keeyask workers. Additional key functions added this past year include membership on the Keeyask Project Diversity and Inclusion Committee and the HDFWIT.

The four partner First Nations' Site Representatives were fully engaged throughout this past reporting period. Over the past year, Site Liaison staff worked closely with the Site Representatives on the following activities:

- Engaging community members in employment and training opportunities;
- Assisting with communication between Keeyask Contractors and community JSMs;
- Facilitating improved communication with partner First Nation workers at site; and
- Site Liaisons and partner First Nation Site Representatives are also members of the following committees:
    - Construction Advisory Committee,
    - Advisory Group on Employment, and
    - Monitoring Advisory Committee.

Engagement with these committees not only provides for direct input and feedback but it also allows the team to bridge networks and expand communications within the entire Project.

Keeyask site tours have been a consistent activity throughout the whole year. A variety of individuals and stakeholder groups have expressed interest in coming to site to learn about Keeyask and to gain more insight on employment and training opportunities. Requests for site tours came in a variety of forms: schools and training centres in northern Manitoba, members of the partner First Nation, Keeyask Committees, and various Manitoba Hydro departments. Sixty-four tours were conducted with 564 visitors at site.

7.2.5 WORKER FAMILY SURVEY

The KGP EIS noted some uncertainty about how the employment experience during Project construction would affect workers and their families. To address this uncertainty, a worker family survey was undertaken over 2018 to assess the experiences of a sample of partner First Nations' members employed on the Project and their families.

The worker family survey covered a wide range of socio-economic topics, including work and camp life, employee experience with measures taken to create a positive workplace culture at site, employee experience with unions, family experience, effects of employment on traditional activities, and community changes as a result of the Project.

The worker family survey was undertaken as a collaborative process. Manitoba Hydro and each of the partner First Nations initiated work on the survey over the fall of 2017 and winter of 2018. Initial work focused on developing a survey that reflected regulatory monitoring commitments, community needs and current understandings of important socio-economic themes related to the Project. The survey was developed through bilateral discussions between Manitoba Hydro and each of TCN, YFFN, FLCN and WLFN. Community researchers were engaged in each of the partner First Nations to conduct the surveys with their members.

The survey process has not been completed in its entirety with all four Partner First Nations. To-date, survey findings have confirmed some of the challenges previously identified through the KWCA, as well as in ongoing Project forums. The results to-date have also identified positive aspects of employment on the Project, and provided an understanding of the effectiveness of existing mitigation measures such as the Keeyask Respect Campaign, Aboriginal Awareness Training, and on-site counseling.

As survey results have become available, Manitoba Hydro and each of the partner First Nations have and will continue to work collaboratively to review findings and take any actions as may be needed. The combined final survey results for all four Partner First Nations will be shared among the partners and will be used to continue to improve the Project experiences of workers and their families.

7.2.6 EMPLOYEE SUCCESS GUIDE

The KGP Employee Success Guide was developed this past year to help prospective and new employees as well as their families learn more about living and working at Keeyask prior to applying or starting employment. The Guide is an online tool, available at Keeyask.com, and has been distributed in hard copy form at key locations including in the partner First Nations. The tool consists of the following seven modules:

- Is Keeyask right for you?
- Preparing yourself and packing.
- Preparing with your family.
- Coming to Keeyask.
- Your room.
- Camp life.
- Safety first.

7.3 CULTURE AND SPIRITUALITY

Since the start of construction, various measures were put in place to ensure that sensitivity and respect for local culture is maintained throughout construction of the Project.

7.3.1 CULTURAL SITE CEREMONIES

Site ceremonies have been held at key construction milestones to help mitigate the effect of the Project on partner First Nations' culture, and to demonstrate respect for the land and all that is supported by the land. Attendance at ceremonies is welcome and voluntary, and consists of various community members and staff of the contractors and Manitoba Hydro. Between April 2018 and March 2019, there were twelve ceremonies held including spring ceremony, Elders dinner, water ceremony, river closing ceremony, river diversion ceremony, National Indigenous Peoples Day celebration, and fall pipe ceremony

On August 31, 2018 a ceremony was held at the KGP site to recognize the diversion of the Nelson River through the KGP spillway. Held on the south shore of the river within sight of the spillway, the event honoured both Christian and Traditional beliefs by including script readings and gospel singers, a pipe ceremony and water ceremony, and a feast for over two hundred people in attendance. Community members from the four partner First Nations were in attendance alongside Manitoba Hydro-Electric Board members, Manitoba Hydro executive and project staff.

The four Partner First Nations have a sacred relationship with water. Water is respected for its life-giving, life-sustaining and healing gifts. The Nelson River is part of everyday life for the partner communities. It is used for transportation, to access traditional food and medicines, and to enjoy recreational activities. River diversion is the term for the waters of the Nelson being channeled through the Spillway.

Once the river changed course, traditional water and land use was altered forever. To respect the Cree worldview, ceremonies held at Keeyask acknowledged the changes to the land and water, and asked for forgiveness and to heal the land.

7.3.2 SWEAT LODGE

A sweat lodge and teepee area was set up at Keeyask in September 2017. Since that time numerous sweat lodge ceremonies have been held which accommodate both night and day shift workers. The sweat lodge is a circular, dome-shaped structure used for many purposes in Indigenous culture. Through ceremonies, it offers a way of clearing, cleaning and freeing obstacles, obstructions and blockages to healing and well-being. During a purification ceremony, participants talk with and listen to the Creator and Grandfathers and Grandmothers for guidance. There are similarities between the physical body and the sweat lodge. Your skin is like the sweat lodge cover; ribs are like the willows; heart beat is like the drumming; songs are your life lived.

7.4 RESPONDING TO COMMUNITY CONCERNS

An important component of socio-economic monitoring is ongoing discussions with communities to identify and address concerns or issues as they arise. Concerns have been raised by the partner First Nations that the Project has contributed to an increase in the presence and use of drugs and alcohol in the region, including at the Project site and in the communities. The Project Drug and Alcohol Standard provides the opportunity for treatment where addiction is present. The treatment for addiction not only supports a safe working environment, but also improves the lives of the individuals and their families.

Manitoba Hydro and each of the partner First Nations have had discussions on what supports can be provided at the community level to mitigate any potential increase of drugs and alcohol associated with the Project. Follow-up support by the substance abuse professional hired to support the Project site occurred in all four partner First Nations. This included community visits by the substance abuse professional, as appropriate, to assist in undertaking an inventory of available local services and to provide additional training and support to community service providers. As well, efforts were made to connect the partner First Nations with the Winnipeg Bear Clan to determine whether any supports could be offered. The Bear Clan is a community grown and based organization that works towards creating safer communities. Their activities include street patrols, crisis intervention, educational outreach and conflict resolution.

Over 2018 Robb Nash concerts were coordinated and sponsored in each of the partner First Nations and at the Project site. The Robb Nash Project is an initiative that engages young people through music and storytelling to inspire hope and encourage positive life choices. These shows tackle difficult topics such as bullying, addiction, self-harm and suicide.

The partner First Nations have also raised concerns regarding possible cases of sexual exploitation and sexual assault. In February 2018 representatives from the partner First Nations and Manitoba Hydro met with members of a regional team tasked with the prevention of sexual exploitation (including members of the provincial initiative Tracia's Trust) to discuss what supports could be provided at the Keeyask site and at the community level to address concerns about sexual exploitation. A wealth of resources and supports were offered during this meeting, including provincial supports and non-governmental/not for profit supports. Follow-up activities have been undertaken as interest has been expressed by individual communities, or as otherwise appropriate. This has included making connections between YFFN and TCN and regional RCMP staff specializing in the prevention of sexual exploitation.

With the assistance of the provincial Tracia's Trust Initiative, on-site training and broader communication materials have been developed and delivered on site regarding sexual exploitation. Representatives from Tracia's Trust visited the Keeyask site in October 2018 to conduct "train-the-trainer" sessions, including some initial pilot training and awareness sessions. Contractors now have trained individuals on staff to continue to deliver this message going forward. Manitoba Hydro will be organizing monthly awareness sessions at the Keeyask site in the evenings. Broader communication materials have been developed and are available on site

at Keeyask (including print materials). Consideration will also be given to how these materials can be built into the existing on-site “Respect” campaign, which was originally rolled out to address concerns regarding harassment and discrimination.

Site policy has been amended to clearly define sexual harassment. Project Site and Camp Rules have been amended to make it clear that purchasing and propositioning sex is illegal, and new documentation will include crisis contact numbers and information regarding sexual exploitation.

7.4.1 WORKER INTERACTION

A Worker Interaction Subcommittee (WIS) was established prior to Keeyask construction to deal with anticipated increases in the Gillam area workforce resulting from Keeyask, other Manitoba Hydro projects or related work occurring concurrently in the area.

WIS is a forum for information sharing and communication to identify potential worker interaction concerns, prevent issues to the extent possible, and identify ways to work cooperatively to address issues as they arise. The mandate includes addressing any related increases in the demand for services and accommodation in Gillam. WIS members are Manitoba Hydro, FLCN, the Town of Gillam, the RCMP (Gillam Detachment), the Gillam Hospital, and the Gillam School. Other stakeholder members attend as needed.

WIS met three times in 2018-19 to continue monitoring and discussion of topics of community interest. Particular areas of interest related to public safety, community services and infrastructure. Service providers, including the Gillam Hospital and local RCMP provided regular updates which helped assess whether new efforts were required to address demands on health services, policing and other concerns. The WIS also established an ‘incident tracker’ to monitor and respond to specific community concerns and incidents.

Since the establishment of WIS, several mechanisms have been put into place to deal with identified issues such as local road conditions and traffic safety, use of Gillam services and facilities, and the behaviour of non-local contractors. This included the establishment of a “PR 280/PR290 Taskforce”, an onsite Nurse Practitioner at Keeyask camp, and cultural awareness programming for contractors working in the Gillam area. As a result, there were fewer incidents reported to WIS this past year than in previous years.

WIS members living in Gillam and FLCN have expressed concern about an increased presence of drugs in the region. WIS has attempted to address this issue acknowledging that the intense activity in the region, particularly relating to the construction of the Keeyask Project, has contributed to increased access to and exacerbated usage of drugs (through employment on the Project). As a first step to develop a longer term strategy to deal with this issue, WIS hosted a special meeting, “Moving Towards a Community-Based Strategy: Addiction Issues”, which involved representatives from local service providers including FLCN and Northern Health Region health care providers.

Additional examples of adaptive measures during 2018-2019 that respond, in part, to concerns and topics raised at WIS include:

- Continued implementation of cultural awareness training for short-term contractors by FLCN;
- Enhanced counseling supports to local residents; and
- Continued provision of health care services, including a nurse practitioner and emergency medical services, on-site at Keeyask.

The information provided by WIS members will continue to be used to assist in identifying potential adaptive measures to reduce the impacts of hydroelectric development in the region.

7.5 POPULATION

The KGP EIS predicted the Project would not result in notable change in the number of people in the partner First Nations' communities or in Gillam. However, measuring levels of in- and out-migration is difficult, with limitations existing for all related data sources, and the partner First Nations have noted that any in-migration to their communities could stress services that are already at capacity. Population is being monitored to confirm the extent of Project-induced migration in the partner First Nation communities and Gillam.

The changes in total population for the 2018 data from the partner First Nations to the end of 2017 for Gillam are consistent with trends observed over time in each of the communities. The slight increases and decreases in population across the communities do not suggest a significant pattern of construction related in- or out-migration.

7.5.1 PARTNER FIRST NATION COMMUNITIES

Population data for the partner First Nations is based on data from Crown-Indigenous Relations and Northern Affairs Canada for on-reserve and on-own-Crown[5] land populations. As shown in the graph below, data for the partner First Nations from 2003 to 2018 shows periods of moderate population growth as well as moderate decline across years. In 2018, modest increases were observed in the WLFN population, and modest decreases were observed in the FLCN, TCN and YFFN populations.

[5] On-Own-Crown lands are those lands not classified as reserve lands but Crown Lands that have been assigned to a particular First Nation.

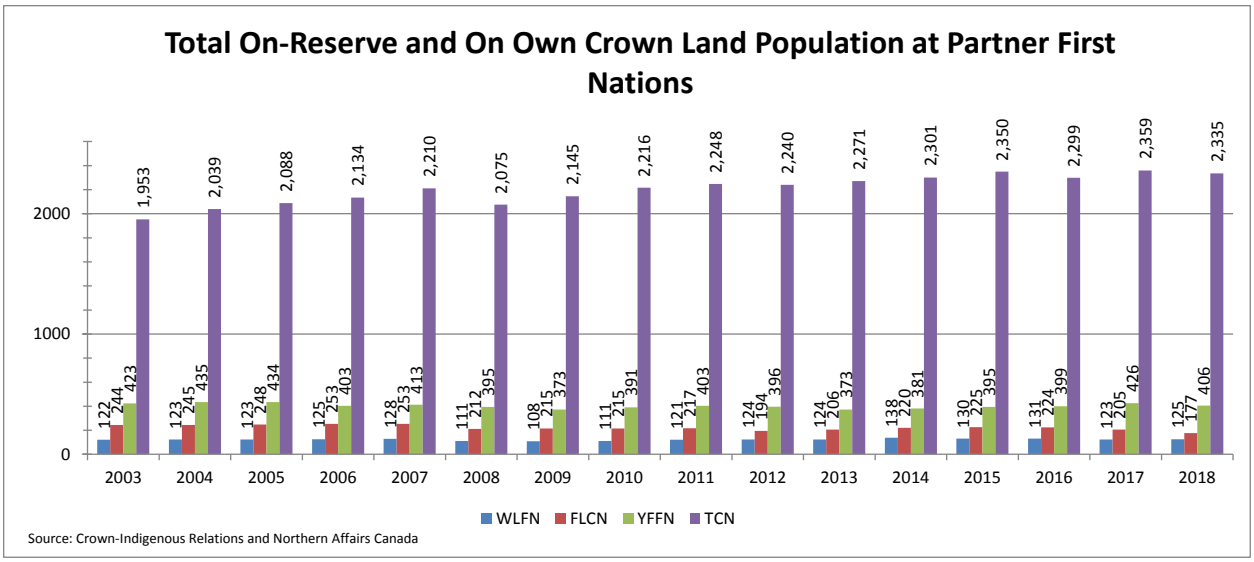


Figure 7: Total On-Reserve and On-Own-Crown Land Population at Partner First Nations (2003-2018)

7.5.2 TOWN OF GILLAM

Population data for the Town of Gillam is based on data from Manitoba Health's annual health statistics, which were available up to 2017. As shown in the graph below, the population of Gillam experienced slight annual increases between 2008 and 2011, and, with the exception of a slight increase between 2012 and 2013, slight annual decreases between 2012 and 2017.

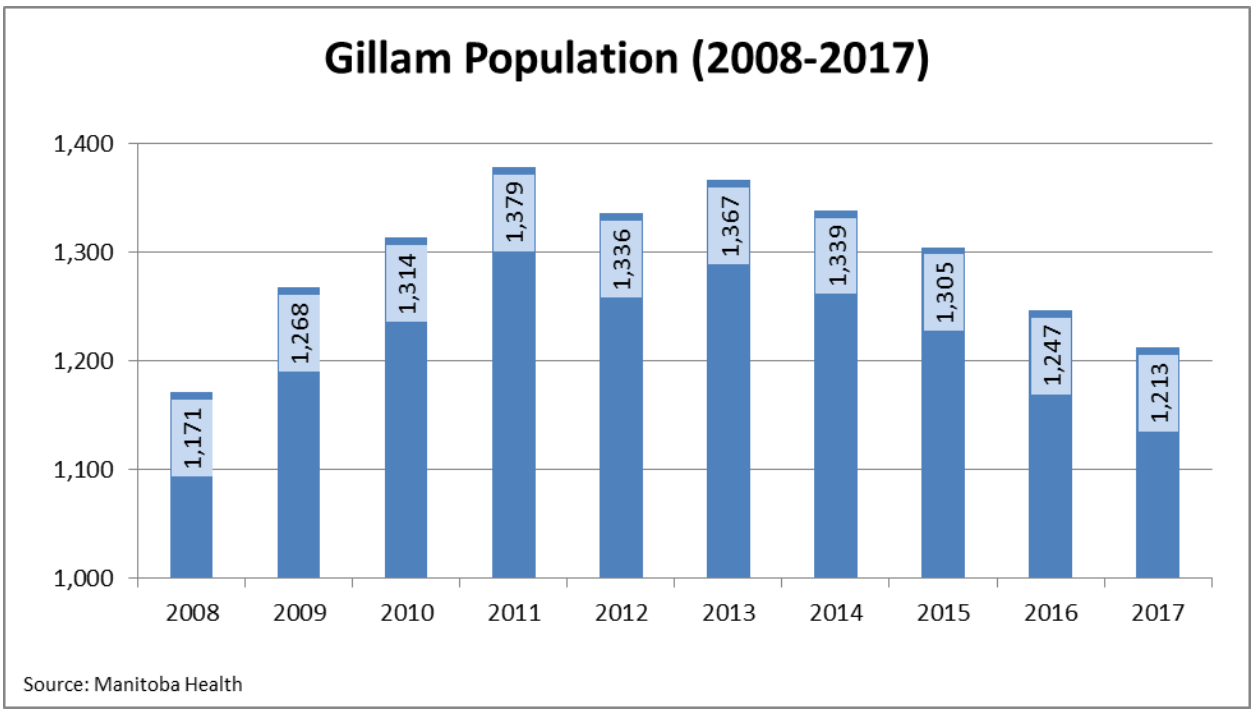


Figure 8: Gillam Population (2008-2017)

7.6 HOUSING, INFRASTRUCTURE AND SERVICES

The KGP EIS predicted minimal population migration into the partner First Nations during Project construction. Therefore, it was anticipated that little new demand for housing, infrastructure and services in the partner First Nation communities and in Gillam would be required during Project construction. Key person interviews were conducted to identify any apparent Project effects on housing, infrastructure and services in the partner First Nations' communities. The results of the YFFN interviews were reported in the 2017-18 Year in Review. Over this past year, interviews were completed by TCN, FLCN and WLFN.

The interviews completed by FLCN document that since 2012, filling open positions in the community and retaining skilled workers for community-based jobs has been a challenge due to the availability of higher wages elsewhere. It was observed that some members who are employed on the Project have chosen to move away from the community. The interviews also suggest that due to higher employment rates, fewer members now require social assistance, but that there has been an increase in the number of people accessing the services offered by Awasis. There was no observed change to the demand for housing or education. Discussions regarding many of the key findings of the interviews are underway within the community and in forums related to the Project.

The interviews completed by TCN document a number of challenges faced by service providers in Split Lake. A lack of funding was the main challenge shared by those providing childcare, recreational programming as well as water and sewer services. It was documented that there are currently higher rates of employment in the community (i.e., reduced unemployment), which has reduced overall usage of income assistance in the community. It was also observed that there is a continual need for enhanced counselling services. In addition, interviewees noted a need for more community activities and recreation facilities. While service providers interviewed indicated that the Project had not changed the way services are provided in the community, an increased presence of drugs and alcohol since the start of the Project has been noted. This increase has resulted in other social effects within families and the community as a whole. Discussions regarding many of the key findings of the interviews are underway within the community and in forums related to the Project.

The interviews completed by WLFN indicate little change to in- and out-migration, with out-migration continuing to predominantly occur due to individuals and families accessing high school education or other postsecondary training opportunities. Members who leave the community to work on the Project maintain their residency and return. Although in-migration has not changed significantly, the demand for new housing has grown since 2012 with many members expressing interest in living in the community especially with in-community training becoming increasingly available. The most negative outcome identified through the interviews was an increase in drug consumption by members and youth due to greater access to a range of harmful drugs as a result of Project employment. Positive outcomes documented through the interviews include improvements to the wastewater treatment system and equipment purchases that are being funded in part from revenues generated from WLFN participation in the Project. The interviews also revealed the Keeyask experience has strengthened members' commitment to education and training to obtain employment opportunities in general. Discussions regarding many of the key findings of the interviews are underway within the community and in forums related to the Project.

7.7 MERCURY AND HUMAN HEALTH

As a result of past experience with hydroelectric development, the Partner First Nations raised the issue of mercury and human health as a primary concern in relation to the project. Manitoba Hydro and the Partner First Nations have been working together since 2007 to study the issue and communicate information related to mercury and the Keeyask Project. The KHLP, through the Mercury and Human Health Implementation Group (MHHIG), with advice from technical and health experts, developed a *Mercury and Human Health Risk Management Plan*. Key components include: a communication strategy about fish consumption for resource users in affected waterbodies; monitoring of mercury in fish, wildlife and plants; voluntary hair sampling; and periodic human health risk assessments.

Mercury is a metal found naturally in small amounts in rock, air, soil, water, and living organisms. It can be released into the environment through natural processes, but mainly as a result of human activity related to industrial development. When organic material such as peat is broken down by bacteria, mercury is converted to a more toxic form called methylmercury. Methylmercury becomes more concentrated as it moves up the food web from bugs to smaller fish to larger predatory fish. This process occurs in the natural environment and can be accelerated by processes such as flooding. It is most affected by unnatural causes, like the larger scale flooding caused by the creation of a hydroelectric reservoir.

The creation of the Keeyask reservoir is predicted to raise mercury (methylmercury) levels in fish in Gull Lake and to a lesser extent, Stephens Lake. Mercury levels will increase temporarily, mostly due to the breakdown of peat in the reservoir. Fish mercury levels are estimated to peak 3 to 7 years after flooding and gradually decrease over the next 20-30 years to levels similar to non-impacted waterbodies in the region.

People can be exposed to mercury (methylmercury) through eating fish. Large, predatory fish, like pickerel and jackfish, generally have higher mercury levels than smaller fish. Too much mercury can cause human health problems, particularly for the developing brain (e.g., babies and children).

Soil and surface water are not affected by the same processes that result in fish having elevated mercury levels. Studies show that at current levels, recreational use of water and land is not a threat to human health as a result of mercury.

Because fish is an important part of a healthy traditional diet and offers many important health benefits, the MHHIG is working to build understanding in the partner First Nation communities about mercury and the risks and benefits of eating fish. Key Partnership Activities in 2018-19 related to mercury and human health included:

- Six meetings as the Mercury and Human Health Implementation Group over the course of the year to develop and plan for mercury and human health activities, with a focus on delivering in-community hair sampling and food survey events . Ongoing communication with provincial and federal health representatives assisted in the planning for these activities and development of materials;
- Planning for and conducting hair sampling and food surveys programs in Partner First Nation communities;
    - This included the hiring of Golder & Associates to assist with the development and implementation of the hair sampling and diet survey programs;
    - A “Know Your Number” campaign was developed to generate interest about voluntary hair sampling and food surveys. The goal is to allow partner First Nation community members to understand their personal mercury exposure and to make informed decisions about their fish consumption practices.
    - TCN and FLCN hosted pilot events for hair sampling and implementation of the food survey in February, 2019. A total of 40 hair samples were collected. Individual results will

be returned to participants privately by letter. Nutritional counselling will be available if desired;
  - All four partner First Nation communities are planning to undertake these programs in the fall and will continue to offer sampling following flooding.
- Distribution of communication materials intended to educate users about mercury in fish and provide consumption advice for those consuming fish from the reservoir and downstream areas (e.g., posters, fish tape, and a short introductory plain language video), and brochure to promote awareness of voluntary hair sampling and food surveys events;
- Employment of a 'Mercury Community Coordinator' in each partner First Nation community to assist in the implementation of mercury and human health related activities. An orientation was provided to each Coordinator as well as federal and provincial health care providers to familiarize them with the Keeyask Project and related mercury and human health activities;
- A "roll-out" session in each partner First Nation community (early May, 2018) to introduce community members to the Keeyask Mercury and Human Health plans, associated communication products and to discuss the issue of mercury and human health; and
- Monitoring for mercury of fish and in wildlife and plants in Keeyask Project area (including a voluntary sampling component, where partner First Nation community members can submit plant and wildlife samples for mercury analysis) (See Appendix A).
  - Communication products for Keeyask Project area were revised in 2017 to reflect updated fish mercury concentrations. The Project Toxicologist reviewed fish data and developed lake-specific consumption recommendations for maximum safe monthly consumption rates for various fish species based on Health Canada and World Health Organization guidance.
  - Samples of plants (blueberries and Labrador tea) and beaver collected in 2017 and 2018 showed that levels of mercury are low and would be safe to consume based on previously reported consumption rates. The most recent wild game/waterfowl sampling of select species identified as key food groups (moose, snowshoe hare, muskrat, ducks or gull eggs) has not provided sufficient data to confirm the earlier conclusion that these foods are safe to consume at reported consumption rates.

7.8 TRANSPORTATION INFRASTRUCTURE, TRAVEL, ACCESS AND SAFETY

While the EIS predicted that existing transportation networks and plans for PR 280 upgrades would be able to accommodate the changes in road use associated with KGP construction, community concerns remain regarding traffic safety and road conditions.

In response to community concerns, the Province, which is responsible for maintenance and upgrades to PR 280, established the PR 280 Joint Advisory Committee in the fall of 2014. The committee is comprised of representatives from the Province of Manitoba, Manitoba Hydro, the Town of Gillam and the partner First Nations' communities to involve the latter directly in the planning of upgrades to PR 280. In the period between April 2018 and March 2019, the PR 280 Joint Advisory Committee met once, in May of 2018.

A number of mitigation measures have been adopted to reduce the impact of project traffic on PR 280 including road reconstruction and increased maintenance efforts, operation of the PTH 6 weigh station near Thompson, the construction and operation of a new temporary weigh station located near the junction of PR 391 and PR 280, and communicating driver expectations to contractors in an effort to promote appropriate driving behavior on PR 280.

In the fall of 2016, Manitoba Hydro developed a comprehensive transportation management plan to reduce the impacts of project traffic on PR 280. The plan includes pre hauling construction materials to site during the winter months, night hauling, reductions in Manitoba Hydro truck traffic and reductions in truck weights during periods when the road has deteriorated substantially.

Manitoba Hydro, in collaboration with Manitoba Public Insurance (MPI) and the RCMP will continue to monitor traffic volumes, speeds, and vehicle types on PR 280 and PR 290 in 2018/19.

7.8.1 TRAFFIC VOLUMES

Traffic volume data is typically collected by Manitoba Infrastructure (MI) every two years. Traffic data for PR 280 is divided into three segments: PR 391 to Split Lake, Split Lake to the PR 280/PR 290 intersection, and PR 280/ PR 290 intersection to Gillam. Use of PR 280 and PR 290 has steadily increased since 2003. A larger increase in use has been observed since the start of construction on the Project as anticipated.

To better understand traffic patterns during construction, Manitoba Hydro worked with MI to have five, permanent traffic counters installed on PR 280 and PR 290. The segment of PR 280 with the highest traffic volumes is between PR 391 and Split Lake where from April 2018 to March 2019, the average traffic counts (northbound and southbound combined) were 347 vehicles per day. Of the 347 vehicles per day, 63 were large trucks.

Further details on traffic volumes are provided in Manitoba Hydro's Northern Road Traffic Monitoring Quarterly Data Collection Summary (Appendix 3).

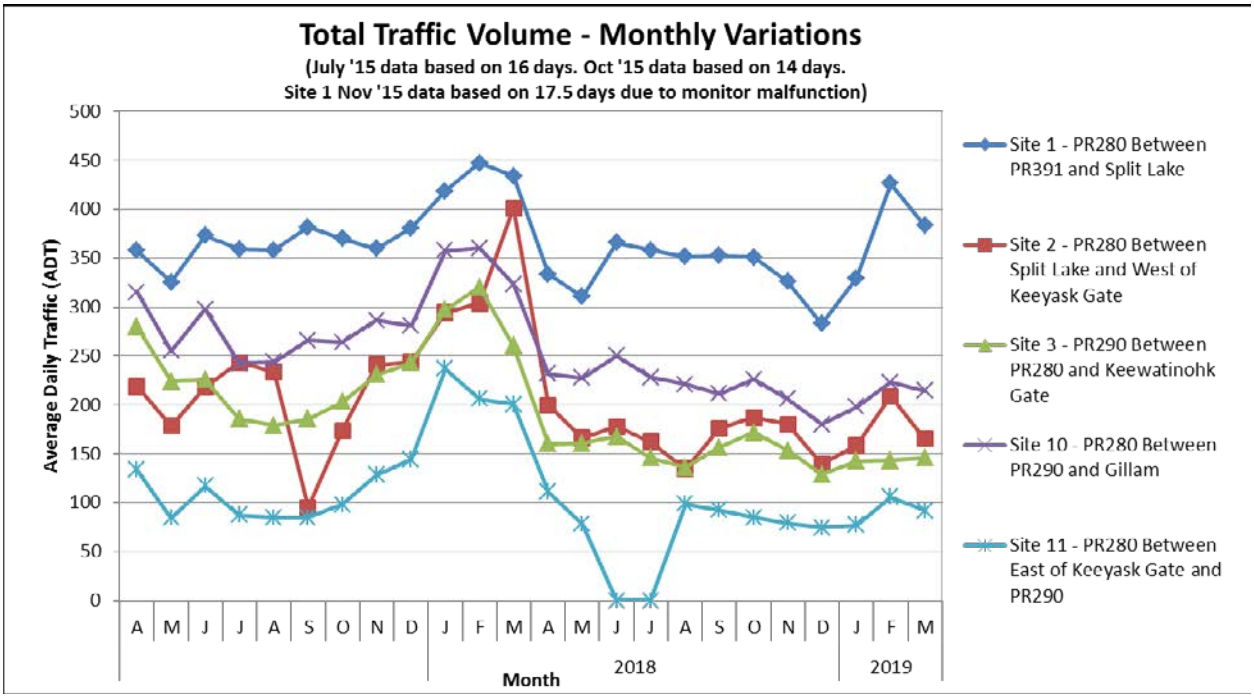


Figure 9: Monthly Variations: Overall Traffic Versus Truck Traffic

7.8.2 COLLISION DATA

Collision rates along PR 280 and PR 290 have remained below the industry standard threshold of 1.50 million vehicle-kilometers of travel (MVKT). Collision rates are a factor of annual average daily traffic (AADT) volume, road length and reported collisions. Spot grade improvements, localized design considerations, and other road safety improvements are being implemented to address ongoing concerns and to improve the driving experience for all road users.

Further details on collisions are provided in Manitoba Hydro's Northern Road Traffic Monitoring Quarterly Data Collection Summary (Appendix 3).

7.8.3 KEEYASK SITE ACCESS

The Keeyask North Access Road connects PR 280 to the construction site. It is a private road with restricted access, which is controlled by a security gate near the PR 280/North Access Road intersection. The gate office is staffed 24 hours per day, 7 days per week and security staff document all authorized vehicles entering and exiting the road. On average, 106 vehicles per day used the road between April 2018 and March 2019.

Traffic counts from the monitoring station located at PR 280 Site 2, which is the closest station to the Keeyask North Access Road, allows construction related traffic to be compared to the overall traffic on PR 280. Over the past year, these two sets of traffic counts indicate that the

percentage of Keeyask related construction traffic varies monthly and accounts for 48% to 87% of all traffic on PR 280 near the PR 280/Keeyask North Access Road intersection.

The Keeyask South Access Road makes it possible to cross the Nelson River to access the south side construction area and Keeyask camp from Gillam resulting in a reduction of construction traffic on PR 280. Traffic is restricted to authorized construction and project vehicles only and all access is documented by gate security staff. On average, 95 vehicles per day used the road between April 2018 and March 2019. Data is reflective of all traffic types including daily construction activities such as hauling.

APPENDIX 1:
INDIRECT AND INDUCED BUSINESS SURVEY

Keeyask Indirect and Induced Business Survey

Effects on Businesses in Thompson and Gillam

Manitoba Hydro

2018

Completed as per requirements of the Keeyask Infrastructure Project Socio-Economic Monitoring Plan

CONTENTS

INTRODUCTION

The Keeyask Project is a 695 megawatt (MW) hydroelectric generating station at Gull Rapids on the lower Nelson River. Construction on the project began in 2014. The development of the Keeyask Project is a collaborative effort between Manitoba Hydro and four partner First Nations – Tataskweyak Cree Nation (TCN), War Lake First Nation (WLFN), York Factory First Nation (YFFN), and Fox Lake Cree Nation (FLCN) – working together as the Keeyask Hydropower Limited Partnership (KHLP). The Keeyask Generation Project follows the Keeyask Infrastructure Project (KIP), which began in 2012 and included a start-up camp, an all-weather north access road and the first phase of the Keeyask main camp. A socio-economic monitoring program has been completed for KIP.

The Keeyask Socio-Economic Monitoring Plan (SEMP) is a commitment made by the Keeyask Hydropower Limited Partnership (the Partnership) in the Environmental Impact Statement (EIS) and is part of an integrated and coordinated Environmental Protection Program. The SEMP focuses on the primary effects to the socio-economic environment identified for monitoring in the EIS. It defines the process, scope, methods, documentation and application of the socio-economic monitoring for the Project. One area of focus in the SEMP is monitoring activity to better understand indirect and induced business impacts generated as a result of Project-related expenditures in Gillam, Thompson and the partner First Nation communities.

FIGURE 1: SUMMARY OF KEEYASK SOCIO-ECONOMIC MONITORING ACTIVITIES

Indirect business effects arise from the project-related purchases by Manitoba Hydro and its principle contractors while induced business effects arise from the spending of income earned by workers (and their families) employed on the Project. These effects can be both beneficial and adverse. While they can take the form of increased activity, employment and revenues on the part of recipient businesses, the added competition for labour and other resources can potentially lead to challenges for others.

This report presents the results of a survey carried out between January and June, 2018 to determine the indirect and induced impacts of the Keeyask Generation Project's related expenditures on businesses in Thompson and Gillam. Interviews are also being completed in the partner First Nation communities, and will be presented in a separate report. Thompson and Gillam are located within relative close proximity to the Keeyask Project. A portion of the Project workforce comes from these communities, and as a result, indirect and induced Project-related expenditures are occurring in these communities.

METHODOLOGY

Surveys of individual businesses were conducted to gather information to create a picture of the indirect and induced effects on Thompson, Gillam and KCN businesses. Questions were organized into four main topic areas: general business information, business impacts, employment impacts and community impacts. The survey was very similar to the one delivered during the Keeyask Infrastructure Project (report prepared in 2014). The full survey is available in Appendix A.

A list of business participants was generated based on the experience of the Keeyask Infrastructure Project survey and using the community Chamber of Commerce and Business directories. A cross-section of individual businesses in each community was contacted by phone and either interviewed or given the option of an on-line survey. Phone and on-line surveys were conducted with key individuals affiliated with the participating businesses. Manitoba Hydro staff conducted the surveys with Thompson and Gillam businesses between January and March 2018. A total of 28 surveys were completed in Thompson and 10 in Gillam. Data collected covered the period from July 2014, which coincides with to start date of construction, to the time of the survey.

Survey information was collated, and aggregated into broad categories to identify patterns and maintain the anonymity of the business participants. For the analysis, participating companies were classified into the following categories:

a) Construction/Manufacturing – includes businesses engaged in constructing, repairing and renovating buildings and engineering works, contractors, and businesses engaged in mechanical or physical transformation of materials or substances into new products.
b) Retail/Wholesale Goods & Services - includes fuel, smaller-scale electrical and other services, waste management, auto repair, general job supplies, equipment purchase/rental, linens and uniforms.
c) Accommodation & Food Services - includes on-site purchased meals purchased by contractor personnel, hotel accommodations, commissary snacks/beverages, office/meeting space.
d) Transportation/Warehousing – businesses engaged in transporting passengers and goods, warehousing and storing goods.
e) Specialty Services – wide range of services including medical, insurance, real estate, recreation, and others.

These categories correspond roughly to the 2017 North American Industry Classification System (NAICS) but have been slightly modified to suit the needs of the research and to ensure confidentiality of participating companies.[1]

LIMITATIONS

The survey is primarily qualitative in nature, and does not attempt to quantify impacts to employment and business performance over time. The intent of the survey was to obtain a general sense of the perspectives and experiences of businesses in these two communities on project impacts and overall change in the business climate.

The reader is cautioned that although attempts were made to have representation from a large cross section of businesses in each of Thompson and Gillam, the sample size is small. As a result, the survey does not reflect a statistically relevant sampling of the perspectives of the business communities in either community.

In some cases survey respondents declined to answer some questions for various reasons including confidentiality or not having a perspective on the question.

THOMPSON

RESULTS OF THE SURVEY

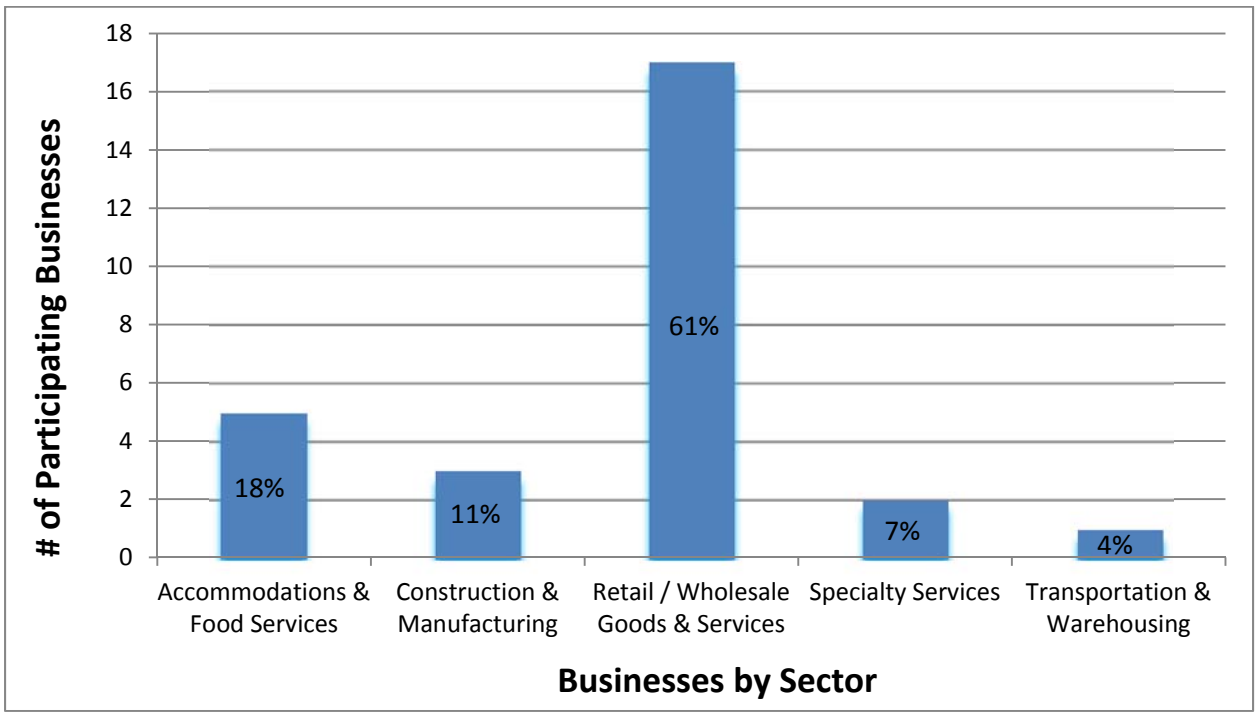
In total 90 businesses were contacted in Thompson with a 31% response rate. Of the 28 responses, 32% completed the on-line survey and 68% participated in the survey via telephone interview with Manitoba Hydro staff. As noted earlier, in some cases, participants were unable to answer specific questions for a variety of reasons such as confidentiality concerns or a question not being relevant to their business. As a result, the total number of responses will not always reflect the number of survey participants.

PROFILE OF BUSINESSES SURVEYED

This section provides a profile of businesses in Thompson that participated in the survey. As shown in Figure 1, by far the largest group of survey respondents (17 or 61%) fell within the Retail/Wholesale Goods and Services classification.

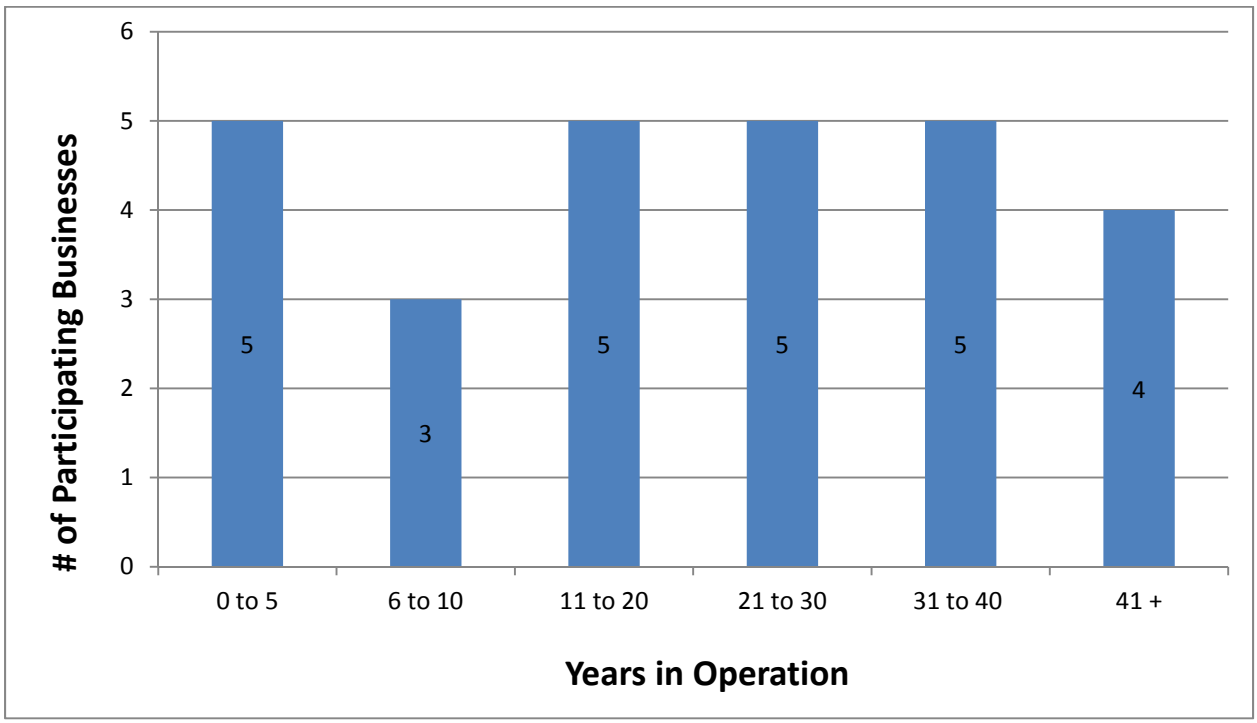
[1] Statistics Canada 2018. North American Industrial Classification System 2017 – Canada. Retrieved from: https://www.statcan.gc.ca/eng/subjects/standard/naics/2017/index.

FIGURE 1: BREAKDOWN OF PARTICIPATING BUSINESSES BY SECTOR



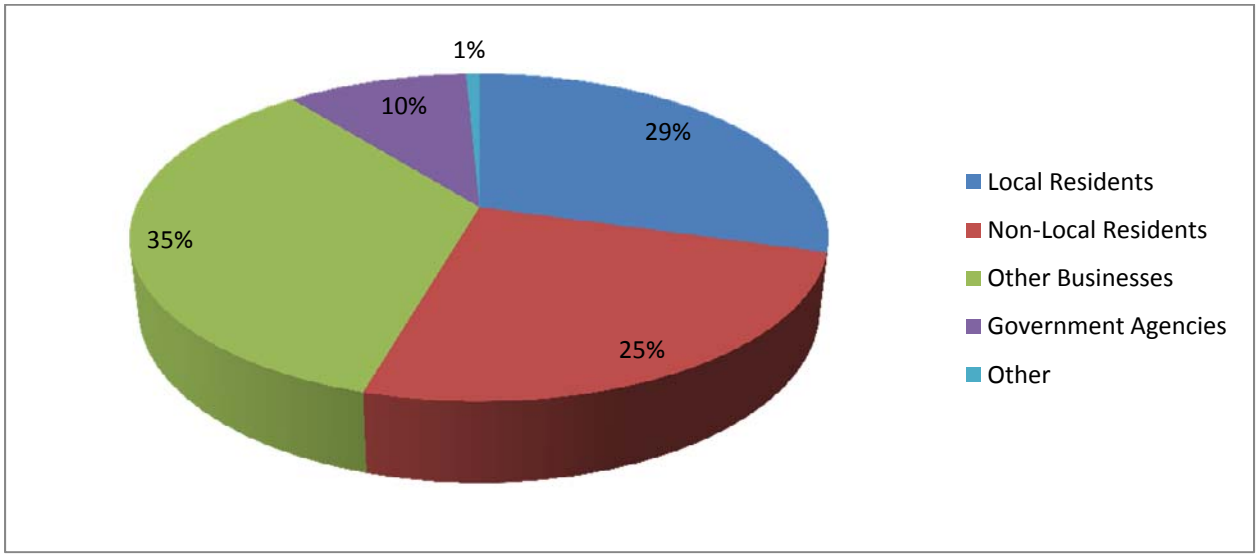
As shown in Figure 2, most of the companies participating in the research had been in operation for a long period of time (more than 10 years) with the sample size uniformly distributed across the range of years in operation. Given this, many of the businesses that participated in the survey will have experienced the ups and downs associated with the Thompson economy, which is heavily influenced by fluctuations in the natural resource industry and major capital projects conducted in the North.

FIGURE 2: YEARS IN OPERATION OF BUSSINESSES THAT PARTICIPATED IN THE SURVEY



As shown in Figure 3, the Thompson businesses survey are dependent on a varied customer type. The overall average of business responses for those surveyed indicates that "Other Businesses" generate the largest portion of sales (35%), followed by "Local Residents" (29%), "Non-Local Residents" (25%) and then "Government Agencies" (10%). Businesses rely on various sources of income, with some relying entirely on local residents, non-local residents, other businesses or a mix. Taken as a whole, "Local Residents", "Non-Local Residents", and "Businesses" were linked to a wide range of sales percentages for the individual companies surveyed, from very minimal percentage of sales, to nearly 100% of sales.

FIGURE 3: AVERAGE PERCENTAGE OF BUSINESS SALES BY CUSTOMER TYPE



BUSINESS IMPACTS

Businesses were asked to describe the changes that they had observed over the last five years, a time period that coincides with the start of construction on the Keeyask Project in July 2014.

Approximately 75% of respondents indicated that they have produced goods and services that can be attributed to the Keeyask project. Approximately 68% saw Keeyask as having a positive impact on their business, 20% indicating that Keeyask had not impacted their business and 12% were uncertain as to any impact. Of those businesses indicating a positive impact 43% saw the change as modest, 50% saw the change as moderate and 7% as extreme. The majority of businesses positively impacted by Keeyask attributed the benefits to spending by project contractors and to a lesser degree to spending by construction workers and their families as reflected in Table 1.

TABLE 1: BUSINESSES POSITIVELY IMPACTED BY KEEYASK DUE TO:

	Number of Businesses*	Percentage
Spending by construction workers & their families	9	53%
Spending by project contractors	17	100%
Uncertain/not sure	1	6%
Other	2	12%

*Note: 17 businesses indicated that the Keeyask Project had impacted them positively. Of these, many businesses attributed these positive impacts to multiple sources of spending. Therefore the numbers in Table 1 are not additive.

As shown in Table 2, the majority of respondents indicated an increase in each of gross revenue, gross costs and wage rates over this time period. Only one respondent indicated a decrease in gross revenue, while five respondents indicated no change in gross revenue.

TABLE 2: NUMBER OF PARTICIPATING BUSINESSES INDICATING THE TYPE OF CHANGE OBSERVED IN ASPECTS OF THEIR BUSINESS

	Type of Change		
Aspect of Operation	**No Change**	**Increase**	**Decrease**
Gross Revenues	5	19	1
Percentage of Total	20%	76%	4%
Gross Costs	3	21	
Percentage of Total	13%	88%	
Wage Rates	3	21	
Percentage of Total	13%	88%	

As shown in Table 3, for each of gross revenue, gross costs and wage rates, the majority of respondents indicated that the magnitude of the change experienced over this time period was in the 0 to 20% range. A small number of respondents (3 and 2 respectively) indicated that the magnitude of change in gross revenues and gross costs was 50% or more.

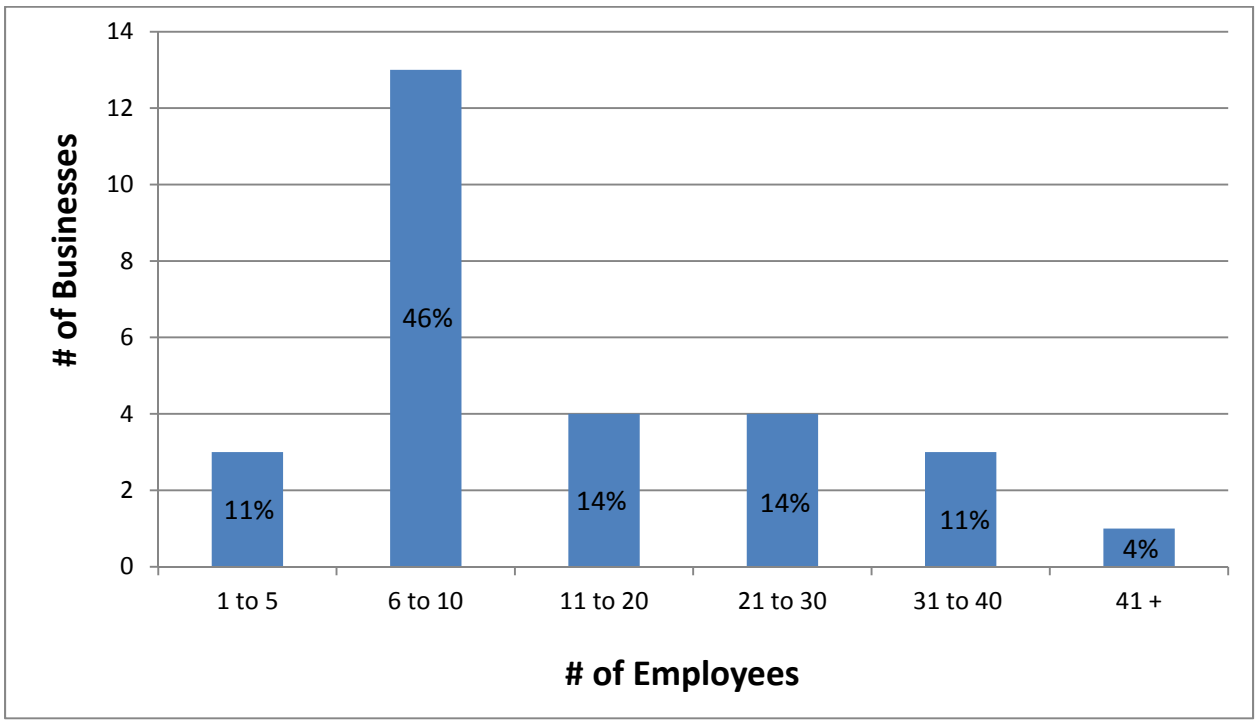
TABLE 3: MAGNITUDE OF OBSERVED CHANGE

	Magnitude of Change		
Aspect of Operation	**0% to 20% Change**	**21% to 49% Change**	**50% or more Change**
Gross Revenues	9	2	3
Percentage of Total	64%	14%	22%
Gross Costs	10		2
Percentage of Total	83%		17%
Wage Rates	15	1	
Percentage of Total	94%	6%	

EMPLOYMENT IMPACTS

The size of businesses responding to the survey, as represented by the number of employees, varied in size from 1 to 5 employees to 41 plus employees. As shown in Figure 4, the majority of businesses participating in the survey (13) reported having 6 to 100 employees.

FIGURE 4: NUMBER OF EMPLOYEES BY BUSINESSES



When asked to characterize changes in their employment numbers from 2014 through 2018, 59% of respondents indicated that employment levels had remained relatively constant over this time period, 11% saw some fluctuations, 22% saw an increase and 7% saw a decline.

For those respondents indicating a change in employment the change was typically described as modest to moderate. For those participants responding on the magnitude of the change 7% indicated an increase of 6 to 10 employees, 19% indicated an increase in 3 to 5 employees, 7% indicated an increase in 1 to 2 employees and 67% indicated no change in employees, as per Table 4. Of the jobs that were impacted, 71% were full-time year round, 3% were full-time seasonal and 26% were part-time year round.

TABLE 4: MAGNITUDE OF CHANGE IN EMPLOYMENT LEVELS FROM 2014 TO 2018

Change in # of Employees*	# of Businesses	Percentage
Increase in 6 to 10	2	7%
Increase in 3 to 5	5	19%
Increase in 1 to 2	2	7%
No change 0	18	67%

*Note: The two businesses (7% of survey respondents) indicating a decline in employment over this time period did not quantify the nature or extent of this decline.

When asked whether the Keeyask Project had affected employment levels at their business, approximately 33% of respondents indicated yes, 63% indicated no and 4% were unsure. The majority of respondents did not see the Keeyask Project as affecting their ability to locate skilled and/or qualified workers with 82% indicating no impact and 18% indicating an impact.

COMMUNITY IMPACTS

Survey participants were asked if they had noticed construction workers visiting the community or their business, and to share their thoughts or experiences with construction workers in the community (including related effects on residents or businesses). Overall the majority of survey respondents suggested that the Keeyask Project has had a positive impact on the community. Of the 20 responses received, 14 remarked positively on the Project's impact. Examples of responses include:

> *"Overall the project and construction workers have positively impacted the community."*
>
> *"Positive impact to business and the community."*
>
> *"Positive impact to the community. Can see construction workers visiting local businesses."*
>
> *"Modest impact to business. Positive impacts in the community with the spin offs."*

Some respondents were more neutral to this question, with 4 of the 20 respondents indicating no or little impact to their business or community. Examples of responses include:

> *"No or minimal impact to business. Neutral on any impacts to the overall community."*
>
> *"No change."*
>
> *"I see the jackets around town but I can't say for certain that I have ever seen them pick up any of my products."*

A few businesses commented that they had received little in terms of purchase orders and that Project related purchases had been going out of Province. One respondent commented that *"Shopping locally is what keeps the northern communities going. Bringing manpower and materials from out of province doesn't help anyone in this community."* Another respondent indicated that the impacts were not always positive with the survey participant indicating that *"the only negative issues in the establishment are caused by construction workers, which on occasion had exhibited rowdy behavior".*

CONCLUSIONS

In summary, the survey results suggest that the Keeyask Project has generally had a positive impact on the Thompson business community. Approximately 75% of respondents indicated producing goods and services that they could attribute to the Keeyask Project and slightly over 2/3 of respondents saw Keeyask as having a positive impact on their business. Impacts to employment were not seen as substantial with only 1/3 of respondents indicating that Keeyask had affected employments levels. With respect to labour, the majority of participating businesses indicated that the pool of available workers was not generally impacted due to the Keeyask.

GILLAM

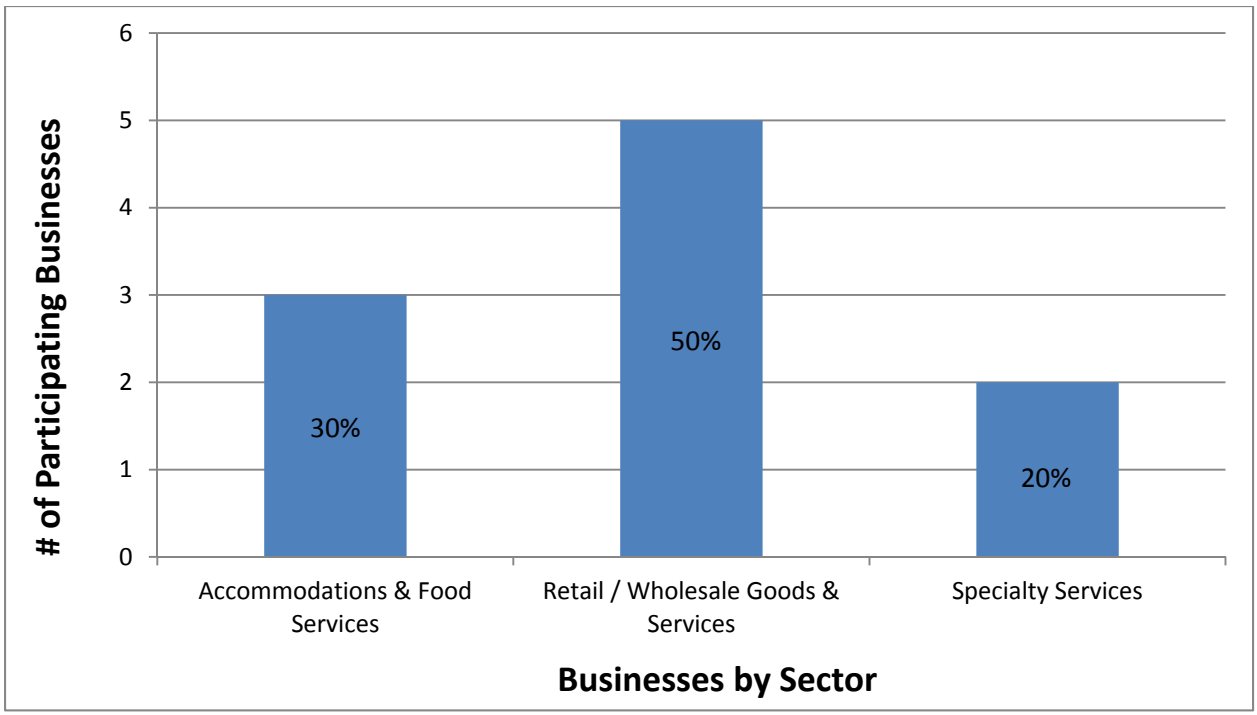
RESULTS OF BUSINESS SURVEY

The results of the business surveys conducted in Gillam are discussed below. As noted earlier, in some cases, participating companies declined to answer some or all questions. Sometimes this was due to reasons of confidentiality, and other times respondents simply did not have a perspective on the question. As a result, the total number of responses for an individual question may not equal the total number of survey respondents. In total Manitoba Hydro staff tried to contact 21 businesses in Gillam. A total of 10 businesses participated in the survey, resulting in a response rate of 48%. The surveys were conducted by Manitoba Hydro staff over the phone.

PROFILE OF BUSINESSES SURVEYED

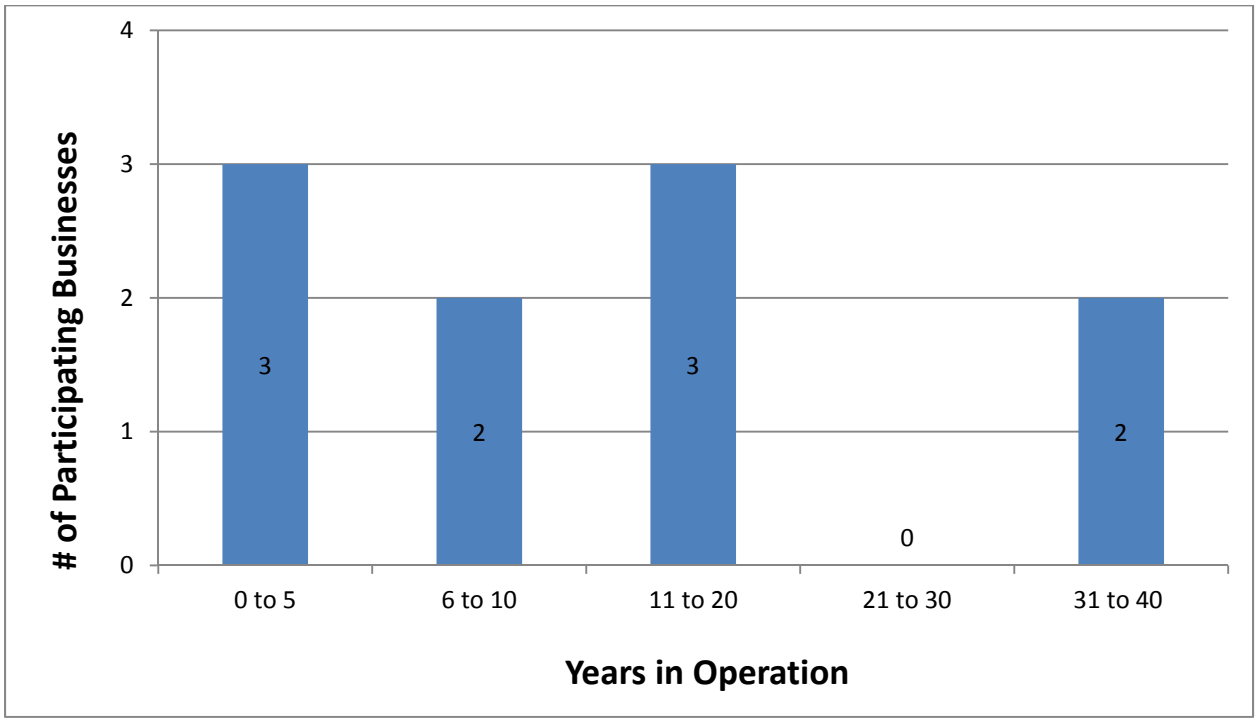
As shown in Figure 5, the businesses surveyed in Gillam fell within the Accommodation & Food Services, Retail/Wholesale Goods & Services, and Specialty Services classifications. Much like in Thompson, the largest group of participating businesses fell in the Retail/Wholesale Goods & Services classification.

FIGURE 5: NUMBER OF PARTICIPATING BUSINESSES BY SECTOR



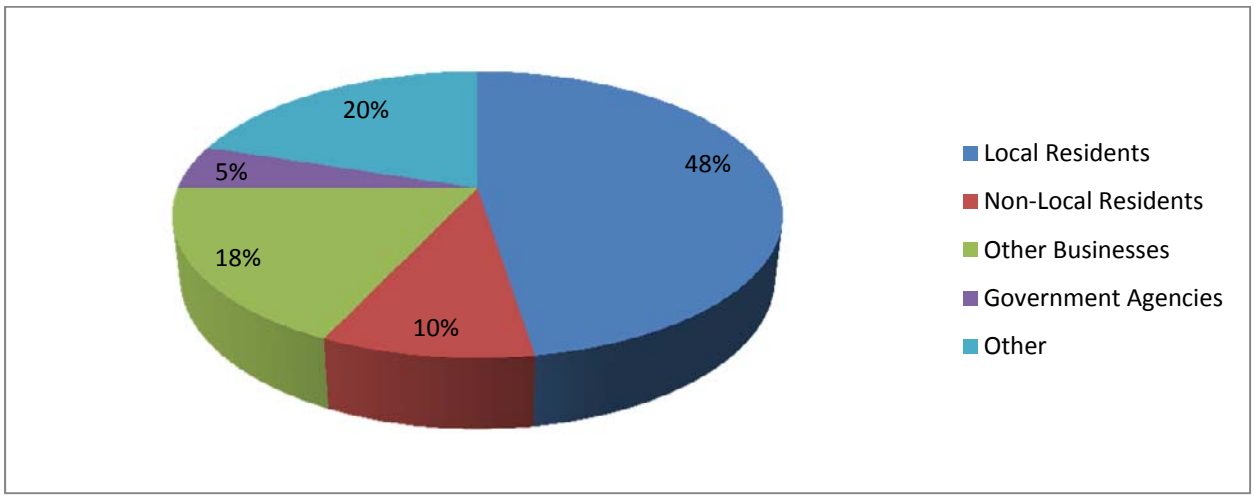
As shown in Figure 6, the companies participating in the survey had been in operation for a varied amount of time with respondents ranging from relatively new (0 to 5 years) to long established (31 to 40).

FIGURE 6: YEARS IN OPERATION



As shown in Figure 7, the Gillam businesses surveyed are dependent on a varied customer type. The overall average of business responses for those surveyed indicates that "Local Residents" generate the largest portion of sales (48%), followed by "Other" (20%) and then "Other Businesses (18%). The survey also demonstrated that, like in Thompson, businesses rely on various sources of income, with some relying entirely on local residents, non-local residents, other businesses or a mix.

FIGURE 7: AVERAGE PERCENTAGE OF SALES BY CUSTOMER TYPE



General Impacts on Gillam Businesses

Businesses were asked to describe the changes that they had observed over the last five years, which coincides with the start of construction on the Keeyask Project in July 2014. As shown in Table 5, over this time period there was a fairly close distribution between respondents who did not see a change and those who saw an increase in gross revenues, gross costs and wage rates. One respondent indicated a decrease in gross revenues. An item of note is that two respondents indicated the magnitude of the change in gross revenues and gross costs that their business experienced was in the 50% or more range.

TABLE 5: NUMBER OF PARTICIPATING BUSINESS INDICATING THE TYPE OF CHANGE OBSERVED IN ASPECTS OF THEIR BUSINESS

	Type of Change		
Aspect of Operation	**No Change**	**Increase**	**Decrease**
Gross Revenues	4	3	1
Percentage of Total	50%	38%	12%
Gross Costs	3	4	
Percentage of Total	43%	57%	
Wage Rates	3	3	
Percentage of Total	50%	50%	

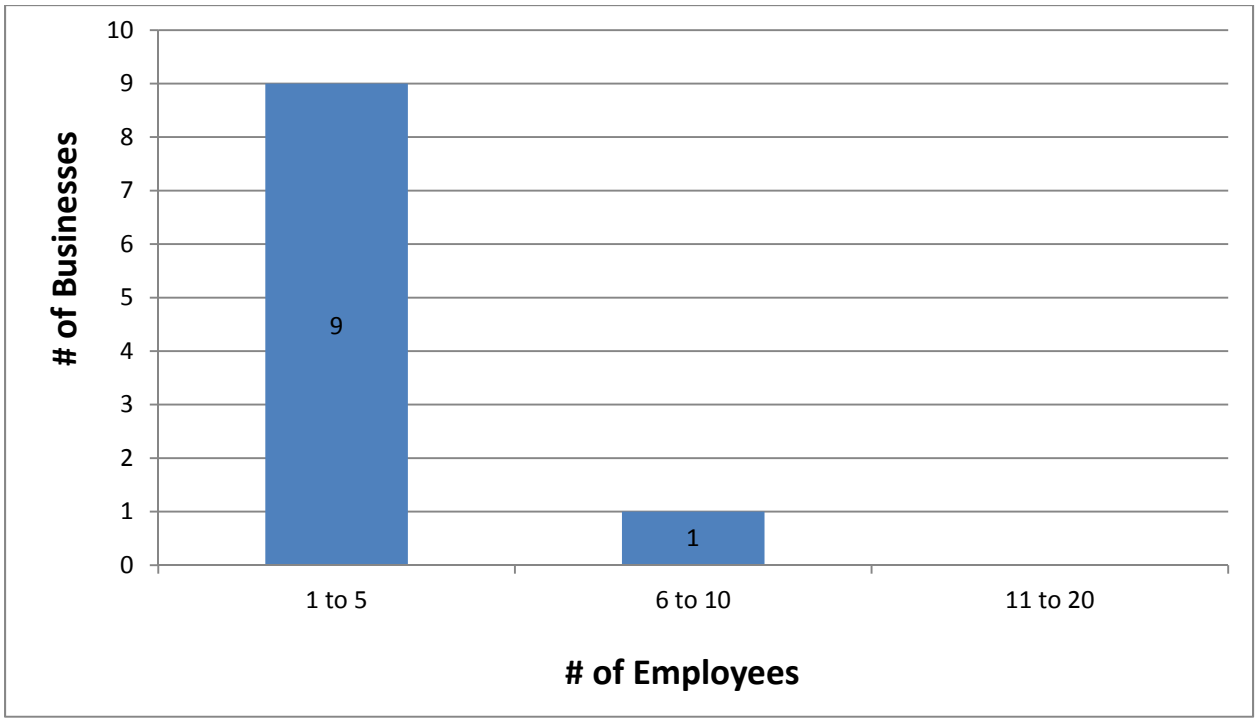
Approximately 89% of respondents indicated their business had provided goods and services they could attribute directly to the Keeyask project. However, only 50% of respondents indicated that their businesses had been impacted positively by the Project, while 30% indicated Keeyask had impacted them negatively and 20% indicated that Keeyask had not impacted them or were uncertain as to its impact.

Of those businesses indicating that they had been impacted by Keeyask, 25% indicated the change as modest, 63% as moderate and 16% as extreme. All businesses positively impacted by Keeyask attributed it to spending by project contractors and to a lesser degree by construction workers and their families.

IMPACT ON EMPLOYMENT

Figure 8 illustrates the number of persons employed by the survey respondents. Of the businesses participating in the survey all indicated having less than 10 employees, with the majority indicating 1 to 5 employees.

FIGURE 8: NUMBER OF EMPLOYEES BY BUSINESS



Survey respondents were asked to characterize changes in their employment levels from 2014 through 2018, and attempt to isolate impacts attributable to Keeyask. In the past 5 years, 1 respondent saw a decrease in staff, 1 respondent saw some fluctuation and 6 saw levels remain constant. As indicated in Table 6, the majority of businesses saw employment levels remain constant.

TABLE 6: CHANGE IN EMPLOYMENT LEVELS FORM 2014 TO 2018

Change in # of Employees	# of Businesses*	Percentage
Increase in 1 to 2	1	12.5%
No change 0	6	75%
Decrease in 1 to 2	1	12.5%

*Note that only 8 of the 10 survey respondents answered this question.

When asked specifically about Keeyask, only 1 respondent indicated the Project has had an effect on employment levels while 8 had indicated it had not. One respondent indicated that Keeyask has had an impact on locating skilled and/or qualified workers, while 8 indicated that it had not.

COMMUNITY IMPACTS

Participating companies were asked if they had noticed construction workers visiting the community or place of business and to share their thoughts on the presence of construction workers in the community, and related effects on residents or businesses.

Overall the general sentiment was that the Keeyask Project has had a positive impact on the community. Respondents remarked that:

> *"Very positive impact for business and the community."*
>
> *"Overall positive impact to the community."*
>
> *"Positive impact in terms of jobs for community members."*

Some of the survey respondents saw some negative impacts to local businesses as a result of community members being away working at site. One respondent indicated their business was also negatively impacted by a change in project demand patterns, which resulted in an inability to recover investments. One respondent also mentioned they had heard concerns about construction workers drinking and driving.

CONCLUSIONS

The Keeyask Project appeared to have some, but generally not substantial, impacts on Gillam businesses. Businesses generally noted positive impacts or a neutral perspective on the Project, but there were a few who indicated negative effects.

APPENDIX A: SURVEY TOOL

Indirect and Induced Business Survey

Section 1 - Business Information

1. What is the name of your business?

2. How many years has your business been operating in this area/community?

3. Identify which sector best describes your company's primary business. (Please select only one)

- ◯ Construction
- ◯ Manufacturing
- ◯ Mining, quarrying, and oil and gas extraction
- ◯ Retail Trade
- ◯ Wholesale Trade
- ◯ Real Estate and Rental/Leasing
- ◯ Arts, Entertainment, Recreation
- ◯ Accommodation Services
- ◯ Food Services/Drinking Places
- ◯ Transportation and Warehousing
- ◯ Other

4. Approximately what percentage of your sales comes from the following types of customers:

Residents of the local community	
Residents of other communities	
Other businesses	
Government agencies	
Other	

If you choose Other, please specify who the other customers are.

Indirect and Induced Business Survey

Section 2 - Business Impacts

5. Can you describe the change you have observed in the following aspects of your business since 2014?

	No change	Increase	Decrease	0% to 20% change	21% to 49% change	50% or more change
Gross Reveneus	☐	☐	☐	☐	☐	☐
Gross costs	☐	☐	☐	☐	☐	☐
Wage rates	☐	☐	☐	☐	☐	☐
Employee turnover rates	☐	☐	☐	☐	☐	☐
Availability of workers to fill jobs	☐	☐	☐	☐	☐	☐

6. Has your business provided any specific products or services you can attribute to the Keeyask project?

◯ Yes
◯ No

If yes, what specific products or services?

7. Overall, has Keeyask affected your business? (Please select only one)

◯ Positively - Business is more successful
◯ Positively - Made non-viable situation viable
◯ Negatively - Business is less successful
◯ Has not affected my business
◯ Uncertain/not sure
◯ Other

8. If your business has been impacted by Keeyask, please describe the type of change and where possible, indicate whether the change was modest, moderate or extreme.

9. If Keeyask has positively impacted your business. your business has been impacted by: (Please check all that apply)

☐ Spending by construction workers and their families
☐ Spending by project contractors
☐ Uncertain/not sure
☐ Other

Indirect and Induced Business Survey

Section 3 - Employment

10. Approximately how many employees do you have?

11. In the past 5 years, have employment levels generally:

- ◯ Increased
- ◯ Decreased
- ◯ Fluctuated up and down
- ◯ Remained constant

12. In the past 5 years, what types of jobs have been affected? (Please check all that apply) * Part-time is defined as under 20 hours per week

- ☐ Full-time, year round
- ☐ Full-time, seasonal
- ☐ Part-time, year round*
- ☐ Part-time, seasonal*

13. Approximately how many more or less employees do you have since 2014?

- ◯ More than 10 increase
- ◯ 6 to 10 increase
- ◯ 3 to 5 increase
- ◯ 1 to 2 increase
- ◯ 0 (no change)
- ◯ 1 to 2 decline
- ◯ 3 to 5 decline
- ◯ 6 to 10 decline
- ◯ More than 10 decline

14. What are the main factors influencing changes in the number of people employed in your business?

15. Construction of the Keeyask Project began in July 2014. Has Keeyask affected the employment levels of your business in any way since that time?

- ◯ Yes
- ◯ No
- ◯ Not sure

16. Has the Keeyask Project affected your ability to locate skilled and/or qualified workers?

- ◯ Yes
- ◯ No

If yes, please describe how the Keeyask Project has affected your ability to locate skilled and/or qualified workers.

Indirect and Induced Business Survey

Section 4 - Community Impacts

17. Have you noticed Keeyask construction workers visiting the community or your place of business?

- ◯ Yes
- ◯ No

If yes, please share your thoughts or experiences on construction workers on the community, its residents, or your business.

18. We appreciate your feedback; please provide any comments you may have on your experience completing the survey.

APPENDIX 2:
TECHNICAL MEMOS:
A) UPDATES OF FISH MERCURY DATA TO FOR DEVELOPMENT OF CONSUMPTION RECOMMENDATIONS AND
B) ASSESSMENT OF HUMAN HEALTH RISK FROM CONSUMPTION OF FISH

Draft Memorandum: Calculation of Length-Class Specific Fish Mercury Concentrations, their Update Based on Recently Collected Data, and Implications for the Keeyask HHRA and related communication products

W. Jansen, 24 July, 2017

File: Memo 1b_Use and baseline updates of fish Hg data for Hg HHRMP Products_WJ_Draft 4_24Jul17_plus app1.docx

Introduction

The memorandum "Proposed Communication Process of Mercury Fish Data Results and Consumption Recommendations, Keeyask Project PHASE 1 (Pre-Impoundment)" outlines the **rationale and process** to communicate to the MHHIG the outcomes of the fish mercury data analysis and implications to consumption recommendations contained within Keeyask risk communication products. The current memo provides details on the **methodology of length-class specific analysis** of fish mercury data, their update with recently (2014-2016) collected data, in consideration of their application in the Mercury and Human Health Risk Management Plan products (e.g., Human Health Risk Assessments (HHRA) and related communication products).

Background

Monitoring of mercury levels in fish occurred at regular intervals throughout the environmental assessment of the Keeyask Project. The Keeyask Project's Aquatics Effects Monitoring Plan (AEMP) commits to sampling for fish mercury concentrations on an annual basis starting in the first year of Keeyask operations (originally scheduled for 2020). Until that time, several waterbodies[1] identified in the AEMP will be sampled every three years as part of CAMP (Split and Stephens lakes) or other long term agreements (Aiken River) and will continue to produce data to contribute information to pre-project baseline concentrations. To supplement Gull Lake data collected between 2002-2006 for the Environmental Impact Statement, additional monitoring of fish mercury concentration was completed in 2014 and 2016 as a condition of the licence issued for the Keeyask Project (Jansen 2016; Jansen 2017). In addition to the calculation and interpretation of mean mercury concentrations for each fish population (represented by the entire sample for a given year), which is the focus of reports issued to fulfill AEMP requirements[2] , fish mercury concentrations have also been analyzed to provide mean concentrations specific to three length classes of Lake Whitefish, Northern Pike, and Walleye. These analyses are consistent with those first performed to provide input into the HHRA as part of the Keeyask EIS and related communication products.

This memo presents the general methodology of length-class specific analysis of fish mercury data. The memo also includes a comparison between the data available at the time of the EIS (2002 -2013) and those obtained from sampling at Split, Gull and Stephen lakes between 2014 and 2016.

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[1] The Longspruce Forebay will only be sampled should fish mercury concentrations in Stephens Lake exceed predicted concentration by more than 10%.

[2] Also see companion memo "Key Results of Recently Collected Fish Mercury Data Obtained for Waterbodies relevant to the Keeyask Project"

Comparison of fish mercury data for Split, Gull, and Stephens lakes used for the Keeyask HHRA and MHHIG communication products in 2013 and those available as of March 2017.

Introduction

The information contained in the Keeyask HHRA and the pre-impoundment communication products for Split, Gull, and Stephens lakes is based on fish mercury data up to 2013, and in some cases only up to 2002 (e.g., Lake Whitefish for Gull Lake). Additional fish mercury data has been collected and analyzed from these lakes since 2013 to ensure the pre-impoundment consumption guidance contained in the Keeyask mercury and human health communication products is current. These assessments account for the increase in mercury concentration with fish length, by estimating potential human mercury exposure separately for three fish size classes. This allows consumers to make choices in terms of mercury exposure based on fish species and fish size within a species. Note that reporting of fish mercury data for the Aiken River and Gull Lake will proceed under the auspices of the Keeyask AEMP, whereas results for Split and Stephens Lake are currently reported under CAMP.

Fish Sampling Frequency and Schedule

The determination of fish mercury concentrations in 2014 and 2016 has fulfilled the Keeyask Project licence requirements for pre-Project monitoring at Gull Lake. Monitoring at Split and Stephens lakes will continue according to the 3-yearly sampling schedule of CAMP, next in 2018 for Stephens Lake and 2019 for Split Lake. Sampling from the Aiken River at York Landing and near Ilford is also scheduled on a 3-year cycle, next in 2018. Once operation starts at Keeyask, fish mercury monitoring will proceed yearly in the directly affected waterbodies, the Keeyask reservoir and Stephens Lake, until maximum fish mercury concentrations are reached. Thereafter, monitoring will revert to a 3-year cycle until concentrations have reached pre-Project levels or are considered stable at a new background level. Monitoring at Split Lake and the Aiken River will continue at a 3-yearly interval throughout the operation phase until sampling at Keeyask reservoir and Stephens Lake will end.

Sample Size and data analysis

Fish species sampled for mercury analysis at Split, Gull, and Stephens lakes include Lake Whitefish, Northern Pike, Walleye, and 1-year-old Yellow Perch; only pike and Walleye will be collected from the Aiken River. Target numbers of fish for mercury analysis consist of up to 36 Northern Pike, Walleye, and Lake Whitefish, and up to 25 one-year-old Yellow Perch in a sampling year. The actual number of fish from each species to be analyzed will largely depend on their availability within the different waterbodies. It is expected that numbers will occasionally differ from the target sample size. Juvenile perch are not considered to be consumed by humans and only whitefish, pike, and Walleye are used for the current analysis. To calculate mean arithmetic mercury concentration for each length-class of the three species, data from two or more sampling years are used to increase the sample size of fish in each class to more reliably estimate average mercury concentrations. Results are made more current by including data from the most recent sampling year while deleting data from the oldest sampling year(s), thereby calculating a running average of mercury concentrations by species and length class

For details of sampling and analytical methods, and general results refer to published AEMP reports (e.g., Jansen 2016).

Summary of Results

The following provides a summary of the results for Lake Whitefish, Northern Pike, and Walleye from Split, Gull, and Stephens lakes, and for Lake Sturgeon from Gull Lake. All figures show fish muscle mercury concentrations as total mercury based on wet weights and fish length measured as fork length. Appendix 1 summarizes changes in fish mercury concentrations between the time period applied to the existing communications products and the period that incorporates the most current data for Gull, Split, and Stephens lakes.

Split Lake

New data year available since 2013/14 assessment: Year 2016

Lake Whitefish

Replacement of the results for 2001 with those of 2016 resulted in a 50% reduction (from 24 to 12 fish) of the number of fish in the smallest size-class (see Figures on page 4). This trend is typical for whitefish from all 3 lakes: less whitefish are being caught in recent years and the fish that are caught tend to be large.

Mean mercury concentrations for whitefish in each length class remained almost identical for the 2001-13 and the 2002-16 data sets.

Northern Pike

If data for 2005 are removed and data for 2016 are added, the sample size for the smallest size class increases, but decreases the number of fish in the largest size class from 12 to 8 (see Figures on page 5).

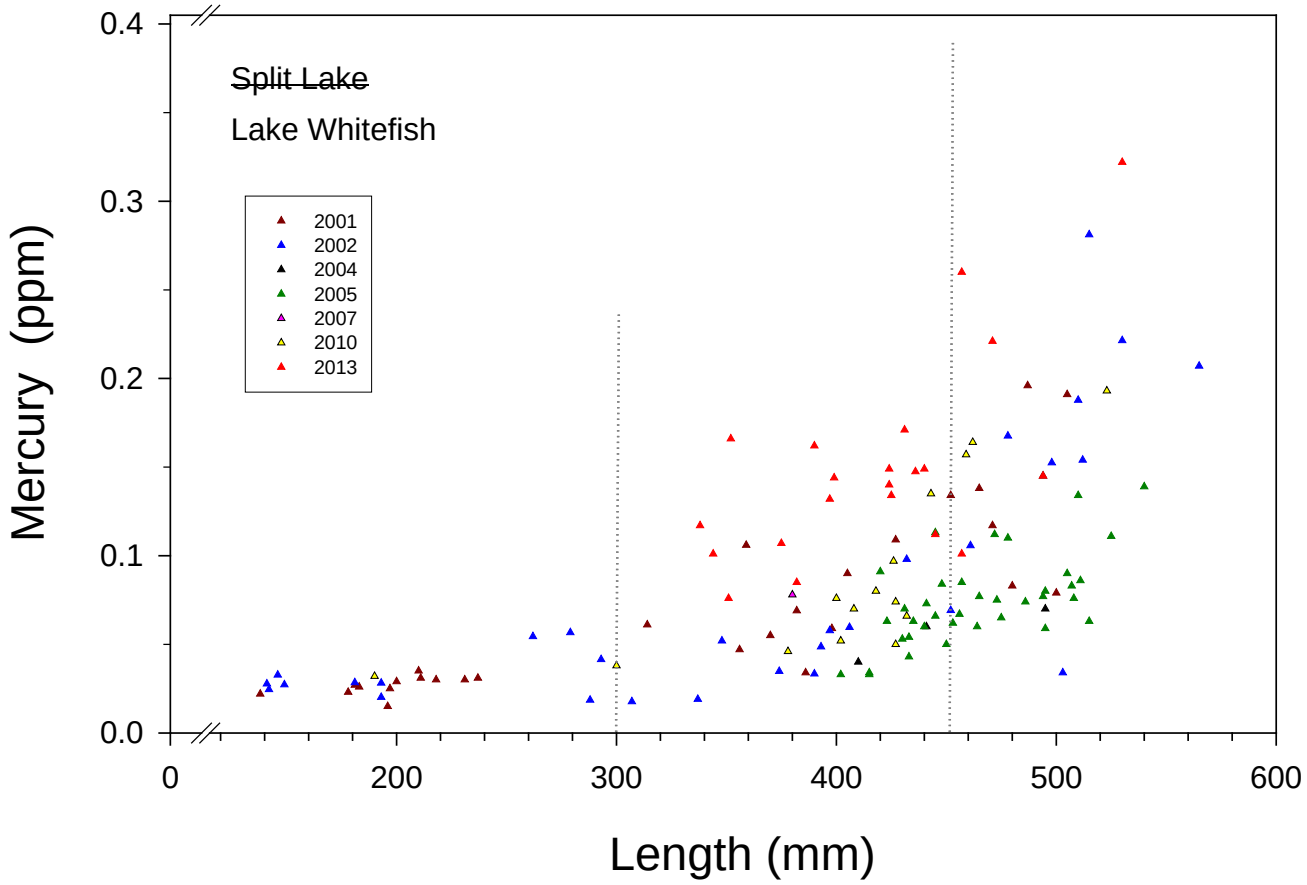
This decrease in the number of large pike analyzed for mercury (which is observed in all three waterbodies) confirms predictions outlined by WJ in a similar assessment in October 2014 and justifies the change in the lower limit of the largest size-class from 800 mm to 750 mm implemented in 2014.

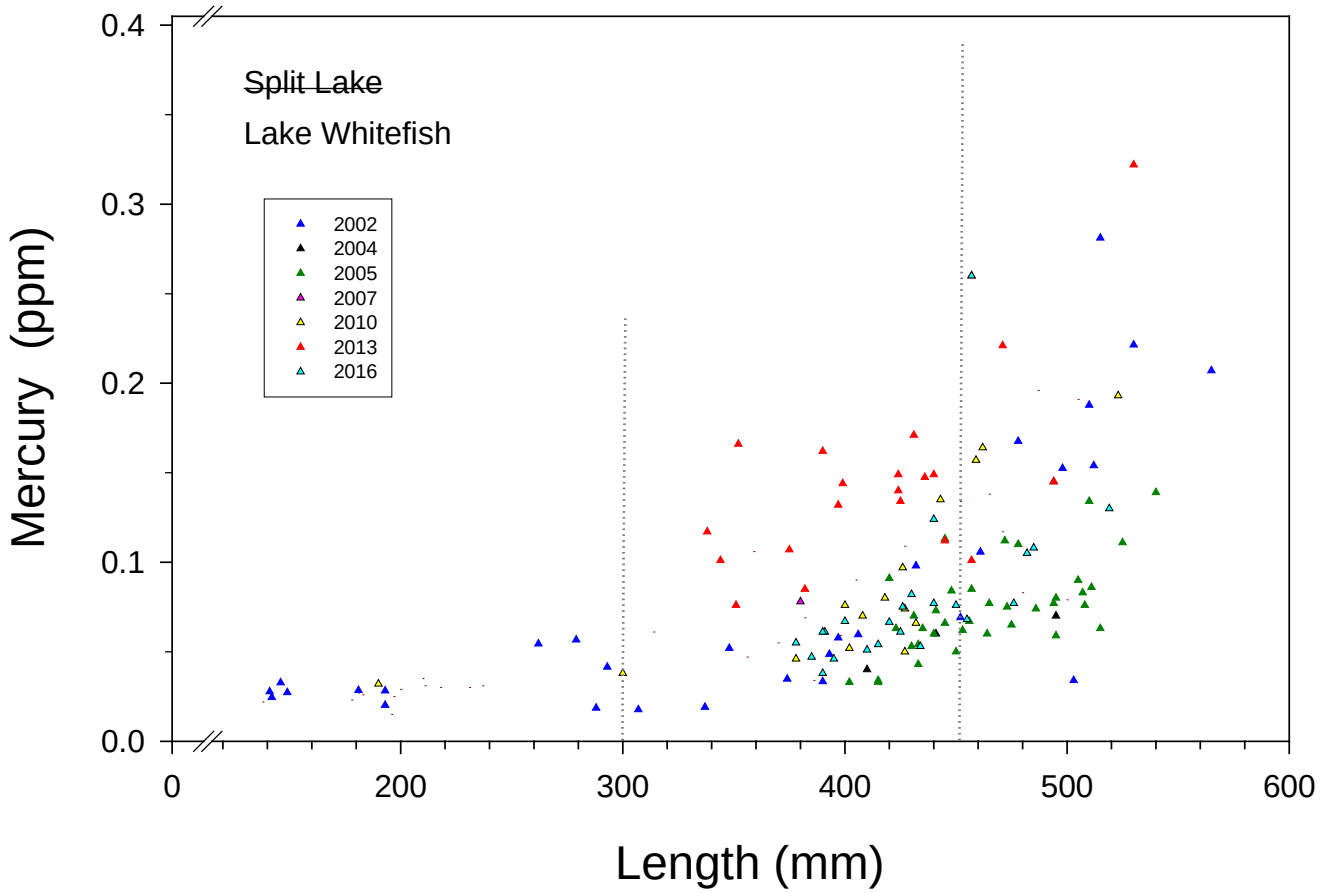
Mean mercury concentrations for pike in each length class increased between 6.3% and 14.8% (500-750 mm).

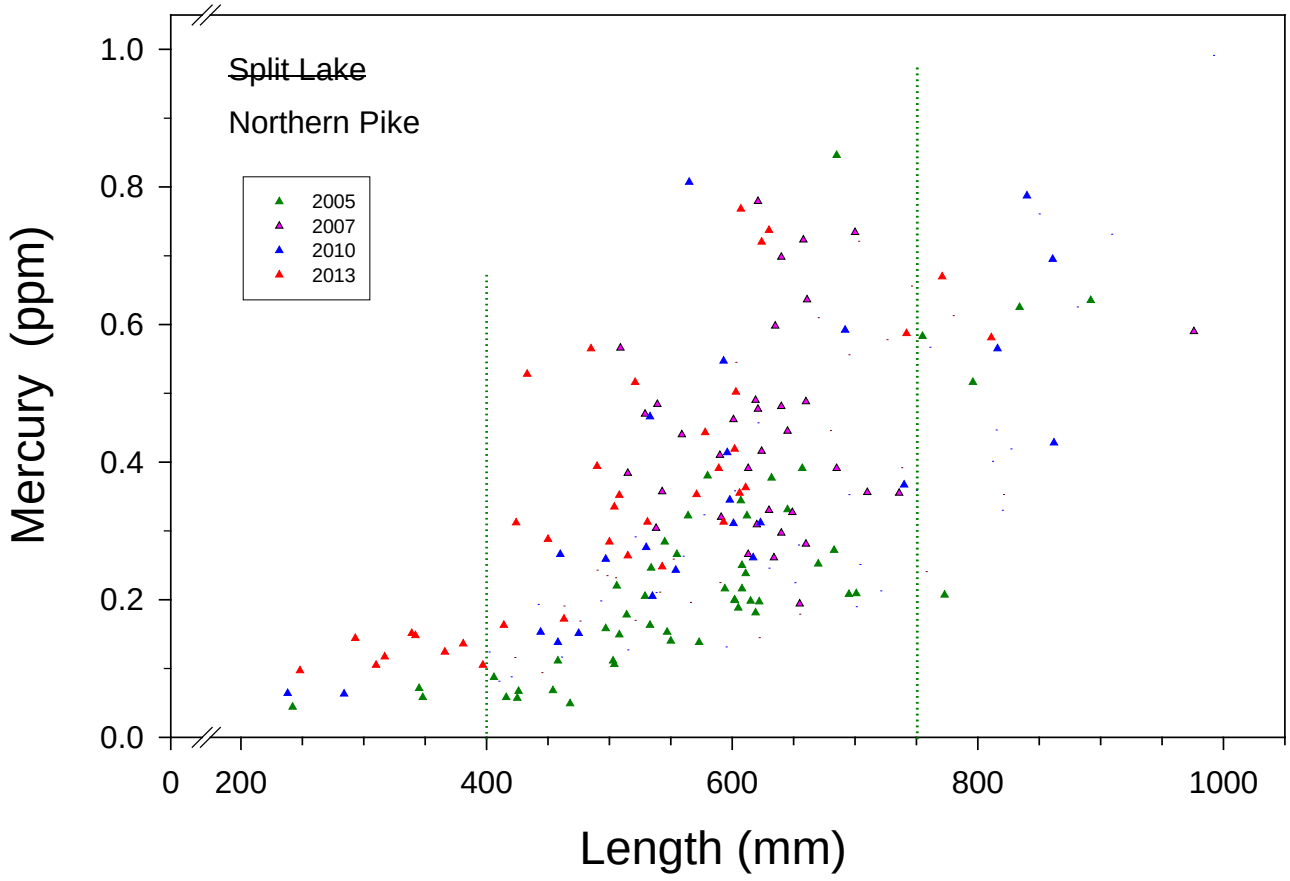
Walleye

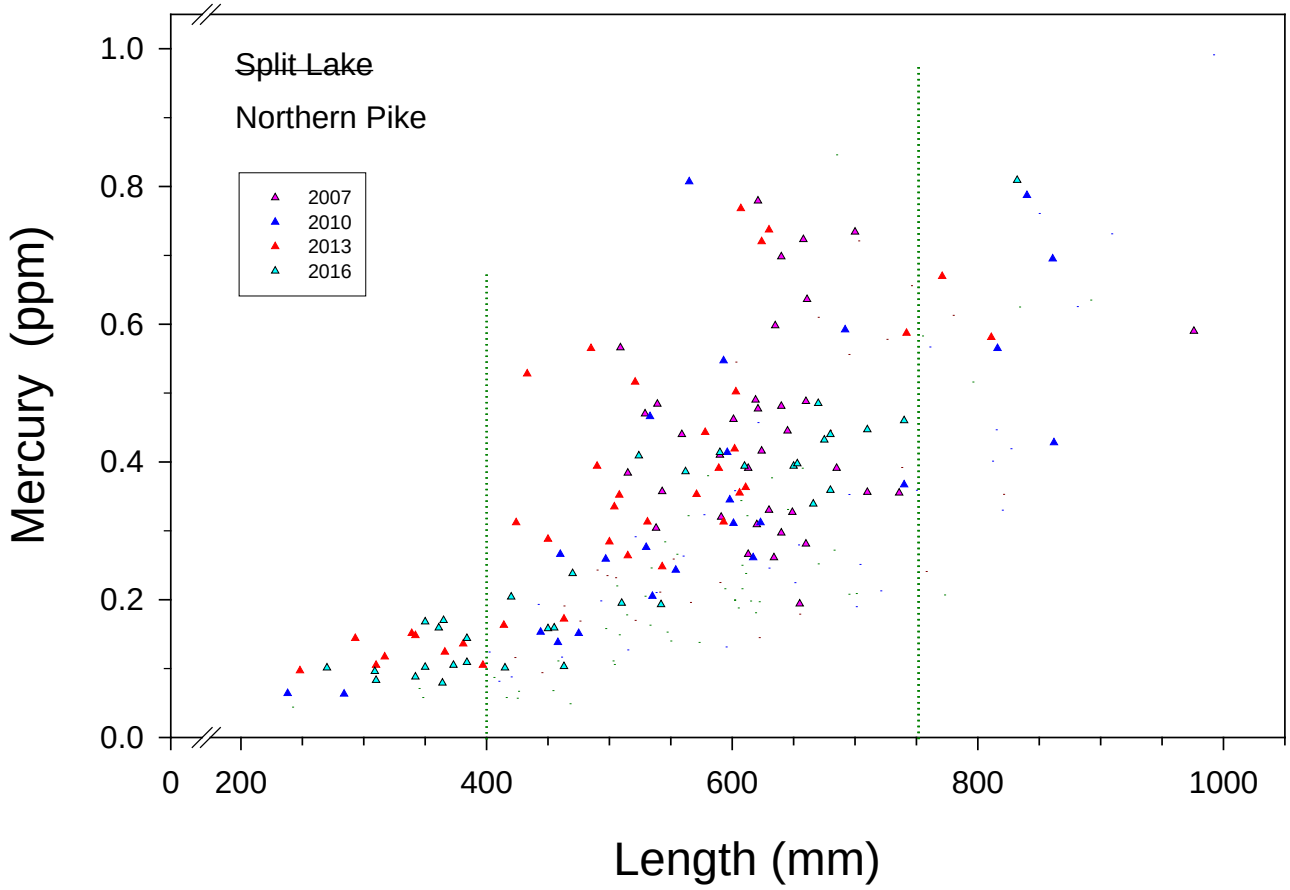
If data for 2004 and 2005 are removed and data for 2016 are added, the overall sample size decreases from 204 to 172 fish, but the largest size-class is represented with 9 instead of 6 fish (see Figures on page 6).

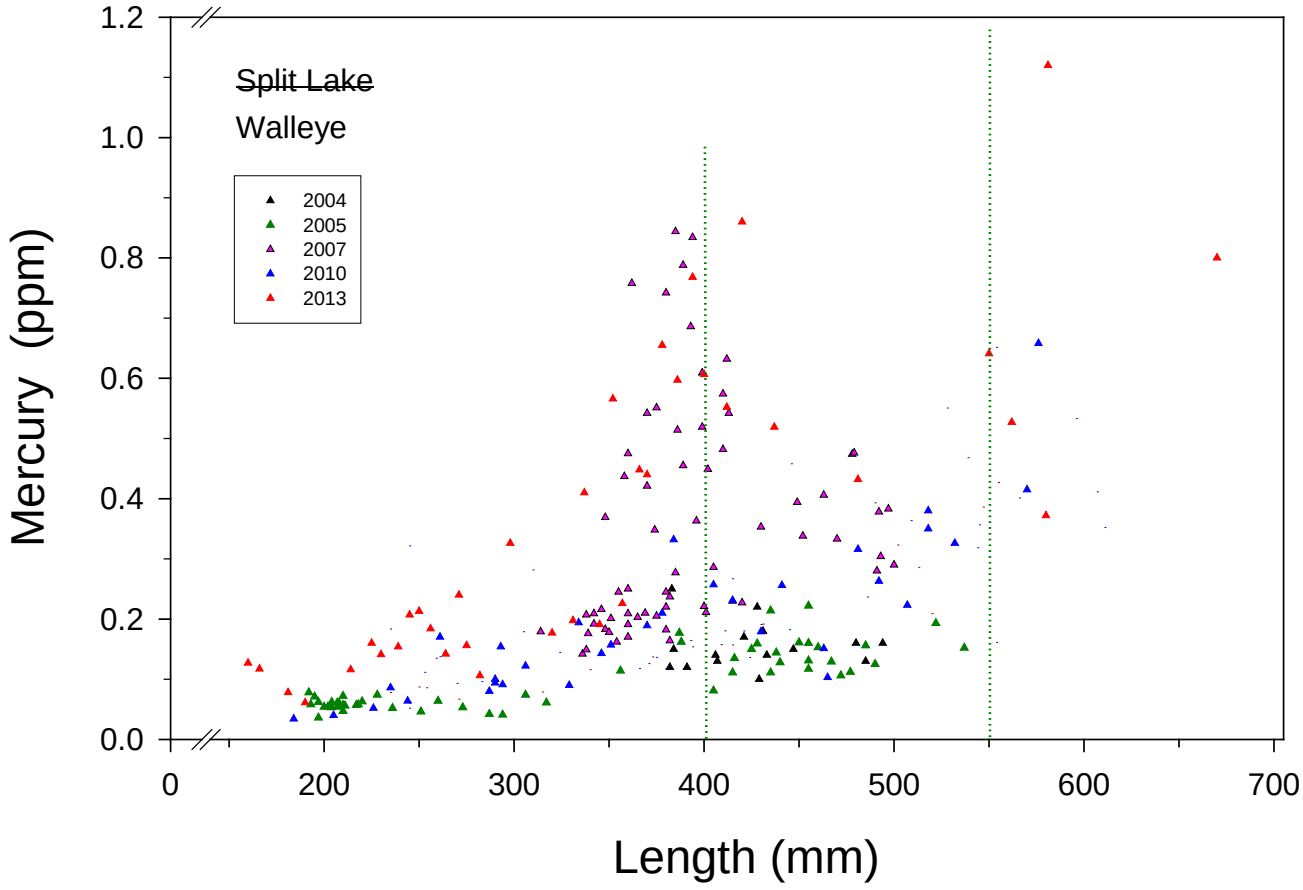
Mean mercury concentrations for Walleye in each length class increased between 6.7% and 30.0% (400-550 mm).

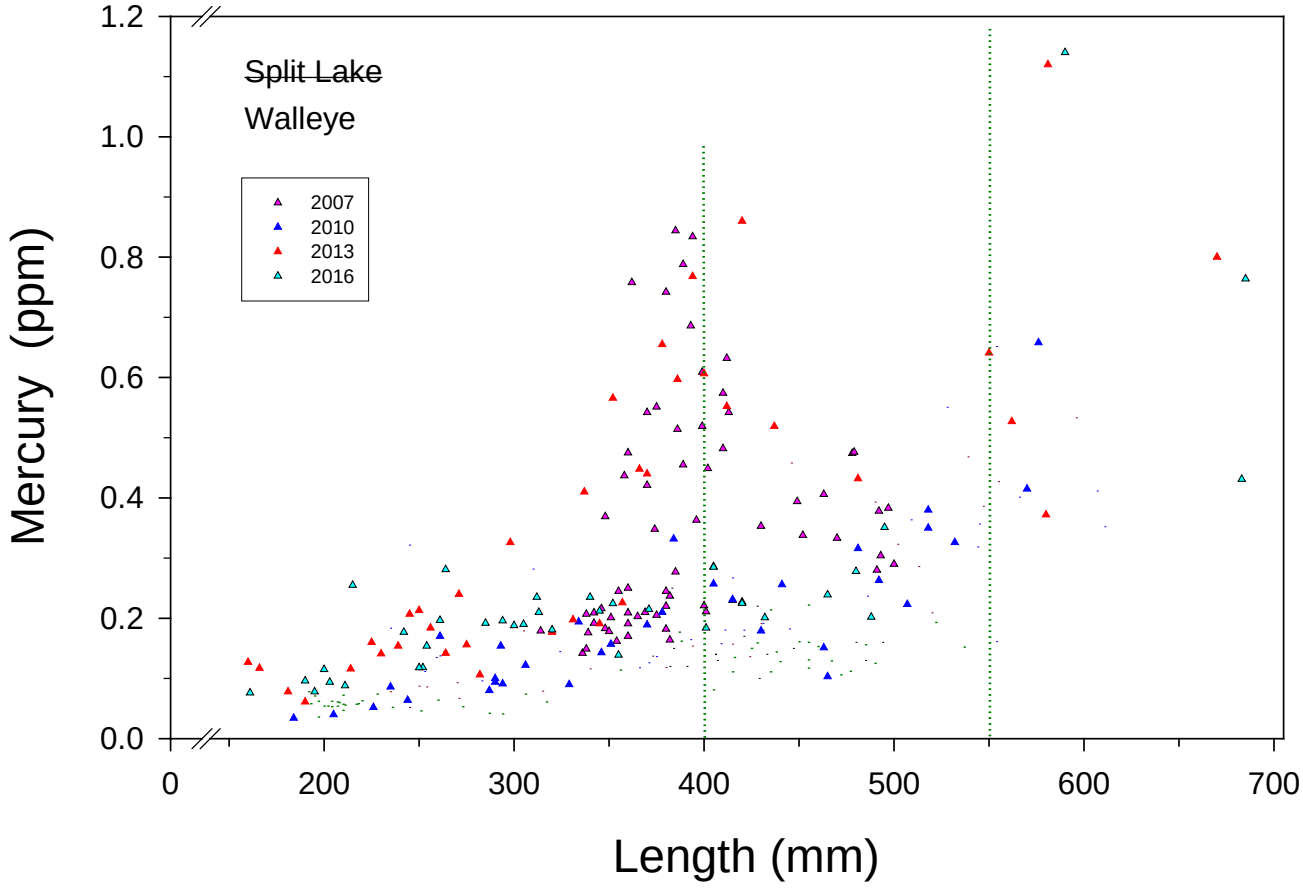

Split Lake
Lake Whitefish
2001
2002
2004
2005
2007
2010
2013
Mercury (ppm)
Length (mm)
0.0
0.1
0.2
0.3
0.4
0
200
300
400
500
600


Split Lake
Lake Whitefish
2002
2004
2005
2007
2010
2013
2016
Mercury (ppm)
Length (mm)
0.0
0.1
0.2
0.3
0.4
0
200
300
400
500
600


Split Lake
Northern Pike
2005
2007
2010
2013
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
0
200
400
600
800
1000


Split Lake
Northern Pike
2007
2010
2013
2016
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
0
200
400
600
800
1000


Split Lake
Walleye
2004
2005
2007
2010
2013
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
200
300
400
500
600
700


Split Lake
Walleye
2007
2010
2013
2016
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
200
300
400
500
600
700

Stephens Lake

New data available since 2013/14 assessment: Year 2015

Updated scattergrams of mercury concentrations versus fish length for all three species have not been produced (see 2014 versions on pages 8-10). Except for Lake Whitefish (see below) the replacement of the results for 2003 and 2004 by those for 2015 results in some decreases in sample sizes for all size-classes of pike and Walleye, but still provides usable sample sizes for the current assessment.

Lake Whitefish

For Lake Whitefish the data for 2003 and 2004 were replaced by those for 2015. This resulted in a very small number of fish in the smallest size-class, and all of these 5 fish were young-of-year with a mean length of 88 mm (i.e. not relevant in terms of for human consumption).

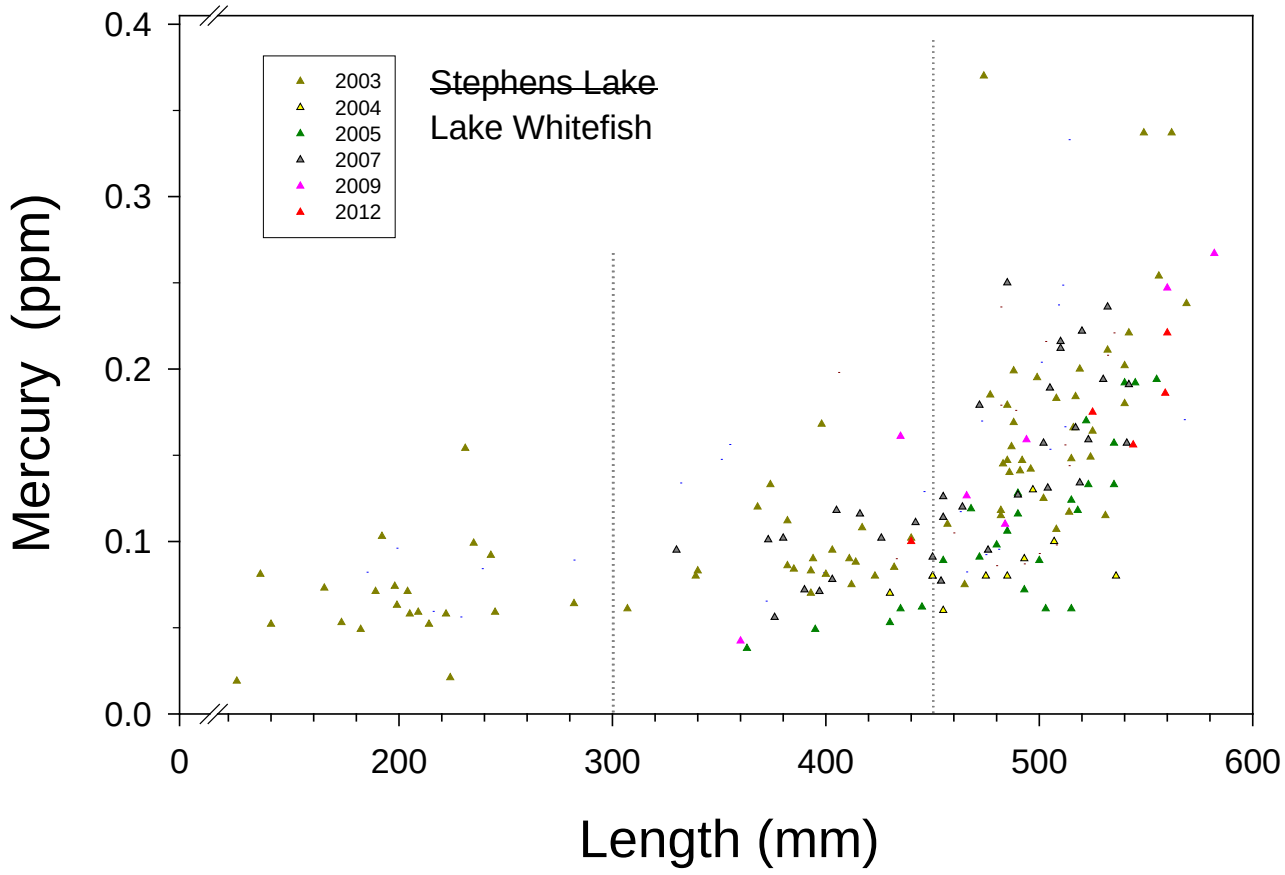
Mean mercury concentrations for whitefish in each length-class decreased to ~25% in the smallest class and by 2.9% in the 300-450 mm class, and increased by 1.2% for the largest class.

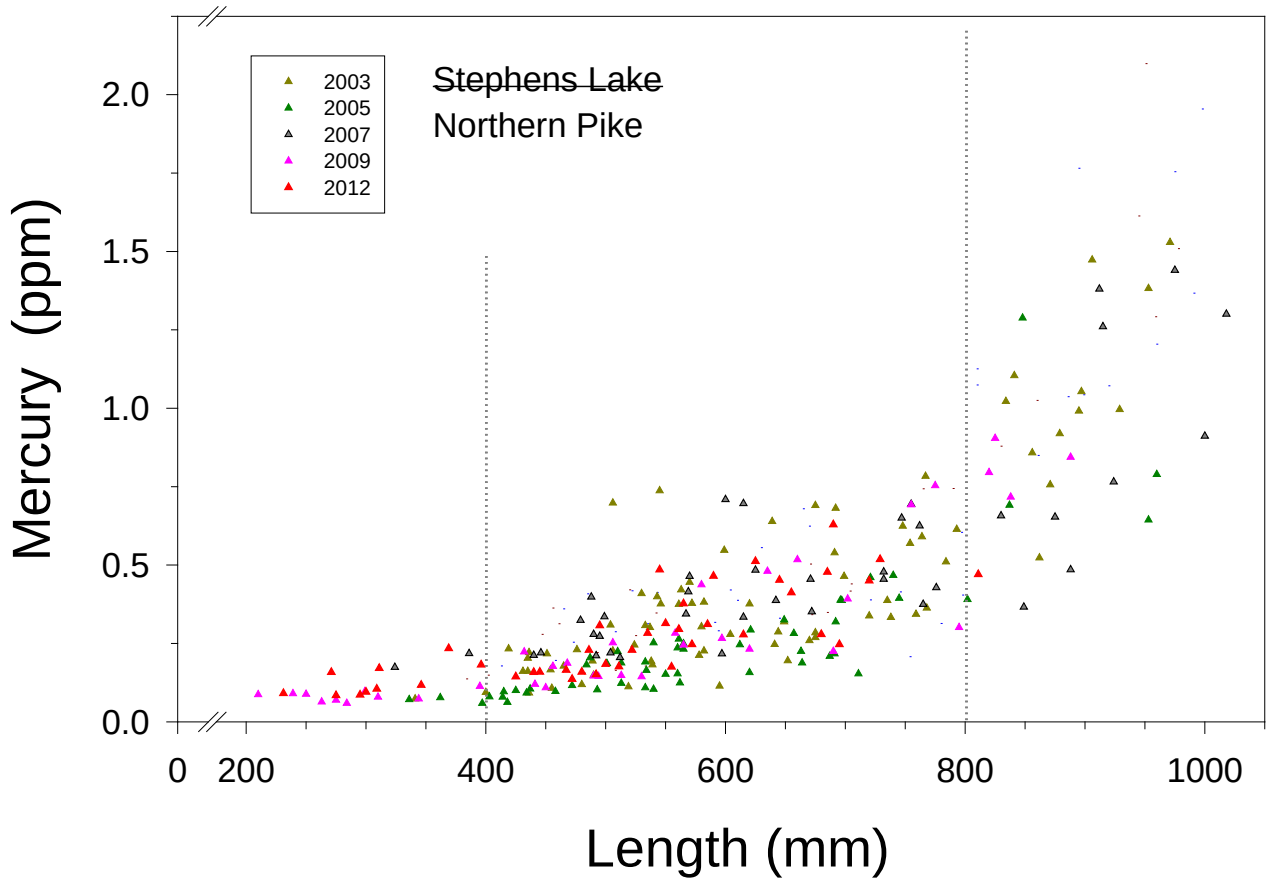
Northern Pike

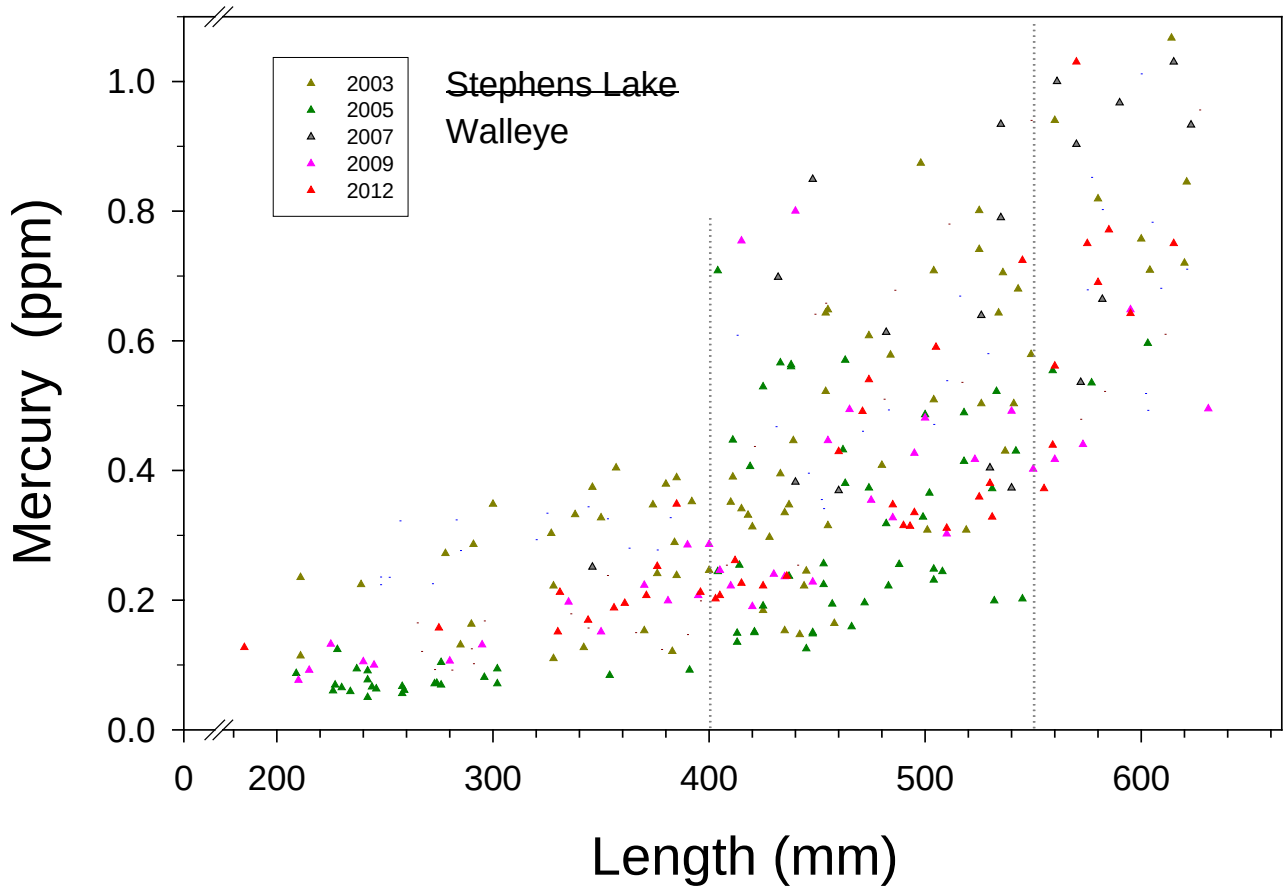
Mean mercury concentrations for pike in the two smaller length classes increased between 10.7% and 12.7%, and remained virtually the same for the largest class (>750 mm).

Walleye

Mean mercury concentrations for Walleye in the two smaller length classes increased between 22.9% and 71.8%, and remained virtually the same for the largest class (>550 mm)


Stephens Lake
Lake Whitefish
2003
2004
2005
2007
2009
2012
Mercury (ppm)
0.0
0.1
0.2
0.3
0.4
0
200
300
400
500
600
Length (mm)


2003
2005
2007
2009
2012
Stephens Lake
Northern Pike
Mercury (ppm)
0.0
0.5
1.0
1.5
2.0
0
200
400
600
800
1000
Length (mm)


2003
2005
2007
2009
2012
Stephens Lake
Walleye
Mercury (ppm)
1.0
0.8
0.6
0.4
0.2
0.0
0
200
300
400
500
600
Length (mm)

Gull Lake

New data available since 2013/14 assessment: Years 2014 and 2016

Lake Whitefish

Except for one individual all whitefish from 2014 and 2016 sampling belong to the largest size-class (see Figures on page 12).

Mean mercury concentrations in whitefish remained virtually the same for the smallest class and in the 300-450 mm class, but increased by 19.2 for the largest class.

Northern Pike

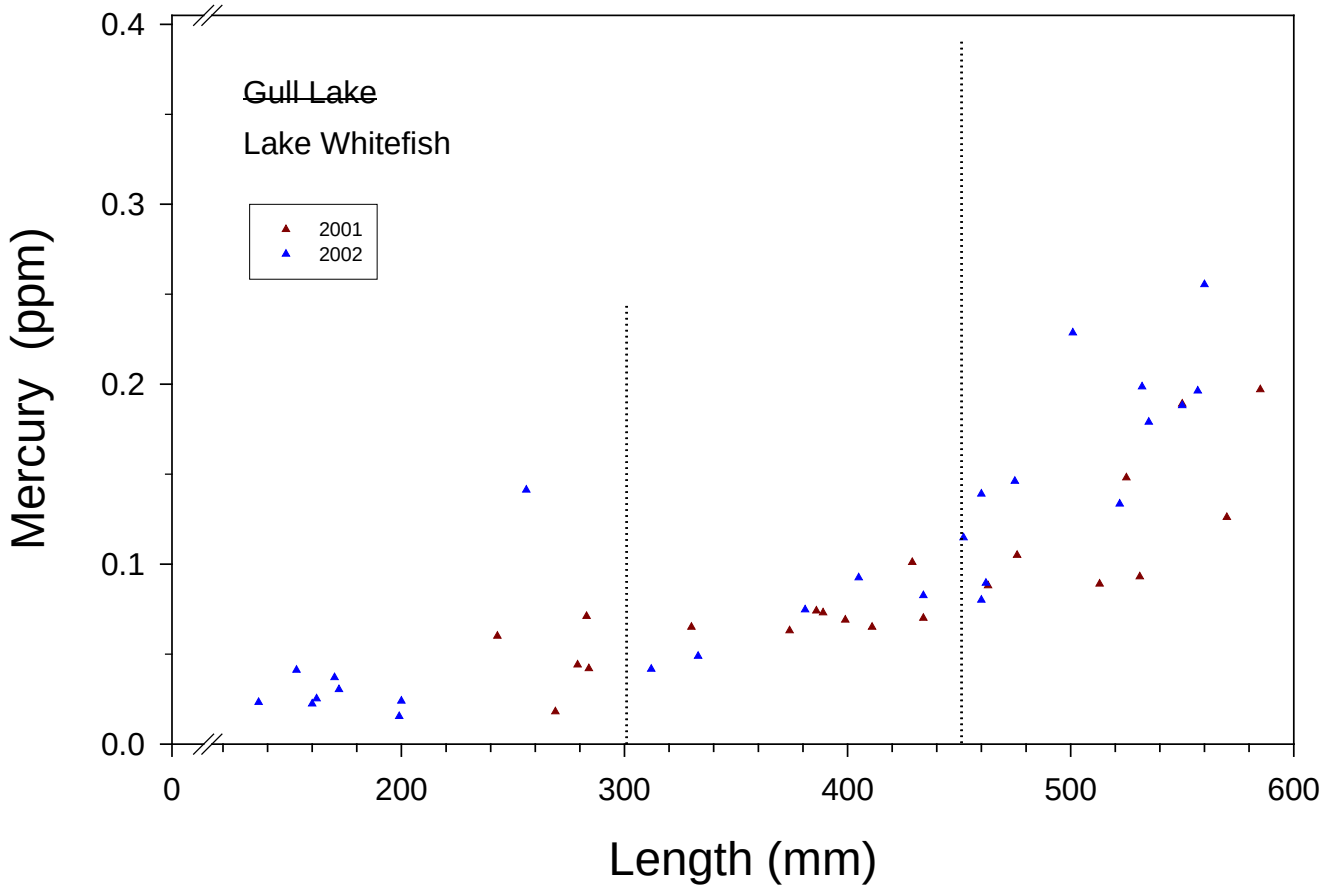
The replacement of more than 60% of the fish for the current assessment did not substantially change the numbers of fish in each size-class, only the largest class experienced a moderate reduction in numbers (see Figures on page 13).

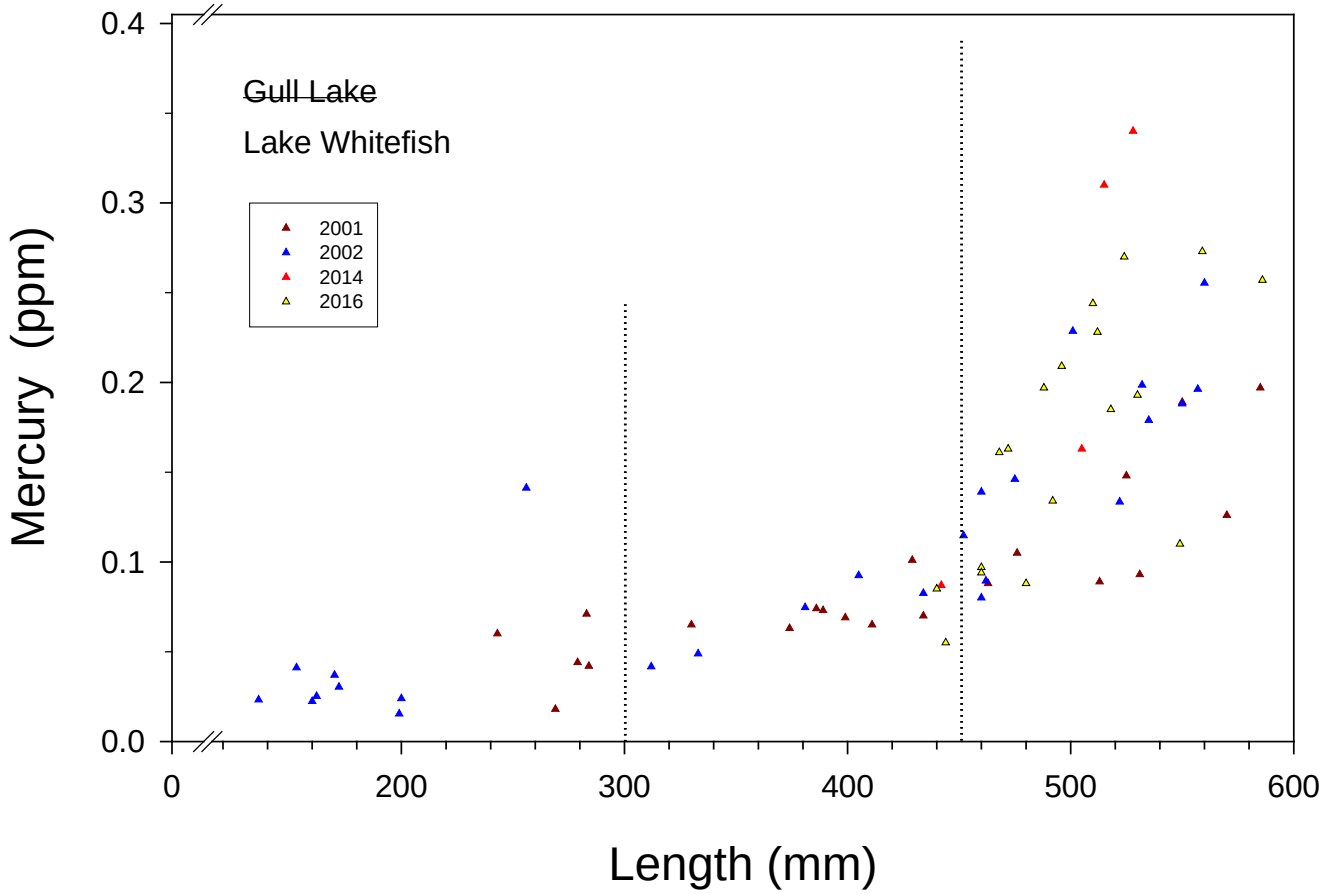
Mean mercury concentrations in pike increased by 6.3% for the smallest class and by 33.3% for the 500-750 mm class, but slightly (1.2%) decreased for the largest class.

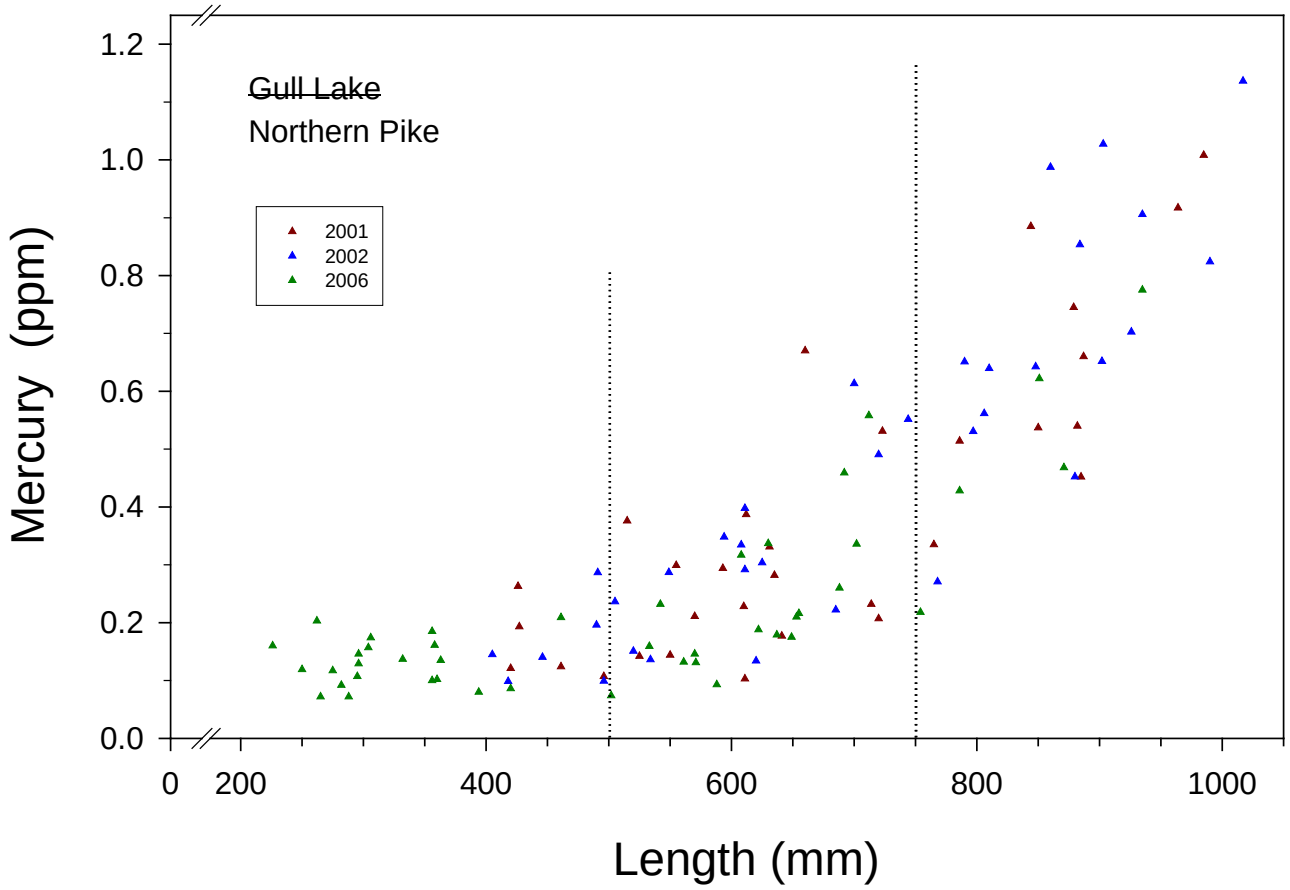
Walleye

The replacement of the data for 2001 and 2002 with those for 2014 and 2016 resulted in an approximately 30% increase in the numbers of fish in smaller two size-classes, and a similar decrease for the largest class (see Figures on page 14).

Mean mercury concentrations in Walleye increased for all 3 size-classes, ranging from 7.4% for the largest class to 50.5% for the smallest class.


Gull Lake
Lake Whitefish
2001
2002
Mercury (ppm)
Length (mm)
0.0
0.1
0.2
0.3
0.4
0
200
300
400
500
600


Gull Lake
Lake Whitefish
2001
2002
2014
2016
Mercury (ppm)
Length (mm)
0.0
0.1
0.2
0.3
0.4
0
200
300
400
500
600


Gull Lake
Northern Pike
2001
2002
2006
Mercury (ppm)
Length (mm)
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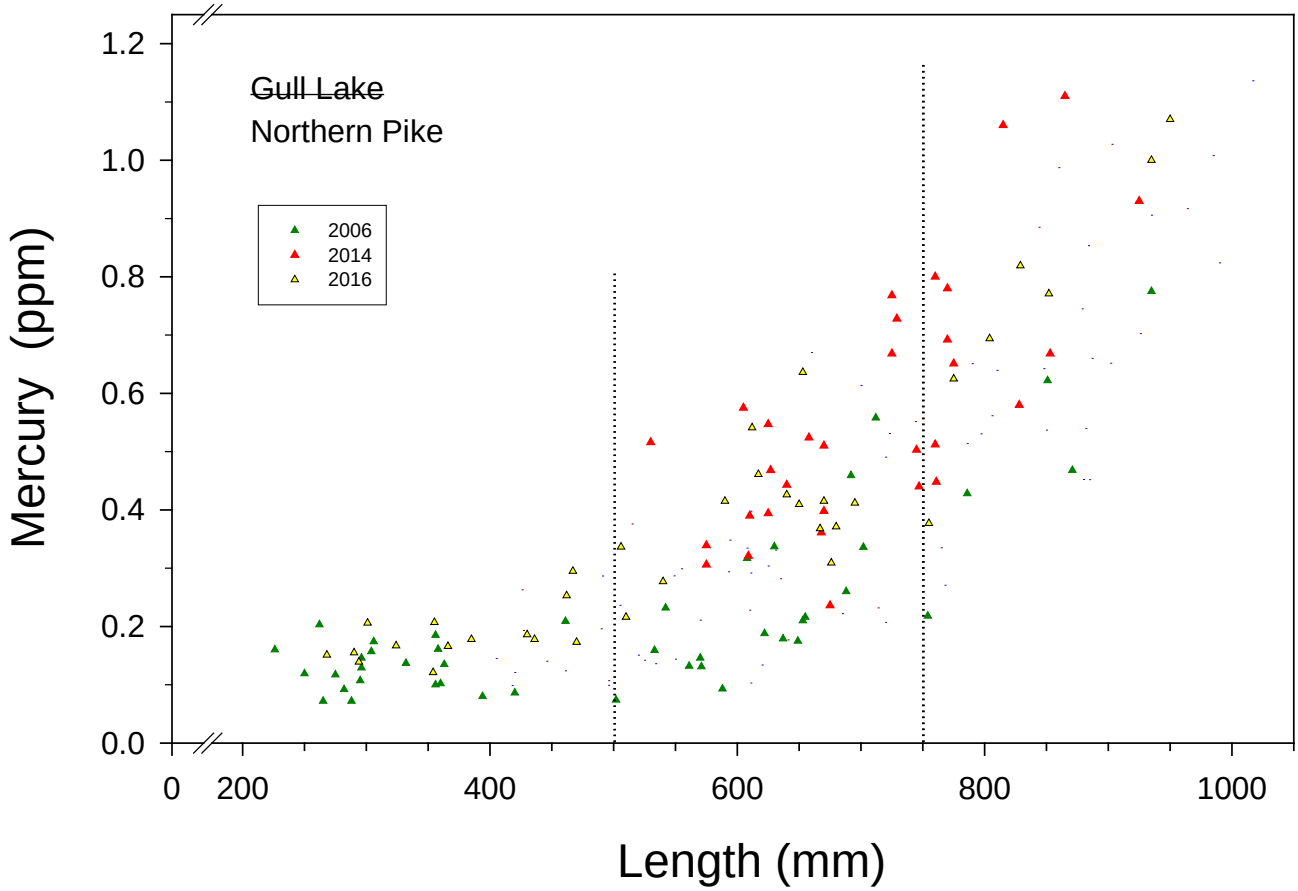
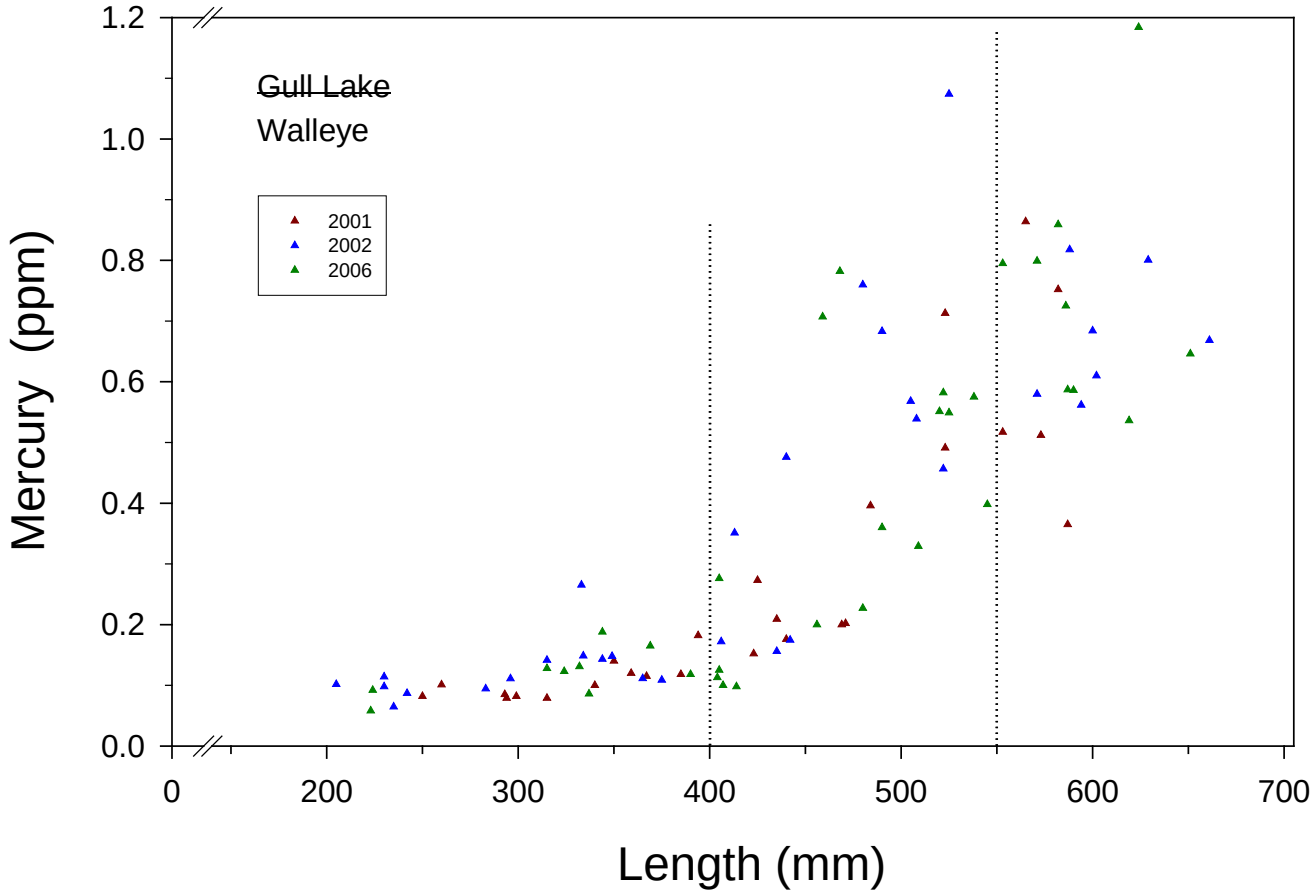
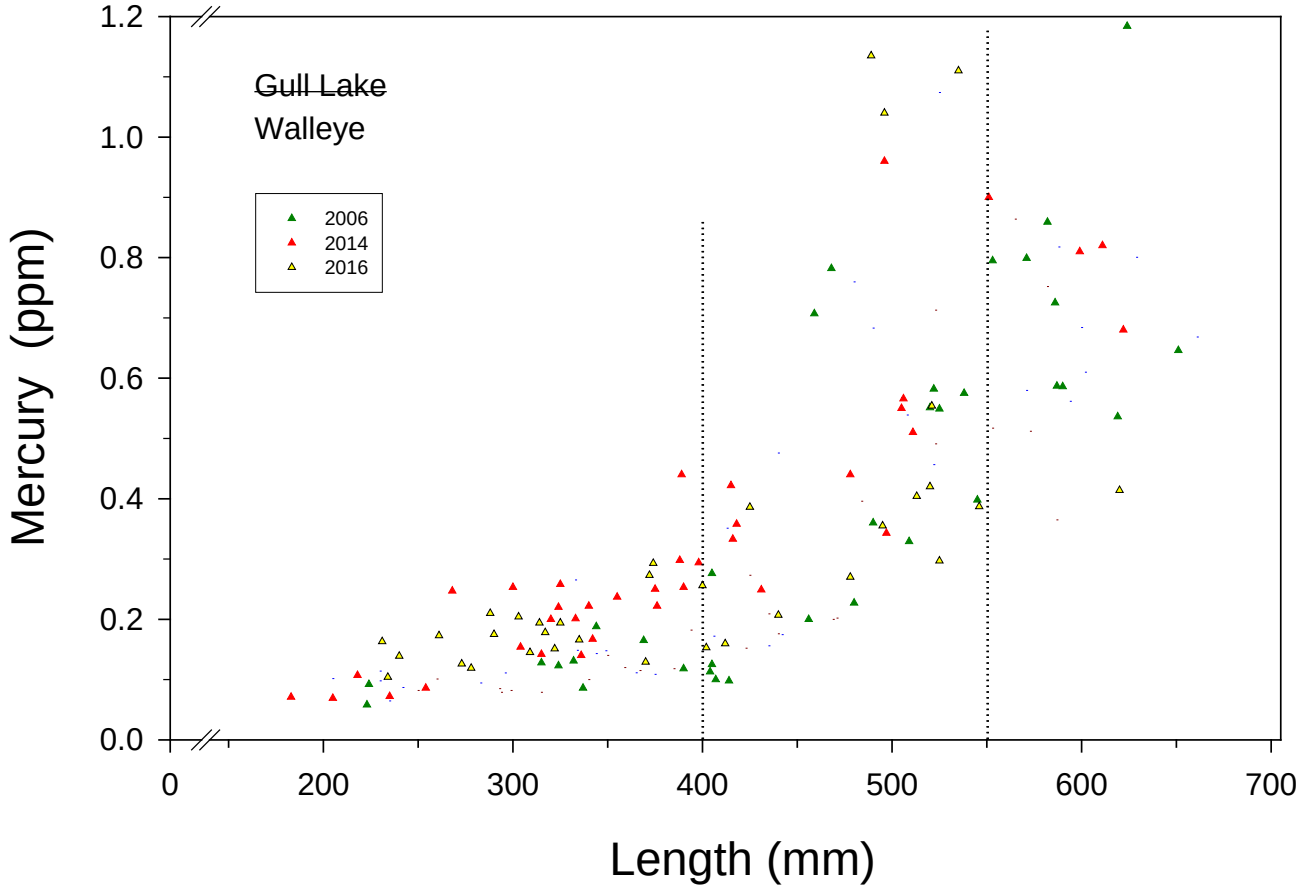
0.2
0.4
0.6
0.8
1.0
1.2
0
200
400
600
800
1000

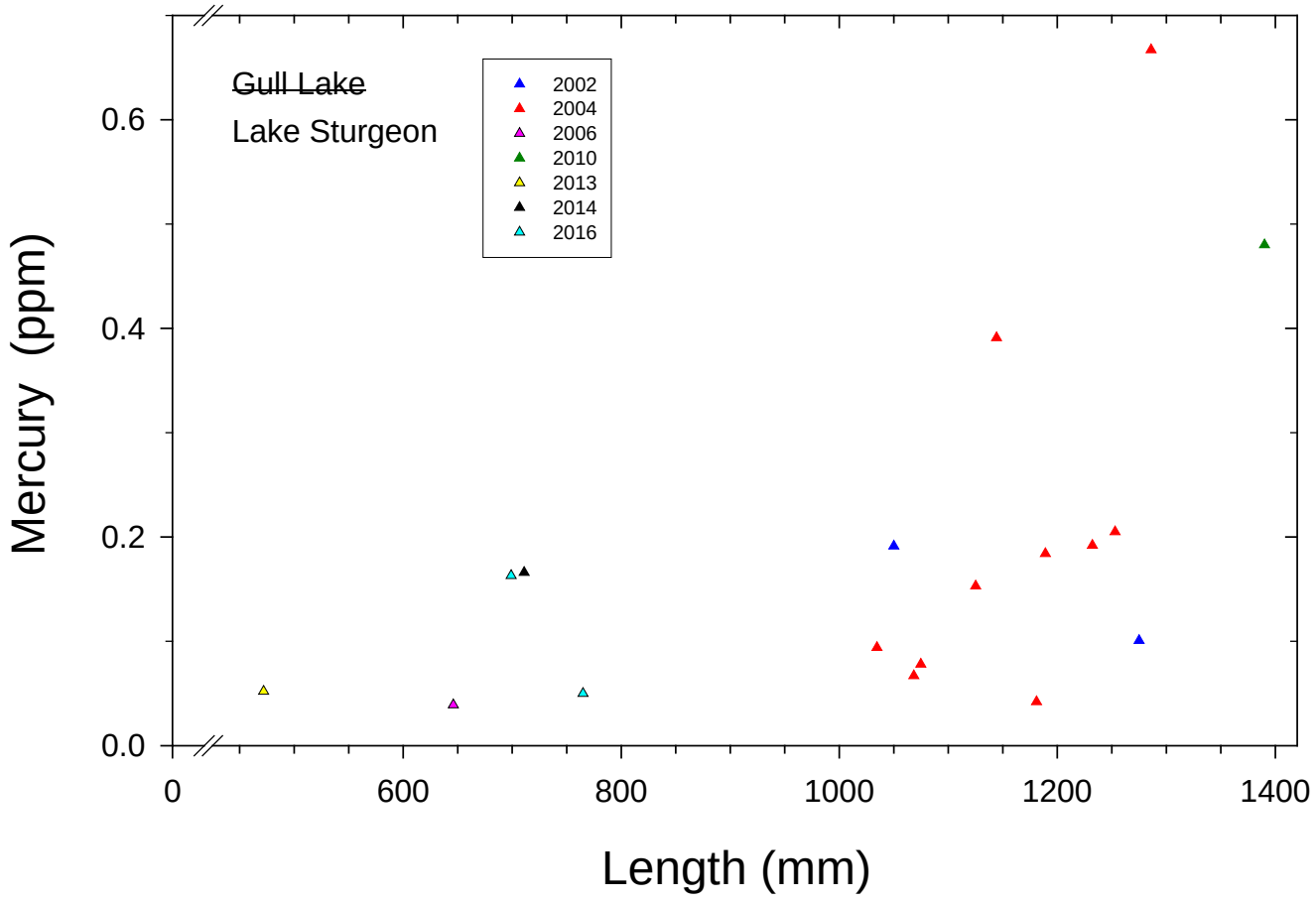

Gull Lake
Northern Pike
2006
2014
2016
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
200
400
600
800
1000


Gull Lake
Walleye
2001
2002
2006
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
200
300
400
500
600
700


Gull Lake
Walleye
2006
2014
2016
Mercury (ppm)
Length (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
200
300
400
500
600
700

Lake Sturgeon

In addition to the 15 sturgeon with mercury and length data for 2002-2013, mercury was analyzed for 1 sturgeon in 2014 and for 3 sturgeon in 2016. The average mercury concentration (i.e., standard mean) of sturgeon from Gull Lake was not significantly changed by the additional data for 2014 and 2016. All statements made in the Keeyask HHRA and the associated communication products remain unaffected by the inclusion of the most recent data.



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Jansen, W. 2016. Mercury in Fish Flesh from Gull Lake in 2014. Keeyask Generation Project Aquatic Effects Monitoring Report #AEMP-2016-11. A report prepared for Manitoba Hydro by North/South Consultants Inc., June 2016.

KHLP (Keeyask Hydropower Limited Partnership) 2014. Keeyask Generation Project Aquatic Effects Monitoring Plan. Winnipeg, MB, 355 pp.

Appendix 1: **Mean mercury concentration, length, and sample size for three size classes of whitefish, pike, and walleye from Stephens, Gull, and Split lakes for two time periods (year ranges). The first period represents the data used for the Keeyask MHHWG fish Hg and human health communication products in 2014, the second range could be used for an update of these products. Lth = Fork length.**

Stephens Lake 2003, 04, 07, 09, 12; new 2015

Lake Whitefish

	~11.8''			~17.7''					
	<300 mm			300-450 mm			>450 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2003-12	0.068	200.5	21	0.088	400.6	44	0.156	507.0	93
2005-15	0.017	87.6	5	0.086	406.7	23	0.158	510.3	53
% Diff Hg	24.8			97.1			101.2		

Northern Pike

	~19.7''			~29.5''					
	<500 mm			500-750 mm			>750 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2003-12	0.151	408.7	77	0.334	608.0	123	0.804	852.9	46
2007-15	0.170	389.8	61	0.369	606.1	67	0.803	842.8	26
% Diff Hg	112.7			110.7			99.8		

Walleye

	~15.8''			~21.7''					
	<400 mm			400-550 mm			>550 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2003-12	0.173	304.9	74	0.409	470.8	131	0.719	586.8	30
2007-15	0.297	317.6	40	0.503	476.1	68	0.721	582.5	22
% Diff Hg	171.8			122.9			100.3		

Gull Lake: 2001, 02, 06; new 2014 and 2016

Lake Whitefish

	~11.8''			~17.7''					
	<300 mm			300-450 mm			>450 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2001-06	0.042	211.9	14	0.071	385.9	13	0.149	514.0	20
2001-16	0.042	211.9	14	0.072	396.4	16	0.178	510.9	40
	100.0			101.3			119.2		

Northern Pike

	~19.7''			~29.5''					
	<500 mm			500-750 mm			>750 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2001-06	0.141	366.3	32	0.277	616.8	48	0.708	872.3	32
2006-16	0.150	336.0	36	0.370	631.8	52	0.700	825.2	23
	106.3			133.3			98.8		

Walleye

	~15.8''			~21.7''					
	<400 mm			400-550 mm			>550 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2001-06	0.117	311.4	35	0.394	469.6	36	0.688	593.7	21
2006-16	0.177	311.3	50	0.491	475.0	44	0.739	597.6	14
	150.4			124.4			107.4		

Split Lake: 2001,02,05,07,10,13 for WFish; 2005,07,10 13 for Pike; 2004,05,07,10,13 for Wall; new 2016

Lake Whitefish

	~11.8''			~17.7''					
	<300 mm			300-450 mm			>450 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2001-13	0.030	201.5	24	0.084	404.8	74	0.130	488.1	53
2002-16	0.033	204.8	12	0.082	409.5	82	0.126	488.8	51
	109.5			97.0			97.1		

Northern Pike

	~19.7''			~29.5''					
	<500 mm			500-750 mm			>750 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2005-13	0.161	396.9	34	0.367	599.6	101	0.573	832.3	12
2007-16	0.171	386.4	41	0.421	608.6	81	0.641	846.1	8
	106.3			114.8			111.7		

Walleye

	~15.8''			~21.7''					
	<400 mm			400-550 mm			>550 mm		
Year range	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n	Hg (ppm)	Lth (mm)	n
2004-13	0.222	307.5	125	0.270	452.4	73	0.649	589.8	6
2007-16	0.255	314.8	115	0.352	452.8	48	0.692	610.8	9
	114.8			130.0			106.7		

Technical Memorandum

To: Manitoba Hydro

From: Ross Wilson, M.Sc., DABT, Wilson Scientific Consulting Inc.

Date: August 18, 2017

Re: Updated Maximum Safe Monthly Consumption for Fish Due to Mercury from Pre-operation Conditions at Stephens, Gull and Split Lakes

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Introduction

The following memorandum provides a human health risk assessment (HHRA) interpretation of the updated concentrations and recommendations for maximum safe monthly consumption rates from pre-operation conditions in Keeyask Project area waterbodies (*i.e.,* Stephens, Gull and Split Lakes). As one component of the Keeyask Project Mercury and Human Health risk management strategy, North/South Consultants Inc. (North/South) has prepared a draft memorandum that outlines their most recent estimates of pre-operation mercury concentrations in lake whitefish, northern pike, walleye and lake sturgeon from Stephens, Gull and Split Lakes (North/South, 2017). Consequently, Wilson Scientific has prepared the following memorandum as a risk-based interpretation of the North/South fish data.

Summary of the Draft North/South Memo

The draft North/South (2017) memorandum provides an update of the pre-operation fish mercury concentrations in Split, Stephen and Gull Lakes and is a key source of information in determining maximum fish consumption recommendations. The North/South (2017) memorandum updated mercury concentrations for the same three fish length-classes used in the previous assessment provided for each species sampled from the aforementioned lakes. Wilson Scientific has relied on the North/South (2017) data as being accurate and representative of conditions in the lakes. The updated mercury concentrations presented by North/South (2017) are summarized in Table 1.

Table 1 Updated Pre-operation Mercury Concentrations in Fish from Stephens, Gull and Split Lakes as Reported in North/South (2017)

Fish Species	Fish Size Class (mm fork length)	Arithmetic Mean Total Mercury Concentration (µg/g; wet weight)		
		Stephens Lake	Gull Lake	Split Lake
Lake Whitefish	<300 mm	0.068 (0.068)	0.042 (0.042)	0.033 (0.030)
	300-450 mm	0.086 (0.088)	0.072 (0.071)	0.082 (0.084)
	>450 mm	0.158 (0.156)	0.178 (0.149)	0.126 (0.130)
Northern Pike	<500 mm	0.170 (0.151)	0.150 (0.141)	0.171 (0.161)
	500-750 mm	0.369 (0.334)	0.370 (0.277)	0.421 (0.367)
	>750 mm	0.803 (0.804)	0.700 (0.708)	0.641 (0.573)
Walleye	<400 mm	0.297 (0.173)	0.177 (0.117)	0.255 (0.222)
	400-550 mm	0.503 (0.409)	0.491 (0.394)	0.352 (0.270)
	>550 mm	0.721 (0.719)	0.739 (0.688)	0.692 (0.649)
Lake Sturgeon	425-1,390 mm	0.186* (Not estimated in earlier material)	0.186* (0.196)	0.186* (Not estimated in earlier material)

Values in parentheses represent the previous values used to develop draft communication material

* Lake Sturgeon greater than 1,100 mm may have substantially higher concentrations than this mean value

Updated Fish Consumption Recommendations

Since the estimated fish mercury concentrations for pre-operation conditions provided by North/South have changed due to the inclusion of the most recent results and the communication products have not been released to the community, it seemed reasonable to update the fish consumption recommendations for these current changes (even though some are quite minor).

The process for determining the fish consumption recommendations was based on Health Canada (2007; 2010) HHRA guidance for mercury and consistent with the approach used by Manitoba Water Stewardship (2007). Many of the details in the HHRA are discussed in Wilson Scientific (2013). Briefly, consistent with Health Canada (2007) and World Health Organization (2010) guidance, a tolerable daily intake of 0.2 µg/kg bw/day was considered to be acceptable for children and women of childbearing age while a tolerable daily intake of 0.47 µg/kg bw/day was considered to be acceptable for all members of the population. Consistent with Manitoba Water Stewardship (2007) recreational fish consumption

guidelines, the receptor groups of concern for developing fish consumption recommendations were based on monthly intakes and developed for: children (weighing 30 kg); women of childbearing age (weighing 60 kg); and men and seniors (weighing 60 kg).

For each fish category, the following equation was used to estimate the maximum amount of fish that could be consumed on a monthly basis and not exceed the Health Canada tolerable daily intake for methylmercury (using the assumption of total mercury in fish being present as 100% methylmercury as a conservative assumption):

$$MSMC = \frac{BW \times DM \times TDI}{MCF \times GP}$$

Where:

MSMC = Maximum safe monthly consumption (pounds per month)
BW = Body weight (kg)

- Children = 30 kg
- Women of childbearing age = 60 kg
- Adult men and seniors = 60 kg

DM = Days in a month (30 d/month)
TDI = Tolerable daily intake for methylmercury (µg/kg bw/d)

- Children = 0.2 µg/kg bw/d
- Women of childbearing age = 0.2 µg/kg bw/d
- Adult men and seniors = 0.47 µg/kg bw/d

MCF = Mercury concentration in fish (µg/g) (see Table 1 for assumed concentrations)
GP = Grams in a pound (454 grams per pound)

As an example, the following maximum safe monthly consumption of Lake Whitefish (less than 300 mm) from Stephens Lake was estimated for children:

$$MSMC = \frac{30 \text{ kg} \times 30 \text{ d/month} \times 0.2 \text{ µg/kg bw/d}}{0.068 \text{ µg/g} \times 454 \text{ g/pound}}$$

MSMC = 5.8 pounds per month

Using this approach, maximum safe monthly consumption rates were estimated for each of the fish size classes from each of the three lakes. Tables 1 to 3 provide the maximum safe monthly consumption estimates for fish from each of lakes.

As noted in Manitoba Water Stewardship (2007), if fish are consumed from different categories, this will change the amount of fish that can be consumed from any one category. Manitoba Water Stewardship (2007) provides examples of how the approach works (briefly, if a person eats one-half of the listed amount from one category, then they can consume one-half of the listed amount from another category without exceeding the safe intake rate for mercury).

Finally, it is noted that due to concerns about conservation, consumption recommendations for Lake Sturgeon are not planned to be included in the communication material for the various communities. Instead, the consumption recommendations provided in Tables 2, 3 and 4 are provided to those involved in Risk Management Plan activities (in case community members were interested in the mercury concentrations and associated risks from Lake Sturgeon).

Table 2 Maximum Safe Monthly Consumption of Fish Due to Mercury under Keeyask Pre-operation Conditions for Stephens Lake

Fish Species	Fish Size Class (mm fork length)	Assumed Total Mercury Concentration (µg/g; wet weight)	Maximum Safe Monthly Consumption (pounds per month)		
			Children	Women of Childbearing Age	Men and Seniors
Lake Whitefish	<300 mm	0.068 (0.068)	5.8 (5.8)	12 (11.7)	27 (27.4)
	300-450 mm	0.086 (0.088)	4.6 (4.5)	9.2 (9.0)	22 (21.2)
	>450 mm	0.158 (0.156)	2.5 (2.5)	5.0 (5.1)	12 (11.9)
Northern Pike	<500 mm	0.17 (0.151)	2.3 (2.6)	4.7 (5.3)	11 (12.3)
	500-750 mm	0.369 (0.334)	1.1 (1.2)	2.1 (2.4)	5.0 (5.6)
	>750 mm	0.803 (0.804)	0.5 (0.5)	1.0 (1.0)	2.3 (2.3)
Walleye	<400 mm	0.297 (0.173)	1.3 (2.3)	2.7 (4.6)	6.3 (10.8)
	400-550 mm	0.503 (0.409)	0.8 (1.0)	1.6 (1.9)	3.7 (4.6)
	>550 mm	0.721 (0.719)	0.5 (0.6)	1.1 (1.1)	2.6 (2.6)
Lake Sturgeon*	425-1,390 mm	0.186 (0.196)	2.1 (2.0)	4.3 (4.0)	10 (9.5)

Values in parentheses represent the previous values used to develop draft communication material. Note that children, women of childbearing age and men/seniors were assumed to weight 30 kg, 60 kg and 60 kg, respectively. In addition, total mercury concentrations were conservatively assumed to be present 100% as methylmercury.

* Because Lake Sturgeon greater than 1,100 mm may have substantially higher mercury concentrations than 0.186 µg/g, these consumption recommendations may not be reflective of risks from consistent consumption of fish larger than 1,100 mm

Table 3 Maximum Safe Monthly Consumption of Fish Due to Mercury under Keeyask Pre-operation Conditions for Gull Lake

Fish Species	Fish Size Class (mm fork length)	Assumed Total Mercury Concentration (µg/g; wet weight)	Maximum Safe Monthly Consumption (pounds per month)		
			Children	Women of Childbearing Age	Men and Seniors
Lake Whitefish	<300 mm	0.042 (0.042)	9.4 (9.4)	19 (18.9)	44 (44.4)
	300-450 mm	0.072 (0.071)	5.5 (5.6)	11 (11.2)	26 (26.2)
	>450 mm	0.178 (0.149)	2.2 (2.7)	4.5 (5.3)	11 (12.5)
Northern Pike	<500 mm	0.150 (0.141)	2.6 (2.8)	5.3 (5.6)	12 (13.2)
	500-750 mm	0.370 (0.277)	1.1 (1.4)	2.1 (2.9)	5.0 (6.7)
	>750 mm	0.700 (0.708)	0.6 (0.6)	1.1 (1.1)	2.7 (2.6)
Walleye	<400 mm	0.177 (0.117)	2.2 (3.4)	4.5 (6.8)	11 (15.9)
	400-550 mm	0.491 (0.394)	0.8 (1.0)	1.6 (2.0)	3.8 (4.7)
	>550 mm	0.739 (0.688)	0.5 (0.6)	1.1 (1.2)	2.5 (2.7)
Lake Sturgeon*	425-1,390 mm	0.186 (0.196)	2.1 (2.0)	4.3 (4.0)	10 (9.5)

Values in parentheses represent the previous values used to develop draft communication material. Note that children, women of childbearing age and men/seniors were assumed to weight 30 kg, 60 kg and 60 kg, respectively. In addition, total mercury concentrations were conservatively assumed to be present 100% as methylmercury.

* Because Lake Sturgeon greater than 1,100 mm may have substantially higher mercury concentrations than 0.186 µg/g, these consumption recommendations may not be reflective of risks consistent consumption of fish larger than 1,100 mm

Table 4 Maximum Safe Monthly Consumption of Fish Due to Mercury under Keeyask Pre-operation Conditions for Split Lake

Fish Species	Fish Size Class (mm fork length)	Assumed Total Mercury Concentration (µg/g; wet weight)	Maximum Safe Monthly Consumption (pounds per month)		
			Children	Women of Childbearing Age	Men and Seniors
Lake Whitefish	<300 mm	0.033 (0.030)	12 (13.2)	24 (26.4)	57 (62.1)
	300-450 mm	0.082 (0.084)	4.8 (4.7)	9.7 (9.4)	23 (22.2)
	>450 mm	0.126 (0.13)	3.1 (3.0)	6.3 (6.1)	15 (14.3)
Northern Pike	<500 mm	0.171 (0.161)	2.3 (2.5)	4.6 (4.9)	11 (11.6)
	500-750 mm	0.421 (0.367)	0.9 (1.1)	1.9 (2.2)	4.4 (5.1)
	>750 mm	0.641 (0.573)	0.6 (0.7)	1.2 (1.4)	2.9 (3.3)
Walleye	<400 mm	0.255 (0.222)	1.6 (1.8)	3.1 (3.6)	7.3 (8.4)
	400-550 mm	0.352 (0.27)	1.1 (1.5)	2.3 (2.9)	5.3 (6.9)
	>550 mm	0.692 (0.649)	0.6 (0.6)	1.1 (1.2)	2.7 (2.9)
Lake Sturgeon*	425-1,390 mm	0.186 (0.196)	2.1 (2.0)	4.3 (4.0)	10 (9.5)

Values in parentheses represent the previous values used to develop draft communication material. Note that children, women of childbearing age and men/seniors were assumed to weight 30 kg, 60 kg and 60 kg, respectively. In addition, total mercury concentrations were conservatively assumed to be present 100% as methylmercury.

* Because Lake Sturgeon greater than 1,100 mm may have substantially higher mercury concentrations than 0.186 µg/g, these consumption recommendations may not be reflective of risks from consistent consumption of fish larger than 1,100 mm

Conclusions

It is recommended that these updates to the consumption recommendations be considered by the Keeyask Project's Mercury and Human Health Implementation Group for future communication products. As new fish data become available, it will be important to revisit the results of the HHRA and the recommendations provided in this memorandum.

References

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NSC (North/South Consultants Inc.). 2017. Draft Memorandum: Calculation of Length-Class Specific Fish Mercury Concentrations, their Update Based on Recently Collected Data, and Implications for the Keeyask HHRA and Related Communication Products. Dated July 24, 2017.

Wilson Scientific. 2013. Human Health Risk Assessment of the Mercury from the Proposed Keeyask Generation Project. June 2012; Revised April 2013.

Statement of Limitations

This report has been prepared by Wilson Scientific Consulting Inc. (Wilson Scientific) for the sole benefit of Manitoba Hydro. Any use that a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Wilson Scientific accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional staff in accordance with generally accepted scientific practices current at the time the work was performed.

Any site-specific information provided by Manitoba Hydro, North/South Consultants or other parties has been assumed by Wilson Scientific to be accurate. Conclusions presented in this report should not be construed as legal advice.

This risk assessment was undertaken exclusively for the purpose outlined herein and was limited to those contaminants, exposure pathways, receptors, and related uncertainties specifically referenced in the

report. This work was specific to the site conditions and land use considerations described in the report. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations.

This report describes only the applicable risks associated with the identified environmental hazards, and is not intended to imply a risk-free site. Should any conditions at the site be observed or discovered that differ from those at the sample locations, or should the land use surrounding the identified hazards change significantly, Wilson Scientific requests that to be notified immediately to reassess the conclusions provided herein.

APPENDIX 3:
NORTHERN ROAD TRAFFIC MONITORING QUARTERLY DATA COLLECTION SUMMARY APRIL 2019

NORTHERN ROAD TRAFFIC MONITORING QUARTERLY DATA COLLECTION SUMMARY MARCH 2019

PR280

Manitoba Hydro

Table of Contents

Summary

Background

Construction-related activities associated with the development of the Keeyask Project, Keewatinohk Converter Station Project and Bipole III Transmission Project (BPIII) has generated additional traffic on various segments of the Provincial Road (PR) network, in particular, on PR 280 and PR 290. Three types of traffic are being realized - local traffic, workforce traffic, and traffic generated from shipping materials and equipment for both local and site specific needs.

The Environmental Impact Statements (EIS) for both the Keeyask Project and the Bipole III Transmission Project (BPIII) contain requirements for continual traffic monitoring throughout the lifespan of these Projects. While the Environmental Impact Statements (EIS) for both the Keeyask and BPIII Projects predicted that existing transportation networks and plans for PR 280 upgrades would be able to accommodate the changes associated with Project construction, community concerns remain regarding traffic safety and road conditions. Manitoba Infrastructure (MI) is responsible for the existing provincial highway system, including maintenance and upgrades to PR 280 and PR 290. Monitoring efforts are being undertaken with information from MI, Manitoba Public Insurance (MPI), and the Keeyask site access gates to assess EIS predictions and respond to community concerns.

Traffic monitoring stations have been installed at five locations on PR 280 and PR 290 – Site 1, 2, 3, 10 and 11. Refer to **Appendix A** for a map of the traffic monitoring station locations and monitoring station failures. MI installed the stations in 2015 with funding provided by Manitoba Hydro (MH) and MI provides ongoing maintenance of the equipment. MI collects the data from the stations and submits the information on a monthly basis to MH. Induction loops are able to differentiate various vehicle types based upon axle count and spacing. Vehicle classifications have been grouped into small, medium and large vehicles as shown in **Appendix B**.

Notable Quarterly Results:

Site 1 *PR 280 – between PR 391 and Split Lake*

- Traffic volumes decreased during the current quarterly time period for the same time period.

Site 2 *PR 280 – between Split Lake and west of Keeyask gate*

- Traffic volumes decreased during January and February compared to the previous year. Results for March cannot be confirmed as the station has an ongoing failure that began March 12, 2019.

Site 3 *PR 290 – east of PR280 / 290 intersection*

- Traffic volumes decreased during the current quarterly time period compared to the previous year.

Site 10 *PR 280 – between PR 290 and Gillam*

- Traffic volumes decreased during the current quarterly time period compared to the previous year.

Site 11 *PR 280 – between east of Keeyask gate and PR 290*

- Traffic volumes decreased during the current quarterly time period compared to the previous year.

Keeyask Gate *North Access*

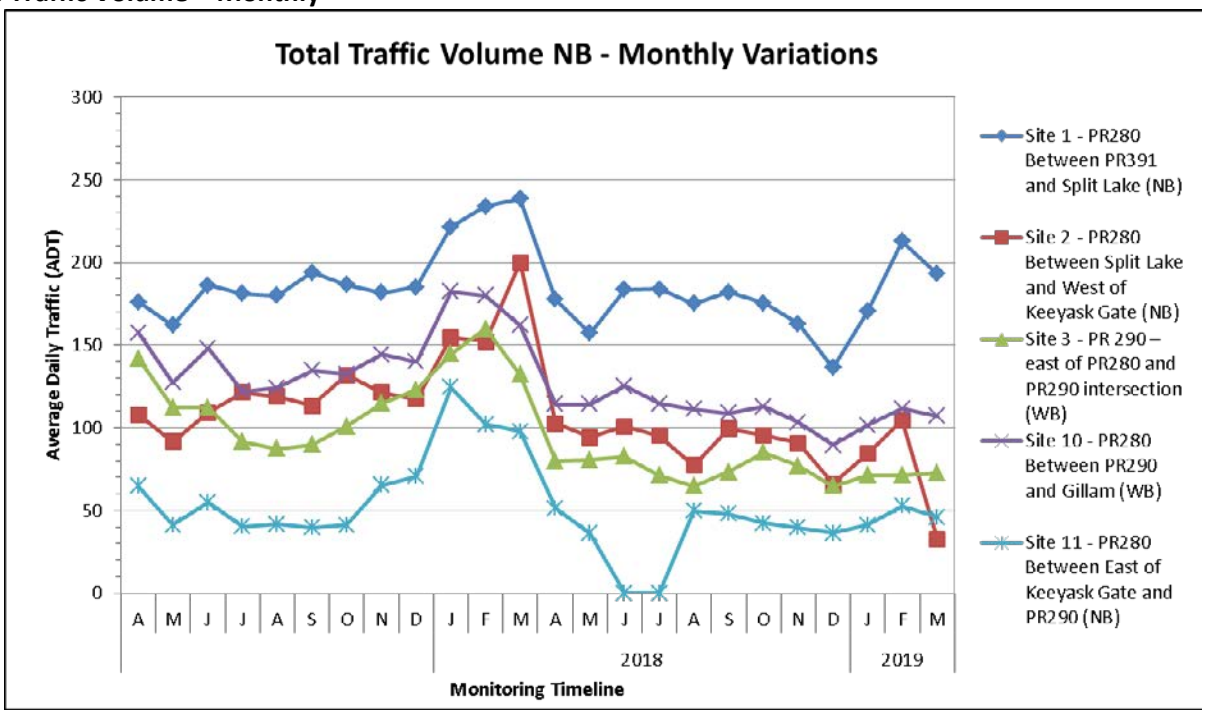
- Gate access has decreased by 55% during this quarter when compared to the previous year.

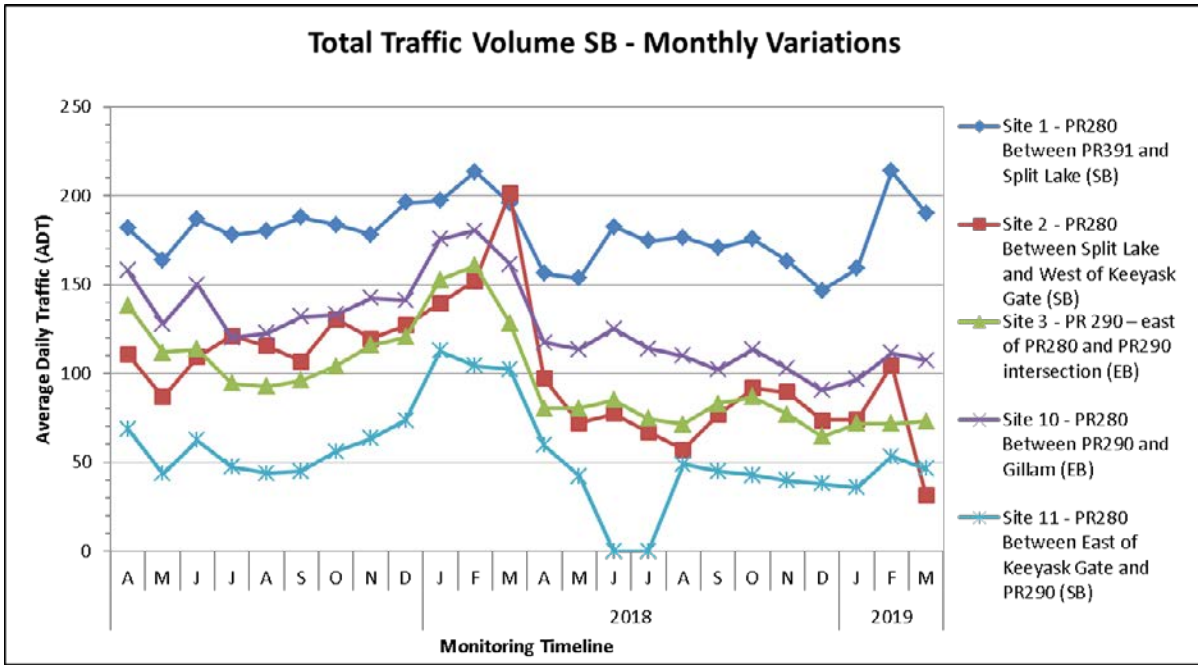
Keeyask Gate *South Access*

- Gate access data added to reporting.

Data Collection Results

Total Traffic Volume – Monthly

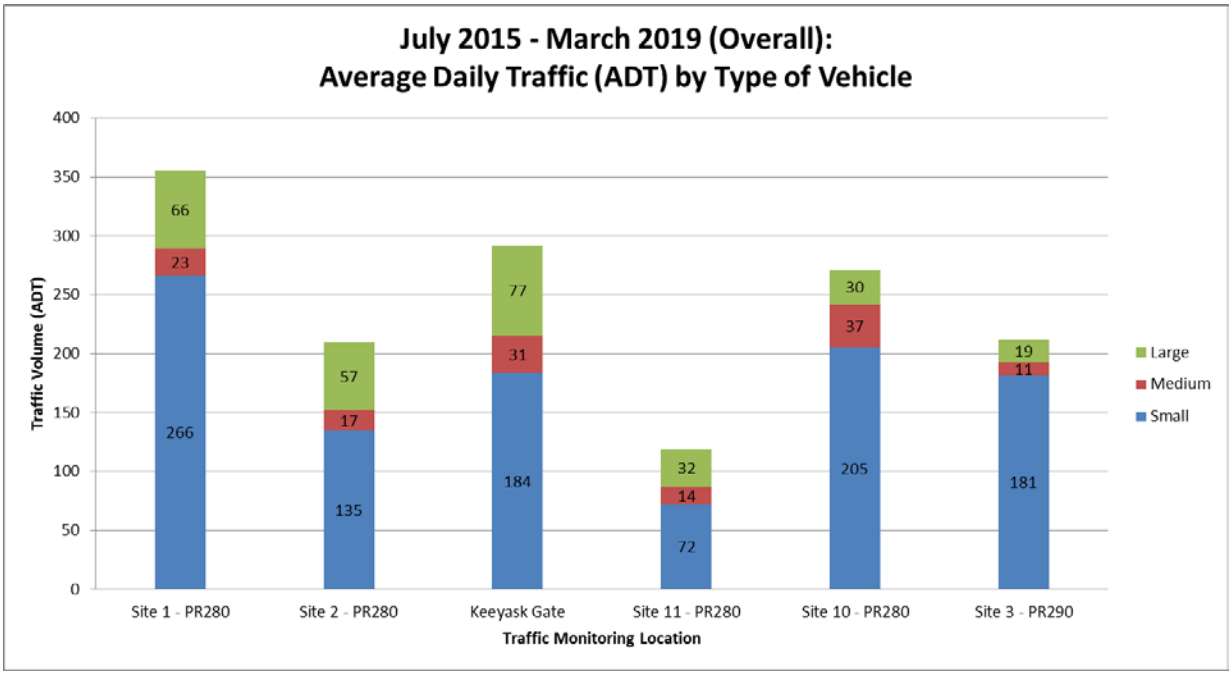


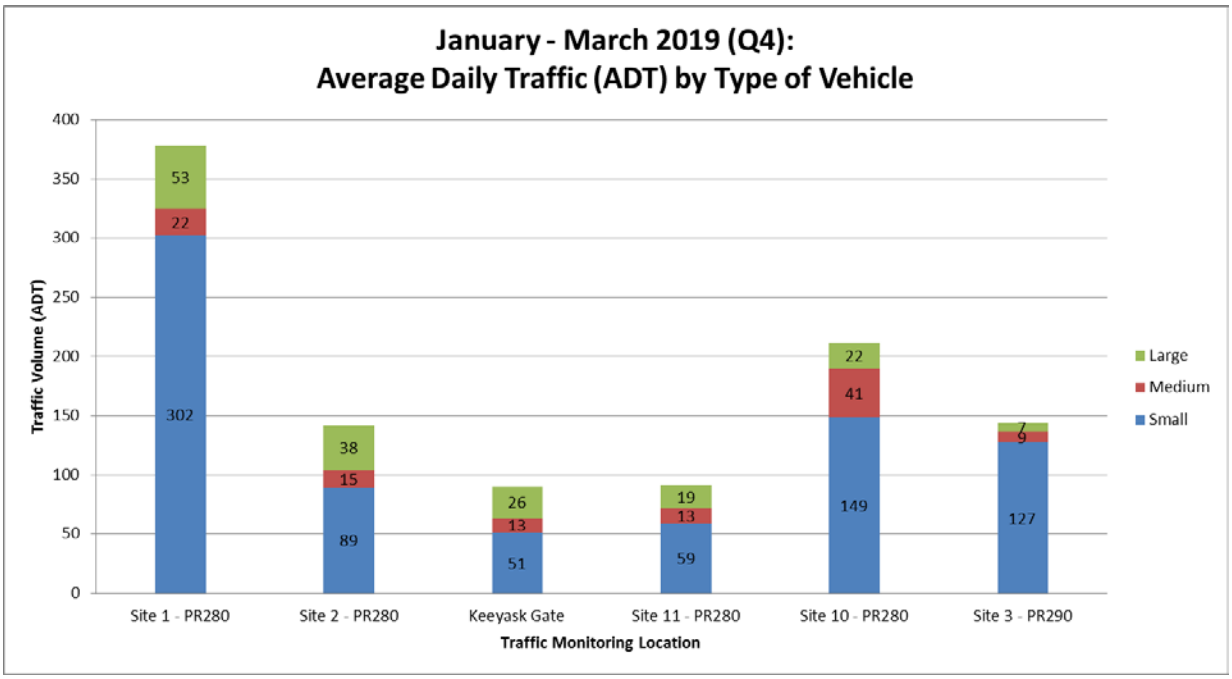


Summary

- Data shows a decrease at all site locations in January, Februaryand March in comparison to the same time frame from the previous year in both Southbound and Northbound directions.

Average Daily Traffic (ADT) – by type of vehicle

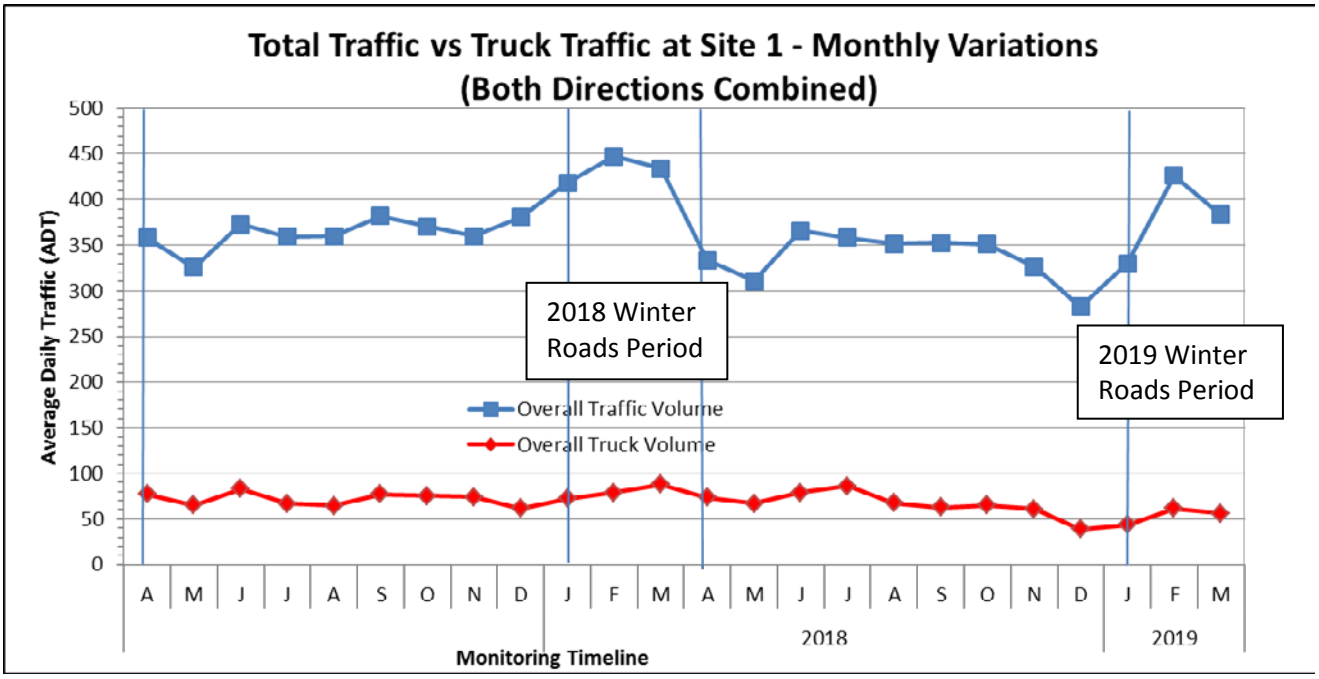




Summary

- Small vehicles result in the highest percentage of vehicle type.
- ADT vs traffic type graphs by site location are given in **Appendix C.**

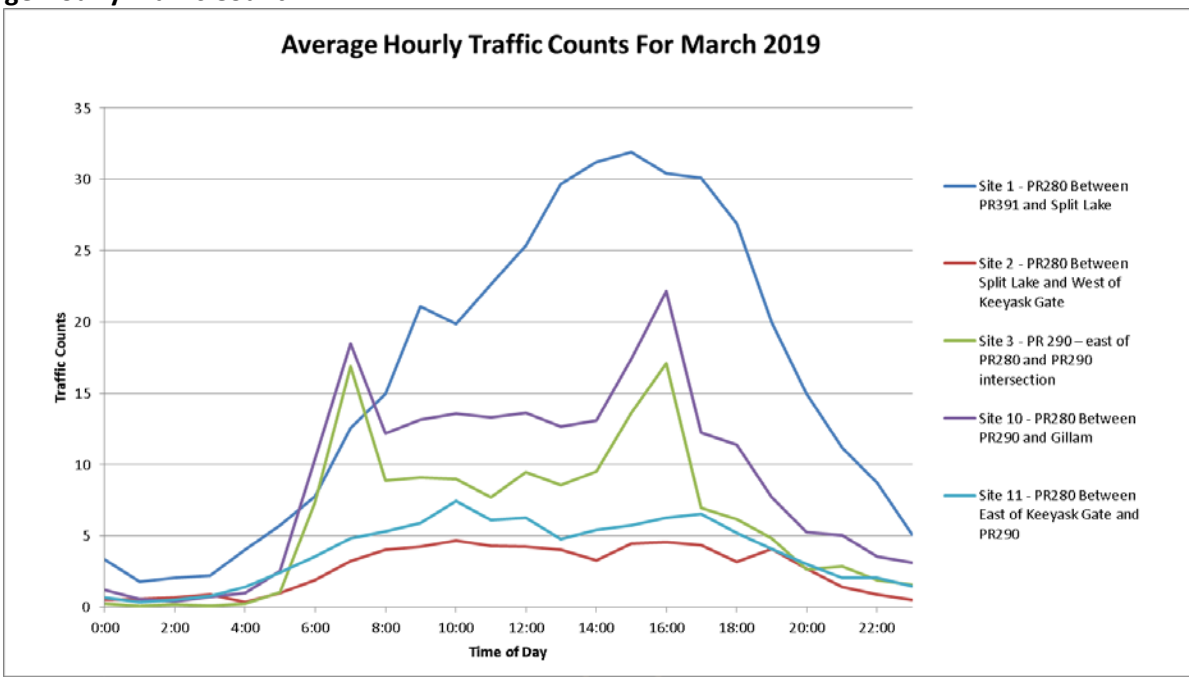
Total Traffic vs Truck Traffic



Summary

- Truck traffic (i.e. large vehicles) graphed against overall traffic does not indicate a correlation to increased volume.
- Truck traffic vs overall traffic graphs for other sites are given in **Appendix D.**

Average Hourly Traffic Count



Summary

- Peak travel time between 12 and 6 pm.

Keeyask Security Gate Records

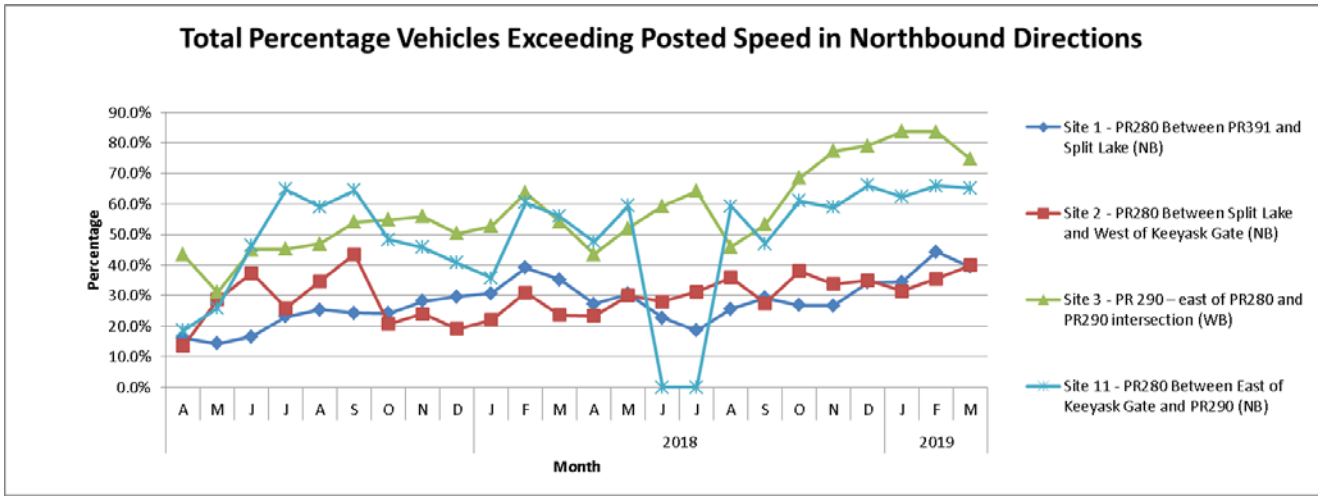
The security gates on the North Access Road and South Access Road into Keeyask collect data on vehicles entering the site. Security personnel located at the gate tracks the type and number of vehicles that enter and leave the site.

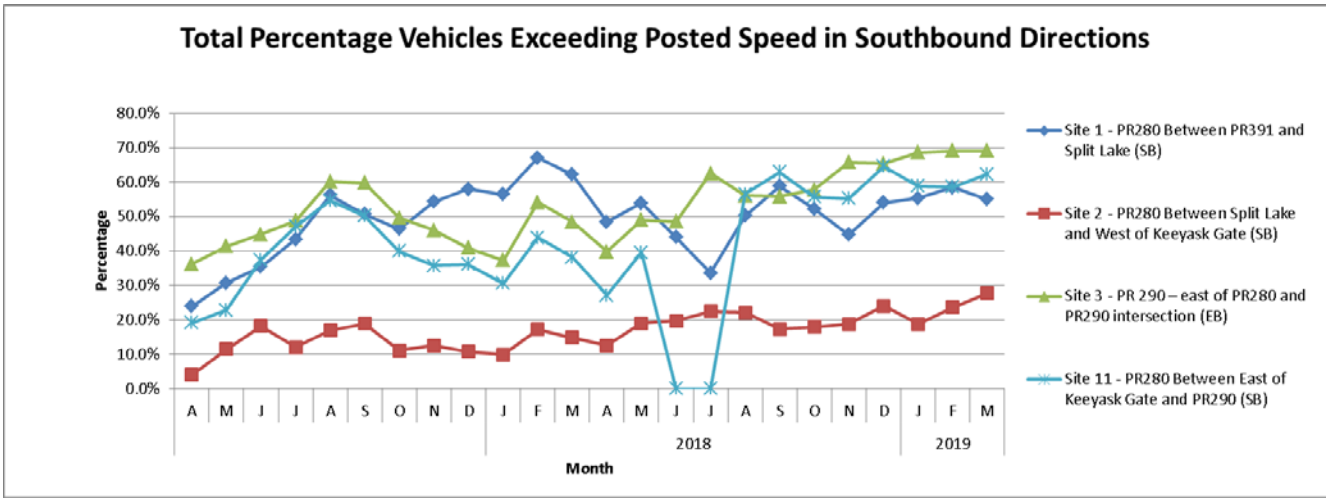
KEEYASK NORTH ACCESS ROAD SECURITY GATE				KEEYASK SOUTH ACCESS ROAD SECURITY GATE			
Period		Gate Count Total	Daily Average	Period		Gate Count Total	Daily Average
2017	April	3,205	107	2017			
	May	3,380	109				
	June	3,510	117				
	July	3,376	109				
	August	3,718	120				
	September	3,732	124				
	October	3,981	128				
	November	2,701	90				
	December	3,117	101				
2018	January	3,842	124	2018			
	February	5,062	181				
	March	5,689	184				
	April	3,581	119		April	3,721	124
	May	3,971	128		May	3,568	115
	June	3,884	129		June	3,365	112
	July	3,869	125		July	3,340	108
	August	3,606	116		August	3,274	106
	September	3,156	105		September	1,833	61
	October	3,465	112		October	1,346	43
	November	3,031	101		November	1,663	55
	December	2,181	70		December	2,136	69
2019	January	2,565	83	2019	January	4,169	134
	February	2,823	101		February	2,810	100
	March	2,689	87		March	3,415	110

Summary

- Gate data shows decrease of 6,516 vehicles through the North Access Gate for the January to March time period year over year. This is as a result of a reduced number of large trucks as well as the opening of the South Access Gate which allows the transport of employees travelling from the Gillam Airport to Keeyask.
- South Access Road gate data added to reporting. Data reporting started April 2018. Data is reflective of all traffic including daily construction activities such as hauling.

Speeding Analysis





Summary

- Graphs are representative of vehicles exceeding the posted speed limit (>90 km/hr.) as recorded by monitoring stations.

Average Vehicle Speed

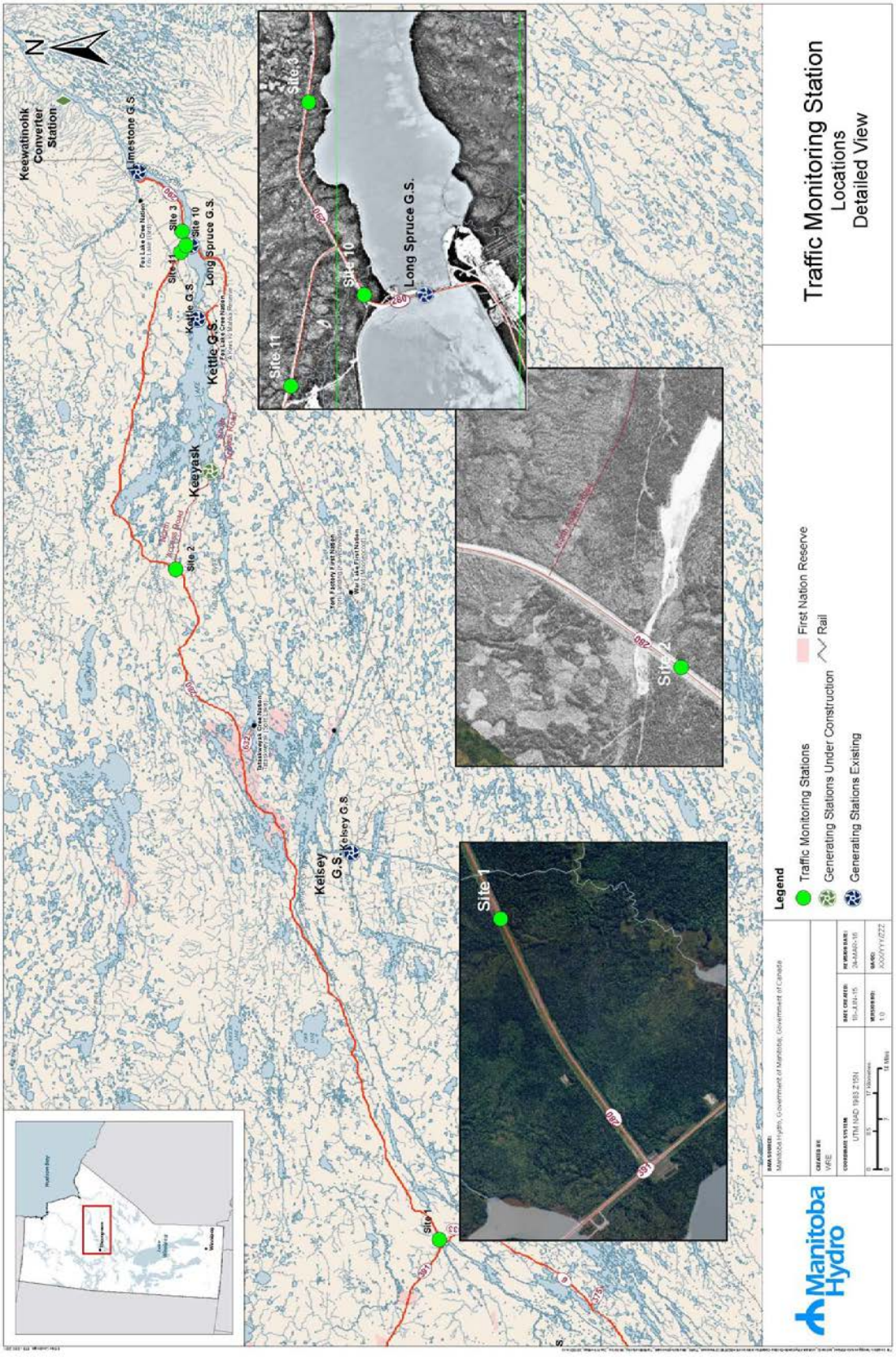
Average Vehicle Speed

Station	Posted Speed	Avg Speed (Apr to June 2018)			Avg Speed (July to Sept 2018)			Avg Speed (Oct to Dec 2018)			Avg Speed (Jan to Mar 2019)		
		Small	Medium	Large	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Site 1 – PR280 between PR391 and Split Lake	90 - NB	84	79	74	83	76	73	84	77	76	73	62	61
	90 - SB	92	84	79	91	82	79	92	83	82	82	70	67
Site 2 – PR280 between Split Lake and Keeyask	90 - NB	84	79	68	85	81	71	88	83	73	93	87	77
	90 - SB	75	73	66	75	74	71	78	74	68	80	72	69
Site 3 – PR290 east of PR280/290 intersection	90 - WB	92	83	83	92	85	85	99	93	92	92	87	80
	90 - EB	90	90	77	93	90	82	95	89	86	93	96	83
Site 11 – PR280 north of the PR280/290 intersection	90 - NB	94	91	82	93	88	80	95	88	86	97	95	84
	90 - SB	85	82	77	96	91	85	94	85	86	93	88	84

Summary

- Average Vehicle Speed data results in the small vehicle category averaging the highest speeds.
- Average speed is higher in winter months which can be attributed to frozen road conditions that tend to be smoother and free of dust.
- Speeding has varied throughout the years with a decrease in spring and fall due an increased likelihood of poor road conditions related to weather, road reconstruction, or even to driver awareness initiatives being implemented by MH and MI.
- Monitoring locations give data related to that specific location only.
    - Site 1 station shows higher speeding rates for SB traffic compared to NB traffic due to the monitoring station being in close proximity to the PR 391 intersection.
    - Site 10 located at curve on north side of Long Spruce Generating Station. Vehicles are slowing down to navigate the curve or have just come out of the curve and are still speeding up; therefore speed data for Site 10 was not included in this analysis.
    - Site 2 has lower speeding rates due to being located near the Keeyask North Access Road, Northbound vehicles would be slowing down to make the turn and Southbound vehicles would still be speeding up after turning on the road.
- Speeding information by vehicle type by Station is given in **Appendix E.**

Appendix A – Traffic Monitoring Locations and List of Failures



Monitoring Station Failures:

- Station 1: November 2015 approximately two weeks.
    - Average daily traffic was extrapolated based on the partial month's data collection.
- Station 1: June 2016 approximately three days.
    - Results have been based on a 27 day period rather than 30 days.
- Station 1: July 2016 approximately three weeks.
    - Results are skewed.
- Station 1: July 31, 2017.
    - Loss of data.
- Station 2: September 2017approximately 2 weeks.
    - Loss of data.
- Station 11: September 2017 approximately 1 week.
    - Loss of data.
- Station 11: June and July 2018 for Station 11.
    - Loss of data due to a recording device error.
- Station 2: March 12 – Ongoing
    - Loss of data due to recording device error.

Appendix B - Vehicle Classifications

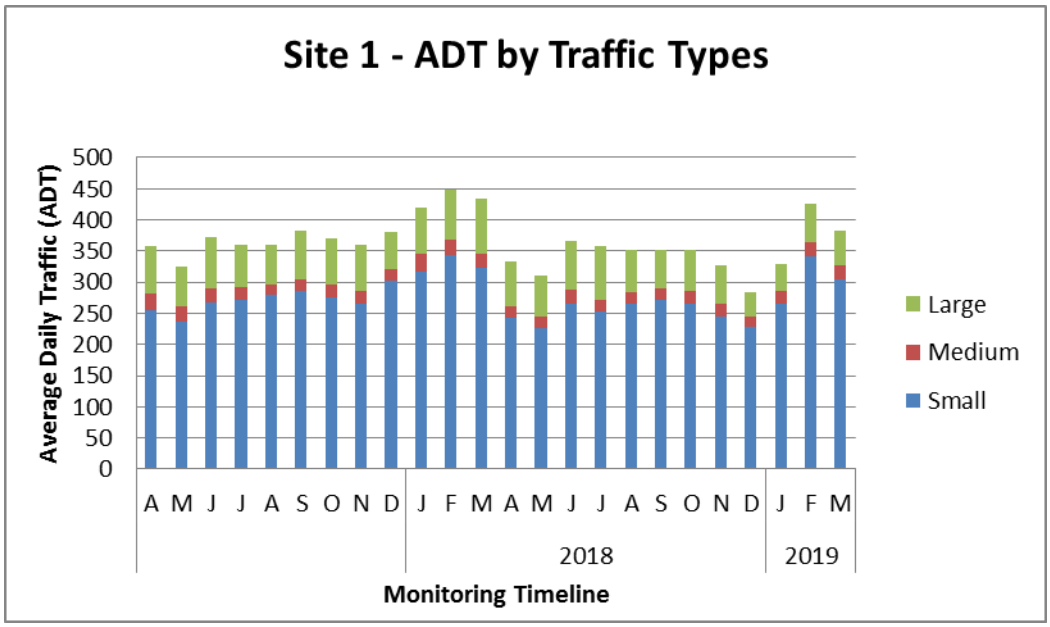
The induction loops that are buried within the roadway are spaced at a given interval. The time it takes for the front axle and rear axle to cross the loops gives an indication of the speed of the vehicle within an accuracy range of +/- 5 km/h. This information is reflective of vehicle speed tendencies at the traffic monitoring station location. The specific location of the traffic monitoring station may impact the speed tendencies dependent upon road geometry in each direction.

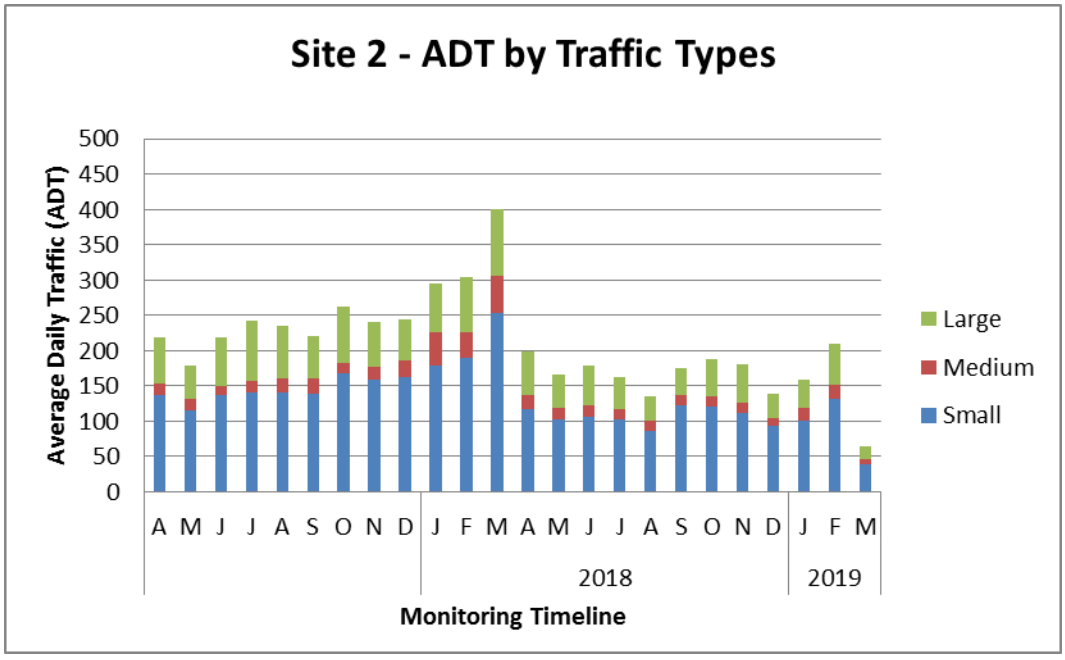
Vehicle Category	Vehicle Description
Small	
Medium	
Large	

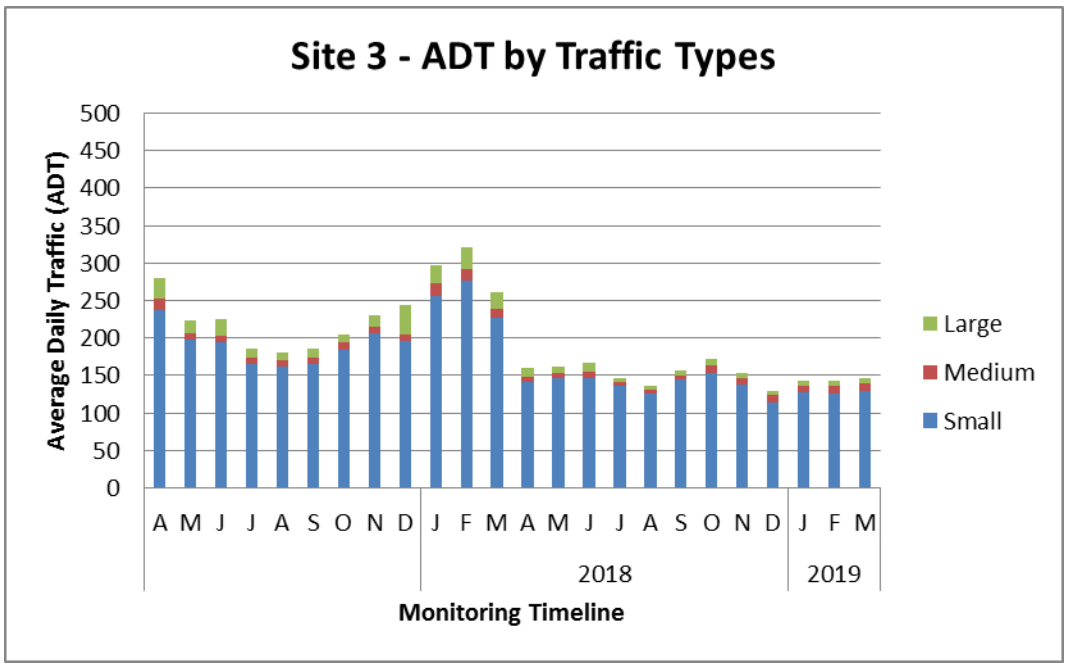
Bin 1	Class 1	Small	Cars, truck and vans
Bin 2	Class 2, 3, 4	Medium	Buses, single dual & tandem dual trucks, dual steering with tandem drive
Bin 3	Class 5 and 6	Large	Trucks 5 axles and up

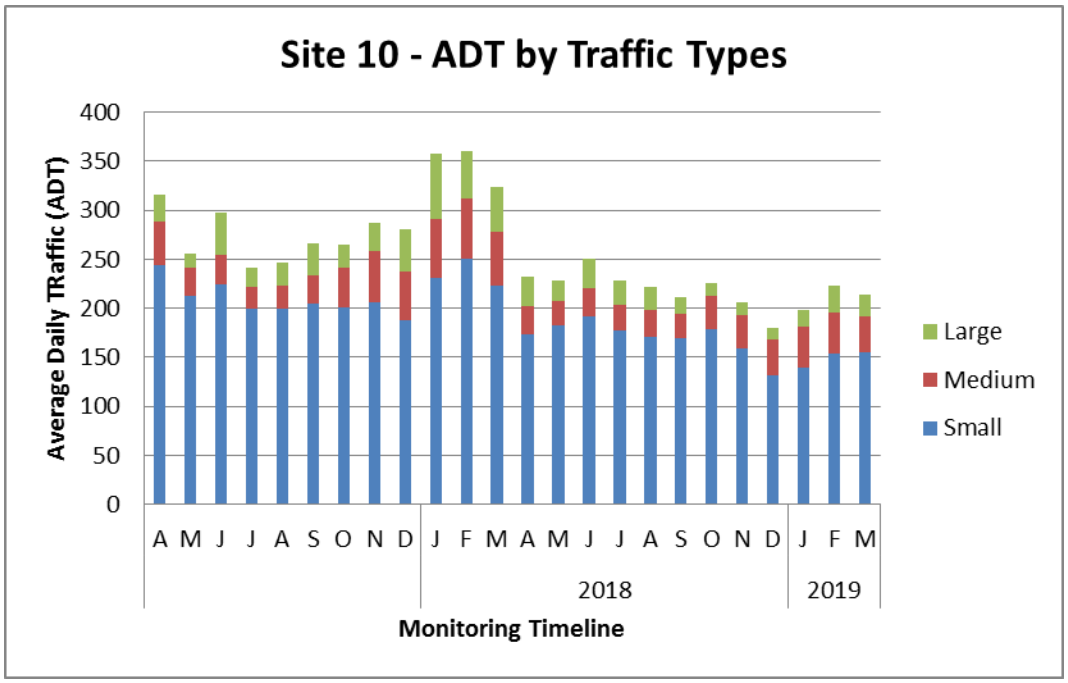
- Small vehicles are categorized as all passenger cars, trucks and vans.
- Medium vehicles are categorized as all buses and dual or tandem axle trucks.
- Large vehicles are categorized as all vehicles with five axles and more.

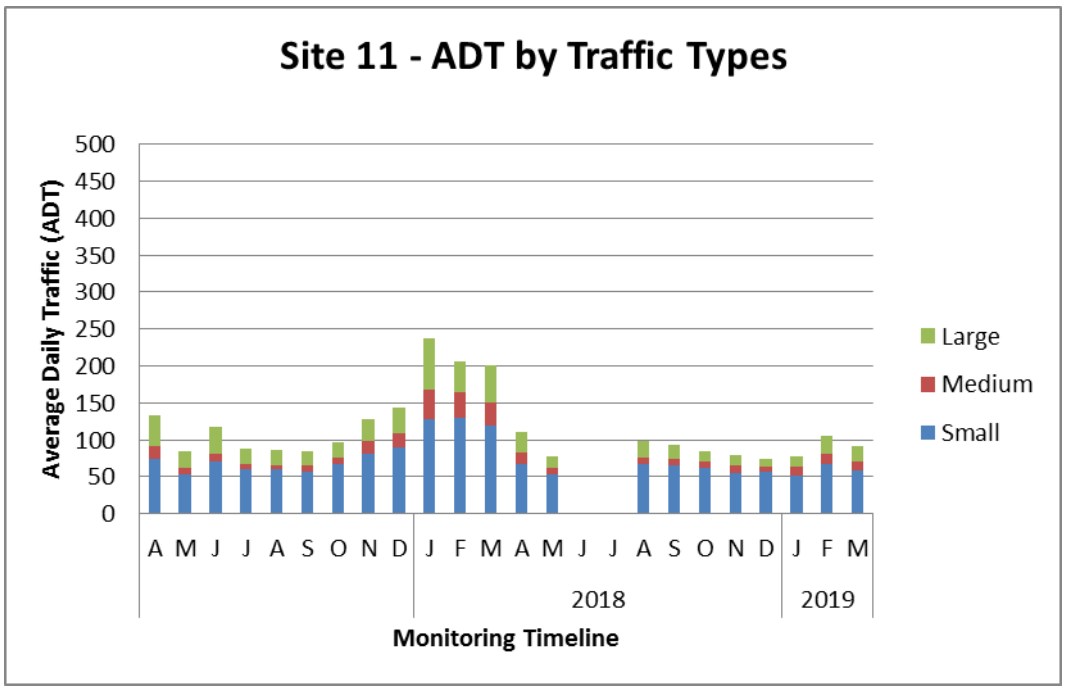
Appendix C – Monthly Traffic Counts



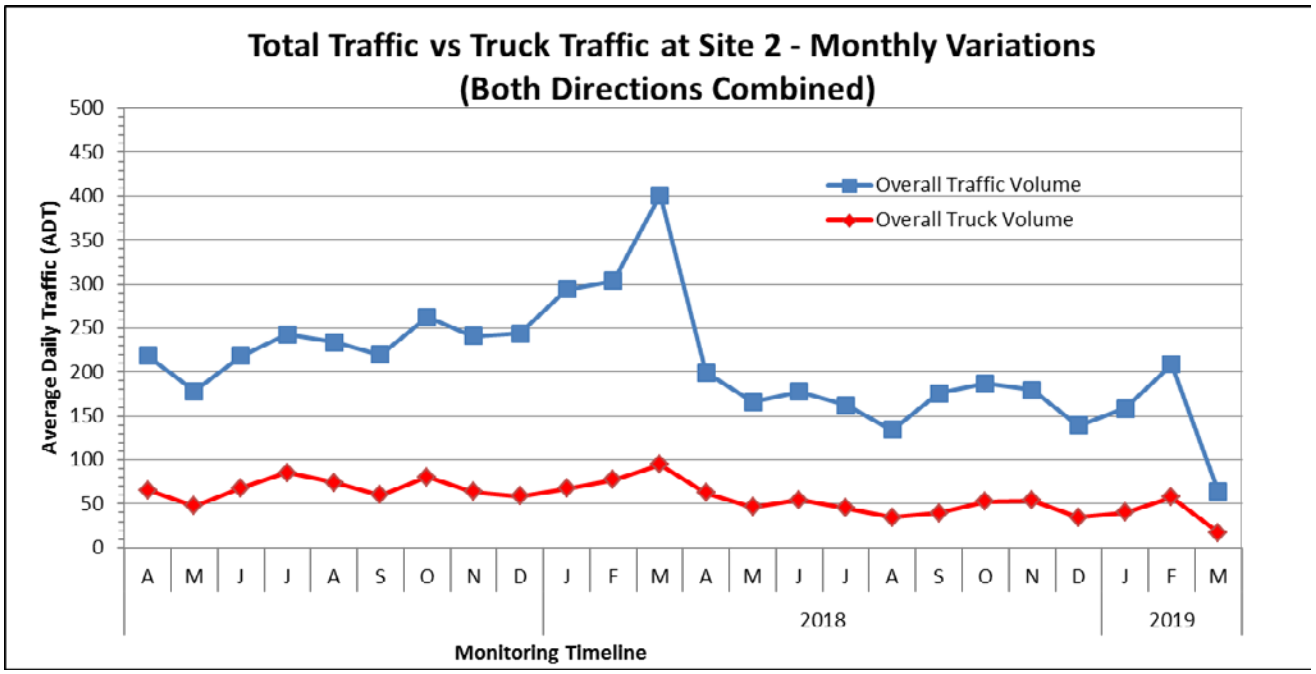


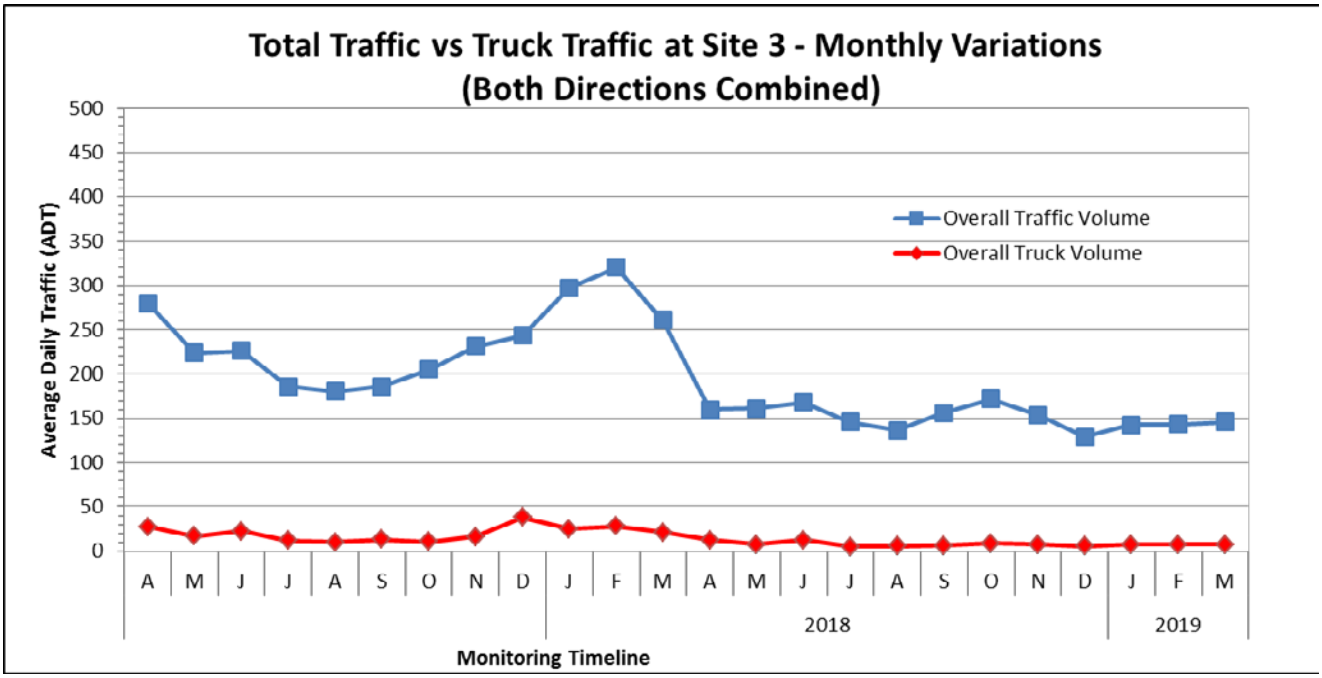


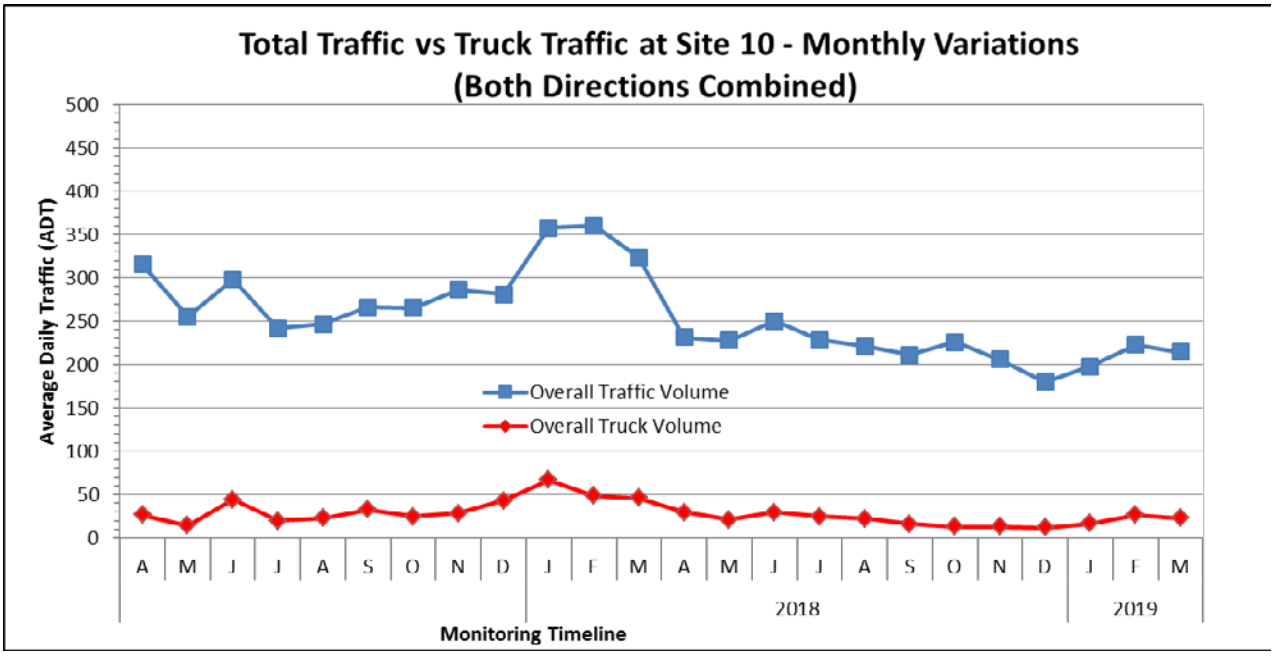


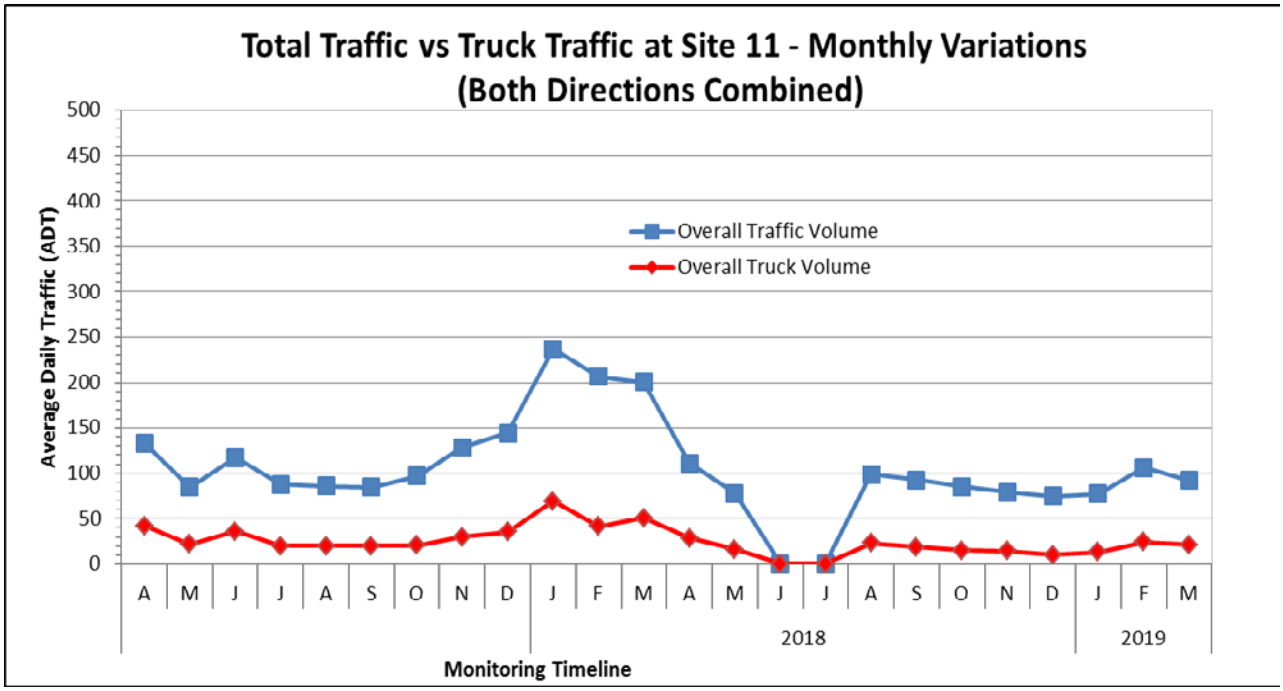


Appendix D – Truck Traffic vs Total Traffic

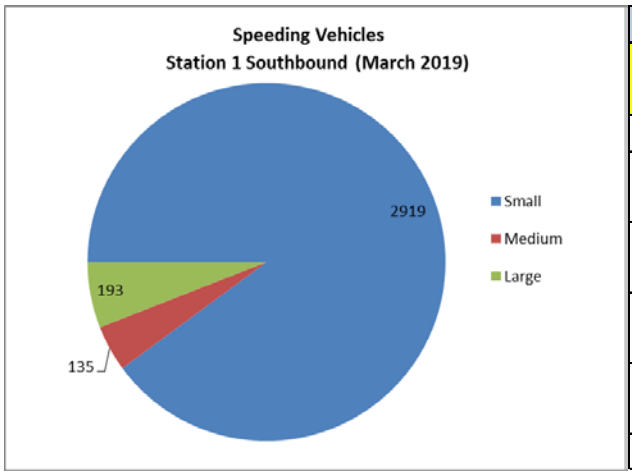






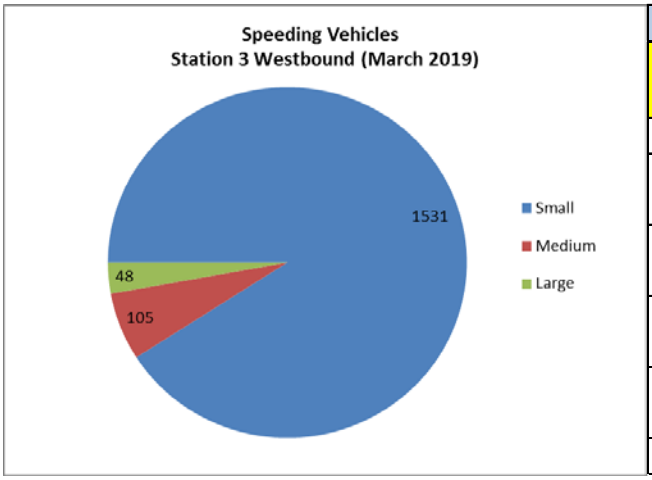


Appendix E – Speed Data by Vehicle Type



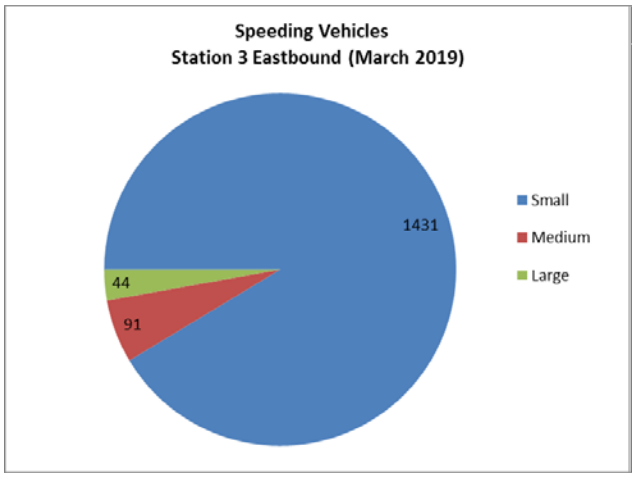
Speed Data Southbound - Station 1 March 2019				
	Small	Medium	Large	Total
<= 90 kph	1786	209	657	2652
	38.0%	60.8%	77.3%	45.0%
> 90 kph	2919	135	193	3247
	62.0%	39.2%	22.7%	55.0%
> 100 kph	1496	38	32	1566
	31.8%	11.0%	3.8%	26.5%
> 110 kph	544	11	2	557
	11.6%	3.2%	0.2%	9.4%
Total	4705	344	850	5899

Station 1 – PR 280 between PR 391 and Split Lake (Southbound)



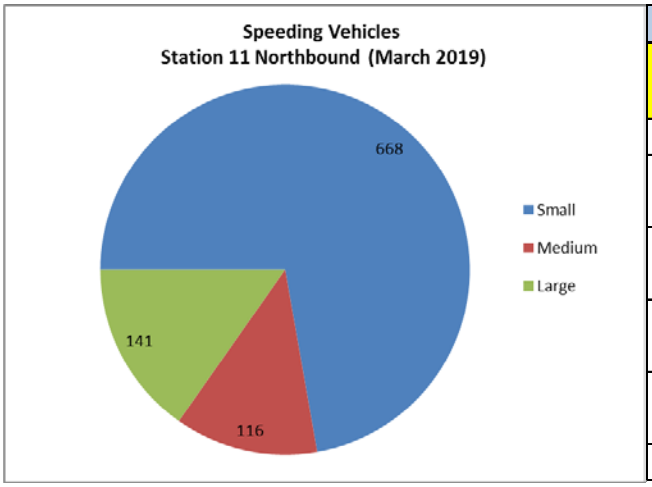
Speed Data Westbound - Station 3 March 2019				
	Small	Medium	Large	Total
<= 90 kph	451	56	67	574
	22.8%	34.8%	58.3%	25.4%
> 90 kph	1531	105	48	1684
	77.2%	65.2%	41.7%	74.6%
> 100 kph	750	39	16	805
	37.8%	24.2%	13.9%	35.7%
> 110 kph	312	12	2	326
	15.7%	7.5%	1.7%	14.4%
Total	1982	161	115	2258

Station 3 – PR 290 East of PR 280 and PR290 Intersection (Westbound)



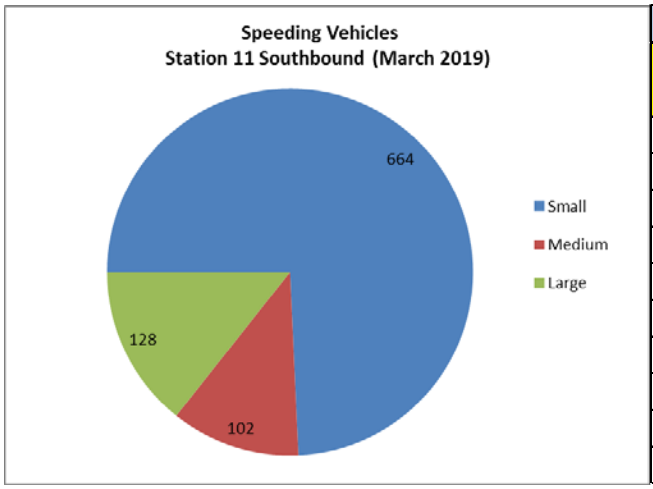
Speed Data Eastbound - Station 3 March 2019				
	Small	Medium	Large	Total
<= 90 kph	578	54	66	698
	28.8%	37.2%	60.0%	30.8%
> 90 kph	1431	91	44	1566
	71.2%	62.8%	40.0%	69.2%
> 100 kph	653	48	14	715
	32.5%	33.1%	12.7%	31.6%
> 110 kph	262	13	3	278
	13.0%	9.0%	2.7%	12.3%
Total	2009	145	110	2264

Station 3 – PR 290 East of PR 280 and PR290 Intersection (Eastbound)



Speed Data				
Northbound - Station 11 March 2019				
	Vehicle Length (cm)			Total
<= 90 kph	242	64	189	495
	26.6%	35.6%	57.3%	34.9%
> 90 kph	668	116	141	925
	73.4%	64.4%	42.7%	65.1%
> 100 kph	464	67	42	573
	51.0%	37.2%	12.7%	40.4%
> 110 kph	257	33	3	293
	28.2%	18.3%	0.9%	20.6%
Total	910	180	330	1420

Station 11 – PR 280 between East of Keeyask Gate and PR 290 (Northbound)



Speed Data				
Southbound - Station 11 March 2019				
	Small	Medium	Large	Total
<= 90 kph	259	80	201	540
	28.1%	44.0%	61.1%	37.7%
> 90 kph	664	102	128	894
	71.9%	56.0%	38.9%	62.3%
> 100 kph	369	44	31	444
	40.0%	24.2%	9.4%	31.0%
> 110 kph	137	16	3	156
	14.8%	8.8%	0.9%	10.9%
Total	923	182	329	1434

Station 11 – PR 280 between East of Keeyask Gate and PR 290 (Southbound)

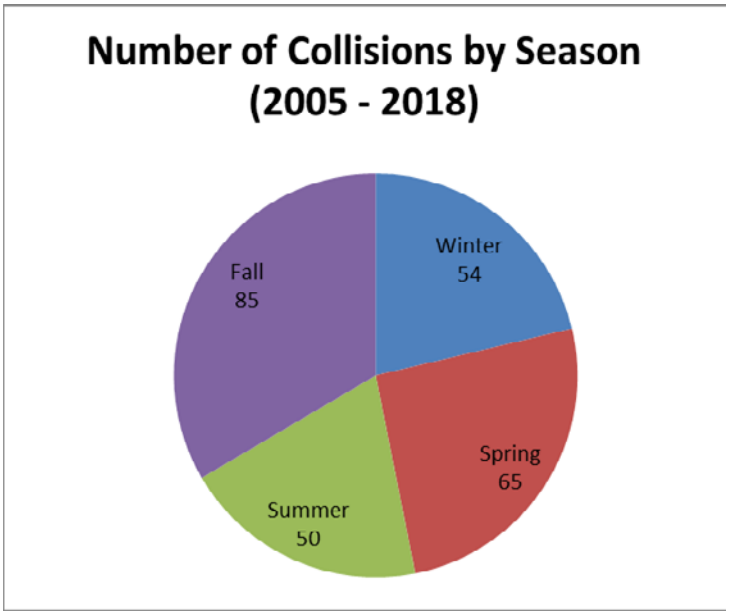
Appendix F – Annual Collision Summary

Reported collision data has been tracked by MPI up to the end of 2018. MPI is only able to log collisions that are reported and the details are limited to what is provided. In addition, the local RCMP detachment provides information on reported collisions.

Collision data is provided by MPI annually in January for PR 280. Collision data for PR 290 is very low and ranges from 0 collisions to a high of 2 collisions per year. For this reason, this data is not included in the following tables and graphs.

A collision is defined as any reported incident involving a personal injury or property damage to a vehicle. Property damage can be attributed to collisions with wildlife, running off the road into a fixed object, head on or side swipe collisions with other vehicles, overturned vehicles, and damage to vehicles as a result of hitting potholes/ruts. It does not include cracked or broken windshields from rocks kicked up by passing vehicles as this would not constitute a reportable collision.

PR 280 Number of Collisions by Season (2005-2018)



Summary

- There were a total of 254 collisions on PR 280 between 2005 and 2018.
- Average of 20 collisions per year.
- 26% of collisions occurred during the spring - March, April and May.
- 33% of collisions occurred during the fall - September, October and November.
- Single vehicle collisions accounted for approximately 100% percent of all collisions during the analysis period.

PR 280 Collision Severity and Contributing Factors

Year	Severity			Contributing Factor		
	Property Damage	Non-Fatal Injury	Fatality	Wildlife	Ran-off Road	Other/Unknown
2005	12	4	0	2	8	6
2006	11	6	0	3	13	1
2007	9	3	1	0	4	9
2008	6	2	0	1	4	3
2009	10	4	1	0	9	6
2010	8	1	0	1	3	5
2011	2	2	0	0	1	3
2012	2	0	0	0	1	1
2013	3	0	1	0	1	3
2014	26	4	0	6	3	21
2015	23	1	0	6	6	12
2016	34	3	0	7	8	22
2017	46	0	0	15	9	22
2018	28	1	0	8	6	14
Total	**220**	**31**	**3**	**49**	**76**	**128**

**Data available annually.*

Summary

- Approximately 87% of collisions along PR 280 were property damage.
- Running off the road was the contributing factor in 30% of collisions.
- Other factors, including collisions with other vehicles and overturning in the roadway accounted for approximately 51% of all reported collisions.
    - Typical causes are considered to be: loss of control, fatigue, speeding along curved sections or attempting to avoid another vehicle or wildlife.
- 2018 reported a decrease in overall collision statistics.

PR 280 Collision Rate

Year	Collision Rate (incidents per MVKT)
2005	0.98
2007	0.79
2009	0.82
2011	0.19
2013	0.14
2015	0.66
2016	0.97
2017	1.14
Average	**0.71**
MI Threshold	**1.5**

**2016 collision rate revised to correct previous reporting error.*

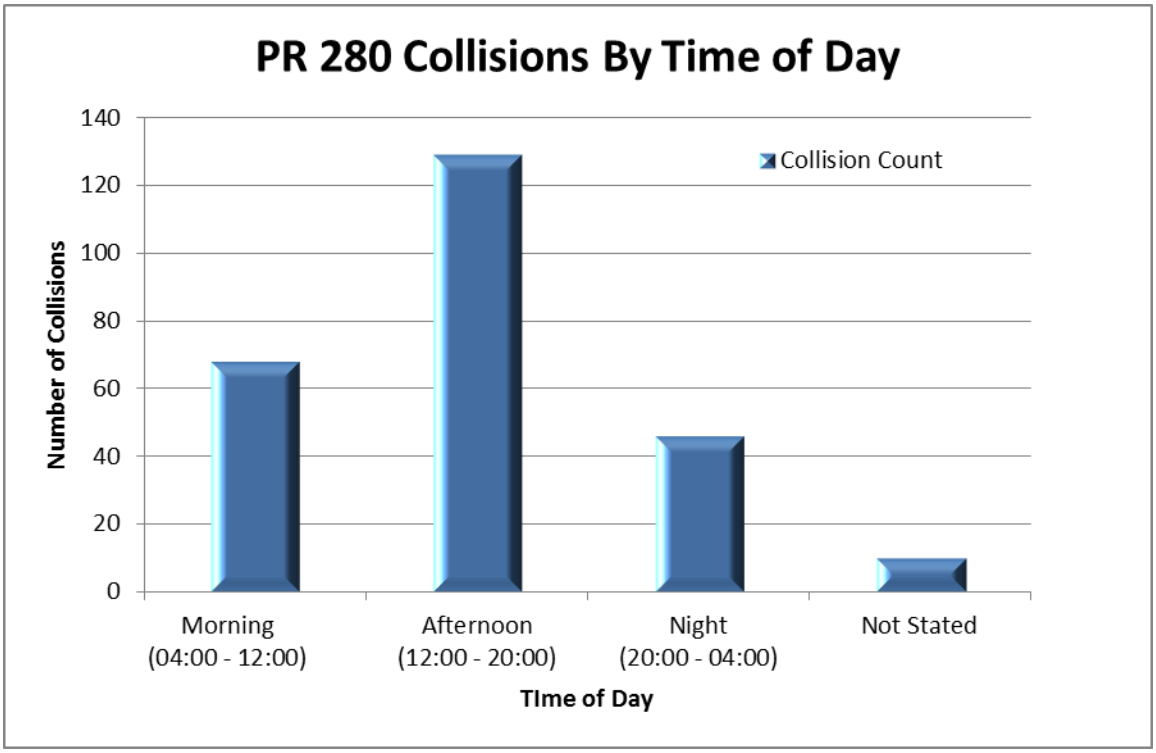
Calculation Notes:

- Collision rate (CR) is based on the number of collisions that occurred and the volume of traffic on a section of roadway during a specified period.
- CR is measured as the number of collisions per million vehicle-kilometres of travel (MVKT) on a section of roadway during the analysis period.
- Traffic volumes used in calculating the collision rate are the average of the annual average daily traffic (AADT) volume recorded each year over the eleven year period.
- Many agencies consider road sections with collision rates exceeding 1.5 incidents per MVKT as warranting further review.
- AADT counts used to calculate collision rate are based on a collection period of two weeks. Counts are extrapolated from two week count.

Summary:

- Based on the AADT and the number of collisions for 2005, 2007, 2009, 2011, 2013, 2015, 2016 and 2017 PR 280 has an average collision rate of approximately 0.71 incidents per MVKT over the study period.
- The collision rate of 1.14 remains below the industry standard threshold of 1.50 incidents per MVKT.

PR 280 Collisions by Time of Day



January 1, 2005 – December 31, 2018
Data available annually.

Summary:

- Approximately 51% of collisions occur in the afternoon.
- Approximately 27% of collisions occur in the morning.
- Daytime collisions are predominant.

